SMD Operations Procedures Manual

8.1.1.43 OPERATION OF UNIVERSAL COIL WINDER

Text Pages 1 through 26
Attachment(s) 1, 2, 3, 4, 5, 6

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Revision No. 03 Approved:

Signature on File 8/22/16
Division Head Date

Preparer(s): G. Jochen/A. Marone/P. Joshi

Table of Contents

1.0 Purpose and Scope 2
2.0 Responsibilities 2
3.0 Prerequisites 3
3.1 Training 3
3.2 Equipment 3
4.0 Precautions 3
5.0 Procedure 3
5.1 Overview of the Universal Coil Winder 3
5.2 Operator Controls 4
5.3 Initial Control Settings 13
5.4 Before Activating Power to the Winder 14
5.5 Winding-Manual Mode Set Up 14
5.5.1 To Activate Power to the Winder 14
5.5.2 Manual Operation 15
5.5.3 To Home Winder 16
5.5.4 To Set Cable Tension 16
5.6 Winding-Auto Mode 17
5.7 Shut Down Winder 19
5.8 Calibration Tensioning System 20
5.9 Interlock Test Procedure 22
5.10 Maintenance Procedure 26
6.0 Documentation 26
7.0 References 26
8.0 Attachments 27
1. Control Console Diagram 27
2. Control Panel 27
3. Gantry Panel 27
4. Interlock Test Form 27
5. Cable and Insulation Routing 27
6. Calibration Form 27

8.1.1.43 Operation of Universal Coil Winder

1.0 Purpose and Scope

1.1 To provide instruction in the operation of the Universal Coil Winder (Winder) located in Building 902.

2.0 Responsibilities

2.1 Authorized operators (Operators) of the Winder shall perform the tasks described here.

2.2 The Operator shall read and complete the following documentation:

2.2.1 Daily Log Book for Coil Programs. Entries shall include any information that the Operator deems important to pass along to the Coil Fabrication Supervisor, the Cognizant Engineer (CE), or the next work shift, including:

A. work accomplished regarding coil production;

B. coil discrepancies;

C. repairs to the Winder (brief description);

D. lessons learned;

E. irregularities during operation of the Winder.

F. Each repair and maintenance procedure;

G. Parts and material used.

2.2.3 Traveler associated with the coil being wound.

2.2.4 Interlock Test Form.

3.0 Prerequisites

3.1 Training

3.1.1 Operators shall be instructed by the Coil Winding/Curing Technician Supervisor before using this Procedure.

3.1.2 Operator shall have training “Electrical Safety I”.

3.2 Equipment

3.2.1 Safety glasses with side shields, or goggles.

4.0 Precautions

4.1 Verify that all guards and shields are in place.

4.2 Verify that outside perimeter of winder is guarded with tape or plastic chain.

4.3 Verify that work area within the yellow border is clear of unauthorized personnel.

4.4 Wear eye protection while cable is under tension.

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

4.6 Test the interlocks on a six month interval. The test method is described in Section 5.12.

4.7 Verify that the cable (and insulator, as applicable) are threaded through the guide wheels as per Attachment 3.

5.0 Procedure

5.1 Overview of the Universal Coil Winder

5.1.1 The Universal Coil Winder provides a means of winding superconducting cable and an insulator into flat “race track” magnet coils.

5.1.2 The cable and insulator are wound off of their spools through a series of guide wheels, then onto a bobbin.

5.1.3 The cable spool and insulator spool are mounted to a rotating carriage that can rotate clockwise, or counterclockwise, and traverse north and south along the floor mounted overhead gantry.

5.1.4 The cable spool carrier assembly can adjust up and down to maintain constant cable payout elevation as required. The cable spool and insulator spool drive shafts rotate clock-wise.

5.1.5 The bobbin assembly is attached to a shuttle table that allows the bobbin assembly to travel east or west.

5.1.6 Carriage, gantry, and table /turntable motion is controlled by the Operator in manual mode or by the Programmable Motion Controller in auto mode.

5.1.7 Pusher bar assemblies used to clamp coil windings; function using electrically operated pneumatic solenoids. There auto and manual modes.

5.2 Operator Controls

5.2.1 Operator controls are located on the Control Cabinet, the hand-held controller, the winding table, and the carriage.

5.2.2 In this section, capital letters indicate how the controls are marked.

5.2.3 Control Panel Controls

5.2.3.1 Control Cabinet Main Power ON/OFF Switch: on RH side of Panel. Activates power to the entire control cabinet.

5.2.3.2 CRASH/E-STOP: Red mushroom push button. De-activates power to the motor drivers and tension controllers.

5.2.3.3 START: Green push button. Activates power to the motor drivers and the tension controllers.

5.2.3.4 AUTO/MANUAL: Selector switch. Determines Manual or Program mode for control.

5.2.3.5 L1, L2, and L3: Reference lights illuminate to indicate

voltage on all three phases of power supply.

5.2.3.6 5vdc, 15vdc,-15vdc, 24vdc: Reference lights illuminate to indicate low level power supply.

5.2.3.7 Table Home, Rotating Arm Home and Gantry Home: Reference lights illuminate to indicate "Home" position.

5.2.3.8 Computer Reset: Toggle switch re-boots computer.

5.2.3.9 Computer Power: Toggle switch activates power to computer.

5.2.3.10 APC Smart-ups: Uninterruptable power source for computer.

5.2.4 Computer Desktop Display in Auto Mode

NOTE: ***Functions in Auto Mode dependent on programmed file selected using National Instruments "Lab View"***

5.2.4.1 Run (-») arrow. Click on arrow to execute program.

5.2.4.2 Run continuously (loop). Program function. – Not Used

5.2.4.3 Red "Stop Sign". Abort execution of program.

5.2.4.4 Pause (II). Not used.

5.2.4.5 No. of Turns to Wind: Total number of turns to be wound in auto mode. Turn number is absolute.

5.2.4.6 Turns on Bobbin: Enter number of turns wound on coil before program interruption/termination. Enter 0 for new or fresh winding.

5.2.4.7 Entry Done: Click on pushbutton when the "No. of Turns to Wind" and the "Turns on Bobbin" have been entered.

5.2.4.8 File Header Text: Record Coil ID and other information.

5.2.4.9 Auto Tension Log On/Off Switch: Click on the Switch to begin logging coil winding data i.e.; time, turn #, tension cable (min/max), tension insulator (min/max) etc.

5.2.4.10 Data Log Cmd: Green light "ON", Data logging active.

5.2.4.11 Time Between Points: Displays the hour, minute or seconds between data logging. Typically set at 5 sec.

5.2.4.12 Last Date Logged: Displays last logged date.

5.2.4.13 Last Time Logged: Displays last logged time.

5.2.4.14 Cable Tension Ref.: Displays target tension setting for cable. (Operator enters setting in lbs).

5.2.4.15 Insulator Tens. Ref.: Displays target tension setting for insulator (operator enters setting in lbs).

5.2.4.16 WIND: Click on pushbutton to begin or continue winding. Directions CW or CCW dependent on turn # entered. Green arrow illuminates momentarily to indicate coil winding in progress

5.2.4.17 WIND Bottom Layer: Click on pushbutton to begin new winding in the clockwise direction. Green arrow illuminates momentarily to indicate coil winding in progress. LARP Longwinder program only.

5.2.4.18 WIND Top Layer: Click on pushbutton to begin new winding in the counter clockwise direction. Green arrow illuminates momentarily to indicate coil winding in progress. LARP Longwinder program only.

5.2.4.19 PAUSE: Click on pushbutton to pause the winding program. Green arrow illuminates momentarily to indicate pause in effect

5.2.4.20 RESUME: Click on pushbutton to resume or continue winding program. Green arrow illuminates momentarily to indicate resume winding in effect.

5.2.4.21 QUIT: Click on red pushbutton when winding is done to terminate the automatic winding program.

5.2.4.22 Main Cont: Green light illuminates to indicate power to the Control Cabinet is activated.

5.2.4.23 Auto Mode: Green light illuminates to indicate winder controls are in programmed automatic mode.

5.2.4.24 Home OK: Green light illuminates to indicate the table, carriage and gantry are in HOME positions. Note: The start of automatic winding will not proceed if light is Off.

5.2.4.25 E-Stop: Red light illuminates to indicate emergency stop is activated. Power to all motors and tension controllers are off.

5.2.4.26 Motion Paused: Red light illuminates to indicate all automatic machine motion has stopped.

5.2.4.27 Position 1: Displays the Table encoder count relative to the Home position or zero.

5.2.4.28 Encoder Axis2: Displays the Carriage encoder count relative to the Home position or zero.

5.2.4.29 Encoder Axis3: Displays the Gantry encoder count relative to the Home position or zero.

5.2.4.30 TURNS COMPLETED: Displays # of turns completed in auto mode.

5.2.4.31 Cable Tension: Displays actual tension applied in lbs. to the Cable.

5.2.4.32 Insulator Tension: Displays the actual tension applied in lbs. to the Insulator.

5.2.4.33 FAULTS: A fault while operating in auto mode will stop all automatic machine motion until corrected.

5.2.4.33.1 Table Mot: Red light indicates a fault with Table Motor.

5.2.4.33.2 Carriage Mot: Red light indicates a fault with Carriage Motor.

5.2.4.33.3 Gant. Mot: Red light indicates a fault with Gantry Motor.

5.2.4.33.4 Cable Tension O.L.: Red light indicates Cable tension out of limits.

5.2.4.33.5 Insu. Tension O.L.: Red light indicates Insulator tension out of limits.

THE FOLLOWING APPLIES TO WINDING USING THE TURNTABLE SETUP

1. With control cabinet power off, manually push table west to turntable home.
2. Fasten stop plate to table and table bed.
3. Disconnect power cable to table motor.
4. Route table motor power cable to turntable motor.
5. Power up control cabinet.
6. Press green “Start” pushbutton
7. Select “Manual” Mode
8. Using manual control box with joysticks position the gantry and carriage in desired location.
9. Activate turntable by moving joystick “East=CCW” rotation, “West=CW” rotation.
10. To prepare for “Auto” mode, rotate turntable to desired “Home” position. Once in “Auto” mode, this will be the starting point for all turn counts.

THE FOLLOWING APPLIES TO 4 METER LARP COILS ONLY

Pusher Bars - Solenoid Actuated Pneumatic Cylinders

WARNING: Pinch Point /Crushing Hazard
Remain clear of pusher Bars at all times during machine operations

WARNING: Do not switch to manual until all switches are configured as per current solenoid positions.

11. Auto/Manual Switch: Click on switch to select automatic (programmed) or manual pusher bar control.

12. Manually Selected Pusher Bar ON/OFF Switches:

A. Up North: Raises/Lowers North Pusher Bar Assembly
B. Retract North: Retracts Extended North Pusher Bars
C. Extend North: Extends North Pusher Bars to Clamp Cable Windings
D. Up South: Raises/Lowers South Pusher Bar Assembly
E. Retract South: Retracts Extended South Pusher Bars
F. Extend South: Extends South Pusher Bars to Clamp Cable Windings

5.2.5 Remote Controls

5.2.5.1 Hand Held Remote Controller

A. E-Stop: Red mushroom pushbutton. De-activates power to the motor drivers and tension controllers.

B. (1) TABLE joystick: Controls direction and speed of the Table. Deflect joystick left or right (east/west).
(2) TURNTABLE joystick: Controls rotational direction and speed of the turntable. Deflect joystick left or right (CCW or CW)

C. CARRIAGE & GANTRY joystick: Deflect the joystick up or down to control the Carriage rotation (cw/ccw) and speed. Deflect the joystick left or right to control the direction and speed of the Gantry (north/south).

5.2.5.2 Table Mounted Control Switches

A. PAUSE: Operational only in AUTO mode. Depressing the black Pause pushbutton will interrupt program execution. Carriage, Gantry and Table motion will stop. The tension controllers will remain activated to maintain cable and insulator tension.

B. CONTINUE: Operational only in AUTO mode. Depressing the green Continue pushbutton will cause the winder to resume the programmed winder motion.

C. EAST E-STOP: Red mushroom pushbutton. Deactivates power to the motor drivers and tension controllers.

D. WEST E-STOP: Red mushroom pushbutton. Deactivates power to the motor drivers and tension controllers.

5.2.5.3 Gantry Mounted E-Stops

A. NORTH E-STOP: Red mushroom pushbutton. De-activates power to the motor drivers and tension controllers.

B. SOUTH E-STOP: Red mushroom pushbutton. De-activates power to the motor drivers and tension controllers.

5.2.6 Winder Operational Limits:

5.2.6.1 TABLE

A. TABLE - HOME: Proximity switch located at the west end of the table. When activated, illuminates the red TABLE HOME light located on the control panel. Indicating the table is in the home/start position.

B. TABLE - EAST TRAVEL LIMIT: Limit switch located at the east end of the table. When activated, inhibits further travel of the table in the east direction.

C. TABLE - WEST TRAVEL LIMIT: Limit switch located at the west end of the table. When activated, inhibits further travel of the table in the west direction.

D. TURNTABLE – No Rotational Limits

5.2.6.2 GANTRY

A. GANTRY - HOME: Proximity switch located overhead at the north end of the gantry frame. When activated, illuminates the red GANTRY HOME light located on the control panel, indicating the gantry is in the home/start position.

B. GANTRY – NORTH TRAVEL LIMIT: Proximity switch located overhead on the north end of the gantry frame. When activated, inhibits further travel of the gantry/carriage in the north direction.

C. GANTRY – SOUTH TRAVEL LIMIT: Proximity switch located overhead on the south end of the gantry frame. When activated, inhibits further travel of the gantry/carriage in the south direction.

CAUTION:

A) To prevent damaging a coil or equipment after a crash limit switch is activated; be sure to set the winder controls to the "initial" control settings before pressing the START pushbutton to power the winder.

B) In the event that the Gantry crash limit switches are activated; STOP!! The Gantry will have to be brought away from switch by hand. This requires work planning and a Work Permit with authorization from supervisor before attempting.

D. GANTRY – NORTH CRASH: Limit switch located on top of the gantry frame at the north end. De-activates power to the winder motors and tension controllers when travel exceeds operational limit. This limit switch is part of the E-STOP system.

E. GANTRY – SOUTH CRASH: Limit switch located on top of the gantry frame at the south end. De-activates power to the winder motors and tension controllers when travel exceeds operational limit. This limit switch is part of the E-STOP system.

5.2.6.3 CARRIAGE

A. CARRIAGE – HOME: Proximity switch located overhead at the north end of the gantry frame. When activated, illuminates the red CARRIAGE HOME light located on the control panel, indicating the carriage is in the home/start position.

B. CARRIAGE - SPOOL HEIGHT - UPPER CRASH: Limit switch located above spool carrier. De-activates power to the winder motors and tension controllers when travel exceeds operational limit. This limit switch is part of E-STOP system.

C. CARRIAGE – SPOOL HEIGHT – LOWER CRASH: Limit switch located below spool carrier. De-activates power to the winder motors and tension controllers when travel exceeds operational limit. This limit switch is part of E-STOP system.

D. CARRIAGE - SPOOL HEIGHT UPPER: Operations limit switch. When activated, prevents further upward travel.

E. CABLE POSITION PHOTO EYES: Located near lead guide wheel is used to properly align cable payout with guide wheel used only for clockwise winding.

F. CABLE TENSION MOTOR DIRECTION: Controls direction of cable tension motor.
"Wind Layer 1": Clockwise (looking down)
"Wind Layer 2": Counter-Clockwise (looking down)

5.2.7 Carriage Controls Box

5.2.7.1 Power to TRAC-3 - TRAC-4 Tension Controllers: Circuit breaker supplies power to tension controllers located in controls box.

5.2.7.2 UP-SPOOL-DN: Actuates spool height motor to move spool carrier up or down manually.

5.2.7.3 TRAVEL LIMIT RESET: Keep pressed to allow spool/carrier to lower using yellow DN pushbutton.

5.2.7.4 CABLE TENSION MOTOR ON/OFF: Actuates cable tension motor located on spool carrier.

5.2.7.5 AUTO/MANUAL CABLE TENSION CONTROL: Select manual for initial tension set-up. Select auto to maintain a constant tension setting as the cable is paved out.

5.2.7.6 CABLE TENSION: Counting dial potentiometer changes applied cable/tension. Tension meter displays tension on % scale. Not used. Tension is read on LARP Long Winder 2 dashboard display on computer.

5.2.7.7 INSULATOR TENSION: Counting dial potentiometer adjusts applied Insulator Tension. Tension meter displays tension on % scale. Not used tension is read on the LARP Long Winder 2 dashboard display on the computer.

5.2.7.8 PUSHERBAR PROXIMITY SWITCH LOCATIONS: S.E. Up, S.W. Up, South retract, N.E. UP, N.W. UP & North Retract. When illuminated indicate pusherbar assemblies are in Home or Safe position.

5.3 Initial Control Settings

5.3.1 Control Cabinet Disconnect Switch to OFF position.

5.3.2 AUTO/MANUAL Switch to MANUAL.

5.3.3 Power to TRAC3 & TRAC4 Tension Controllers to ON.

5.3.4 Cable Tension Motor Switch to OFF.

5.3.5 Cable Tension AUTO/MANUAL Switch to AUTO.

5.3.6 Insulator Tension Motor Switch to OFF.

5.3.7 Cable Tension Counting Dials set to 000.

5.3.8 Insulator Tension Counting Dials set to 000.

5.4 Before Activating Power to the Winder

5.4.1 Verify that controls are set to their "initial" settings (5.3)

5.4.2 Verify that the interlocks have been tested within the past six months. An Interlock Test Form is posted near the Winder.

5.5 Winding-Manual Mode Set Up

5.5.1 To Activate Power to the Winder

5.5.1.1 Verify safety interlocks have been tested within last six months. See posted Interlock Test Form.

5.5.1.2 Verify the winder is set to Initial Control Settings. See Section 5.3.

WARNING:

Be sure to be wearing proper Personal Protective Equipment (safety glasses with side shields, cotton long sleeved shirt, cotton full length pants and cotton/leather gloves) before switching ON service disconnect switches.

5.5.1.3 Plug power cord into the 208v receptacle mounted on the gantry frame.

5.5.1.4 Using proper PPE, switch control cabinet main power to ON.

5.5.1.5 Verify that the 5vdc, 15vdc, -15vdc & 24vdc low level power supply red reference lights are illuminated. If any of the lights are not illuminated; notify the cognizant engineer or supervisor.

5.5.1.6 Press the green START pushbutton.

5.5.1.7 Verify that the L1, L2 & L3 three phase voltage indicator lights are illuminated. If any of the lights are not illuminated; notify the cognizant engineer or supervisor.

5.5.2 Manual Operation

5.5.2.1 Turn the AUTO/MANUAL switch to MANUAL.

5.5.2.2 The winder is ready to be operated manually using the hand-held remote control.

NOTE:

Deflection of the joystick will determine speed.

5.5.2.3 To Move Table /Turntable

A. To move east; move table joystick to the left /rotates turntable CCW.

B. To move west; move table joystick to the right /rotates turntable CW.

5.5.2.4 To Move Gantry

A. To move north; move gantry/carriage joystick to the left.

B. To move south; move gantry/carriage joystick to the right.

5.5.2.5 To Rotate Carriage

A. To rotate clock-wise; move gantry/carriage joystick up.

B. To rotate counter clock-wise; move gantry/carriage joystick down.

5.5.3 To Home Winder

5.5.3.1 Move table slowly to the west until the red TABLE HOME indicator light is illuminated on the control panel.

5.5.3.2 Move gantry north to the operational limit. Then move slowly to the south until the red GANTRY HOME indicator light illuminates on control panel.

5.5.3.3 Rotate the carriage clock-wise slowly until the red CARRIAGE HOME indicator light illuminates on the control panel.

5.5.4 To Set Cable Tension

NOTE: The skin hazard warning only applied to coils wound with .0015" stainless steel insulating ribbon.

WARNING:
SKIN HAZARD

- **Personnel must wear cut resistant protective gloves when handling the stainless steel insulator ribbon.**
- **The insulator is sharp and will cause injury if not properly handled.**

5.5.4.1 Verify that the cable/insulator is anchored to the bobbin and properly threaded thru the guide wheels. Remove all slack in the cable and the insulator by hand.

5.5.4.2 Verify that the TRAC-# & TRAC-4 circuit breaker is in the ON position.

NOTE:

LARP coils only require the use of the cable tension motor.

5.5.4.3 Verify that both the counting dial potentiometers are set to 000.

5.5.4.4 Switch the INSULATOR TENSION MOTOR ON/OFF switch to ON.

5.5.4.5 Set insulator tension counting dial to 090 (3.5 lbs.).

5.5.4.6 If necessary, adjust the spool height to allow level payout of cable.

5.5.4.7 Switch the CABLE TENSION MOTOR ON/OFF switch to ON.

5.5.4.8 Set the cable counting dial to 078 (3.5 lbs.).

5.6 Winding-Auto Mode

5.6.1 Verify the safety interlocks (emergency stops) have been tested within last six months. See posted Interlock Test Form.

5.6.2 Begin winding in auto mode by performing all procedures in section 5.5, MANUAL MODE.

5.6.3 Verify that the table, gantry and carriage are at home or start positions. See section 5.5.3

5.6.4 Verify that the cable and insulator tension are at initial settings. See section 5.5.4

5.6.5 Turn the AUTO/MANUAL switch to AUTO.

5.6.6 Log on the computer. Double click on the **National Instruments** icon located on the desktop.

5.6.7 Click **Open VI** to view list of files.

5.6.8 Double click on desired winding file.

5.6.9 Start the program by clicking white solid arrow on left top corner. Wait 15 seconds.

5.6.10 Enter coil ID in header text box.

5.6.11 Enter total number of turns to be wound in **No. Of Turns to Wind** box. (Note: turn number is absolute).

5.6.12 Enter number of turns wound on Bobbin (if winding after break or interruption).

5.6.13 Press and hold "Entry Done" pushbutton for 10 seconds. Wait for dialogue box to appear. Then enter file using the coil ID number (select original file name if winding after break) followed by .xls to save as an excel file.

NOTE:

This will be the excel file with all the data.

5.6.14 Click "Save".

NOTE:

Be sure readings are within ± 2.5lbs of the references.

5.6.15 Enter cable tension (lbs.) set point in **Cable Tension ref.** box. Refer to MAP/Traveler.

5.6.16 Enter insulator tension (lbs.) set point in **Insulator Tens. ref.** box. Refer to MAP/Traveler.

5.6.17 Click on **AUTO TENSION LOG** switch to ON.

5.6.18 Enter 1 in the **Time Between Points** box. Data to be recorded once every second.

5.6.19 Verify **Main Cont, Auto Mode and Home OK** green lights are Illuminated and all other fault indicators are off.

WARNING:

- **The winding technician must wear safety glasses when operating the winder machine.**
- **Personnel not actively involved must stay outside of marked boundary.**
- **The winding technician must follow the carriage when winding in "AUTO" mode and not stand in way of moving parts.**

5.6.20 When ready, click **WIND** to begin automatic winding.

NOTE 1
During a pause, never turn off power to the computer or close winding file.

NOTE 2
If you are stopping for an extended period of time, you must:

A) Record turn count
B) Record table, gantry and carriage positions.
C) Clamp cable and insulator to bobbin (to prevent loosening).
D) Turn the tension control dials fully counter clockwise to 000.

NOTE 3
Switching to Manual while in Auto Mode will terminate the automatic program operation.

NOTE 4 (LARP Coils Only)

To "Wind Top Layer" (counterclockwise) you must complete the winding of the bottom layer and the pusherbar assembly must be in the Home position (retracted + Down)

5.6.21 Prepare to wind the "Top Layer". During this time the pusherbar assembly is placed in Manual Mode. Install the temporary coil pusher bars and mount cable spool for counterclockwise winding. The pusherbar stop pads are removed and the pusherbar controls placed in AUTO mode.

5.6.22 When winding is done, terminate the winding program by pressing the red "QUIT" button. Winder is now ready to operate in manual mode.

5.7 Shut Down Winder

5.7.1 Set all controls to their Initial Control Setting. See Section 5.3 Initial Control Settings.

5.7.2 Disconnect the power plug from the receptacle.

5.8 Calibration Tensioning System

NOTE 1:

This procedure should be performed by an Authorized Technician at the start of every production run and once a month thereafter during production.

NOTE 2:

Adjustment of the Tensioning system should be performed by a qualified Calibration Technician with a generic Energized Work Permit.

5.8.1 Attach force gage to bobbin.

5.8.2 Mount spool of cable and insulator to carriage.

5.8.3 Run cable or insulator through guide wheels. (See attachment 3) Attach to other end of force gage.

5.8.4 Position carriage so that cable or insulator are in a straight line parallel to the bobbin from the last guide wheel, to the force gage.

5.8.5 Zero the gage.

5.8.6 Turn on the tension controller as per section 5.5.4.

5.8.7 Adjust the potentiometer until the force gauge reads 5 lbs.

5.8.8 Record the "actual" tension (force gauge reading) and the tension shown on the computer desktop display in the Tension Calibration Form.

5.8.9 Increase the tension in 5 lb. increments as read on the force gauge, recording the actual tension and the displayed tension at each point.

5.8.10 Repeat step 5.8.9 until a tension of ± 25 lbs., as read on the force gauge, is reached.

5.8.11 IF all of the readings are within the Specified Tolerance of ±2.5 lbs.

THEN perform the following steps:

5.8.11.1 Dismantle the set-up.

5.8.11.2 Check off, date, and initial the "TRAC-1 Calibration" form posted on the Winder (Attachment 4).

5.8.11.3 Note in the Universal Winder Log Book that no adjustment to the system was required.

5.8.12 IF one or more readings are outside the Specified Tolerance of ±2.5 lbs.

THEN perform the following steps:

<Calibration Technician:

WARNING

You will be exposed to 120 VAC line voltage during the performance of steps 5.8.13.1 and 5.8.13.2. An Energized Work Permit is required.

5.8.12.1 Open the lower cover on the carriage to access the TRAC-3 (cable) + TRAC-4 (insulator) control cards.

5.8.12.2 Adjust the TRAC-3/TRAC-4 tension controller by following the instructions in the TRAC-3/TRAC-4 Instruction Manual.

5.8.12.3 Close and secure the lower cover.

5.8.12.4 Check off and initial the “Tension Calibration" form posted on the Winder.

<Technician:

5.8.13 IF the Calibration Technician is able to adjust the TRAC-3/TRAC-4 so that all readings are within the Specified Tolerance,

THEN perform the following steps:

5.8.13.1 Record the final readings in the Log Book. Note in the Log Book that the system was adjusted to within spec.

5.8.13.2 Dismantle the set-up.

5.8.13.3 Check off, date, and initial the "Tension Calibration" form posted on the Winder.

5.8.14 IF the Calibration Technician is NOT able to adjust the TRAC-3/TRAC-4 so that all readings are within the Specified Tolerance,

THEN perform the following steps:

5.8.14.1 Immediately inform the Cognizant Engineer and the Coil Fabrication Supervisor.

5.8.14.2 Do not dismantle the set-up before consulting with your supervisor. Others may want the opportunity to verify your findings.

5.8.14.3 Note in the Log Book that the system could not be adjusted to within spec.

5.8.14.4 Check off, date, and initial the "Tension Calibration" form.

5.9 Interlock Test Procedure

NOTE 1:

Two technicians, designated "Technician 1" and "Technician 2", are required to perform this section.

NOTE 2:

The interlock test procedure should be performed at a six month interval.

<Technician 1:

5.9.1 Set all controls to their "initial" settings (5.3).

5.9.2 Activate the Winder in the Manual Mode (5.5).

WARNING

Failure to follow step 5.9.3 could result in unexpected machine motion and possible injury.

5.9.3 Verify that the TENSION CONTROL COUNTING DIAL potentiometers, located on the carriage, is set to zero (000).

5.9.4 Set the CABLE TENSION ON/OFF toggle switche to ON.

5.9.5 Set the cable TENSION COUNTING DIAL potentiometer to (020). The spool holder should rotate.

5.9.6 Move the carriage and table using the joystick controls.

5.9.7 While the spool carrier shaft, carriage, and table are in motion, depress the STOP push button on the control console.

5.9.8 IF all machine motion stops,

THEN check the appropriate box on the Interlock Test Form (Attachment 2).

5.9.9 IF all machine motion does not stop,

THEN stop work, write "fail" on the Interlock Test Form, and notify the Cognizant Engineer, the Cognizant Technical Supervisor, and the ES&H Coordinator.

WARNING

Personnel should stand away from the spool holder before step 5.9.10 is performed.

5.9.10 Depress the green START push button on the control console. The spool carrier shaft should rotate.

5.9.11 Move the carriage and table using the joystick controls.

<Technician 2:

5.9.12 While the spool holder, carriage, and mandrel are in motion, depress the STOP push button on the hand-held controller.

<Technician 1:

5.9.13 IF all machine motion stops,

THEN check the appropriate box on the Interlock Test Form.

5.9.14 IF all machine motion does not stop,

THEN stop work, write "fail" on the Interlock Test Form, and notify the Cognizant Engineer, the Cognizant Technical Supervisor, and the ES&H Coordinator.

5.9.15 Depress the green START push button on the control console. The spool holder should rotate.

5.9.16 Move the carriage and table using the joystick controls.

<Technician 2:

WARNING

The next step requires that you stand within the yellow border. Do not allow your clothes or body to come in contact with any moving parts. Do not linger in the area or become distracted.

5.9.17 While the spool carrier shaft, carriage, and mandrel are in motion, and while the carriage is moving away from you, depress the STOP push button on the Winder carriage.

<Technician 1:

5.9.18 IF all machine motion stops,

THEN check the appropriate box on the Interlock Test Form.

5.9.19 IF all machine motion does not stop,

THEN stop work, write "fail" on the Interlock Test Form, and notify the Cognizant Engineer, the Cognizant Technical Supervisor, and the ES&H Coordinator.

5.9.20 Repeat steps 5.9.15 to 5.9.19 for the other STOP push button and the two crash switches on the Winder Carriage.

5.9.21 Depress the green START push button on the control console. The spool holder should rotate.

5.9.22 Move the carriage and table using the joystick controls.

5.9.23 While the spool carrier shaft carriage and table are in motion, depress the STOP push button on the Gantry frame.

5.9.24 If all machine motion stops, then check the appropriate box on the Interlock Test Form (Attachment 2).

5.9.25 If all machine motion does not stop, then stop work, write “fail” on the Interlock Test Form, and notify the Cognizant Engineer, the Cognizant Technical Supervisor, and the ES&H Coordinator.

5.9.26 Repeat steps 5.9.21 to 5.9.25 for the other STOP push button on the Gantry Frame.

5.9.27 Depress the green START pushbutton on the control console. The spool holder should rotate.

5.9.28 Move the carriage and table using the joystick controls.

5.9.29 While the spool carrier shaft carriage and table are in motion, depress the STOP pushbutton on the winder table.

5.9.30 If all machine motion stops, then check the appropriate box on the Interlock Test Form (Attachment 4)

5.9.31 If all machine motion does not stop, then stop work, write "fail" on the Interlock Test Form, and notify the Cognizant Engineer, the Cognizant Technical Supervisor, and the ES&H Coordinator.

5.9.32 Repeat steps 5.9.27 to 5.9.31 for the other pushbuttons on the winder table.

5.9.33 Initial and date the Interlock Test Form. Post the Form near the Winder.

5.10 Maintenance Procedure

5.10.1 Inspect carriage bearings. Replace bearing as necessary. Add grease as required.

5.10.2 Inspect chains, sprockets. Adjust tension as necessary.

5.10.3 Inspect drive mechanisms, shaft, journals that engage mandrel.

6.0 Documentation

6.1 Coil Winder Log Book.

6.2 Magnet Travelers.

6.3 Interlock Test Form.

6.4 Maintenance Log.

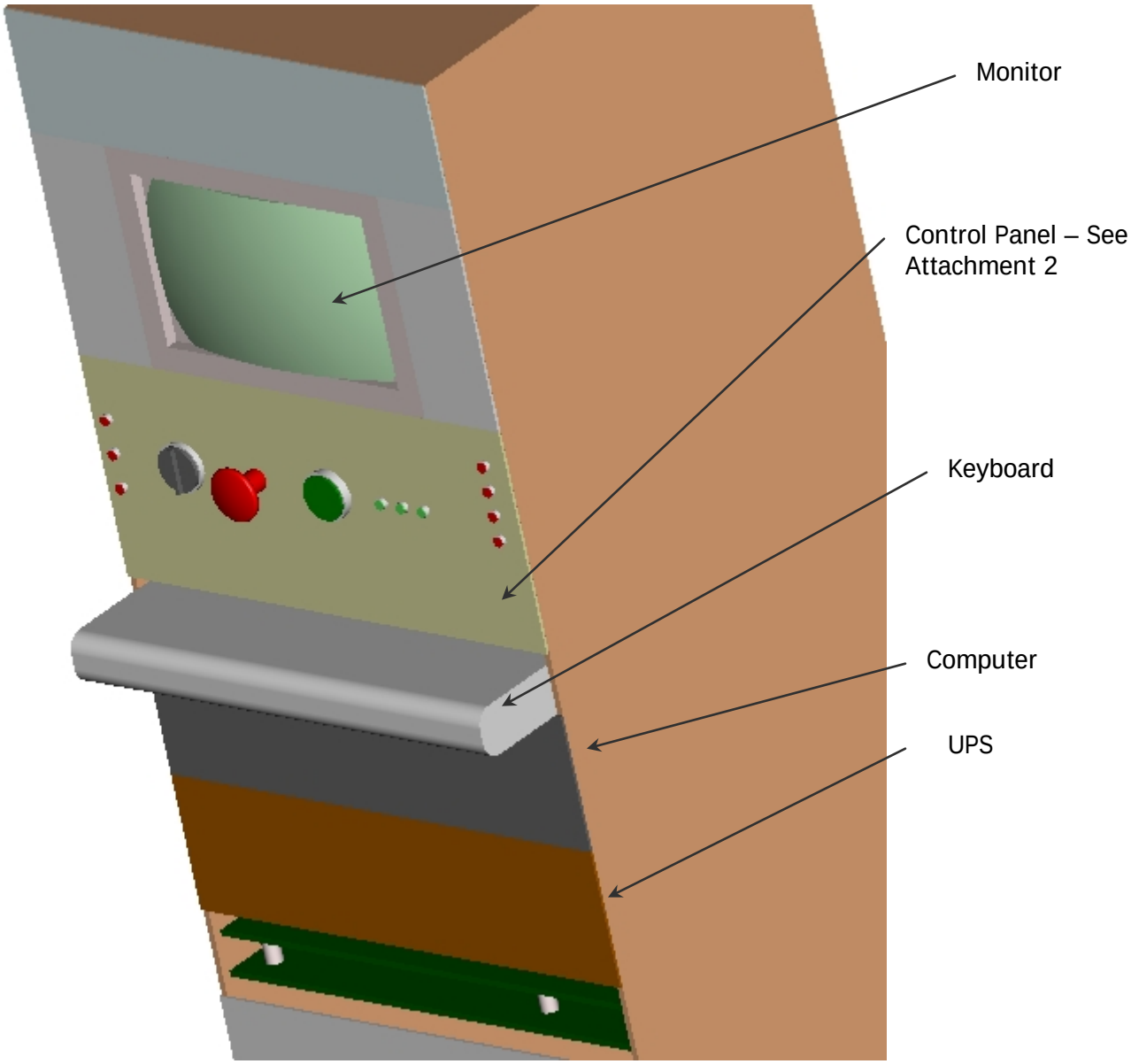
6.5 Magnet Assembly Procedure

7.0 References

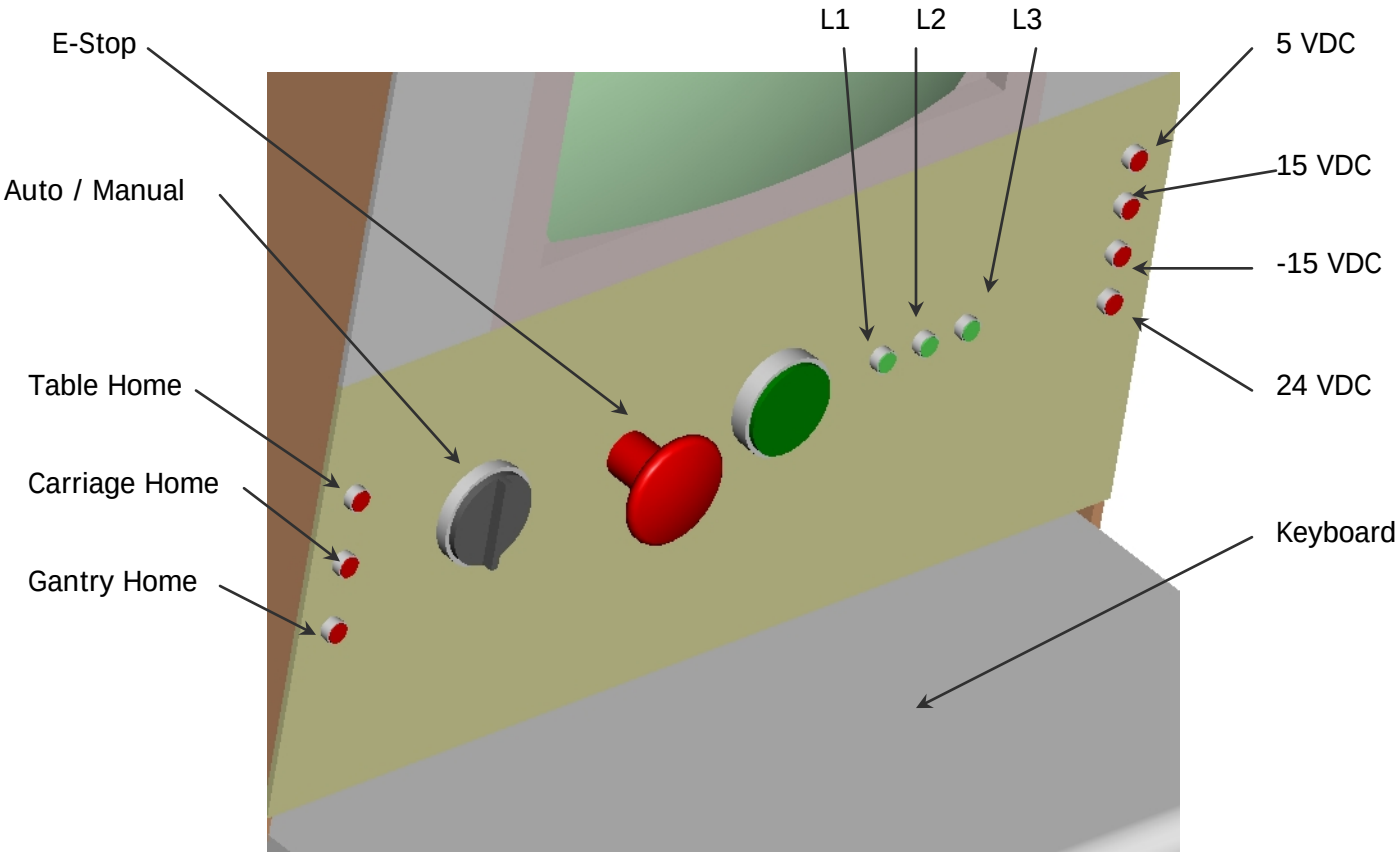
7.1 SBMS Subject Area: Lockout/Tagout (LOTO)

8.0 Attachments

1. Control Console Diagram
2. Control Panel
3. Gantry Panel
4. Interlock Test Form
5. Cable and Insulation Routing
6. Calibration Form

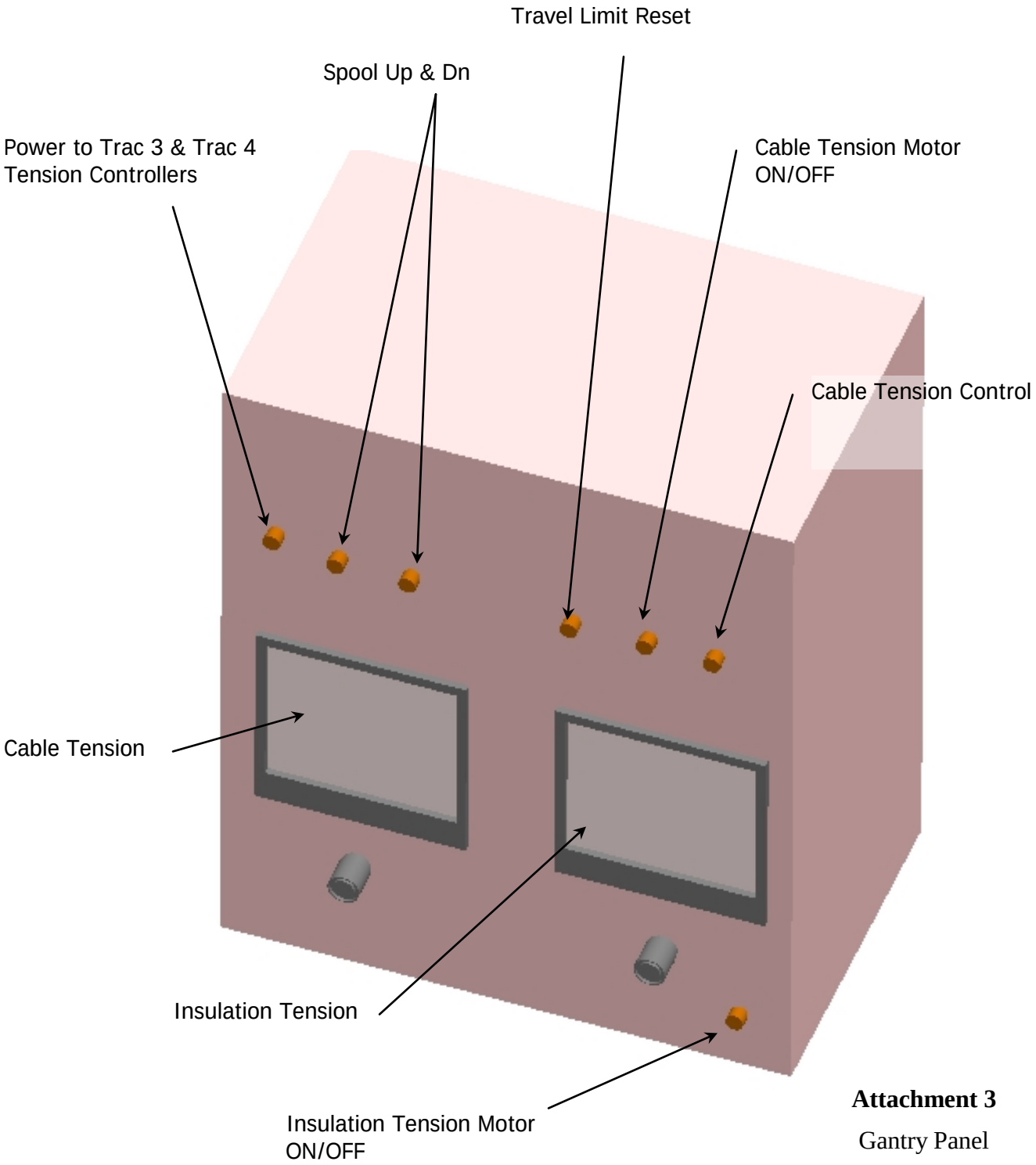


Attachment 1
Control Console



Attachment 2

Control Panel



Attachment 3

Gantry Panel

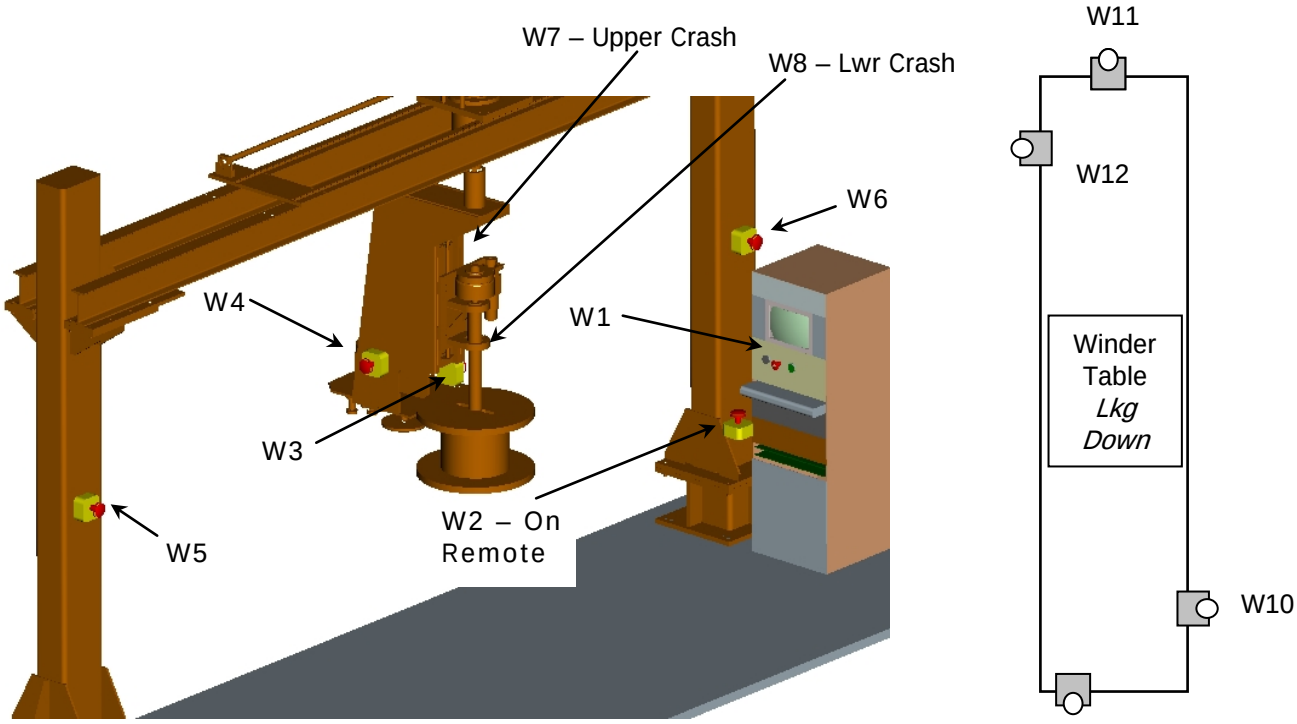
The only official copy of this file is the one on-line on the Superconducting Magnet Division website. Before using a printed copy, verify that this is the most current version by checking the document issue date on the website.

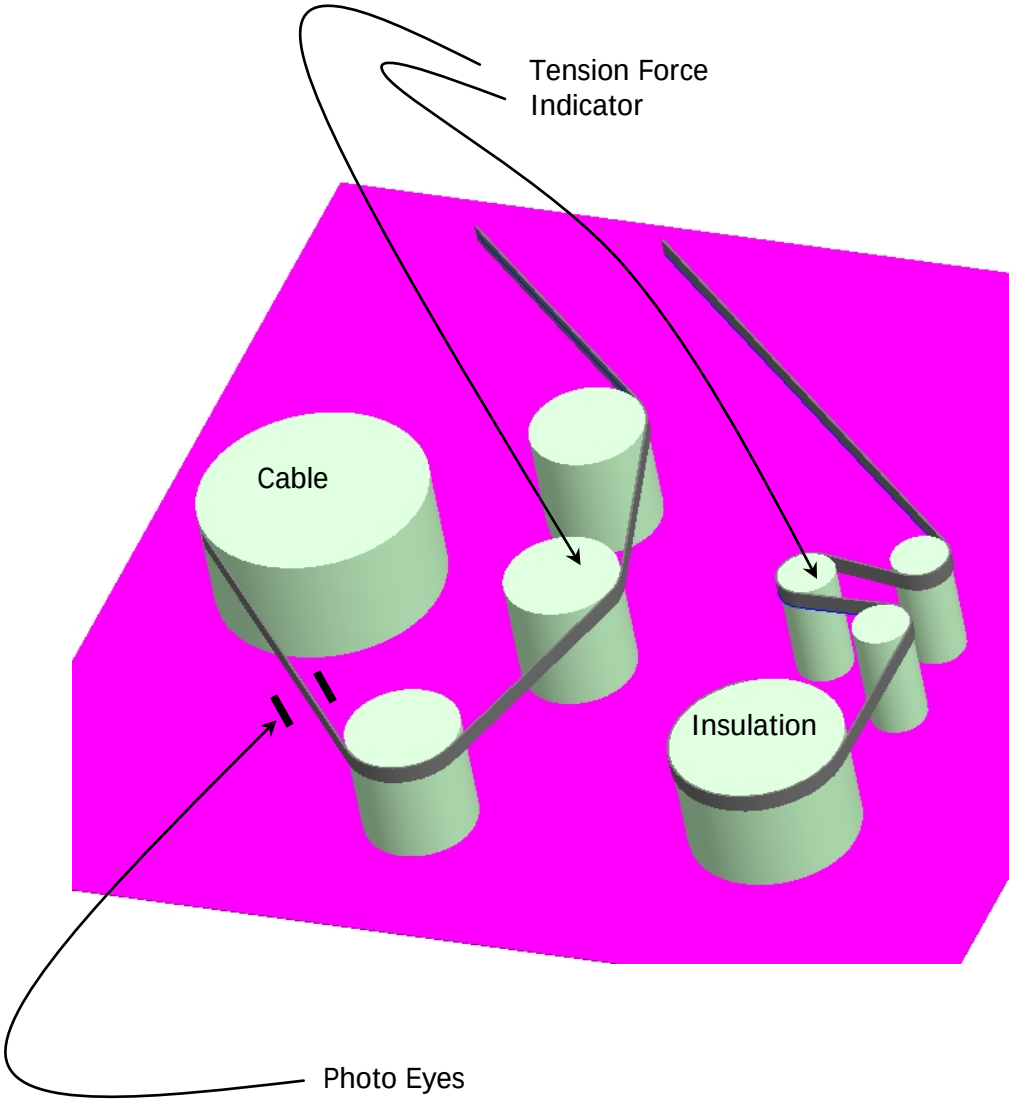
Instructions:

1. Post this form near the winder
2. Do not operate the winder if the interlocks have not been tested within the past six months.
3. Refer to the Operations Procedure for the winder for the proper interlock test method
4. Check box as each device is tested. Initial and date the form. If an interlock fails the test, write "fail" in the appropriate box, and notify the Cognizant Engineer and the ES&H Coordinator immediately.

W1						
W2						
W3						
W4						
W5						
W6						
W7						
W8						
W9						
W10						
W11						
W12						
Initial						
Date						

Attachment 4
Interlock Test Form





Attachment 5

Cable & Insulation Routing

Attachment 6

Calibration Form

Notes:

1. Calibration Procedure: RHIC-OPM 8.1.1.19, section 5.9.
2. Specified Tolerance: ±2.5 lbs.
3. See Short Winder Log Book for data.

Check one:

No adjustment required.............<>	Date ____________
Adjusted to within spec............<>	Operator Initials ____________
Could not adjust to within spec.....<>	Calib. Tech. Initials ____________

Comments:

Check one:

No adjustment required.............<>	Date ____________
Adjusted to within spec............<>	Operator Initials ____________
Could not adjust to within spec.....<>	Calib. Tech. Initials ____________

Comments:

Check one:

No adjustment required.............<>	Date ____________
Adjusted to within spec............<>	Operator Initials ____________
Could not adjust to within spec.....<>	Calib. Tech. Initials ____________

Comments:

Check one:

No adjustment required.............<>	Date ____________
Adjusted to within spec............<>	Operator Initials ____________
Could not adjust to within spec.....<>	Calib. Tech. Initials ____________

Comments:

Check one:

No adjustment required.............<>	Date ____________
Adjusted to within spec............<>	Operator Initials ____________
Could not adjust to within spec.....<>	Calib. Tech. Initials ____________

Comments:

Check one:

No adjustment required.............<>	Date ____________
Adjusted to within spec............<>	Operator Initials ____________
Could not adjust to within spec.....<>	Calib. Tech. Initials ____________

Comments: