

**Fermi National Accelerator Laboratory
Batavia, IL 60510**

**LARGE HADRON COLLIDER
YOKE & SKINNING ASSEMBLY TRAVELER**

**Reference Drawing(s):
Skinned Yoke Assembly
5520-ME-369579
Final Long Cold Mass Assembly
5520-ME-369578**

4/23/02

36

Budget Code: <i>LPT</i>		Project Code: <i>LHC</i>
Released by: <i>J. Anstath</i>		Date: <i>11/27/01</i>
Prepared by: M. Cullen, J. Larson,		
Title	Signature	Date
TD / E&F Process Engineering	<i>Bob Jensen</i> Bob Jensen/Designee	<i>10/4/01</i>
TD / LHC Production Supervisor	<i>Jim Kerby</i> Jim Kerby/Designee	<i>10/5/01</i>
TD / LHC Production Engineer	<i>Rodger Bossert</i> Rodger Bossert/Designee	<i>10/5/01</i>
TD / LHC Tooling Engineer	<i>John Carson</i> John Carson/Designee	<i>10/5/01</i>
TD / LHC Program Manager	<i>Jim Kerby</i> Jim Kerby/Designee	<i>10/5/01</i>

Revision Page

<u>Revision</u>	<u>Step No.</u>	<u>Revision Description</u>	<u>TRR No.</u>	<u>Date</u>
None	N/A	Initial Release	N/A	11/29/00
	4.6 / 4.9 / 5.3	Change Drawing to 32 Loose Laminations and 1 5/8" for the Wires	1224	10/4/01
	4.7 / 4.8 / 4.9	Moved to after 4.10		
	6.0	Removed all Strain Gauge Measurements. Added R, Ls and Q measurements for the magnet Before Pressing and After. Tac Weld the Skin and Keys After pressing and electrical inspection.		
	7.0	Removed all Strain Gauge Measurements.		
	8.2	Change from 1.221" to 2.221".		
	8.7	Change to Return End.		
	9.3	Angle measured in .001 mm / m = 0.2 sec		
	10.0	Combine step 9.0 and 10.0.		
	9.7	Update the electrical inspection form.		

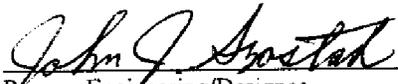
Ensure appropriate memos and specific instructions are placed with the traveler before issuing the sub traveler binder to production.

1.0 General Notes

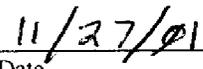
- 1.1 White (Lint Free) Gloves (Fermi stock 2250-1800) or Surgical Latex Gloves (Fermi stock 2250-2494) shall be worn by all personnel when handling all product parts after the parts have been prepared/cleaned.
- 1.2 All steps that require a sign-off shall include the Technician/Inspectors first initial and full last name.
- 1.3 No erasures or white out will be permitted to any documentation. All incorrectly entered data shall be corrected by placing a single line through the error, initial and date the error before adding the correct data.
- 1.4 All Discrepancy Reports issued shall be recorded in the left margin next to the applicable step.
- 1.5 All personnel performing steps in this traveler must have documented training for this traveler and associated operating procedures.
- 1.6 Personnel shall perform all tasks in accordance with current applicable ES&H guidelines and those specified within the step.
- 1.7 Cover the product/assembly with green Herculite (Fermi stock 1740-0100) when not being serviced or assembled. Completed wedges are to be stored in the LHC Coil Storage Area.

2.0 Parts Kit List

- 2.1 Attach the completed Parts Kit List for the LHC Yoke/Skinning Assembly to this traveler. Ensure that the serial number on the Parts Kit List matches the serial number of this traveler. Verify that the Parts Kit received is complete.

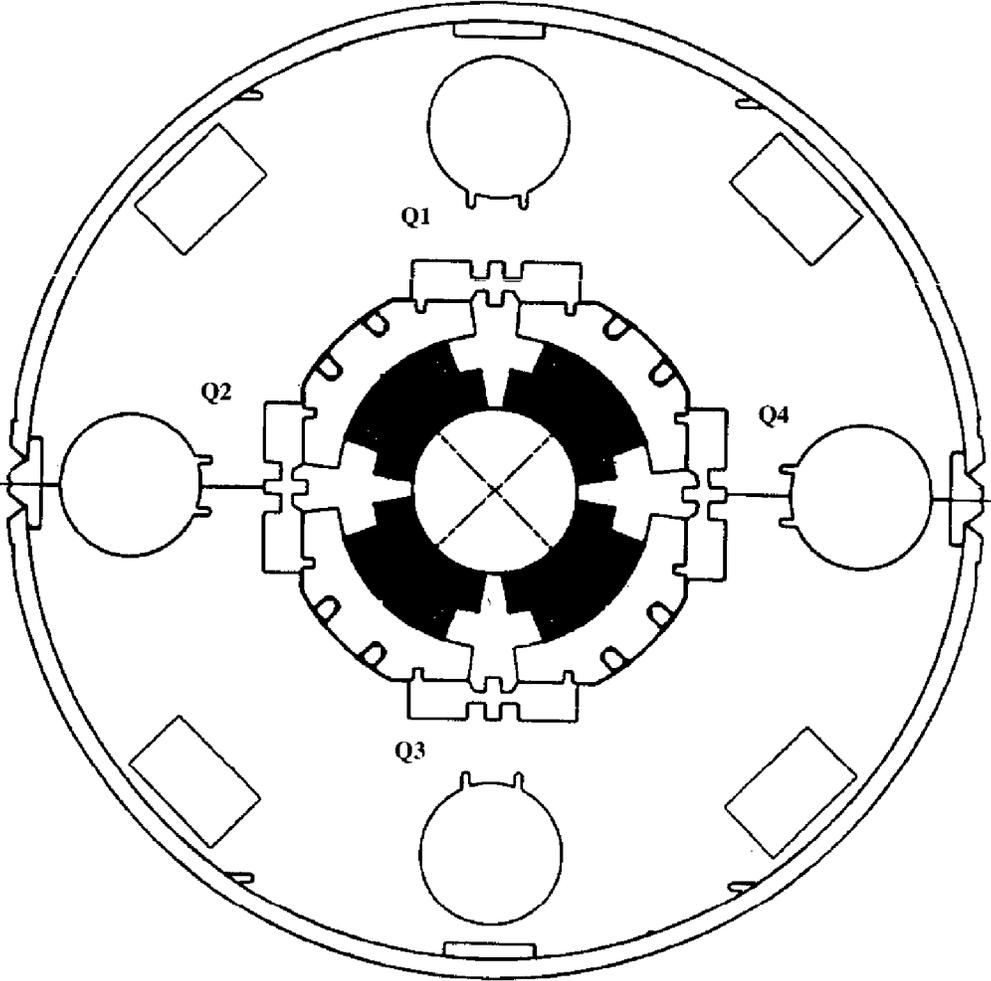


Process Engineering/Designer



Date

SKINNED YOKE ASSEMBLY 5520-ME-369579
(View from Lead End of center cross section)
Top

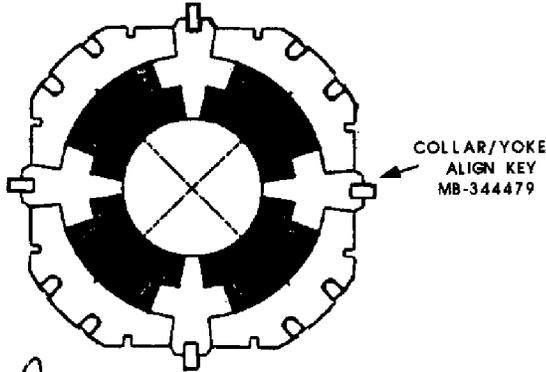


Bottom

3.0 Preparation

TRR# 1255 (3.1)

Install the Collar/Yoke Alignment Keys (MB-344479) into all four sides of the Collared Coil Assembly as shown below.



W. Howd
Technician(s)

12/18/01
Date

3.2 Thoroughly clean the Lower Mold contact areas using Isopropyl Alcohol (Fermi stock 1920-0300) and a Lint Free Heavy Duty Wipe (Fermi stock 1660-2600) or equivalent.

V. Steele
Technician(s)

12/4/01
Date

3.3 Remove and record two Lower Mold Side Plates from both sides of the Lower Mold

Plate # 5
V. Steele
Technician(s)

Plate # 15
12/4/01
Date

X 3.4 Inspect the Mold at the contact areas to ensure it has a smooth surface without imperfections (nicks, burrs, contaminants, etc.), and verify the Lower Mold Side Plates have been removed.

W. Howd
Crew Chief

12/4/01
Date

4.0 Installing the Bottom of the Cold Mass

4.1 Clean the Bottom Skin (MD-369585) as per the Cleaning and Handling Standards for Stainless Steel Yoke Components (ES-292380).

L. Ruiz Technician(s) 12/4/01 Date

4.2 Transport and place the Bottom Skin (MD-369585) in Lower Mold Assembly (MD-344361) as per the Skin Lifting Procedure (ES-293859).

M. Oued Technician(s) 12/4/01 Date

4.3 Install the Lower Mold Side Plates that were removed in Step 3.5.

M. Oued Technician(s) 12/4/01 Date

4.4 Prepare the Lower Yoke Packs for installation.

Note(s):

Roll over the Yoke Packs using the Rollover Fixture (FNAL 46245) with threaded rods.

Clean the Yoke Packs with Isopropyl Alcohol (Fermi stock 1920-0300) and Lint Free Heavy Duty Wipers (Fermi stock 1660-2600).

Title	Part #	Quantity	Cleaned	Rolled Over
Lead End Yoke Pack	ME-369587	1	1	1
Lead End Straight Section Yoke Pack	ME-369588	1	1	1
Straight Section Yoke Pack	ME-369727	2	2	2
Return End Yoke Pack	ME-369589	1	1	1
Filler Packs	No part No.	8		
Loose Laminations	ME-369279	32		

M. Oued Technician(s) 12-4-01 Date

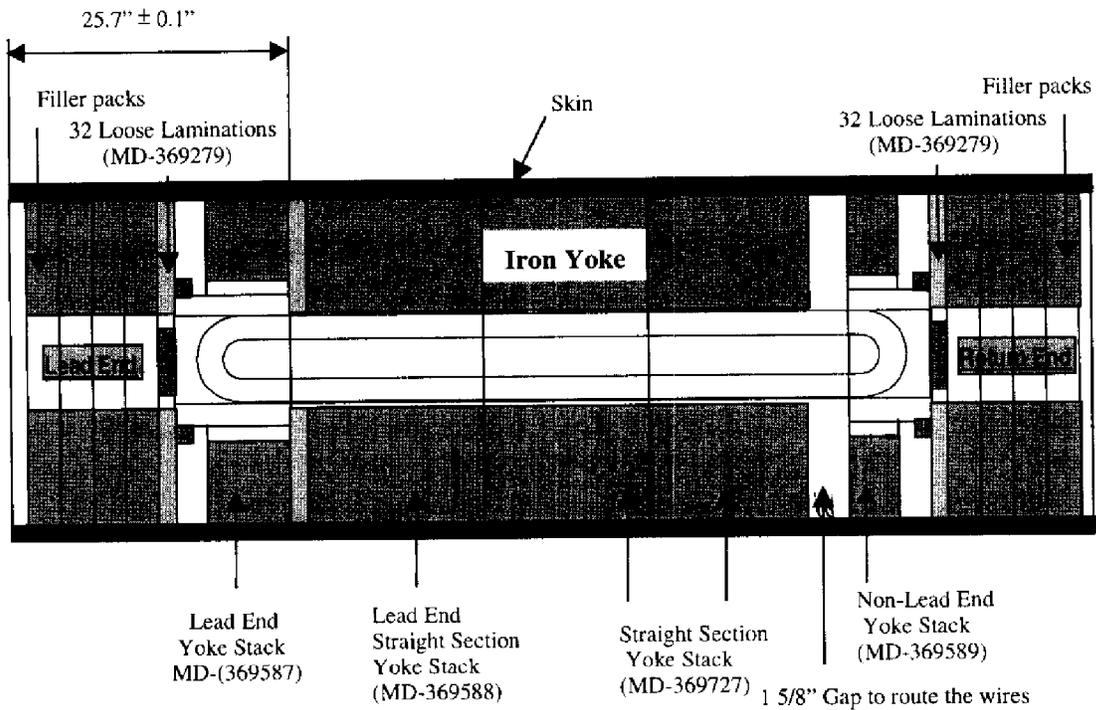
X 4.5 Inspect the Lower Yoke Packs from step 4.4.

M. Oued Lead Person 12-4-01 Date

- 4.6 Insert the Lower Yoke Packs into the Bottom Skin in accordance with the Skinned Yoke Assembly (ME-369579).

Note(s):

Place the Lower Lead End Straight Section Yoke Packs in the Bottom Skin 25.7" from the end of the skin. Ensure all yoke packs are in contact, excluding the 2" gap for the wires.



[Handwritten Signature]

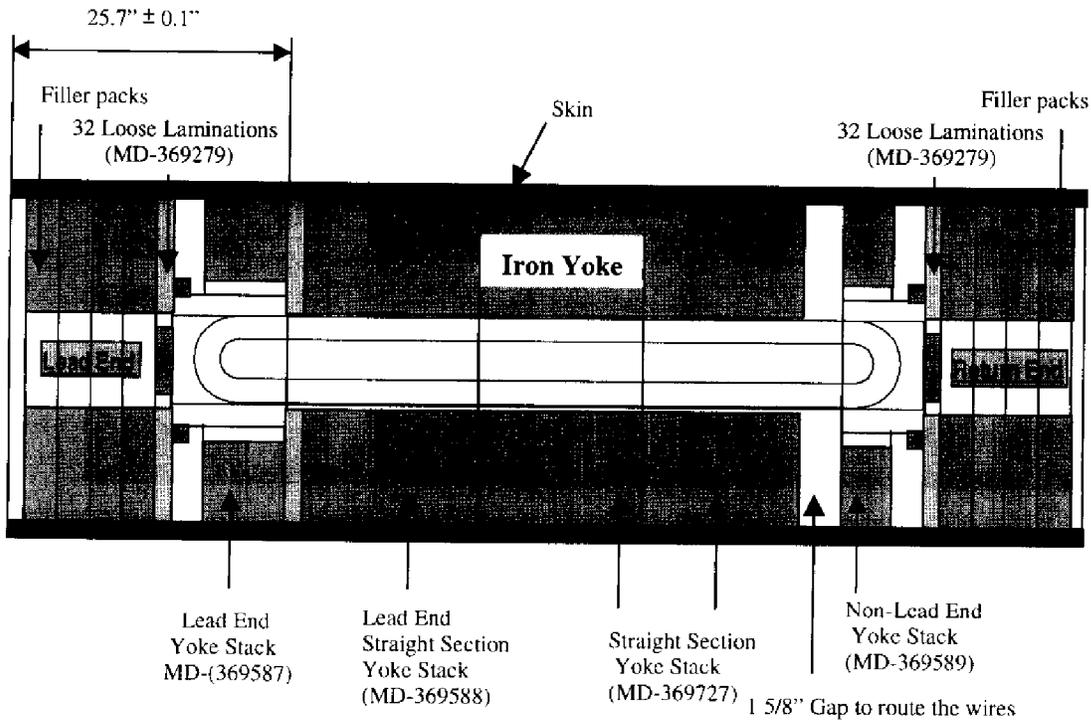
Technician(s)

12-20-01
Date

- 4.7 Install the Collared Coil so Quadrant #1 is on top as per the Skinned Yoke Assembly (ME-369579) and ensure that the Strain Gage Wires and Power Leads are free and clear.

Note(s):

Ensure that the Collared Coil Assembly is rotated so the Collared Coil \ Alignment Keys are vertical and horizontal. Quadrant #1 is up and the Collared Coil is in contact with the Lead End Straight Section Yoke Lamination Pack.



J. R. Rice

Technician(s)

12-20-01
Date

- 4.8 Clean the Skin Alignment Keys (MC-369586) as per the Cleaning and Handling Standards for Stainless Steel Yoke Components (ES-292380).

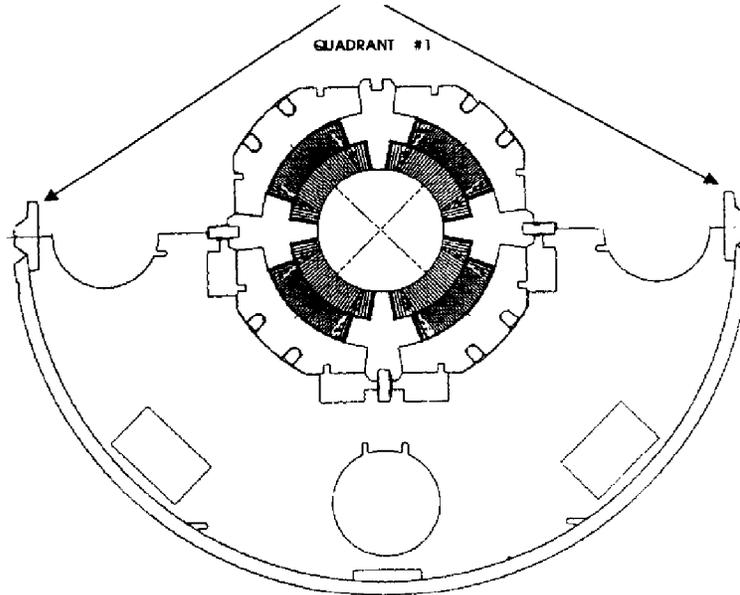
Technician(s)

Date

12-20-01

- 4.9 Install the Skin Alignment Keys (MC-369586) onto the Lower Yoke Assembly (ME-369579) (on both sides) as shown below.

Skin Alignment Keys (MC-369586)



Technician(s)

Date

12-20-01

- X 4.10 Verify the Lower Yoke Packs and Skin Alignment Keys are installed in the skin as per the Skinned Yoke Assembly (ME-369579).

Inspector(s)

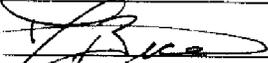
Date

12/20/01

5.0 Installing the Top of the Cold Mass

5.1 Clean the Yoke Packs with Isopropyl Alcohol (Fermi stock 1920-0300) and Lint Free Heavy Duty Wipers (Fermi stock 1660-2600).

Title	Part #	Quantity	Cleaned
Lead End Yoke Pack	ME-369587	1	1
Lead End Straight Section Yoke Pack	ME-369588	1	1
Straight Section Yoke Pack	ME-369727	2	2
Return End Yoke Pack	ME-369589	1	1
Filler Packs	No part No.	8	8
Loose Laminations	ME-369279	32	32

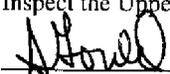


 Technician(s)

12-20-01

 Date

X 5.2 Inspect the Upper Yoke Packs from step 5.1.



 Lead Person

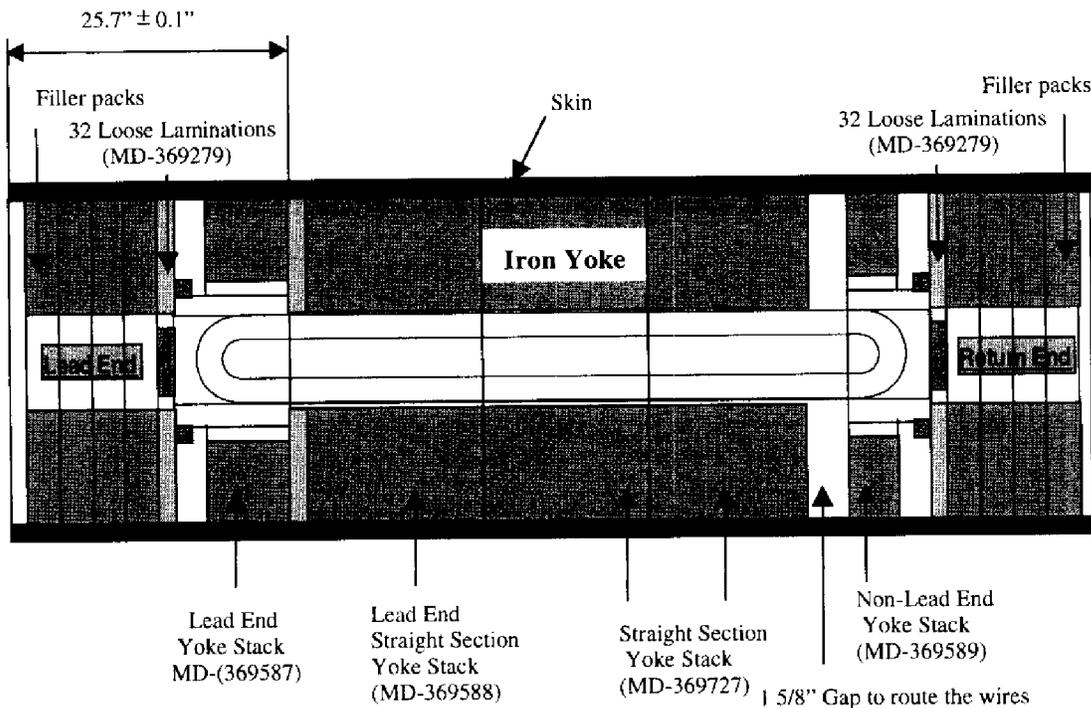
12/20/01

 Date

5.3 Install the Top Yoke Lamination Packs as per the Skinned Yoke Assembly (ME-369579).

Note(s):

Ensure that the Top Lead End Straight Section Yoke Lamination Pack is in contact with the Lead End Can and all Yoke Lamination Packs are in contact.



[Signature]
Technician(s)

12-20-01
Date

5.4 Transport and place the Top Skin (MD-369585) on the Bottom Yoke Lamination/Skin Assembly.

[Signature]
Technician(s)

12-20-01
Date

6.0 Pressing the Cold Mass

6.1 Roll Skin Assembly into press as per Yoke and Skin Press Operating Procedure (ES-301502).

[Signature]
Technician(s)

12-20-01
Date

X 6.2 Perform an Electrical Inspection of the Magnet.

	Nominal	Measurements
Resistance	2.3 Ω	2.297 Ω
Q @ 1 kHz	4.3	5.04
Inductance(Ls) @ 1 kHz	17 mH	13.2757 mH

[Signature]
Inspector

12-20-01
Date



6.3 Verify that the Readings in Step 6.2 are acceptable Approved for next Major Assembly Procedure.

[Signature]
Responsible Authority/Physicist

12-20-01
Date

6.4 Energize the Press to 600 psi pump as per the Yoke and Skin Press Assembly Operating Procedure (ES-301502).

[Signature]
Technician(s)

12-20-01
Date

6.5 Tac Weld the Skin and Keys.

[Signature]
Technician(s) WELDER(S)

1/2/02
Date

6.6 Perform an Electrical Inspection of the Magnet.

	Nominal	Measurements
Resistance	2.3 Ω	2.301 Ω
Q @ 1 kHz	4.3	5.04
Inductance(Ls) @ 1 kHz	17 mH	13.2912 mH

[Signature]
Inspector

1/2/02
Date



6.7 Verify that the Readings in Step 6.6 are acceptable Approved for next Major Assembly Procedure.

[Signature]
Responsible Authority/Physicist

1-2-02
Date

LHC Yoke & Skinning Assembly

LHC Serial No.

MQXB02

TAC# 1256
+
TRAC every
other column!
SG
1/2/02

7.0 Welding the Cold Mass

7.1 Measure the Gap between the upper and lower support plates at 21 1' intervals on the north and south side.

South			North		
1- 2.2995	8- 2.2985	15- 2.3045	1- 2.3035	8- 2.292	15- 2.2955
2- 2.2975	9- 2.301	16- 2.3	2- 2.2965	9- 2.289	16- 2.298
3- 2.3015	10- 2.294	17- 2.301	3- 2.292	10- 2.3	17- 2.2945
4- 2.3015	11- 2.299	18- 2.304	4- 2.306	11- 2.2955	18- 2.2945
5- 2.299	12- 2.3045	19- 2.2995	5- 2.291	12- 2.291	19- 2.311
6- 2.303	13- 2.2965	20- 2.3015	6- 2.289	13- 2.2985	20- 2.2915
7- 2.2945	14- 2.3	21- 2.307	7- 2.2985	14- 2.2965	21- 2.293

[Signature]
Inspector(s)

1/2/02
Date

7.2 Refer to the LHC Yoke/Skinning Welding Procedure (ES-344959). Perform the Fusion Pass, on the cold mass, as per the Skinned Yoke Assembly (ME-369579).

[Signature]
Welder(s)

1/2/02
Date

7.3 Clean the welds using Stainless Steel Wire Brush (Fermi stock 1246-0860), Vacuum, Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes (Fermi stock 1660-2500) or equivalent to remove any and all dirt and foreign materials.

[Signature]
Technician(s)

1/2/02
Date

7.4 Measure the Gap between the upper and lower support plates at 21 1' intervals on the north and south side.

South			North		
1- 2.2565	8- 2.2355	15- 2.238	1- 2.2545	8- 2.2295	15- 2.2355
2- 2.243	9- 2.2405	16- 2.234	2- 2.24	9- 2.2285	16- 2.239
3- 2.245	10- 2.2325	17- 2.233	3- 2.2295	10- 2.2375	17- 2.236
4- 2.24	11- 2.2355	18- 2.2385	4- 2.237	11- 2.236	18- 2.2315
5- 2.239	12- 2.2245	19- 2.2345	5- 2.2275	12- 2.2285	19- 2.2365
6- 2.2405	13- 2.234	20- 2.241	6- 2.2265	13- 2.241	20- 2.2325
7- 2.2315	14- 2.237	21- 2.2665	7- 2.233	14- 2.235	21- 2.2485

[Signature]
 Inspector(s)

1/2/02
 Date

7.5 Refer to the LHC Yoke/Skinning Welding Procedure (ES-344959). Perform Filler Pass #1, on the cold mass, as per the Skinned Yoke Assembly (ME-369579).

[Signature]
 Welder

1/4/02
 Date

7.6 Clean the welds using Stainless Steel Wire Brush (Fermi stock 1246-0860), Vacuum, Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes (Fermi stock 1660-2500) or equivalent to remove any and all dirt and foreign materials.

[Signature]
 Technician(s)

1/4/02
 Date

7.7 Measure the Gap between the upper and lower support plates at 21 1' intervals on the north and south side.

South			North		
1- 2.210	8- 2.173	15- 2.1765	1- 2.211	8- 2.168	15- 2.1765
2- 2.1885	9- 2.1785	16- 2.173	2- 2.186	9- 2.1675	16- 2.1805
3- 2.1845	10- 2.170	17- 2.173	3- 2.175	10- 2.1775	17- 2.175
4- 2.180	11- 2.173	18- 2.177	4- 2.1785	11- 2.174	18- 2.1695
5- 2.1775	12- 2.177	19- 2.177	5- 2.168	12- 2.167	19- 2.182
6- 2.1805	13- 2.177	20- 2.192	6- 2.1665	13- 2.178	20- 2.183
7- 2.1705	14- 2.175	21- 2.234	7- 2.1725	14- 2.175	21- 2.214

[Signature]
 Inspector(s)

1/4/02
 Date

7.8 Refer to the LHC Yoke/Skinning Welding Procedure (ES-344959). Perform Filler Pass #2, on the cold mass, as per the Skinned Yoke Assembly (ME-369579).

[Signature]
 Weldor(s) 1/4/02
Date

7.9 Clean the welds using Stainless Steel Wire Brush (Fermi stock 1246-0860), Vacuum, Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes (Fermi stock 1660-2500) or equivalent to remove any and all dirt and foreign materials.

[Signature]
 Technician(s) 1/4/02
Date

7.10 Measure the Gap between the upper and lower support plates at 21 1' intervals on the north and south side.

South			North		
1- 2.1795	8- 2.1245	15- 2.130	1- 2.1725	8- 2.121	15- 2.1325
2- 2.151	9- 2.1305	16- 2.1285	2- 2.1465	9- 2.12	16- 2.135
3- 2.1405	10- 2.123	17- 2.1285	3- 2.1295	10- 2.128	17- 2.134
4- 2.134	11- 2.125	18- 2.1345	4- 2.130	11- 2.1285	18- 2.131
5- 2.1305	12- 2.1295	19- 2.1415	5- 2.1195	12- 2.12	19- 2.1435
6- 2.1335	13- 2.1255	20- 2.165	6- 2.1185	13- 2.129	20- 2.1535
7- 2.124	14- 2.1285	21- 2.2105	7- 2.12	14- 2.1315	21- 2.2015

[Signature]
 Inspector(s) 1/4/02
Date

7.11 Refer to the LHC Yoke/Skinning Welding Procedure (ES-344959). Perform Filler Pass #3, on the cold mass, as per the Skinned Yoke Assembly (ME-369579).

[Signature]
 Weldor(s) 1/4/02
Date

7.12 Clean the welds using Stainless Steel Wire Brush (Fermi stock 1246-0860), Vacuum, Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes (Fermi stock 1660-2500) or equivalent to remove any and all dirt and foreign materials.

[Signature]
 Technician(s) 1/4/02
Date

7.13 Measure the Gap between the upper and lower support plates at 21 1' intervals on the north and south side.

South			North		
1- 2.1445	8 2.085	15- 2.093	1- 2.1445	8 2.0795	15- 2.09
2- 2.1195	9- 2.0905	16- 2.09	2- 2.1125	9- 2.08	16- 2.0955
3- 2.1025	10- 2.0875	17- 2.0875	3- 2.093	10- 2.0955	17- 2.092
4- 2.096	11- 2.087	18- 2.0915	4- 2.0925	11- 2.09	18- 2.088
5- 2.084	12- 2.0845	19- 2.1035	5- 2.078	12- 2.0745	19- 2.099
6- 2.09	13- 2.0805	20- 2.1215	6- 2.075	13- 2.0935	20- 2.135
7- 2.0815	14- 2.084	21- 2.178	7- 2.0805	14- 2.09	21- 2.165

A. Hald
Inspector(s)

1/4/02
Date

7.14 Refer to the LHC Yoke/Skinning Welding Procedure (ES-344959). Perform Filler Pass #4, on the cold mass as per the Skinned Yoke Assembly (ME-369579).

Joseph S. Hartoul
Welder(s)

1/4/02
Date

7.15 Clean the welds using Stainless Steel Wire Brush (Fermi stock 1246-0860), Vacuum, Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes (Fermi stock 1660-2500) or equivalent to remove any and all dirt and foreign materials.

A. Hald
Technician(s)

1/4/02
Date

7.18 Measure the Gap between the upper and lower support plates at 21 1' intervals on the north and south side.

South			North		
1- 2.13	8 2.0535	15- 2.0625	1- 2.1355	8 2.0485	15- 2.061
2- 2.097	9- 2.0585	16- 2.058	2- 2.0885	9- 2.048	16- 2.065
3- 2.0765	10- 2.052	17- 2.0615	3- 2.063	10- 2.0575	17- 2.0645
4- 2.0655	11- 2.0545	18- 2.0695	4- 2.0615	11- 2.0575	18- 2.064
5- 2.0595	12- 2.059	19- 2.0775	5- 2.0465	12- 2.049	19- 2.08
6- 2.0585	13- 2.055	20- 2.1055	6- 2.0450	13- 2.0585	20- 2.0955
7- 2.0495	14- 2.0575	21- 2.1655	7- 2.048	14- 2.061	21- 2.153

David
Inspector(s)

1/4/02
Date

7.19 Refer to the LHC Yoke/Skinning Welding Procedure (ES-344959). Perform Filler Pass #5, on the cold mass, as per the Skinned Yoke Assembly (ME-369579).

John O. ...
Welder(s)

1/7/02
Date

7.20 Clean the welds using Stainless Steel Wire Brush (Fermi stock 1246-0860), Vacuum, Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes (Fermi stock 1660-2500) or equivalent to remove any and all dirt and foreign materials.

Michael ...
Technician(s)

1/7/02
Date

7.21 Measure the Gap between the upper and lower support plates at 21 1' intervals on the north and south side.

South			North		
1- 2.1175	8 2.0275	15- 2.0335	1- 2.1255	8 2.024	15- 2.0355
2- 2.0755	9- 2.0345	16- 2.032	2- 2.0725	9- 2.023	16- 2.04
3- 2.0535	10- 2.03	17- 2.036	3- 2.0415	10- 2.0315	17- 2.039
4- 2.0405	11- 2.03	18- 2.042	4- 2.0415	11- 2.031	18- 2.038
5- 2.034	12- 2.032	19- 2.053	5- 2.0235	12- 2.025	19- 2.0555
6- 2.034	13- 2.0285	20- 2.08	6- 2.021	13- 2.0425	20- 2.074
7- 2.026	14- 2.03	21- 2.1435	7- 2.025	14- 2.036	21- 2.135

David ...
Inspector(s)

1/7/02
Date

TRC # 1233
x
Move this
STEP TO
AFTER 8.1
SWG
2/7/02

7.22 Release Press pressure and remove the cold mass from the press.

[Signature]
Technician(s)

1/7/02
Date

7.23 Perform an Electrical Inspection on the magnet.

	Nominal	Measurements
Resistance	2.3 Ω	2.3 Ω
Q@ 1 kHz	4.3	4.94
Inductance(Ls) @ 1 kHz	17 mH	17.544 mH

[Signature]
Inspector

1/8/02
Date



7.24 Verify that the Readings in Step 7.23 are acceptable. Approved for next Major Assembly Procedure.

[Signature]
Responsible Authority/Physicist

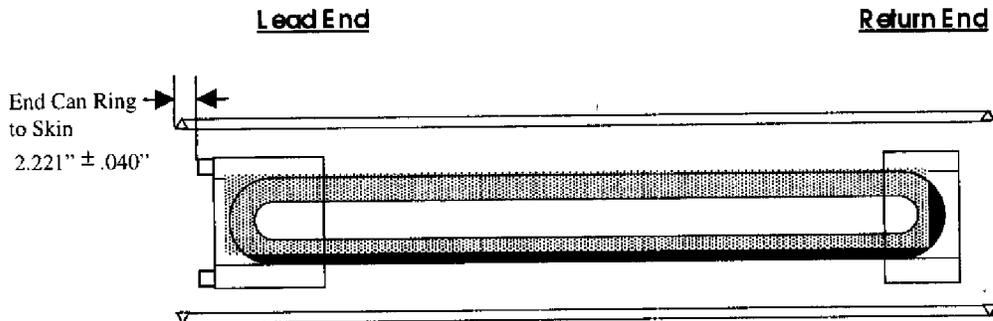
1-8-02
Date

8.0 Cutting the Cold Mass Skin to Length

8.1 Remove the same Lower Mold Side Plates as in step 3.5. Lift the Cold Mass using approved and appropriate lifting procedures and transport to the Skin Cutting Station.

M. Gould Technician(s) 1/18/02 Date

8.2 Mark the Lead End of the Cold Mass Skin as shown in the figure below.



M. Gould Technician(s) 1/18/02 Date

X 8.3 Verify that the Lead End of the Cold Mass has been marked and the Wachs Cutter is placed in the proper location.

D. Murray Crew Chief 1-18-02 Date

X 8.4 Cut the Lead End of the Cold Mass to the proper length using the Wachs Cutter as per the Skinned Yoke Assembly (ME-369579).

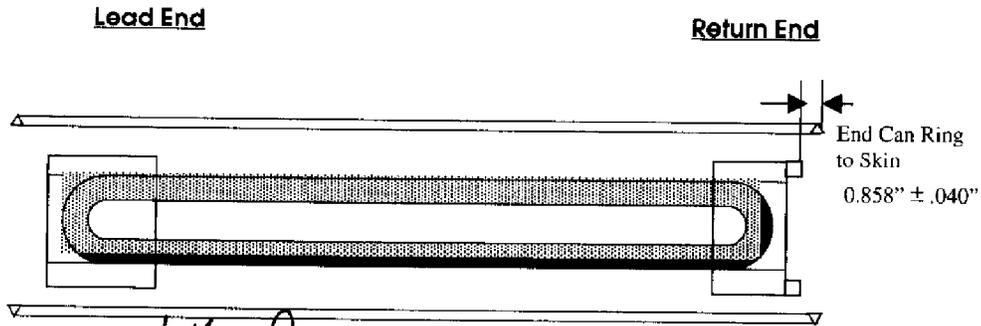
Note(s):

While cutting or filing ensure that all exposed parts are covered and a vacuum is used during the process to collect all debris.

Make two cuts, first a rough-cut 1" away from mark, and final cut at the mark.

M. Gould Lead Person 1/18/02 Date

8.5 Mark the Return End of the Cold Mass Skin as shown in Figure below



A. Gould Technician(s) Date 1/24/02

X 8.6 Verify that the Return End of the Cold Mass has been marked and the Cutting Fixture is placed in the proper location.

D. Murphy Crew Chief Date 1-24-02

X 8.7 Cut the Return End of the Cold Mass to the proper length using the Wachs Cutter as per the Skinned Yoke Assembly (ME-369579).

Note(s):

While cutting or filing ensure that all exposed parts are covered and a vacuum is used during the process to collect all debris.

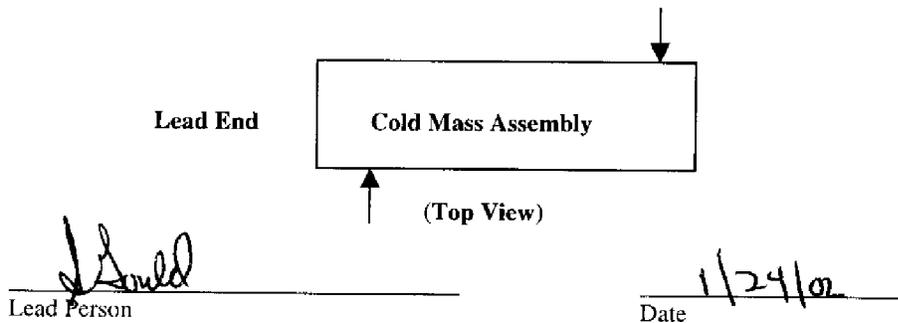
Make two cuts, first a rough-cut 1" away from mark, and final cut at the mark.

A. Gould Lead Person Date 1/24/02

8.8 Remove any loose yoke laminations from the ends.

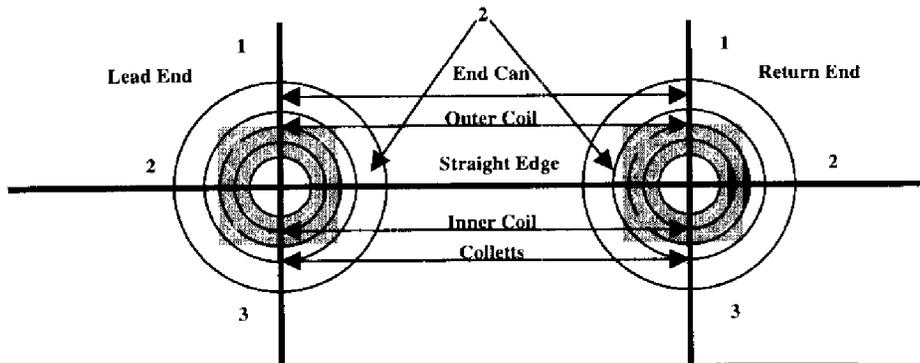
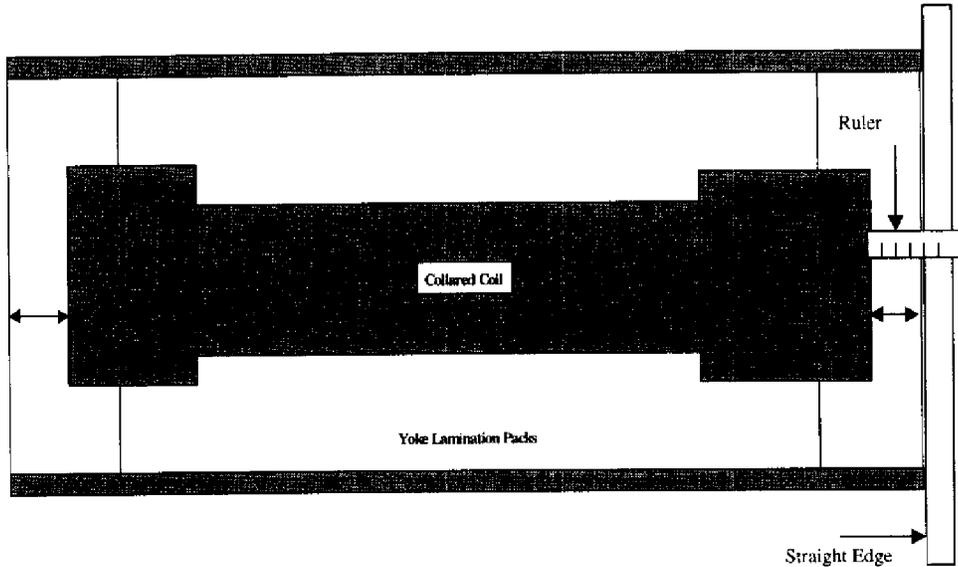
A. Gould Technician(s) Date 1/24/02

X 8.9 Stamp the Magnet Serial Number on both ends of the Cold Mass Skin in 1/2" high numbers/letters approximately 3 inches above the Alignment Key.



9.0 Cold Mass Mechanical Inspection

- X 9.1 Measure the end of the Cold Mass Skin to End of the Saddles with a ruler to the closest 1/64". The nominal lengths are Lead End at 1.639" and Return End at 1.202" as per Skinned Yoke Assembly.

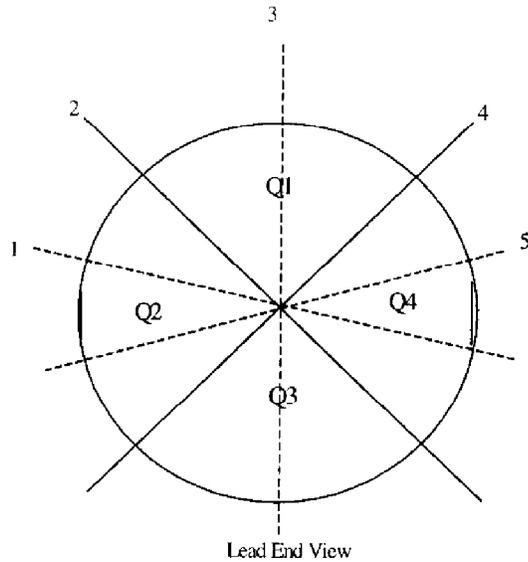


Quadrant	Lead End (Inch) 1+39/64" to 1+43/64"		Return End (Inch) 1+11/64" to 1+15/64"	
	Inner	Outer	Inner	Outer
#1	1.419	1.426	1.423 1.425 ^{SW6}	1.4405 1.3085 ^{SW6}
#2	1.4255	1.395	1.4005	1.3705
#3	1.399	1.423	1.435	1.4195
#4	1.4215	1.421	1.425	1.437

J. Gould
Inspector

1/25/02
Date

X 9.2 Final Outer Diameter Measurement with 0" to 24" caliper (Starrett S436KRLSZ) or equivalent to closest 0.001".



Distance from the Lead End	Position #1 5°	Position #2 45°	Position #3 90°	Position #4 135°	Position #5 175°
0" (LE)	16.494	16.337	16.310	16.343	16.480
50"	16.395	16.376	16.377	16.387	16.397
100"	16.405	16.384	16.380	16.388	16.399
150"	16.406	16.385	16.381	16.381	16.392
200"	16.389	16.381	16.379	16.386	16.389
240" (RE)	16.451	16.339	16.339	16.350	16.455

[Signature]
 Inspector

1/25/02
 Date

9.3 Twist check with MINILevel (#1045 or #75) or equivalent.

Note(s):

Ensure the MINILevel Selector Knob is in position #1.

Position	Angle 0.001mm/m=0.2sec	Position	Angle 0.001mm/m=0.2sec
0" (LE)	1.000	130"	'062
10"	'029	140"	'029
20"	'051	150"	'048
30"	'047	160"	'056
40"	'049	170"	'043
50"	'053	180"	'007
60"	'085	190"	'041
70"	'067	200"	'019
80"	'090	210"	'032
90"	'080	220"	'015
100"	'055	230"	N/A
110"	'055	240"	N/A
120"	'048		

J. H. [Signature]
 Technician(s)

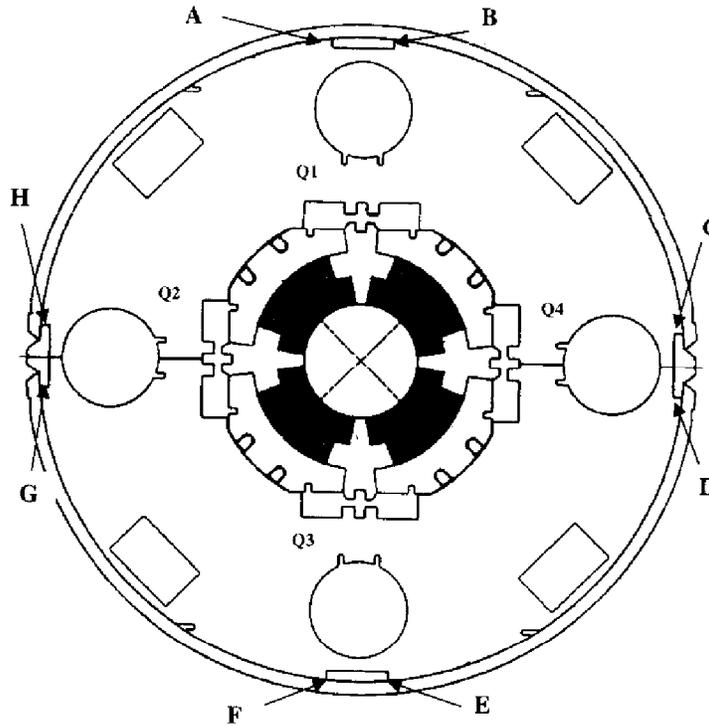
1/28/02
 Date

9.4 Measure the Cold Mass Yoke Skin Assembly (ME-369404) from the Lead End of the Skin to the Return End of the Skin with a Standard Tape Measure. Record the Length from the Lead End of the Skin to the Return End of the Skin in the table below to the closest 1/32". The measurements are taken at the center of the Quadrants.

Position of the Measurement	Measurement in Inches
Q1	223 ⁵ / ₁₆ "
Q2	223 ⁷ / ₈ "
Q3	223 ¹³ / ₁₆ "
Q4	223 ¹³ / ₁₆ "

J. H. [Signature]
 Technician(s)

1/28/02
 Date



9.5 Measure the gap between the Lamination and the Skin to the side of the cutout

Position	Limit	Lead End	Return End
A	No Limit For Reference Only	\emptyset	\emptyset
B	No Limit For Reference Only	\emptyset <i>0.0015</i>	\emptyset <i>.002</i>
E	No Limit For Reference Only	\emptyset <i>.001</i>	\emptyset
F	No Limit For Reference Only	\emptyset	\emptyset

[Signature]
Technician(s)

1/28/02
Date

9.6 Measure the gap between the Lamination and the Key

Position	Limit	Lead End	Return End
C	No Limit For Reference Only	\emptyset	\emptyset
D	No Limit For Reference Only	\emptyset	\emptyset
G	No Limit For Reference Only	\emptyset	\emptyset <i>.003</i>
H	No Limit For Reference Only	\emptyset	\emptyset

[Signature]
Technician(s)

1/28/02
Date

9.7 Perform an electrical inspection on each of the individual Inner Coils, Outer Coils, Quadrants and the Magnet. Refer to the Valhalla and Leader Free Standing Coil Measurement Procedure (ES-292306), and the Procedure for Electrical Inspection of Voltage Taps (ES-301383).

Note(s):

Ensure that all measurements are recorded correctly, and have the proper value and symbol (i.e., mΩ, mH, etc.).

Valhalla 4300B settings:

Test current	_____	Off (not testing)
Power	_____	On
Full scale voltage	_____	20mv
Amp selector knob	_____	1 A
Temperature compensator	_____	On
Test current	_____	On (testing)

Hp 4263 B:

Function _____ "Ls-Q" selected

Record the Serial Number of the test equipment used.

Valhalla 32-858
 HP 4263b 2848J00912

Resistance		Inner	Outer	Total	Pass	Fail
Nominal		345 mΩ to 390 mΩ	410 mΩ to 455 mΩ	560 to 585 mΩ		
Quadrant 1	Inner	256.4 mΩ				
	Outer		318.6 mΩ			
	Total			575.0 mΩ		
Quadrant 2	Inner	257.5 mΩ				
	Outer		318.9 mΩ			
	Total			576.1 mΩ		
Quadrant 3	Inner	257.3 mΩ				
	Outer		317.8 mΩ			
	Total			575.1 mΩ		
Quadrant 4	Inner	257.4 mΩ				
	Outer		318.8 mΩ			
	Total			576.0 mΩ		

Inductance		Inner	Outer	Total	Pass	Fail
Nominal		620-650 μ H	1.120 to 1.17 mH	2.880 to 2.935 mH		
Quadrant 1	Inner	534.413526 876.485 μ H				
	Outer		1.217 866.47 mH			
	Total			2.2909 mH		
Quadrant 2	Inner	535.962 μ H				
	Outer		867.271 mH			
	Total			2.2941 mH		
Quadrant 3	Inner	538.021 μ H				
	Outer		869.570 mH			
	Total			2.3030 mH		
Quadrant 4	Inner	537.530 μ H				
	Outer		870.885 mH			
	Total			2.3020 mH		

Q-Factor		Inner	Outer	Total	Pass	Fail
Nominal		3.0 to 3.5	4.3 to 5.0	4.5 to 5.2		
Quadrant 1	Inner	^{SWG} 2.08 1.28				
	Outer		2.20 1.58			
	Total			4.67		
Quadrant 2	Inner	1.29				
	Outer		1.59			
	Total			4.69		
Quadrant 3	Inner	1.31				
	Outer		1.61			
	Total			4.65		
Quadrant 4	Inner	1.31				
	Outer		1.61			
	Total			4.70		

J. Honeo
Inspector

1/28/02
Date

	Nominal	Measurements
Resistance	2.3 Ω	2,302 Ω
Q @ 1 kHz	4.3	4.94
Inductance(Ls) @ 1 kHz	17 mH	13,5605 mH

J. Honeo
Inspector

1/28/02
Date

Electrical Test	Limit	Actual Measurement	Pass	Fail
Heater Strips 1/2 Resistance	9.10 to 9.50 Ω	9.224 Ω	✓	
Heater Strips 2/3 Resistance	9.10 to 9.50 Ω	9.198 Ω	✓	
Heater Strips 3/4 Resistance	9.10 to 9.50 Ω	9.263 Ω	✓	
Heater Strips 4/1 Resistance	9.10 to 9.50 Ω	9.320 Ω	✓	

J. Honeo
Inspector

1/28/02
Date

Perform a Hipot on the Collared Coil Assembly (Maximum Leakage 2.5µA)

5 KV	Measurement(s)
Heater #1/2 to Ground	.2
Heater #2/3 to Ground	.2
Heater #3/4 to Ground	.2
Heater #4/1 to Ground	.2
Heater #1/2 to All 4 Quadrants	.2
Heater #2/3 to All 4 Quadrants	.2
Heater #3/4 to All 4 Quadrants	.2
Heater #4/1 to All 4 Quadrants	.2
All 4 Quadrants to Ground	.2

Coil to Coil 3.0 KV	Measurement(s)
Quadrant 1 to Quadrant 2	.1
Quadrant 2 to Quadrant 3	.1
Quadrant 3 to Quadrant 4	.1
Quadrant 4 to Quadrant 1	.1

J. Gould
 Inspector

1/29/02
 Date



9.8 Verify that the results in Step 9.7 are acceptable.
 Approved for next Assembly Procedure.

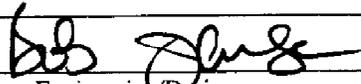
[Signature]
 Responsible Authority/Physicist

29 JAN 02
 Date

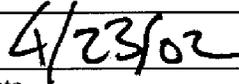
10.0 Production Complete

10.1 Process Engineering verify that the LHC Yoke/Skinning Traveler (TR-333497) is accurate and complete. This shall include a review of all steps to ensure that all operations have been completed and signed off. Ensure that all Discrepancy Reports, Nonconformance Reports, Repair/Rework Forms, Deviation Index and dispositions have been reviewed by the Responsible Authority for conformance before being approved.

Comments:



Process Engineering/Designee



Date

TD/ENGINEERING & FABRICATION

PARTS KIT REQUEST

ORIGINAL

IMPORTANT NOTES:

- 1) MAGNET NUMBER MUST BE FILLED IN.
- 2) ONLY ONE FORM PER MAGNET.
- 3) PARTS COORDINATOR OR DESIGNEE MUST SIGN THIS FORM.
- 4) MATERIAL CONTROL WILL ISSUE PARTS AND RECORD ROUTING NUMBER.
- 5) ANY QUANTITIES NOT AVAILABLE WILL HAVE COMMENTS RETURNED TO THE PARTS COORDINATOR FOR REVIEW.

DELIVER TO: _____ ICB

BUDGET CODE: LQB

MAGNET NUMBER: **MOX8c-002**

RELEASED BY: _____ PRODUCTION SIGNATURE: *T. J. Gardner*

TODAYS DATE: **12-Nov-01**

NEED DATE: **14-Nov-01**

ISSUE VERIFICATION: _____

MATERIAL CONTROL SIGNATURE: *Marsha Schmidt*

DATE ISSUED TO STOCKROOM: **11/12/01**

THIS KIT LIST IS FOR: **A SKINNED YOKE ASSEMBLY**

PART NUMBER	REV	DESCRIPTION	REQUIRED QTY/ASSY	MATERIAL		CONTROL		PROD VERIFY PART	SUPT. VERIFY PART
				QTY FILLED OUT BY STOCK ROOM	ROUTE FORM	DATE AVAIL	COMMENTS TO PRODUCTION MANAGER		
344479	C	COLLAR/YOKE ALIGNMENT KEY	68 EA	168	70484	11/12/01			
369585	A/B	SKIN	2 EA	2	76155				
369586	B	ALIGNMENT KEY	2 EA	2	74440				
369587	A	LEAD END YOKE STACK	2 EA	2	N/A				
369588	B	STRAIGHT SECTION LEAD STACK-LEAD END	2 EA	2	N/A				
369589	A	NON-LEAD END YOKE STACK	2 EA	2	N/A				
369727		STRAIGHT SECTION YOKE STACK	4 EA	4	N/A				
369580	B	COLLARED COIL W/ ENDS ASSEMBLY	ICB HAS						

RETURN THIS COMPLETED PARTS KIT REQUEST WITH THE ISSUED PARTS TO THE PARTS COORDINATOR.

TRAVELER NO. TR-333497

KIT IS COMPLETE (PARTS COORDINATOR SIGNATURE): *John A. ...*

STOCKROOM SIGNATURE AND DATE: *11/14/01*

BUOGE # 02943C

DATE: **11/14/01**

Revision Request Control Number:

Specification Number: Current Revision:

Traveler or Document Title

Step #/Description of Revision:

- 3.1 Modified Step. Added "Modify the Lengths of the Keys to fit."
- 7.20 Added Step. "Inspect the Welds and determine if a 6th pass is necessary." DR No. HGQ-0263.
- 9.1 Added Step. "Install the Jumper Wires (length as required) (MA-369833) on the Heater Strips at the NON-Lead End as per Figure 1." (Old Step 3.1 of 333498)
- 9.2 Added Step. "Install Saddle Shim Stock (MA-369817) Outer pieces (Qty. 4) into the four quadrants. Modify as necessary to fit properly."

Originator

Responsible Authority

Date

Revision Incorporated into the Traveler:

Revision Incorporated By

Date

Process Engineering Final Review:

Process Engineering/Designee

Date

Instructions for the completion of the Revision Request Form

Note(s):

Multiple steps may be effected by one Revision Request Form but only one specific Traveler or Document may be effected by each Revision Request Form.

If completing this form by hand, a Revision Request Control Number must be obtained before processing.

If completing this form entirely by electronic means, the printed copy to be filed in the Process Engineering Office is to be initiated by the individual incorporating the Revision Request and the individual who reviewed the Traveler or Document.

Originator Instructions:

- 1) **Specification Number:** - Enter the Specification Number of the Traveler or Document to be revised. (Document title is inserted automatically from the spec. #)
- 2) **Current Revision:** - Enter the Revision of the Traveler or Document to be revised.
- 3) **Step# / Description of the Revision:** - Enter a description of the revision to be made and the step# it applies to, if applicable. If needed to describe the revision attach a copy of the page(s). If the revision is coming from a related document such as a Discrepancy Report or an Engineering Order attach a copy of that document to the Revision Request Form.
- 4) **Originator:** - Originator is the person generating the form. (Select Name from List)
- 5) **Responsible Authority:** - Responsible Authority is person responsible for the process in question. (Select Name from List)

Process Engineering Office Instructions:

- 1) **Revision Incorporated into the Traveler:** - Signature of the individual who incorporated the revision.
- 2) **Process Engineering Final Review:** - Review the Traveler or Document revised, sign and date the form. The original completed Revision Request Form will be retained by the Process Engineering Office in the Revision Request Binder.

Revision Request Control Number: 1256

Specification Number: 5520 - TR - 333497 Current Revision: A

Traveler or Document Title LHC Yoke & Skinning Traveler

Step #/Description of Revision:

- 6.2 Modified Step. Updated nominals. R=2.305 W, Q=5.036, Ls=13.3376 mH.
- 6.5 Modified Step. Added " Tack Weld at every other Press Column, beginning with the First Column at Lead End." Changed Technician signature to Weldor.
- 6.6 Modified Step. Updated nominals. R=2.305 W, Q=5.036, Ls=13.3376 mH.
- 7.24 Modified Step. Updated nominals. R=2.305 W, Q=5.036, Ls=13.3376 mH.
- 9.3 Modified Table. Changed the Angle Header Column from "mm/m = 0.2 sec." to "mm/m = 2 sec".
- 10.1 Modified Step. Updated nominals. R=2.305 W, Q=5.036, Ls=13.3376 mH.

Jim Rife

Originator

Jim Rife

Responsible Authority

10/18/2001

Date

Revision Incorporated into the Traveler:

John Szostak

Revision Incorporated By

3/20/2002

Date

Process Engineering Final Review:

Bob Jensen

Process Engineering/Designee

3/20/2002

Date

Instructions for the completion of the Revision Request Form

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- 4) Originator: - Originator is the person generating the form. (Select Name from List)
- 5) Responsible Authority: - Responsible Authority is person responsible for the process in question. (Select Name from List)

Process Engineering Office Instructions:

- 1) Revision Incorporated into the Traveler: - Signature of the individual who incorporated the revision.
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Revision Request Control Number: 1283

Specification Number: 5520 - TR - 333497 Current Revision: A

Traveler or Document Title LHC Yoke & Skinning Traveler

Step #/Description of Revision:

- 4.4 Modified Step. Added "Straight Section Yoke Pack - Non - Lead End MD-369828" to the Table. DR. No. HGQ-0262.
- 4.6 Modified Step. Changed to "Using the Iron Core Transport Fixture Assembly (ME-344634), insert the five Lower Yoke Packs into the Bottom Skin in accordance with the Skinned Yoke Assembly (ME-369579). Ensure all yoke packs are in contact, excluding the 1/4" gap. 1) Lead End Yoke Stack (MD-369587) 2) Lead End Straight Section Yoke Stack (MD-369588) 3) Straight Section Yoke Stack (MD-369727) 4) Straight Section Yoke Stack - Non-Lead End (MD-369828) 5) Non-Lead End Yoke Stack (MD-369589)." Changed Drawing to Show New Straight Section Yoke Pack (MD-369828), 9 Stainless Steel Laminations at the Lead End and 21 Stainless Steel Laminations at the Return End. DR. No. HGQ-0262.
- 4.7 Modified Step. Changed Drawing to Show New Straight Section Yoke Pack (MD-369828), 9 Stainless Steel Laminations at the Lead End and 21 Stainless Steel Laminations at the Return End. DR. No. HGQ-0262.
- 4.8 Added Step. "Transfer the Magnetic Center mark to the outside of the Lower Skin." DR No. HGQ-0265.
- 4.9 Added Step. "Verify the Magnetic Center Mark on the outside of the Lower Skin is correct." DR No. HGQ-0265.
- 4.12 Modified Step. Changed signoff from Inspector to Crew Chief.
- 5.1 Modified Step. Changed to "Clean the Upper Yoke Packs ..." Added "Straight Section Yoke Pack - Non - Lead End MD-369828" to the Table.
- 5.3 Modified Step. Changed Drawing to Show New Straight Section Yoke Pack (MD-369828), 9 Stainless Steel Laminations at the Lead End and 21 Stainless Steel Laminations at the Return End. DR. No. HGQ-0262. Changed Note from "...Top Lead End ..." to "...Upper Lead End..."
- 5.4 (New) Added Step. "Install Loose Laminations from the Face of the Magnet to 113" from Magnetic Center. Install Filler Packs to the End of the Skin."
- 5.4 Modified Step. Corrected "...Bottom Yoke Lamination/Skin Assembly." to "...Upper Yoke Lamination/Skin Assembly."
- 7.23 Added Step. Moved old step 8.1 to new location as Step 7.23.
- 8.1 - 8.17 Modified Steps. Modified multiple steps for Skin Cutting procedure.
- 9.7 Modified Step. Added Note "Note(s): Ensure Assembly is isolated from ANY Ground."
- 10.0 Modified Step. Changed Numbering. Moved Electrical Inspection to 10.1 and Verification to 10.2.

Jim Rife

Originator

Jim Kerby

Responsible Authority

1/10/2002

Date

Revision Incorporated into the Traveler:

John Szostak

Revision Incorporated By

3/20/2002

Date

Process Engineering Final Review:

Bob Jensen

Process Engineering/Designee

3/20/2002

Date

Instructions for the completion of the Revision Request Form

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