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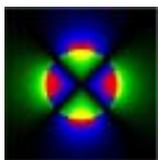
05/13/2014
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Serial No	Part No	Part	P/L	ECN	Rev	P/L	ECN	Rev	P/L
Work Order #: _____				Deviation & Waiver: _____					

OP	Description	Name/Life #	Date	DR
10	All lifting and handling operations requiring overhead crane operations shall be performed by personnel having up to date Material Handling Equipment (or Overhead Crane Operations) qualifications as recorded in the training records within BTMS. Operators shall also be instructed in the use of the appropriate lifting device by the Cognizant Engineer or Technical Supervisor. Hard hats, safety shoes and safety glasses with side shields (or goggles) are required during crane operations.			
15	The technicians shall be instructed by their cognizant technical supervisor in the operation of the required electrical test equipment and the electrical testing procedures.			
20	Boron Nitride spray anti-seize contains chemicals that can be cause skin irritation, eye irritation / burns. Product may be harmful if absorbed through the skin. Vapors can be harmful if inhaled. The aerosol is flammable. See MSDS for further information.			

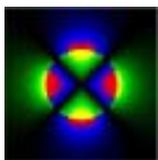
Chemical goggles or a face shield with safety glasses and side shields must be worn when spraying this material. Chemical resistant gloves shall be worn when using this material.





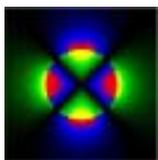
OP	Description	Name/Life #	Date	DR
25	<p>The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with SMD-MAG-1003.</p> <p>Measuring and test equipment used for this procedure shall contain a valid calibration label in accordance with the SBMS Subject Area 'Calibration', where applicable.</p>			
30	<p>Containers of liquid argon are used to supply argon gas to the oven during coil reaction. Liquid argon is a cryogenic liquid, exposure to the extremely cold gas can cause tissue / eye damage.</p> <p>Safety glasses with side shields, a full face shield, long sleeves and appropriate gloves must be worn when handling the argon containers and when installing or removing the gas regulator.</p>			
35	<p>Reference Documents: Operation of Long Coil Oven: OPM 8.1.1.46 Reaction Fixture Assembly: P/N 25-2033001 Reaction Materials Assembly: P/N 25-2033070 Prep Table Assembly: P/N 25-2034002 Coil Lifting Fixture Assembly: P/N 25-2034001 Oven Support Stand Assembly: P/N 25-2034003 Fixture Lifting Assembly: P/N 25-2038003</p>			
50	<p>Place the reaction base plate on the assembly table standoffs. Install hold down brackets on both ends of base plate and clamp to table.</p>			
60	<p>Place the mandrel blocks on the base plate. The blocks are serialized, start with no.1 at the lead end and install in sequential order.</p>			
65	<p>Open the shipping crate. Visually inspect and photograph the coil before removing it from shipping fixture.</p>			





OP	Description	Name/Life #	Date	DR
70	Remove shipping clamps from OD of coil. Leave midplane support bars in place to support coil.			
80	Place coil lifting beam on coil. Install lifting tabs. Remove midplane support bars one at a time as the tabs are being installed so the coil is never left unsupported.			
85	Install temporary .080" shims on the mandrel block midplane surfaces, leave gaps to allow space for the coil lifting tabs.			
90	Using coil lifting beam, lift coil from shipping fixture. Transfer to reaction fixture and place coil in the mandrel blocks. Lifting tabs fit into the gaps between the intermittent coil shims. Position NL end of coil 1.50" from end of base plate.			
100	Remove the coil lifting tabs and then remove the coil lifting beam.			
110	Visually inspect the coil and insulation for damage. Photograph the coil.			
130	Remove and measure the thickness of the coil lead shims. Outer layer shim thickness: _____ Inner layer shim thickness: _____			
140	Remove the LE saddle extension bolts, apply BN anti-seize compound to bolts and reinstall. Ensure that the extensions are aligned with the saddles when the bolts are tightened.			

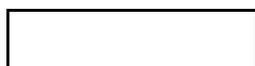


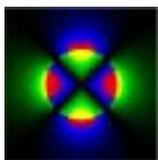


OP	Description	Name/Life #	Date	DR
160	Install the .151" thick stainless steel lead shims between the coil leads and the saddle extensions.			
180	Verify all outer layer voltage taps are installed: See voltage tap schematic in OP 825: B3: _____, B4: _____, B5: _____, B6: _____, B7: _____			
185	Measure and record coil resistance, verify value is within acceptable range. Set power supply to 25 V DC maximum and apply 1 amp to coil. Use DVM to measure voltage (equal to resistance). Voltage (mV): _____			
200	Measure and record coil inductance and quality factor, verify values within acceptable range.			

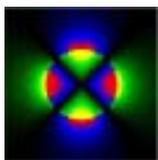
F (Hz)	20	50	100	200	500	1000
L (mH)						
Q						

205	Perform continuity checks: Coil to LE outer layer saddle: _____ Coil to LE inner layer saddle: _____ Coil to NL outer layer saddle: _____ Coil to NL inner layer saddle: _____ Coil to End Spacers (3 LE, 2 NL): _____ Coil to Pole (check all 3 segments): _____			
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OP	Description	Name/Life #	Date	DR
210	Cognizant Electrical Engineer to sign-off results "OK to proceed". Cog. Electrical Engineer: _____			
215	Measure outer layer coil end lengths. Record on data sheet in OP 800.			
220	Measure and record outer pole gap sizes (inches): LE: _____ NL: _____			
225	Measure the gaps at the ends of the outer wedges: Transition Side - LE: _____, NL: _____ Non-Transition Side - LE: _____, NL: _____			
230	Install the pole alignment keys, spanning the joints between pole segments.			
235	Install 2 layers of .005" thick x 8.25" wide S2 fiberglass cloth (Hexcel #4522) over the pole and the coil. Trim so that it covers the coil, end saddles and saddle extensions. Cut holes at the four alignment pin locations. The recess in the mandrel blocks allows the cloth to extend beyond the coil midplane surfaces.			
240	Install 2 layers of .005" thick x 8.25" wide mica paper over the pole and the coil. Trim so that it covers the coil, end saddles and saddle extensions. Cut holes at the four alignment pin locations. The recess in the mandrel blocks allows the mica paper to extend beyond the coil midplane surfaces.			

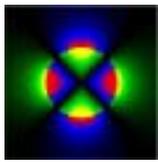


OP	Description	Name/Life #	Date	DR
250	Install .025" stainless steel radial filler and .020" stainless steel liner.			
260	Install alignment pins, with BN anti-seize compound, in the four modified formblocks. Apply BN to and install set screws to seat and secure the pins.			
270	Install the reaction formblocks. The blocks are serialized, start with no.1 at the lead end and install in sequential order.			
275	Install the top plate. Verify that the base plate, form blocks and top plate are aligned at both ends so that the end plates will seal properly.			
280	Install M20 sst bolts with BN anti-seize compound. Torque the bolts to 50 ft-lbs then increase torque in 25 ft-lb increments. Measure and record the gap between the blocks and base plate after each step. Continue until the fixture is closed. Contact cognizant engineer if fixture is not closed at 100 ft-lbs.			

Distance From LE	50 ft-lbs		75 ft-lbs		100 ft-lbs	
	L	R	L	R	L	R
10"						
25"						
40"						
54"						

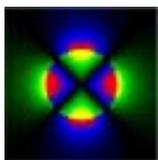
300	Install the side rails using M10 sst bolts and BN anti-seize compound.			
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OP	Description	Name/Life #	Date	DR
305	Disconnect fixture hold down brackets.			
310	Install NL end plate.			
320	Install mounting lugs and hoist rings, lift fixture high enough to allow it to be rotated. Rotate 180 deg (swing LE up) and place back onto support blocks.			
325	Remove NL end plate, install hold down brackets on both ends of fixture and clamp to table.			
330	Remove M20 bolts, base plate, mandrel blocks and intermittent coil shims. Leave a few mandrel blocks in place and clamp to secure coil.			
335	Visually inspect the coil and insulation for damage. Photograph the coil.			
340	Verify all inner layer voltage taps are installed: See voltage tap schematic in OP 825: A3: _____, A4: _____, A5: _____ A6: _____, A7: _____, A8: _____			
345	Measure and record coil resistance, verify value is within acceptable range. Set power supply to 25 V DC maximum and apply 1 amp to coil. Use DVM to measure voltage (equal to resistance).			

Voltage (mV): _____



OP	Description	Name/Life #	Date	DR
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350 Measure and record coil inductance and quality factor, verify values within acceptable range.

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F (Hz)	20	50	100	200	500	1000
L (mH)						
Q						

365 Perform continuity checks:

Coil to LE outer layer saddle: _____
 Coil to LE inner layer saddle: _____
 Coil to NL outer layer saddle: _____
 Coil to NL inner layer saddle: _____
 Coil to End Spacers (3 LE, 2 NL): _____
 Coil to Pole (check all 3 segments): _____

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370 Cognizant Electrical Engineer to sign-off results "OK to proceed".

Cog. Electrical Engineer: _____

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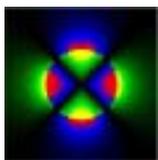
375 Measure inner layer coil end lengths. Record on data sheet in OP 825.

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380 Measure the inner and outer layer coil overall length, including end saddles and saddle extensions, using Invar rod / micrometer assembly. Record on data sheet in OP 800.

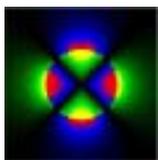
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OP	Description	Name/Life #	Date	DR
390	Measure and record inner pole gap sizes (inches): LE: _____ NL: _____			
395	Measure the gaps at the ends of the inner wedges: Transition Side - LE: _____, NL: _____ Non-Transition Side - LE: _____, NL: _____			
400	Install 2 layers of .005" thick x 1.50" wide mica paper on each coil midplane surface and install the .087" full length coil shims.			
410	Install 2 layers of .005" thick x 4.72" wide mica paper over the pole and the coil. Trim so that it covers the coil, end saddles and saddle extensions.			
420	Install the saddle links. Lightly tighten set screws to hold saddles against the coil.			
430	Install the mandrel blocks. The blocks are serialized, start with no.1 at the lead end and install in sequential order.			
440	Install longitudinal seals (stainless steel tubes) and pusher bars.			
460	Install the base plate. Verify that the base plate, form blocks and top plate are aligned at both ends so that the end plates will seal properly.			





OP	Description	Name/Life #	Date	DR
470	Install M20 sst bolts with BN anti-seize compound. Torque the bolts to 50 ft-lbs then increase torque in 25 ft-lb increments. Measure and record the gap between the blocks and base plate after each step. Continue until the fixture is closed. Contact cognizant engineer if fixture is not closed at 100 ft-lbs.			

Distance From LE	50 ft-lbs		75 ft-lbs		100 ft-lbs	
	L	R	L	R	L	R
10"						
25"						
40"						
54"						

475	Tighten the longitudinal seal pusher bolts to compress the stainless steel tube seals on each side.			
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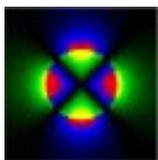
490	Trim coil leads to fit in the extension tubes of LE cover plate. Weld the cable ends to seal against tin leakage during reaction.			
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510	Install seals (3/16 copper tube) in the end plates.			
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520	Install end cover plates using M10 sst bolts and BN anti-seize compound.			
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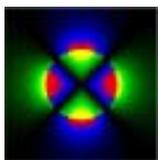
540	Install mounting lugs and hoist rings, lift fixture high enough to allow it to be rotated. Rotate 180 deg (swing LE up), move to the oven loading station and place on oven 3-point support cradles (base plate should now be on bottom).			
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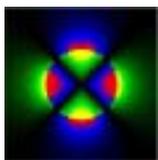


OP	Description	Name/Life #	Date	DR
550	Remove hoist rings and mounting lugs.			
570	Attach thermocouple wires to the reaction fixture: Top: LE - #4, Center - #2, NL - #10 Left Side: LE - #6, NL - #7 Right Side: LE - #9, NL - #8 Bottom: LE - #1, NL - #3 Sample canister - #5			
575	Place the sample canister on the reaction fixture above the LE support. Place the test samples in the canister.			
580	Verify with cognizant scientist that all the required samples have been installed. Close the canister.			
585	Connect argon supply and vent lines to the fixture. The supply connects to the NL end of sample canister. The LE of the canister connects to the LE of the reaction fixture. The NL of the reaction fixture connects to the exhaust line.			
590	Roll the reaction fixture into the oven. Connect supply and exhaust lines to the tube stubs inside the oven.			
595	Confirm the presence of ODH warning signs posted on the gate to the trench and of the Argon spill warning signs posted above the oven prior to initiating Argon flow.			
600	Place one Argon cylinder on each scale. Connect the gas regulators to the two cylinders.			

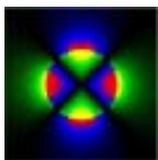
Record cylinder use data in "Argon Use Table" in OP 850.



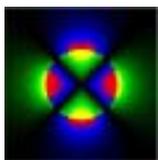
OP	Description	Name/Life #	Date	DR
615	<p>Open the gas supply valves on the two Argon cylinders.</p> <p>The pressure building valves on the Argon cylinders may need to be opened to maintain adequate gas flow..</p>			
620	<p>Adjust the gas regulators:</p> <p>Primary supply cylinder = 100 psi. Backup cylinder = 75 psi.</p> <p>Check valves prevent flow between cylinders. Backup cylinder supplies argon only when primary cylinder runs out and pressure drops below 75 psi.</p>			
625	<p>On the oven control panel, open the process gas shutoff valve and set the process gas regulator to 25 psi.</p>			
630	<p>Adjust argon flow to the reaction fixture with the flow control on the oven control panel. Verify that a minimum positive pressure of 4 inches H₂O can be achieved at or below a flow rate of 25 SCFH.</p>			
640	<p>Close and secure the oven door.</p>			
645	<p>Argon purge: Use the flow controls on the oven control panel to set flow rates: Set reaction fixture flow rate to 50 SCFH. Set oven flow rate to 300 SCFH Open the vent lines and purge until the O₂ level in both the oven and the reaction fixture is below 1.0% (approx 2-4 hours).</p>			
650	<p>When O₂ levels are below 1.0% close the vent line on the top of the oven. Set the O₂ sensor valves to monitor reaction fixture exhaust.</p>			



OP	Description	Name/Life #	Date	DR
655	Adjust argon flow rates: Reaction fixture = 25 SCFH Oven = 50 SCFH			
660	Turn on the oven and engage the fans per OPM 8.1.1.46.			
665	Login to the computer and start LabView: - Open "KTC Read Long LarpOven 4" - Click the "Run" arrow to start the data recording program. - Use the coil serial number and the date for the name of the data file. - Select the "Desktop\Reaction Data" folder for the data file location.			
670	Enter / verify fault alert contact info for the cognizant technician, technician supervisor and cognizant engineer.			
675	Set the data recording time interval to 2 minutes (00:02:00) and the argon monitor usage interval to 2 minutes (00:02:00).			
680	Set the fault alert limits: Temperature upper limit - 655C Argon flow Oven - 40 Argon flow Retort - 10 Oven pressure - 0.1 Retort pressure - 3 % Oxygen - 2 Argon rate upper limit - 0.6 Fan fault delay - 600 sec Argon minimum weight - cylinder tare weight plus 30 lbs.			

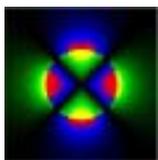


OP	Description	Name/Life #	Date	DR
685	Set E-mail Notification toggle to "Engage" Set Argon Usage Rate toggle to "Engage" Set Argon Weight Monitor toggle to "Engage"			
690	Verify the reaction recipe with the cognizant scientist: Ramp to 210C at 50 C/hr Soak at 210 C for 78 hrs Ramp to 400 C at 50 C/hr Soak at 400 C for 52 hrs Ramp to 640 C at 50 C/hr Soak at 640 C for 50 hrs Cool to room temperature. Cognizant scientist approval: _____			
695	Start SpecView and upload the SQXF recipe to the oven: - Click "Go Online" button - Click "Program" button - Click "Profile #" button - Type "1" - Click "Send" - Close pop-up - Click "Recipes" button - Select "SQXF" recipe - Verify steps - Click "Send" - Close pop-up - Click "Start" button - Click "Start" - Close pop-up			
700	In SpecView, enter the coil number in the box labeled "Batch # ". Leave SpecView running so that oven temperature data is recorded for the complete reaction cycle.			



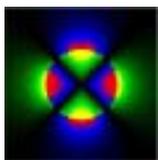
OP	Description	Name/Life #	Date	DR
705	<p>Use oven display panel to verify recipe was uploaded</p> <ul style="list-style-type: none"> - Press "2" button - Select "More commands", "Edit" - Use "F1" / "F2" buttons to step thru recipe - Press "Esc" button to return to display mode <p>Verify oven control program includes:</p> <ol style="list-style-type: none"> 1 - Soak, 25 C, 0.1 hr _____ 2 - Ramp, 25 C, 50 C/hr _____ 3 - Soak, 210 C, 78 hr _____ 4 - Ramp, 210 C, 50 C/hr _____ 5 - Soak, 400 C, 52 hr _____ 6 - Ramp, 400 C, 50 C/hr _____ 7 - Soak, 640 C, 50 hr _____ 8 - Ramp, 20 C .01 C/hr _____ 9 - Soak, 20 C, 24 hr _____ 			
710	<p>Set up the web publishing option found under the tools menu:</p> <ul style="list-style-type: none"> - Select VI Named " KTC Read Long LarpOven 4" - Set mode to "Snapshot" - Set Filename to "oven" - Click "Start", "Save" 			
715	<p>Monitor argon cylinder weight and replace the primary cylinder as required during the reaction cycle.</p> <p>Record cylinder use data in "Argon Use Table" in OP 850.</p>			
720	<p>Maintain Argon flow until the reaction cycle is complete and the oven has cooled to below 100 C.</p>			
725	<p>Close the Argon cylinder gas supply valves. Turn down the pressure regulators and remove them from the cylinders.</p>			
730	<p>When the oven has cooled to room temperature, shut off the fans and shut down the oven per OPM 8.1.1.46.</p>			





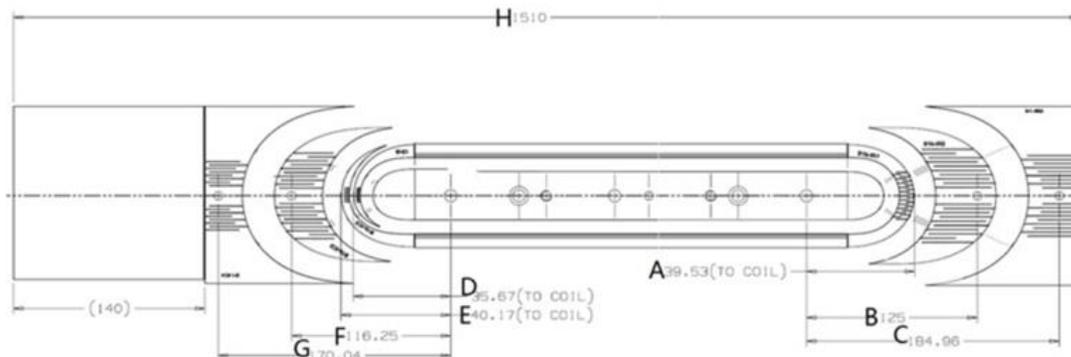
OP	Description	Name/Life #	Date	DR
740	Open the oven door and roll the reaction fixture out. Remove the thermocouple wires and argon lines from the fixture.			
745	Open the sample canister and carefully remove the test samples. Disconnect and remove the canister.			
750	Install mounting lugs and hoist rings, lift fixture, transfer to the assembly table and place onto support blocks (base plate down / do not rotate). Remove hoist rings.			





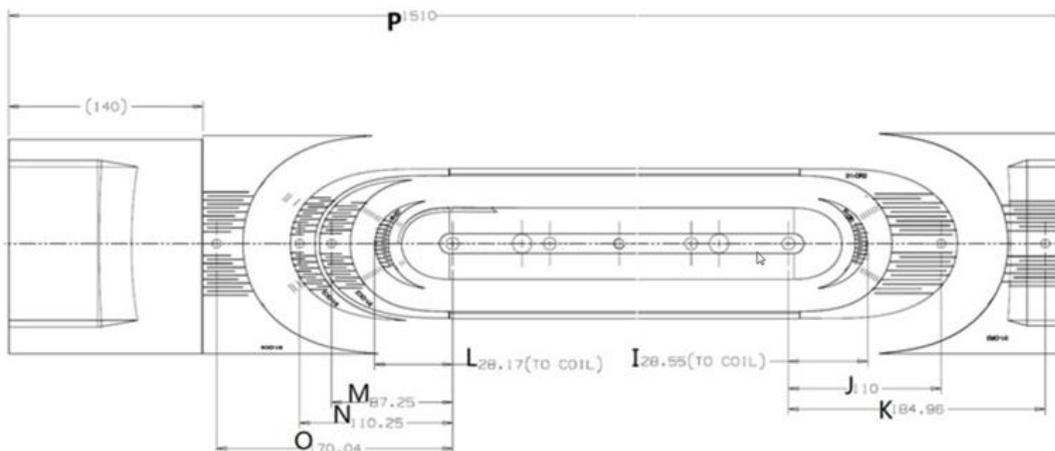
OP	Description	Name/Life #	Date	DR
800	Coil Length Measurements: Insert pins in holes, record distance between centers.			

Inner Layer:



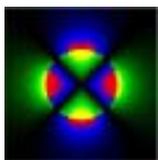
	A	B	C	D	E	F	G	H
Measurement (inches)								
Nominal (inches)	1.556	4.921	7.400	1.404	1.581	4.577	6.694	59.449

Outer Layer:



	I	J	K	L	M	N	O	P
Measurement (inches)								
Nominal (inches)	1.124	4.331	7.282	1.109	3.435	4.314	6.694	59.449

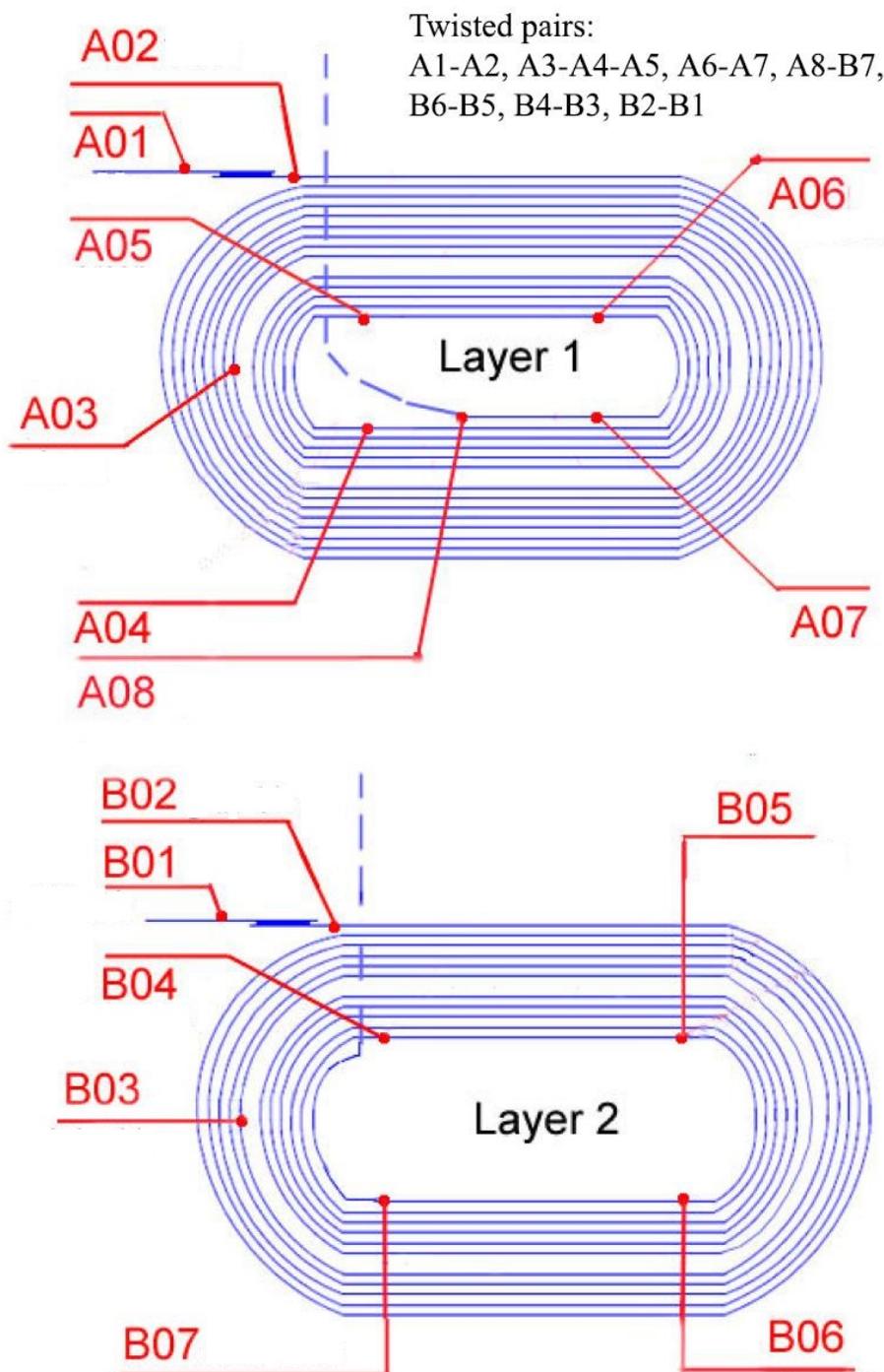


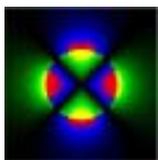


OP	Description	Name/Life #	Date	DR
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825 Voltage Tap Schematic:

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OP	Description	Name/Life #	Date	DR
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Not for Production

