



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

**LARGE HADRON COLLIDER
END CLAMP INSTALLATION TRAVELER**

**Reference Drawing(s)
Collared Coil Assembly w/Ends
ME-369580**

11/22/02

96 pages

Budget Code: LPT Project Code: FNAL CMAS

Released by: [Signature] Date: 6/16/01

Prepared by: M. Cullen, J. Larson,

Title	Signature	Date
TD / E&F Process Engineering	<u>Bob Jensen</u> Bob Jensen/Designee	10/30/00
TD /LHC Production Supervisor	<u>Rodger Bossert</u> for Jim Rife Jim Rife/Designee	11/1/00
TD / LHC Production Engineer	<u>Rodger Bossert</u> Rodger Bossert/Designee	11/1/00
TD / LHC Project Engineer Coldmass	<u>Fred Nobrega</u> Fred Nobrega/Designee	11/2/00
TD / LHC Tooling Engineer	<u>John Carson</u> John Carson/Designee	11/4/00
TD / LHC Project Physicist	<u>Alexander Zlobin</u> Alexander Zlobin/Designee	11/3/00
TD / LHC Program Manager	<u>Jim Kerby</u> Jim Kerby/Designee	12/3/00

Revision Page

Revision	Step No.	Revision Description	TRR No.	Date
None	N/A	Initial Release	N/A	10/30/00

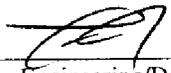
Ensure appropriate memos and specific instructions are placed with the traveler before issuing the sub traveler binder to production.

1.0 General Notes

- 1.1 White (Lint Free) Gloves (Fermi stock 2250-1800) or Surgical Latex Gloves (Fermi stock 2250-2494) or equivalent shall be worn as required 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 as required, with Green Herculite (Fermi stock 1740-0100) or equivalent when not being serviced or assembled.

2.0 Parts Kit List

- 2.1 Attach the completed Parts Kit List for the LHC End Clamp 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/Designee

17 Jun 01
Date

3.0 Return End Clamp Assembly with Fuji Film

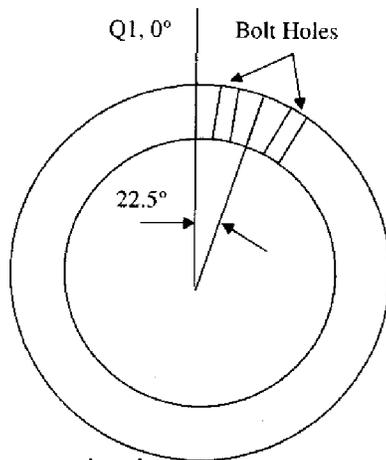
- 3.1 Clean the Tapered Ring-Return End (ME-369031) and the Filler Cone-Return End (ME-369030) with Isopropyl Alcohol (Fermi stock 1920-0300) and saturated lint free Heavy Duty Wipers (Fermi stock, 1660-2600) or equivalent.

J. Howell
Technician(s)

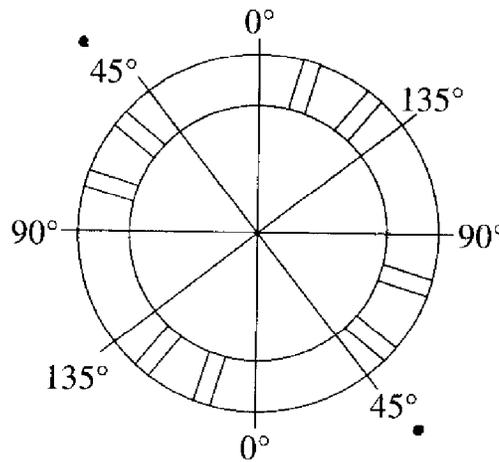
6/14/01
Date

- 3.2 On the Return End-Tapered Ring (ME-369031) find the center of a pair of boltholes. Place the Tapered Ring on the Indexing Fixture and rotate the Tapered Ring 22.5 degrees clockwise from the center of the pair of boltholes. Then mark both of the 0, 45, 90, and 135-degree positions.

View from the Return End looking toward the Lead End



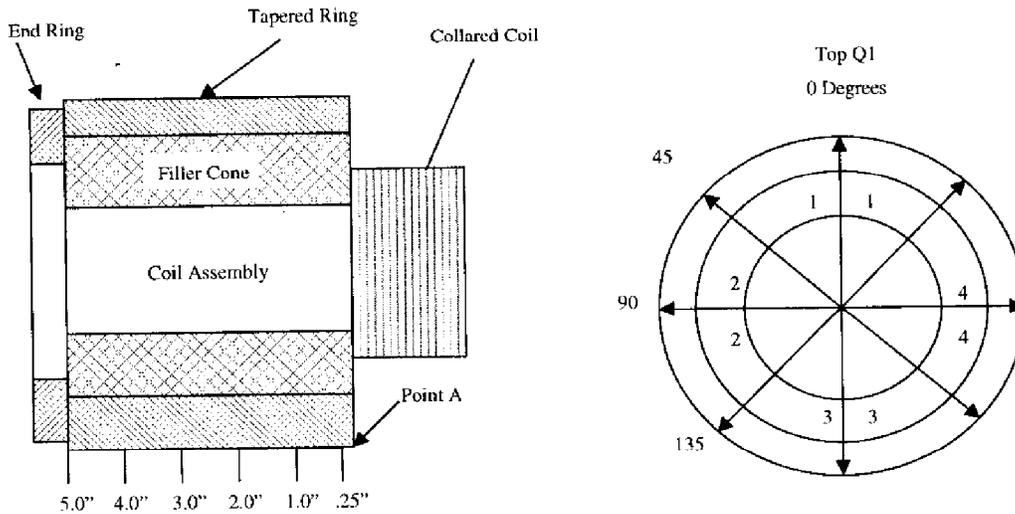
J. Howell
Technician(s)



6/18/01
Date

- 3.3 Measure the diameter of the Tapered Ring-Return End (ME-369031) in the free state in the 0, 45, 90 and 135 degree directions at 1" intervals using a 9"-10" Micrometer and a Pi Tape. Use a fine tip marker (not black) to mark the intervals on the Tapered Ring from point A.

View from the Return End looking toward the Lead End



Distance from the Coil End of the Tapered Ring (A)	0 Degrees	45 Degrees	90 Degrees	135 Degrees	Pi Tape
0.25 inches	9.840	9.841	9.840	9.840	9.840
1.0 inches	9.840	9.841	9.840	9.840	9.840
2.0 inches	9.841	9.841	9.840	9.841	9.840
3.0 inches	9.841	9.841	9.840	9.841	9.840
4.0 inches	9.840	9.840	9.840	9.840	9.840
5.0 inches	9.841	9.841	9.840	9.840	9.840

J.P. / [Signature]
 Technician(s)

18 JUNE 2001
 Date

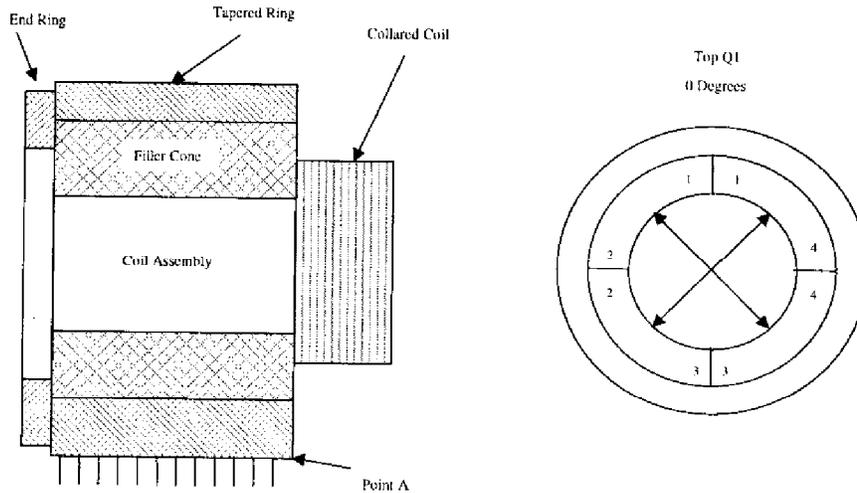
- 3.4 Position the Filler Cone-Return End (ME-369030) in the Aluminum Tapered Ring (ME-369031). If the Filler Cone is too loose, add shims until it becomes necessary to use a rubber mallet on the partially inserted shims.

JP
Technician(s)

18 June 2001
Date

- 3.5 Mark with a fine tip marker (not black) and measure the Filler Cone Inner Diameter from the center of Quadrants 1 to 3 and the center of Quadrants 2 to 4, at all intervals marked on table below, using a Telescoping Micrometer and a Dial Caliper. Record data in table below.

View from the Return End looking toward the Lead End



Note(s):

Measure to three digits past the decimal point

Distance from the Coil End of the Tapered Ring (A)	Diameter Filler Cones 1,2 to 3,4	Diameter Filler Cones 2,3 to 1,4
0.25 inches	5.280	5.278
1.00 inches	5.277	5.2765
4.00 inches	5.278	5.2785
4.75 inches	5.279	5.2795

Technician(s)

Date

MQXB01

- 3.6 Etch the Magnet Serial Number LHCXXX, using .025 to .0375 inch high letters, onto both End Cap End Ring (ME-344533) on the Lead and Return Ends.

J. Gould
Technician(s)

6/20/01
Date

- 3.7 Score the Inside of the Filler Cone.

J. Gould / JP
Technician(s)

6/20/01
Date

TRC
#1200

- 3.8 Clean the inside of the Filler Cone with lint free Heavy Duty Wipers (Fermi stock 1660-0150), and Isopropyl Alcohol (Fermi stock 1920-0300) or equivalent.

A. Gould Date 6/20/01
 Technician(s) Date

- 3.9 Coat the inside of the Aluminum Tapered Ring-Return End (ME-369031), the outside faces and the Preform slots of the Filler Cone-Return End (ME-369030) with Dry Lubricant Spray (Miller Stephenson MS-122N/002). Apply 2nd coat after 5 minutes drying time.

Note(s):

Ensure dry lubricant contacts only the outside, Tapered Ring surfaces and Preform slots of the Filler Cone, and not the Lead End surfaces.

V.M. Date 6-27-01
 Technician(s) Date

TRR # 1422 (3.10)

- 3.10 Pick up the Collared Coil Assembly with Crane (using slings) and place it into End Squeezer Assembly (ME-344350).

Note(s):

All wires shall be clear of the End Squeezer Assembly (ME-344350) prior to installation. "Peel back" the Strain Gage Wires 24 inches to avoid any pinching or damage to the wires during the end clamp procedure.

344351 TRR: USE APPROVED LIFTING FIXTURE, OR EQ.

[Signature] Date 6-27-01
 Technician(s) Date

- 3.11 Slide the Tapered Ring-Return End (ME-369031) using a Mylar sleeve, onto the Collared Coil.

J.P. Date 27 June 2001
 Technician(s) Date

- 3.12 Bolt the (4) Quadrant Pusher Plates (MD-344358) with 0.50 inch-13UNC x 13.0 inch Socket Head Cap Screws and 0.50 inch Flat Washers, onto the End Squeezer Assembly (ME-344350).

Note(s):

Pusher Plates must be installed with hydraulic cylinder sides facing towards center of Coil as not to interfere with any wiring involved in Lead End Assembly.

J.P. Date 27 June 2001
 Technician(s) Date

TRR

- 3.13 Install the Fuji Film and the Filler Cone-Return End (ME-369030) around the Saddles. Secure with Plastic Cable ties.

Caution:

Ensure dry lubricant coating remains intact and free of damage.

J.P. Date 27 June 2001
 Technician(s) Date

- 3.14 Slide the Tapered Ring-Return End (ME-369031) on the Filler Cone-Return End (ME-369030) as per the Collared Coil with Ends (ME-369580).

Note(s):

**Top of the Tapered Ring and the top of the Collared Coil match.
 Strain Gage wires are on the outside of the Aluminum Tapered Ring.
 Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring.**

J.P. Technician(s) 27 June 2001 Date

- 3.15 Position the Holder Plate with the installed Half Rings (MC-344359), until it contacts the back surface of the Filler Cone (ME-369030).

J.P. Technician(s) 27 June 2001 Date

- 3.16 Attach the Enerpac Hose to Hydraulic Cylinders (Model RC 106) as per the End Squeezer Assembly (ME-344350).

Note(s):

Face shield must be worn during operation of hydraulic cylinders.

J.P. Technician(s) 6-27-01 Date

- 3.17 Record Total Coil Starting Resistance 2.315 Ω

J.P. Technician 27 June 2001 Date

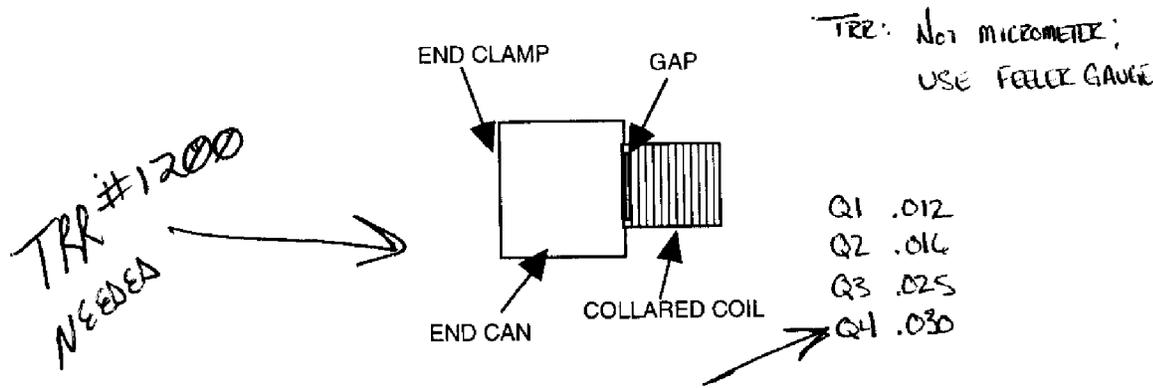
- 3.18 Gradually apply pressure to the End Squeezer Assembly until the Aluminum Tapered Ring covers the Filler Cone. Maximum pump pressure is to be greater than 4000psi.

Maximum Pump Pressure 4600
J.P. Technician(s) 6-27-01 Date

- 3.19 Record Total Coil End Resistance 2.315 Ω

J.P. Technician 27 June 2001 Date

3.20 Before removing the End Squeezer Assembly, measure the gap between the Filler Cone and the Coil Lamination, as shown below, using a Micrometer.



Gap Measurement _____
 Technician(s) J.P. Date 27 JUNE 2001

3.21 Remove the End Squeezer Assembly.
 Technician(s) D. Gould Date 6/27/01

3.22 Perform a Pi tape measurement on the Tapered Ring at the following locations.

Distance from the Coil End of the Tapered Ring (A)	Pi Tape
0.0 inches	9.852
1.0 inches	9.852
2.0 inches	9.852
3.0 inches	9.849
4.0 inches	9.849
5.0 inches	9.848

Technician(s) D. Gould Date 6/27/01

3.23 Remove the End Clamp Assembly from the Collared Coil.
 Technician(s) J. Rice Date 6/27/01

4.0 Return End Clamp Installation onto Collared Coil

- 4.1 Clean the inside of the Filler Cone with lint free Heavy Duty Wipers (Fermi stock 1660-0150), and Isopropyl Alcohol (Fermi stock 1920-0300) or equivalent.

J. Man Technician(s) 6-28-01 Date

- 4.2 Coat the inside of the Aluminum Tapered Ring (MC-344456), the outside faces and the Preform slots of the Filler Cone (MC-344457) with Dry Lubricant Spray (Miller Stephenson MS-122N/002). Apply 2nd coat after 5 minutes drying time.

Note(s):

Ensure dry lubricant contacts only the outside, Tapered Ring surfaces and Preform slots of the Filler Cone, and not the Lead End surfaces.

J. Man Technician(s) 6-28-01 Date

- 4.3 Slide the Tapered Ring (MC-344456) using a Mylar sleeve, onto the Collared Coil.

J. Rice Technician(s) 6-28-01 Date

- 4.4 Bolt the (4) Quadrant Pusher Plates (MD-344358) with 0.50 inch-13UNC x 13.0 inch Socket Head Cap Screws and 1/2" Flat Washers, on the End Squeezer Assembly (ME-344350).

Note(s):

Pusher Plates must be installed with hydraulic cylinder sides facing towards center of Coil as not to interfere with any wiring involved in Lead End Assembly.

J. Rice Technician(s) 6-28-01 Date

- 4.5 Install the Kapton and the Filler Cone (MC-344457) atop the Saddles with Plastic Cable ties.

Caution:

Ensure dry lubricant coating remains intact and free of damage.

Record the amount of Kapton used:

.003

J. Rice Technician(s) 6-28-01 Date

- 4.6 Slide the Tapered Ring (MC-344456) on the Filler Cone (MC-344457) as per the Collared Coil with Ends (ME-369580).

Note(s):

**Top of the Tapered Ring and the top of the Collared Coil match.
Strain Gage wires are on the outside of the Aluminum Tapered Ring.
Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring.**

J. Rice Technician(s) 6-28-01 Date

- 4.7 Position the Holder Plate with the installed Half Rings (MC-344359), until it contacts the back surface of the Filler Cone (MC-344457).

J. B. [Signature] 6-28-01
Technician(s) Date

- 4.8 Attach the Enerpac Hose to the Hydraulic Cylinders (Model RC 106) as per the Collared Coil End Squeezer Assembly (ME-344350).

Note(s):

Face shield must be worn during operation of hydraulic cylinders.

J. B. [Signature] 6-28-01
Technician(s) Date

- 4.9 Record Total Coil Starting Resistance 2.315 Ω.

J.P. [Signature] 28 June 2001
Technician Date

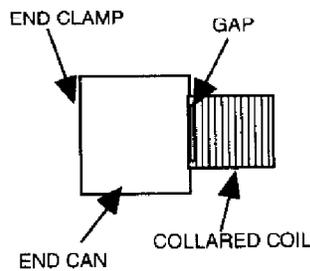
- 4.10 Gradually apply pressure to the End Squeezer Assembly until Aluminum Tapered Ring covers the Filler Cone. Maximum pump pressure is to be greater than 4000 psi.

Maximum Pump Pressure 3150
J. B. [Signature] 6-28-01
Technician(s) Date

- 4.11 Record Total Coil End Resistance 2.315 Ω.

J.P. [Signature] 28 June 2001
Technician Date

- 4.12 Before removing the End Squeezer Assembly, measure the gap between the Filler Cone and the Coil Lamination, as shown below, using a Micrometer.



Q1 - .010
Q2 - .016
Q3 - .030
Q4 - .030

Gap Measurement _____
[Signature] _____
Technician(s) Date

6/28/01
Date



4.13 Verify that the results in Step 4.12 are acceptable.
Approved for next Assembly Procedure.

[Signature]
Responsible Authority/Physicist

6/28/01
Date

4.14 Remove the End Squeezer Assembly.

[Signature]
Technician(s)

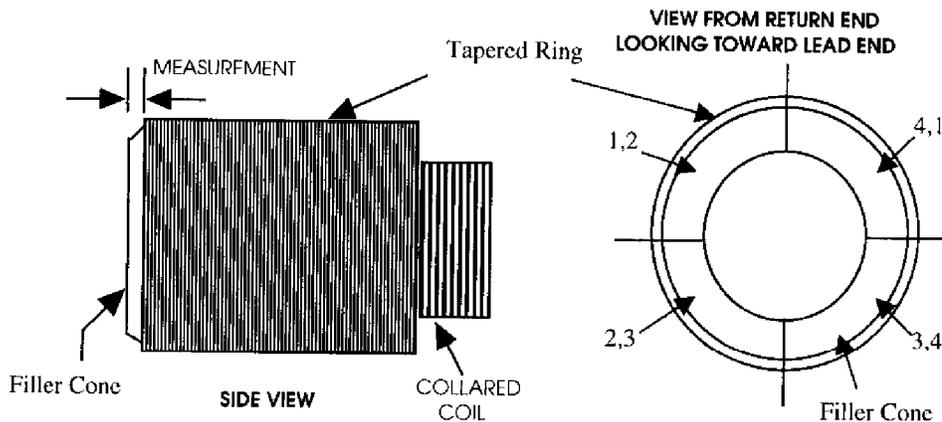
6/28/01
Date

4.15 Clean the Filler Cone using Isopropyl Alcohol (Fermi stock 1920-0300) Kimwipes (Fermi stock 1660-2600) or equivalent.

[Signature]
Technician(s)

6/28/01
Date

4.16 Measure the distance between each Filler Cone and the Tapered Ring, using a Depth Gauge.



Filler Cone 1,2 .003

Filler Cone 2,3 .003

Filler Cone 3,4 .003

Filler Cone 1,4 .003

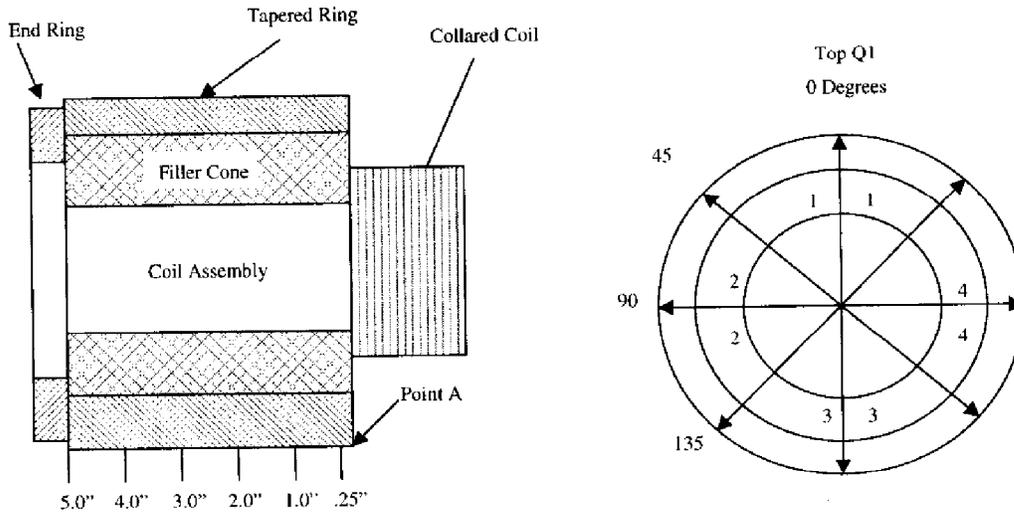
AVERAGE .003

[Signature]
Technician(s)

6/28/01
Date

4.17 Measure the diameter of the Tapered Ring (MC-344456) in the fully clamped state, at 0, 45, 90 and 135 Degrees at 1" intervals using a 9"-10" Micrometer and PI Tape.

View from the Return End looking toward the Lead End



Distance from the Coil End of the Tapered Ring (A)	0 Degree	45 Degree	90 Degree	135 Degree	Pi Tape
0.0 inches	9.8495	9.849	9.854	9.850	9.852
1.0 inches	9.8495	9.849	9.853	9.850	9.851
2.0 inches	9.8495	9.847	9.852	9.8495	9.851
3.0 inches	9.8475	9.846	9.851	9.8485	9.850
4.0 inches	9.8465	9.845	9.850	9.848	9.848
5.0 inches	9.8485	9.844	9.850	9.848	9.849

M. Harold / J.P.
 Technician(s)

28 June 2001
 Date

- 4.18 Perform an Electrical Inspection. Refer to the Valhalla and Leader Free Standing Coil Measurement Procedure ES-292306.

Note(s):

Coils in the free state during an electrical inspection shall be at least 150 mm (6") away from any conductive material (i.e., surface of the coil preparation / storage table).

Electrical connections to the coil leads shall be 305 mm ± 13 mm (12" ± .5") away from the end of the coil to be tested.

Ensure that all measurements are recorded correctly, and have the proper value and symbol (i.e., m², mH, etc.).

Caution:

Before applying power to the Valhalla 4300B, ensure that the test current is OFF.

During testing, ensure that the test current is off and the disconnect status safe light is lit while connecting and disconnecting test leads from the Coil Assembly. An unsafe signal indicates a test current is still being generated.

Valhalla 4300B settings:

Power must be on for 30 minutes before testing.

Test Current	_____	OFF
Power	_____	ON
Full Scale Voltage	_____	20mv
Amp Selector Knob	_____	.10 A
Temperature Compensator	_____	ON
Test Current	_____	ON (testing)
Test Current	_____	ON (testing)

Hp 4263B:

Function _____ "Ls-Q" selected

Record the Serial Number of the test equipment used.

Valhalla 32-858

HP 4263b 288-00912

Resistance Limits		Inner	Outer	Total	Pass	Fail
		XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω		
Quadrant 1	Inner	.2599				
	Outer		.3227			
	Total			.5812		
Quadrant 2	Inner	.2589				
	Outer		.3202			
	Total			.5780		
Quadrant 3	Inner	.2591				
	Outer		.3216			
	Total			.5795		
Quadrant 4	Inner	.2604				
	Outer		.3218			
	Total			.5798		
Magnet	Limit	XX.X Ω to XX.X Ω		2.515		

Inductance Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X mH	XX.X to XX.X mH	XX.X to XX.X mH		
Quadrant 1	Inner	532.601				
	Outer		873.139			
	Total			2.3275		
Quadrant 2	Inner	530.095				
	Outer		869.627			
	Total			2.3236		
Quadrant 3	Inner	530.833				
	Outer		869.478			
	Total			2.32156		
Quadrant 4	Inner	534.723				
	Outer		873.802			
	Total			2.32939		
Magnet	Limit	XX.X to XX.X mH				

(Q) Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X	XX.X to XX.X	XX.X to XX.X		
Quadrant 1	Inner	3.12				
	Outer		3.00			
	Total			5.34		
Quadrant 2	Inner	3.12				
	Outer		3.05			
	Total			5.33		
Quadrant 3	Inner	3.10				
	Outer		3.04			
	Total			5.32		
Quadrant 4	Inner	3.10				
	Outer		3.03			
	Total			5.31		
Magnet	Limit	XX.X to XX.X				

[Signature]
Inspector

7/23/01
Date

Electrical Test	Limit	Actual Measurement		Pass	Fail
		A	B		
Heater Strips 1/2 Resistance	XX.X to XX.X Ω	9.370		✓	
Heater Strips 2/3 Resistance	XX.X to XX.X Ω	9.460		✓	
Heater Strips 3/4 Resistance	XX.X to XX.X Ω	9.477		✓	
Heater Strips 4/1 Resistance	XX.X to XX.X Ω	9.412		✓	

Electrical Test	Limit	Actual Measurement	Pass	Fail
Spot Heater 1 Resistance	XX.X to XX.X Ω	N/A		
Spot Heater 2 Resistance	XX.X to XX.X Ω	N/A		
Spot Heater 3 Resistance	XX.X to XX.X Ω	N/A		
Spot Heater 4 Resistance	XX.X to XX.X Ω	N/A		

[Signature]
Inspector

7-23-01
Date

5.0 Lead End Clamp Assembly with Fuji Film

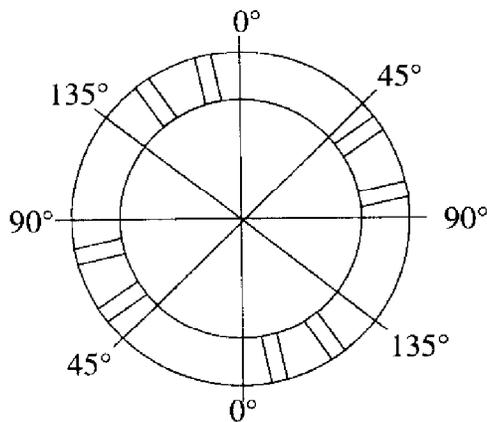
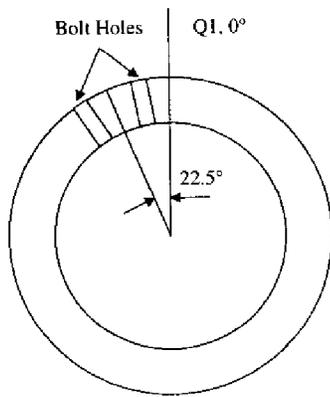
- 5.1 Clean the Tapered Ring (MC-344456) and Filler Cone (MC-344457) with Isopropyl Alcohol (Fermi stock 1920-0300) and saturated lint free Heavy Duty Wipers (Fermi stock 1660-2600) or equivalent.

[Signature]
Technician(s)

6/20/01
Date

- 5.2 On the Lead End Tapered Ring find the center of a pair of boltholes. Place the Tapered Ring on the Indexing Fixture and rotate the Tapered Ring 22.5 degrees counter clockwise from the center of the pair of boltholes. Then mark both of the 0, 45, 90, and 135-degree positions.

View from the Lead End looking toward the Return End

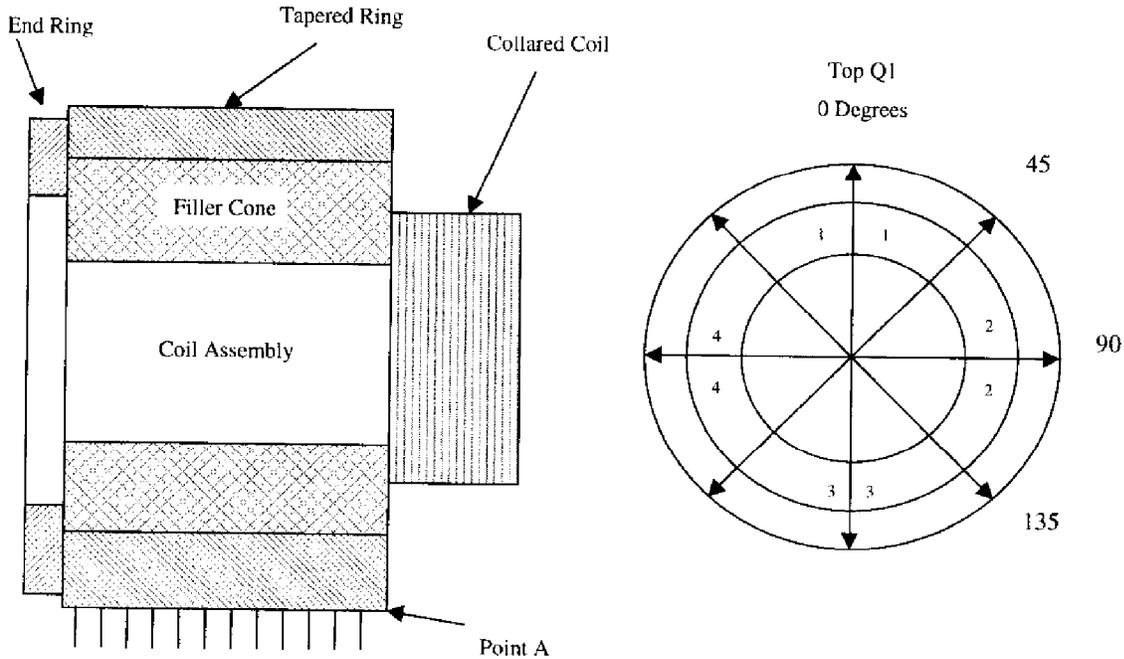


[Signature]
Technician(s)

6/20/01
Date

- 5.3 Measure the diameter of the Tapered Ring (MC-344456) in the free state in the 0, 45, 90 and 135 degree directions at 1" intervals using a 9"-10" Micrometer and a Pi Tape. Use a fine tip marker (not black) to mark the Tapered Ring from point A. Mark the "TOP" of the Tapered Ring.

View from the Lead End looking toward the Return End



Distance from the Coil End of the Tapered Ring (A)	0 Degree	45 Degree	90 Degree	135 Degree	Pi Tape
0.0 inches	9.840	9.840	9.8405	9.840	9.839
1.0 inches	9.8395	9.8405	9.840	9.8395	9.839
2.0 inches	9.8395	9.8405	9.8395	9.8395	9.838
3.0 inches	9.8395	9.8405	9.8395	9.840	9.840
4.0 inches	9.8395	9.840	9.8395	9.8395	9.839
5.0 inches	9.840	9.840	9.8395	9.8395	9.840
6.0 inches	9.840	9.8405	9.8395	9.8395	9.840
7.0 inches	9.8395	9.8405	9.840	9.840	9.840
8.0 inches	9.840	9.841	9.839	9.8405	9.840
9.0 inches	9.840	9.8405	9.840	9.8405	9.840
9.5 inches	9.8395	9.840	9.839	9.840	9.840

M. H. / J. P.
 Technician(s)

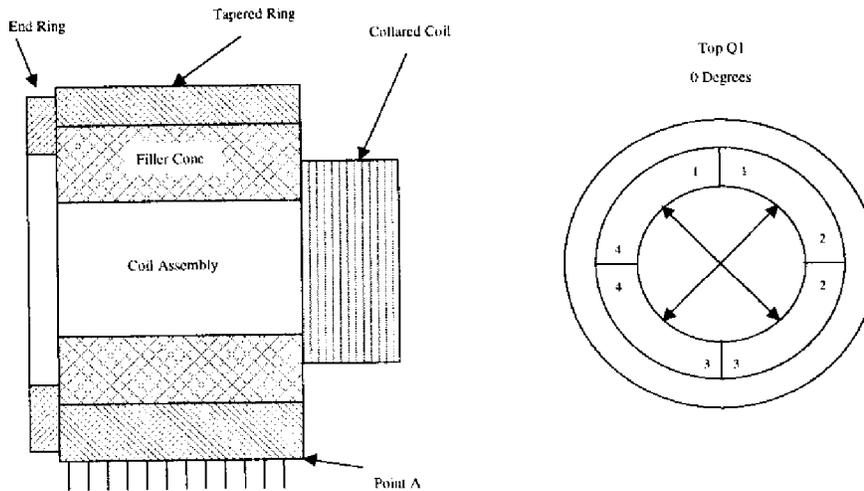
20 June 2001
 Date

- 5.4 Position the Filler Cone into the Aluminum Tapered Ring. If the Filler Cone is too loose, increase the shims until it becomes necessary to use a rubber mallet on the partially inserted shims.

Shawed _____ Date 6/21/01
 Technician(s)

- 5.5 Mark using a fine tip marker (not black) and measure the Filler Cone Inner Diameter from the center of Quadrants 1 to 3 and the center of Quadrants 2 to 4, at all intervals marked on table below, using a Telescoping Micrometer and a Dial Caliper. Record data in table below.

View from the Lead End looking toward the Return End



Distance from the Coil End of the Tapered Ring (A)	Diameter Filler cone 1,4 to 2,3	Diameter Filler Cone 1,2 to 3,4
0.25 inches	5.277	5.273
1.00 inches	5.278	5.2725
9.00 inches	5.281	5.274
9.50 inches	5.281	5.281

Shawed / P. May _____ Date 6/21/01
 Technician(s)

- 5.6 Etch the Magnet Serial Number LHCXXX, using 0.25 to .0375 inch high letters, onto both End Can End Rings (MB-344533) on the Lead and Return Ends.

Shawed _____ Date 6/20/01
 Technician(s)

- 5.7 Score the inside of the Filler Cone

P. May _____ Date 6/21/01
 Technician(s)

- X 5.14 Slide the Tapered Ring (ME-344456) on to the Filler Cone (ME-344457) as per the Collared Coil with Ends (ME-369580).

Note(s):

Top of the Tapered Ring and the top of the Collared Coil match.
Strain Gage wires are on the outside of the Aluminum Tapered Ring.
Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring.

[Signature]
 Technician(s)

7-23-01
 Date

- 5.15 Position the Holder Plate with the installed Half Rings (MC-344359), until it contacts the back surface of the Filler Cone (ME-344457).

[Signature]
 Technician(s)

7-23-01
 Date

- 5.16 Attach the Enerpac Hose to the Hydraulic Cylinders (Model RC 106) as per the Collared Coil End Squeezer Assembly (ME-344350).

Note(s):

Face shield must be worn during operation of hydraulic cylinders.

[Signature]
 Technician(s)

7-23-01
 Date

- 5.17 Record Total Coil Starting Resistance 2.315 Ω .

[Signature]
 Technician

7-23-01
 Date

- 5.18 Gradually apply pressure to the End Squeezer Assembly until the Aluminum Tapered Ring covers the Filler Cone. Maximum Pump pressure is to be greater than 4000psi.

Maximum Pump Pressure 7200

[Signature]
 Technician(s)

7/23/01
 Date

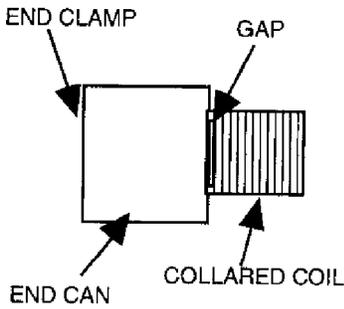
- 5.19 Record Total Coil End Resistance 2.315 Ω

[Signature]
 Technician

7/23/01
 Date

5.20 Before removing the End Squeezer Assembly, measure the gap between the Filler Cone and the Coil Lamination, as shown below, using a Micrometer. The gap should be no more than 10 mils.

TRR# 1700
NEED FOR SPOTS FOR
DR# GAP MEASUREMENTS
HGO-Ø240



.012
.024
.030
.030

Gap Measurement .024" AVERAGE

[Signature]
Technician(s)

4-23-01
Date

5.21 Remove the entire End Squeezer Assembly.

[Signature]
Technician(s)

7/23/01
Date

(8.1) TRR# 1422
SEE PAGE 29

5.22 Perform a Pi tape measurement on the Tapered Ring at the following locations.

Distance from the Coil End of the Tapered Ring (A)	Pi Tape
0.0 inches	
1.0 inches	
2.0 inches	
3.0 inches	
4.0 inches	
5.0 inches	

N/A
Technician(s)

Date

5.23 Remove End Clamp Assembly from the Collared Coil.

[Signature]
Technician(s)

7/23/01
Date

6.0 Lead End Clamp Installation onto Collared Coil

TRR# 1200 (6.1)
TRR# 1200 (6.2)
SEE P9 22 DR # 0239 (6.4)
TRR# 1200

Clean the Inside of the Filler Cone with lint free Heavy Duty Wipers (Fermi stock 1660-0150) and Isopropyl Alcohol (Fermi stock 1920-0300) or equivalent.

N/A Technician(s) _____ Date _____

Coat the inside of the Aluminum Tapered Ring (MC-344456), the outside faces and the Preform slots of the Filler Cones (MC-344457) with Dry Lubricant Spray (Miller Stephenson MS-122N/002). Apply 2nd coat after 5 minutes drying time.

Note(s):

Ensure dry lubricant contacts only the outside, Tapered Ring surfaces and Preform slots of the Filler Cone, and not the Lead End surfaces.

N/A Technician(s) _____ Date _____

Slide the Tapered Ring (MC-344456) using a Mylar sleeve, onto the Collared Coil.

N/A Technician(s) _____ Date _____

Bolt the (4) Quadrant Pusher Plates (MD-344358) with .50 inch-13UNC x 13.0 inch Socket Head Cap Screws and 1/2" Flat Washers, onto the Squeezer Assembly (ME-344350).

Note(s):

Pusher Plates must be installed with hydraulic cylinder sides facing towards center of the Coil as not to interfere with any wiring involved in the Lead End Assembly.

N/A Technician(s) _____ Date _____

6.5 Install the Kapton and the Filler Cone Non/Lead End (ME-369030) atop the Saddles with Plastic Cable ties.

Caution:

Ensure dry lubricant coating remains intact and free of damage.

Record the amount of Kapton used:

_____ .003 _____

J. Gould Technician(s) _____ Date 7/23/01

TRR# 1200 (6.6)

Place the Tapered Ring (ME-344456) on the Filler Cone (ME-344457) as per the Collared Coil with Ends (ME-369580).

Note(s):

Top of the Tapered Ring and the top of the Collared Coil match.
Strain Gage wires are on the outside of the Aluminum Tapered Ring.
Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring.

N/A Technician(s) Date

Position the Holder Plate with the installed Half Rings (MC-344359), until it contacts the back surface of the Filler Cone.

N/A Technician(s) Date

Attach the Enrcpac Hose to the Hydraulic Cylinders (Model RC 106) as per the Collared Coil End Squeezer Assembly (ME-344350).

Note(s):

Face shield must be worn during operation of hydraulic cylinders.

N/A Technician(s) Date

Record Total Coil Starting Resistance _____ Ω.

N/A Technician Date

Gradually apply pressure to the End Squeezer Assembly until the Aluminum Tapered Ring covers the Filler Cone. Maximum Pump pressure is to be greater than 4000psi.

Maximum Pump Pressure _____

N/A Technician(s) Date

Record Total Coil End Resistance _____ Ω

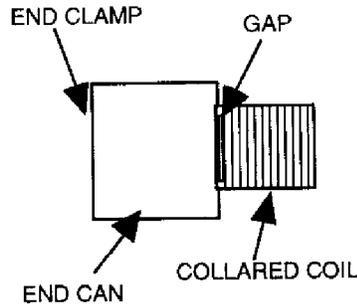
N/A Technician Date

SEE PG 23 DE 70232
TRR# 1200 (6.7)
TRR# 1200 (6.8)
TRR# 1200 (6.9)
TRR# 1200 (6.10)

TRR# 1200 (6.11)

- 6.12 Before removing the End Squeezer Assembly, measure the gap between the Filler Cone and the Coil Lamination, as shown below, using a Micrometer.

TRR SEE
#1200 P9
24



Gap Measurement _____

Technician(s) *MA*

Date



- 6.13 Verify that the results in Step 6.12 are acceptable. Approved for next Assembly Procedure.

[Signature]
Responsible Authority/Physicist

7-23-01
Date

- 6.14 Remove the End Squeezer Assembly.

[Signature]
Technician(s)

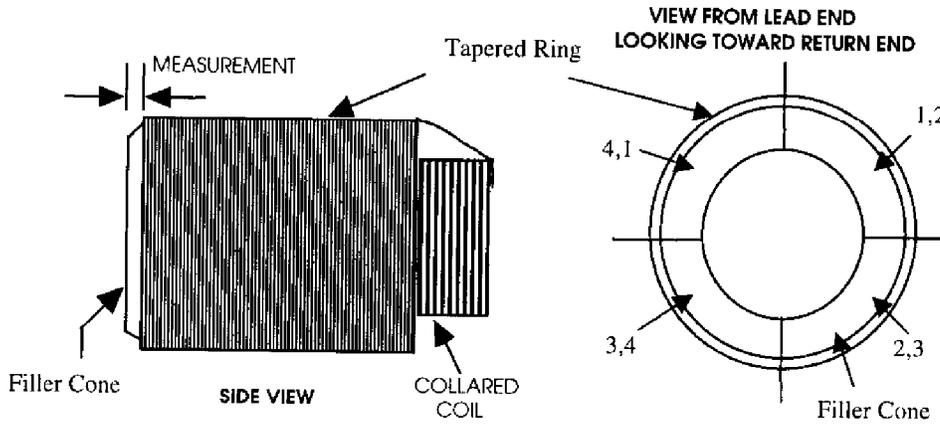
7/23/01
Date

- 6.15 Clean the Filler Cone using Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes or equivalent.

[Signature]
Technician(s)

7/23/01
Date

6.16 Measure the distance between each Filler Cone and the Tapered Ring, using a Depth Gauge.



Filler Cone 1,2	<u>.010"</u>
Filler Cone 2,3	<u>.013</u>
Filler Cone 3,4	.010 <u>.011</u>
Filler Cone 1,4	<u>.006"</u>
AVERAGE	.009 <u>.010"</u>

Technician(s) *A. Gould*

Date 7/23/01

- 6.18 Perform an Electrical Inspection. Refer to the Valhalla and Leader Free Standing Coil Measurement Procedure ES-292306.

Note(s):

Coils in the free state during an electrical inspection shall be at least 150 mm (6") away from any conductive material (i.e., surface of the coil preparation / storage table).

Electrical connections to the coil leads shall be 305 mm ± 13 mm (12" ± .5") away from the end of the coil to be tested.

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

Caution:

Before applying power to the Valhalla 4300B, ensure that the test current is OFF. During testing, ensure that the test current is off and the disconnect status safe light is lit while connecting and disconnecting test leads from the Coil Assembly. An unsafe signal indicates a test current is still being generated.

Valhalla 4300B settings:

Power must be on for 30 minutes before testing.

Test Current	_____	OFF
Power	_____	ON
Full Scale Voltage	_____	20mv
Amp Selector Knob	_____	.10 mA
Temperature Compensator	_____	ON
Test Current	_____	ON (testing)
Test Current	_____	ON (testing)

Hp 4263B:

Function _____ "Ls-Q" selected

Record the Serial Number of the test equipment used.

Valhalla 32-858

HP 4263b 288-00912

Resistance Limits		Inner	Outer	Total	Pass	Fail
		XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω		
Quadrant 1	Inner	1,5780				
	Outer	.2592	.3202			
	Total			.5780		
Quadrant 2	Inner	.2587				
	Outer		.3210			
	Total			.5757		
Quadrant 3	Inner	1,2606				
	Outer		.3231			
	Total			1,5805		
Quadrant 4	Inner	.2596				
	Outer		.3214			
	Total			.5797		
Magnet	Limit	XX.X Ω to XX.X Ω		2,313		

Inductance Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X mH	XX.X to XX.X mH	XX.X to XX.X mH		
Quadrant 1	Inner	530.829				
	Outer		870.200			
	Total			2,31985		
Quadrant 2	Inner	526.712				
	Outer		864.508			
	Total			2.31307		
Quadrant 3	Inner	528.707				
	Outer		862.990			
	Total			2.30786		
Quadrant 4	Inner	532.954				
	Outer		868.832			
	Total			2.31447		
Magnet	Limit	XX.X to XX.X mH		13,3246		

(Q) Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X	XX.X to XX.X	XX.X to XX.X		
Quadrant 1	Inner	3.10				
	Outer		3.05			
	Total			5.33		
Quadrant 2	Inner	3.08				
	Outer		3.03			
	Total			5.31		
Quadrant 3	Inner	3.09				
	Outer		3.05			
	Total			5.30		
Quadrant 4	Inner	3.09				
	Outer		3.02			
	Total			5.29		
Magnet	Limit	XX.X to XX.X		5.94		

A. Howard
Inspector

7/24/01
Date

Electrical Test	Limit	Actual Measurement		Pass	Fail
		A	B		
Heater Strips 1/2 Resistance	XX.X to XX.X Ω	9.390	X		
Heater Strips 2/3 Resistance	XX.X to XX.X Ω	9.450			
Heater Strips 3/4 Resistance	XX.X to XX.X Ω	9.440			
Heater Strips 4/1 Resistance	XX.X to XX.X Ω	9.363			

Electrical Test	Limit	Actual Measurement	Pass	Fail
Spot Heater 1 Resistance	XX.X to XX.X Ω	N/A		
Spot Heater 2 Resistance	XX.X to XX.X Ω	N/A		
Spot Heater 3 Resistance	XX.X to XX.X Ω	N/A		
Spot Heater 4 Resistance	XX.X to XX.X Ω	N/A		

A. Howard
Inspector

7/24/01
Date

Perform an electrical inspection of the Inner Voltage Taps (Readings accurate $\pm 1mV$).

Voltage Tap	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Color				
Coil Serial Number				
Valhalla Serial Number				
1A	mV	mV	mV	mV
2A	mV	mV	mV	mV
10B	mV	mV	mV	mV
11A	mV	mV	mV	mV
11C	mV	mV	mV	mV
11D	mV	mV	mV	mV
11B	mV	mV	mV	mV
12A	mV	mV	mV	mV
12C	mV	mV	mV	mV
12D	mV	mV	mV	mV
12B	mV	mV	mV	mV
13B	mV	mV	mV	mV
14A	mV	mV	mV	mV
14C	mV	mV	mV	mV
14D	mV	mV	mV	mV
14B	mV	mV	mV	mV
Wires (ramp splice)	mV	mV	mV	mV
Wires	mV	mV	mV	mV

Inspector N/A

Date _____

Perform an electrical inspection of the Outer Voltage Taps (Readings accurate $\pm 1mV$).

Voltage Tap Color	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Coil Serial Number				
Valhalla Serial Number				
1B	mV	mV	mV	mV
1D	mV	mV	mV	mV
1N	mV	mV	mV	mV
1M	mV	mV	mV	mV
14A	mV	mV	mV	mV
15B	mV	mV	mV	mV
15D	mV	mV	mV	mV
15C	mV	mV	mV	mV
15A	mV	mV	mV	mV
16B	mV	mV	mV	mV
16N	mV	mV	mV	mV
16M	mV	mV	mV	mV
16D	mV	mV	mV	mV
16C	mV	mV	mV	mV
16A	mV	mV	mV	mV
iors (ramp splice)	mV	mV	mV	mV
iors - OC	mV	mV	mV	mV

Inspector

N/A

Date



6.19 Verify that the results in Step 6.18 are acceptable.
Approved for next Assembly Procedure.

Rodger B. H
Responsible Authority/Physicist

7-24-01
Date

6.20 Thread the Coil Leads, Voltage Taps and Heater Strips through the openings of the End Can End Ring (MB-344533).

J. Gould
Technician(s)

7/24/01
Date

6.21 Place the End Can End Ring (MB-344533) onto the Tapered Ring (MC-344456).

J. Gould
Technician(s)

7/24/01
Date

6.22 Remove the old Strain Gage Wire RTV from the top and bottom instrumentation slots of the collared coil at both return and lead ends (only from areas where Strain Gage Wires had originally been "peeled back"). Re-apply Silicone Rubber Primer (Fermi stock 1940-1300) or equivalent onto the instrumentation slots and secure Strain Gage Wires into position with a mixture of RTV (Fermi stock 1940-0750) or equivalent.

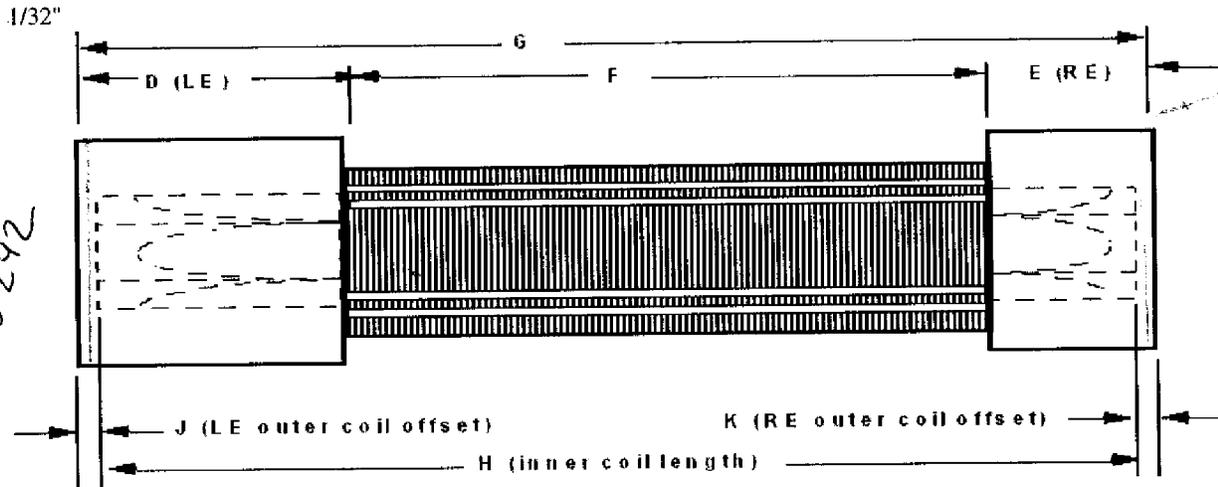
N/A
Technician(s)

Date

DR #
0241
TRR
#1422
(8.8)

7.0 Mechanical measurements after installing the End Clamp Assemblies.

- 7.1 (D+E) Measure the length of the Tapered Rings using the (Starrett 120-12) or equivalent
 (F) Measure the length of exposed Collared Coil using a Ruler to the closest 1/32"
 (G) Measure the distance between the outside of the Tapered Rings using a ruler to the closest



Keyed body and end Measurements after End Can Installation

Quadrant	D	E	F	G
1	10.220	^{SUG} 10 5.573	205 #2	221 ⁵ / ₁₆
2	10.218	5.570	205 ¹⁵ / ₃₂	221 ⁵ / ₁₆
3	10.226	5.570 ^{SUG}	205 1/2	221 ⁵ / ₁₆
4	10.228	5.570 ^{SUG}	205 1/2	221 ³ / ₈

Technician(s) J. Jones

Date 7/25/01

- 7.2 (H) Measure the length of the Inner Coils with a standard tape through the bore.
 (J+K) Measure the offset of the Outer Coil and the Tapered Ring

Quadrant	H	"J" Offset	"K" Offset
1	221 ³ / ₃₂	.163	.076
2	221 ¹ / ₈	.1475	.053
3	221 ³ / ₃₂	.156	.0495
4	221 ³ / ₃₂	.1445	.0465

Technician(s) J. Jones

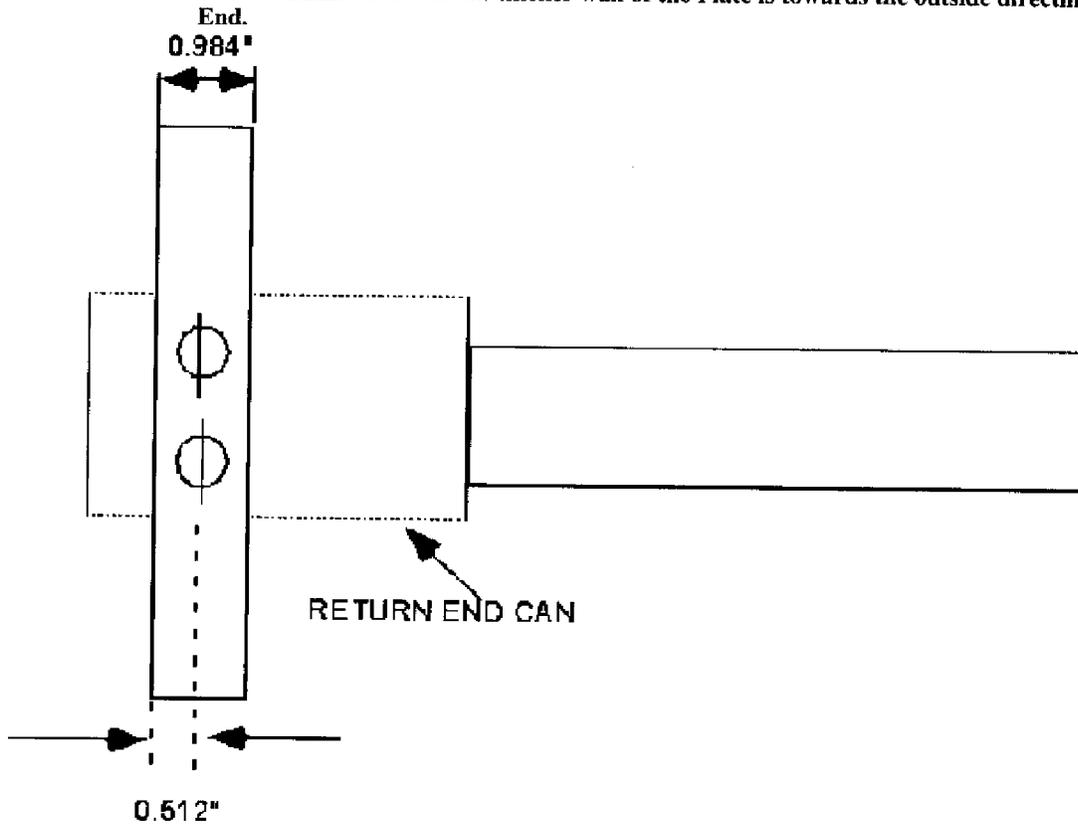
Date 7/25/01

8.0 Install End Axial Preload Plates

8.1 Obtain (1) Axial Preload Plate (MD-369094), and bolt it onto the Outer surface of Return End Tapered Ring as shown.

Note(s):

Make sure that the thicker wall of the Plate is towards the outside directing Return



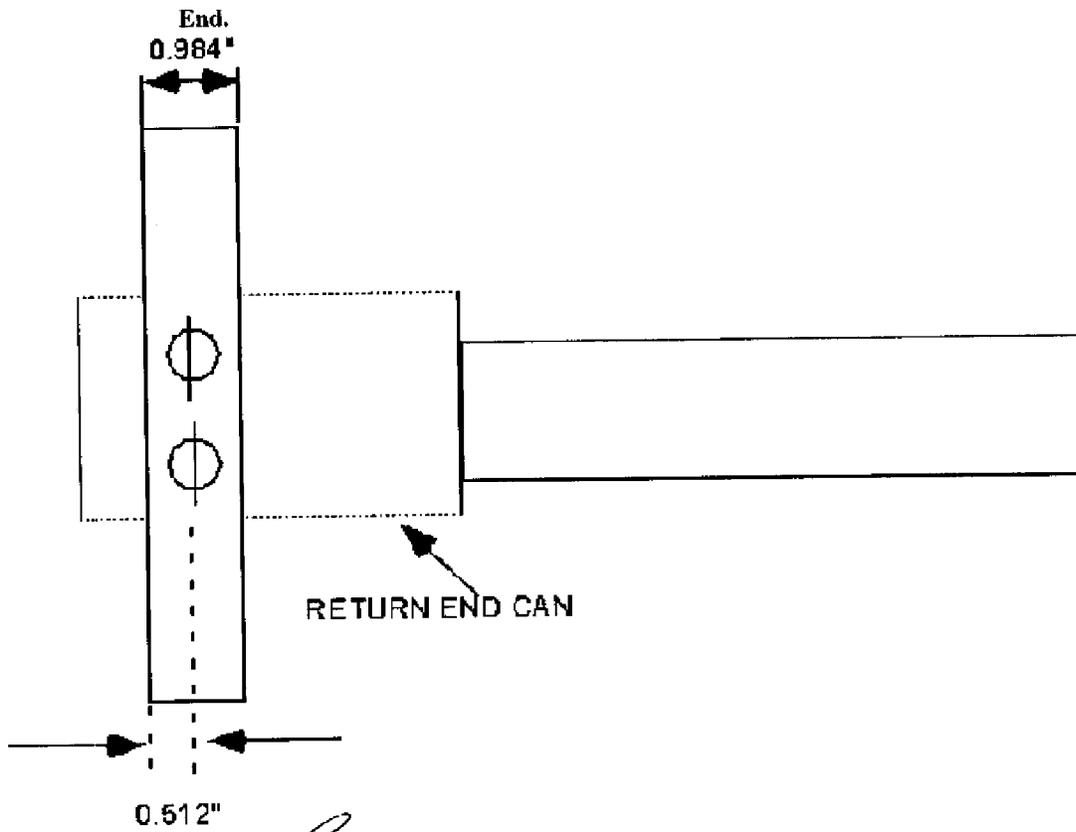
Technician(s)

Date

7-25-01

- 8.2 Obtain (1) Axial Preload Plate (MD-369094), and bolt it onto the Outer surface of Lead End Tapered Ring as shown.

Note(s):
Make sure that the thicker wall of the Plate is towards the outside directing Lead



[Signature]
Technician(s)

7-25-01
Date

DR# 0243
DR# 0254

9.0 Mole Measurement

9.1 Perform a "Mole Measurement Run" on the coils per Procedure (ES-292481). Attach the completed ES to this traveler.

Philip Sullivan
Technician

8/20/01
Date

7.0 RING THE MAGNET

J. J. Jones

8/21/01

~~Technician~~
Responsible Authority

~~DATE~~

TRR NEEDED TO
ADD STEP TO
RING THE MAGNET
TRR# 1254

10.0 Production Complete

10.1 Process Engineering verify that the Large Hadron Collider End Clamp Installation Assembly Traveler (TR-333496) 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:

Bob Jones
Process Engineering/Designee

11/22/02
Date

11.0 Attach the Process Engineering "O.K. to Proceed" Tag to the Collard Coil Assembly.

Process Engineering/Designee

Date

12.0 Proceed to the next major assembly operation - LHC Yoke/Skinning Traveler (TR-333497).

Traveler Title:

LHC End Can Installation Traveler

Specification No:

5520-TR-333496

Revision:

DR No:

HGQ-0237

Step No:

4.18

Drawing No:

ME-369580

Routing Form No:

Serial No:

MQXBC-001

Discrepancy Description:

During the disassembly of groundwrap on the MQXBO-022 coil, a cut in the strip heater was found.

Originator:

Steve Gould

Date:

7/18/2001

Cause of Nonconformance:

Kapton area of strip heater was severed, nearly to the steel element, during attempted repair of ground short.

Responsible Authority:

Rodger Bossert

Date:

7/18/2001

Disposition:

Cover area between heater and coil with extra piece of 3 mil kapton and proceed with Magnet area exterior so heater will be covered by the G-11 Collet.

Responsible Authority:

Rodger Bossert

Date:

7/18/2001

Corrective Action to Prevent Recurrence:

"Corrective Action" is to prevent the ground shorts, eliminating the need for attempted repairs. This corrective action is shown in DR No. HGQ-0233.

Responsible Authority:

Rodger Bossert

Date:

7/18/2001

Corrective Action/Disposition Verified By:

Rodger Bossert

Date:

7/18/2001

Will Configuration be affected?: YES NO

Identified problem area:

Material Manpower Method Machine Measurement

Reviewed By:

Jamie Blowers

Date:

8/13/2001

Traveler Title:

LHC End Can Installation Traveler

Specification No:

5520-TR-333496

Revision:

DR No:

HGQ-0236

Step No:

4.18

Drawing No:

ME-369580

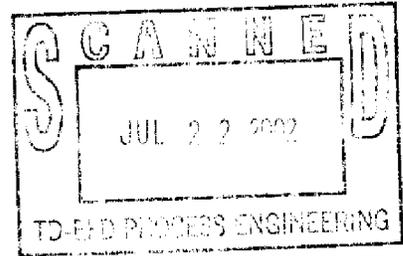
Routing Form No:

Serial No:

MQXBC-001

Discrepancy Description:

During the coil to ground hipot, Coil No. MQXBO-022 shorted to ground at 1.1 kV.



Originator:

Steve Gould

Date:

7/17/2001

Cause of Nonconformance:

The previously repaired ground short is still arcing to the last collar lamination.

Responsible Authority:

Rodger Bossert

Date:

7/17/2001

Disposition:

Remove the last three collar lamination packs (Approximately 6 inches, or one key length). Repair the last layer of ground wrap by cutting out a section and splicing in a replacement 5 mil piece, as shown on attached sketch. Also, add a 3 mil piece, identical, but longer longitudinally, to the 5 mil piece, which will cover the crack made by cutting out and replacing the 5 mil layer. Then re-key the last six inches of the magnet, stopping three laminations away from the previous end of the collared area. Fill in the area normally covered by the last three laminations with a specially made part, the "key extension" (MC-369845), and install the Lead End Clamp three laminations farther toward the body of the magnet. (Disposition typed in by John Szostak per Rodger Bossert's "attached sheet and diagrams.") (Re-issue Steps 4.0 & 6.1 to 6.18 omitting steps as necessary)

Responsible Authority:

Rodger Bossert

Date:

7/17/2001

Corrective Action to Prevent Recurrence:

1) Add several tapped holes to each end of Assembly Mandrel to allow temporary pole inserts to be placed near the ends during Coil Assembly. This will allow ground wrap to be placed more accurately before collar laminations are installed. 2) Round edges of last collar lamination to relieve pressure in that area.

Responsible Authority:

Rodger Bossert

Date:

7/17/2001

Corrective Action/Disposition Verified By:

Rodger Bossert

Date:

7/17/2001

Will Configuration be affected?: YES NO

Identified problem area:

Material
 Manpower
 Method
 Machine
 Measurement

Reviewed By:

Jamie Blowers

Date:

8/13/2001

4.0 Return End Clamp Installation onto Collared Coil

4.1 Clean the inside of the Filler Cone with lint free Heavy Duty Wipers (Fermi stock 1660-0150), and Isopropyl Alcohol (Fermi stock 1920-0300) or equivalent.

J. Gould Technician(s) 9/12/01 Date

4.2 Coat the inside of the Aluminum Tapered Ring (MC-344456), the outside faces and the Preform slots of the Filler Cone (MC-344457) with Dry Lubricant Spray (Miller Stephenson MS-122N/002). Apply 2nd coat after 5 minutes drying time.

Note(s):

Ensure dry lubricant contacts only the outside, Tapered Ring surfaces and Preform slots of the Filler Cone, and not the Lead End surfaces.

J. Gould Technician(s) 9/12/01 Date

4.3 Slide the Tapered Ring (MC-344456) using a Mylar sleeve, onto the Collared Coil.

J. Gould Technician(s) 9/12/01 Date

4.4 Bolt the (4) Quadrant Pusher Plates (MD-344358) with 0.50 inch-13UNC x 13.0 inch Socket Head Cap Screws and 1/2" Flat Washers, on the End Squeezer Assembly (ME-344350).

Note(s):

Pusher Plates must be installed with hydraulic cylinder sides facing towards center of Coil as not to interfere with any wiring involved in Lead End Assembly.

J. Gould Technician(s) 9/12/01 Date

4.5 Install the Kapton and the Filler Cone (MC-344457) atop the Saddles with Plastic Cable ties.

Caution:

Ensure dry lubricant coating remains intact and free of damage.

Record the amount of Kapton used:

N/A SAME AS BEFORE
J. Gould Technician(s) 9/12/01 Date

4.6 Slide the Tapered Ring (MC-344456) on the Filler Cone (MC-344457) as per the Collared Coil with Ends (ME-369580).

Note(s):

Top of the Tapered Ring and the top of the Collared Coil match.
Strain Gage wires are on the outside of the Aluminum Tapered Ring.
Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring.

J. Gould Technician(s) 9/12/01 Date

4.7 Position the Holder Plate with the installed Half Rings (MC-344359), until it contacts the back surface of the Filler Cone (MC-344457).

Technician(s)

Date

9/12/01

4.8 Attach the Enerpac Hose to the Hydraulic Cylinders (Model RC 106) as per the Collared Coil End Squeezer Assembly (ME-344350).

Note(s):

Face shield must be worn during operation of hydraulic cylinders.

Technician(s)

Date

9/12/01

4.9 Record Total Coil Starting Resistance 2305 Ω.

Technician

Date

9/12/01

4.10 Gradually apply pressure to the End Squeezer Assembly until Aluminum Tapered Ring covers the Filler Cone. Maximum pump pressure is to be greater than 4000 psi.

Maximum Pump Pressure

4200

Technician(s)

Date

9/12/01

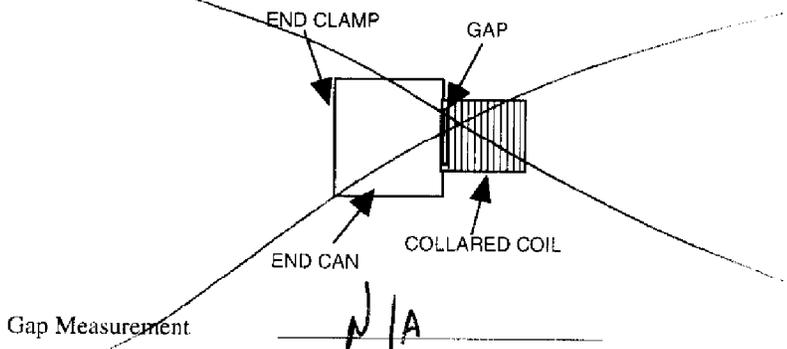
4.11 Record Total Coil End Resistance 2305 Ω.

Technician

Date

9/12/01

4.12 Before removing the End Squeezer Assembly, measure the gap between the Filler Cone and the Coil Lamination, as shown below, using a Micrometer.



Technician(s)

Date



4.13 Verify that the results in Step 4.12 are acceptable. Approved for next Assembly Procedure.

Responsible Authority/Physicist

Date

9-12-01

4.14 Remove the End Squeezer Assembly.

Technician(s)

Date

9/12/01

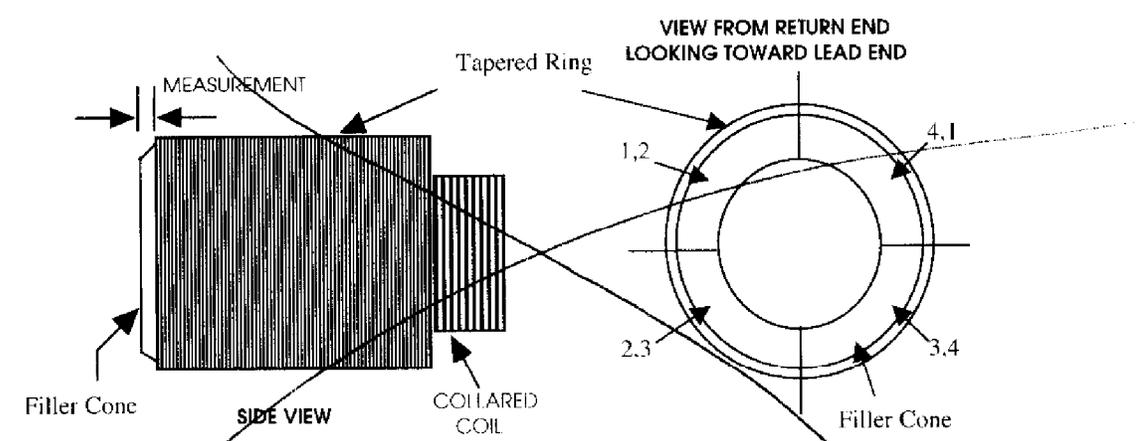
4.15 Clean the Filler Cone using Isopropyl Alcohol (Fermi stock 1920-0300) Kimwipes (Fermi stock 1660-2600) or equivalent.

Technician(s)

Date

9/12/01

4.16 Measure the distance between each Filler Cone and the Tapered Ring, using a Depth Gauge.



Filler Cone 1,2

Filler Cone 2,3

Filler Cone 3,4

Filler Cone 1,4

AVERAGE

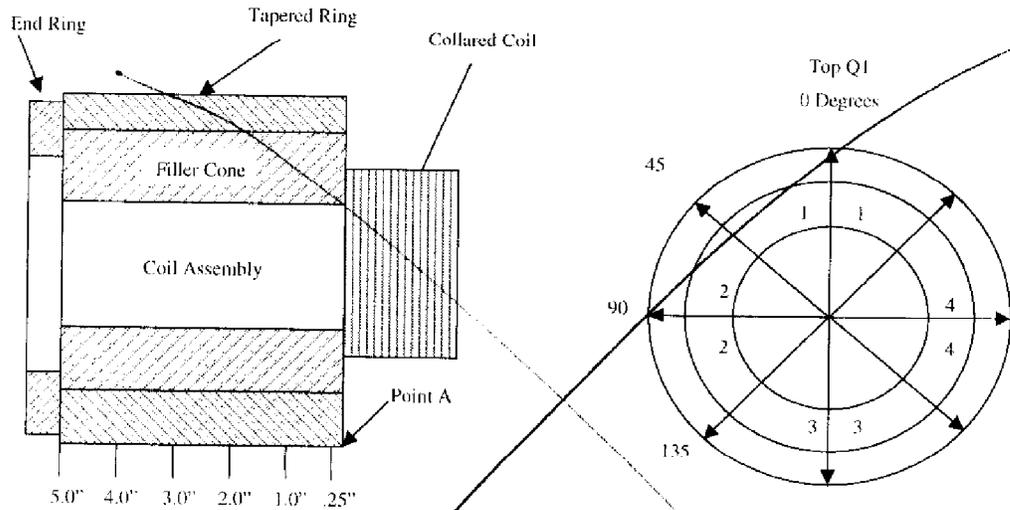
Technician(s)

Date

N/A

- 4.17 Measure the diameter of the Tapered Ring (MC-344456) in the fully clamped state, at 0, 45, 90 and 135 Degrees at 1" intervals using a 9"-10" Micrometer and PI Tape.

View from the Return End looking toward the Lead End



Distance from the Coil End of the Tapered Ring (A)	0 Degree	45 Degree	90 Degree	135 Degree	Pi Tape
0.0 inches					
1.0 inches					
2.0 inches					
3.0 inches					
4.0 inches					
5.0 inches					

Technician(s) N/A

Date _____

4.18 Perform an Electrical Inspection. Refer to the Valhalla and Leader Free Standing Coil Measurement Procedure ES-292306.

Note(s):

Coils in the free state during an electrical inspection shall be at least 150 mm (6") away from any conductive material (i.e., surface of the coil preparation / storage table).

Electrical connections to the coil leads shall be 305 mm ± 13 mm (12" ± .5") away from the end of the coil to be tested.

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

Caution:

Before applying power to the Valhalla 4300B, ensure that the test current is OFF.

During testing, ensure that the test current is off and the disconnect status safe light is lit while connecting and disconnecting test leads from the Coil Assembly. An unsafe signal indicates a test current is still being generated.

Valhalla 4300B settings:

Power must be on for 30 minutes before testing.

Test Current	_____	OFF
Power	_____	ON
Full Scale Voltage	_____	20mv
Amp Selector Knob	_____	.10 A
Temperature Compensator	_____	ON
Test Current	_____	ON (testing)
Test Current	_____	ON (testing)

Hp 4263B:

Function	_____	"Es-Q" selected
----------	-------	-----------------

Record the Serial Number of the test equipment used.

Valhalla _____

HP 4263b _____

Resistance Limits		Inner	Outer	Total	Pass	Fail
		XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω		
Quadrant 1	Inner					
	Outer					
	Total					
Quadrant 2	Inner					
	Outer					
	Total					
Quadrant 3	Inner					
	Outer					
	Total					
Quadrant 4	Inner					
	Outer					
	Total					
Magnet	Limit	XX.X Ω to XX.X Ω		2.305		

Inductance Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X mH	XX.X to XX.X mH	XX.X to XX.X mH		
Quadrant 1	Inner					
	Outer					
	Total					
Quadrant 2	Inner					
	Outer					
	Total					
Quadrant 3	Inner					
	Outer					
	Total					
Quadrant 4	Inner					
	Outer					
	Total					
Magnet	Limit	XX.X to XX.X mH				

(Q) Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X	XX.X to XX.X	XX.X to XX.X		
Quadrant 1	Inner					
	Outer					
	Total					
Quadrant 2	Inner					
	Outer					
	Total					
Quadrant 3	Inner					
	Outer					
	Total					
Quadrant 4	Inner					
	Outer					
	Total					
Magnet	Limit	XX.X to XX.X				

Inspector SMB [Signature]

Date 9/12/01

Electrical Test	Limit	Actual Measurement		Pass	Fail
		A	B		
Heater Strips 1/2 Resistance	XX.X to XX.X Ω				
Heater Strips 2/3 Resistance	XX.X to XX.X Ω				
Heater Strips 3/4 Resistance	XX.X to XX.X Ω				
Heater Strips 4/1 Resistance	XX.X to XX.X Ω				

Electrical Test	Limit	Actual Measurement	Pass	Fail
Spot Heater 1 Resistance	XX.X to XX.X Ω			
Spot Heater 2 Resistance	XX.X to XX.X Ω			
Spot Heater 3 Resistance	XX.X to XX.X Ω			
Spot Heater 4 Resistance	XX.X to XX.X Ω			

Inspector [Signature]

Date 9/12/01

Perform a Hipot on the Collared Coil Assembly (**Maximum Leakage .5µA**)

1.5 KV	Measurement(s)	
	A	B
Heater #1 to Ground		
Heater #2 to Ground		
Heater #3 to Ground		
Heater #4 to Ground		
Heater #1 to Coils		
Heater #2 to Coils		
Heater #3 to Coils		
Heater #4 to Coils		
Coil to Ground		

1.0 KV	Measurement(s)
Quadrant 1 to Quadrant 2	
Quadrant 2 to Quadrant 3	
Quadrant 3 to Quadrant 4	
Quadrant 4 to Quadrant 1	

Inspector N/A

Date _____



4.19 Verify that the results in Step 4.18 are acceptable.
Approved for next Assembly Procedure.

Responsible Authority/Physicist

Date

9.12.01

4.20 Thread the Voltage Taps, and Heater Strips through the openings of the End Can End Ring (MB-344533).

Technician(s)

Date

9/20/01

4.21 Place the End Can End Ring (MB-344533) onto the Tapered Ring (MC-344456).

Technician(s)

Date

9/20/01

4.22 Remove the old Strain Gage Wire RTV from the top and bottom instrumentation slots of the Collared Coil at both Return and Lead ends (only from areas where Strain Gage Wires had originally been "peeled back"). Re-apply Silicone Rubber Primer (Fermi-Stock 1940-1300) or equivalent onto the instrumentation slots and secure Strain Gage Wires into position with a mixture of RTV (Fermi-Stock 1940-0750) or equivalent.

Technician(s)

Date

M/A

6.0 Lead End Clamp Installation onto Collared Coil

6.1 Clean the Inside of the Filler Cone with lint free Heavy Duty Wipers (Fermi stock 1660-0150) and Isopropyl Alcohol (Fermi stock 1920-0300) or equivalent.

N/A
Technician(s)

9/20/01^{SE}
Date

6.2 Coat the inside of the Aluminum Tapered Ring (MC-344456), the outside faces and the Preform slots of the Filler Cones (MC-344457) with Dry Lubricant Spray (Miller Stephenson MS-122N/002). Apply 2nd coat after 5 minutes drying time.

Note(s):

Ensure dry lubricant contacts only the outside, Tapered Ring surfaces and Preform slots of the Filler Cone, and not the Lead End surfaces.

N/A
Technician(s)

9/20/01
Date

6.3 Slide the Tapered Ring (MC-344456) using a Mylar sleeve, onto the Collared Coil.

Shoel
Technician(s)

9/20/01
Date

6.4 Bolt the (4) Quadrant Pusher Plates (MD-344358) with .50 inch-13UNC x 13.0 inch Socket Head Cap Screws and 1/2" Flat Washers, onto the Squeezer Assembly (ME-344350).

Note(s):

Pusher Plates must be installed with hydraulic cylinder sides facing towards center of the Coil as not to interfere with any wiring involved in the Lead End Assembly.

Shoel
Technician(s)

9/20/01
Date

6.5 Install the Kapton and the Filler Cone Non/Lead End (ME-369030) atop the Saddles with Plastic Cable ties.

Caution:

Ensure dry lubricant coating remains intact and free of damage.

Record the amount of Kapton used:

N/A
Technician(s)

Date

- X 6.6 Place the Tapered Ring (ME-344456) on the Filler Cone (ME-344457) as per the Collared Coil with Ends (ME-369580).

Note(s):

Top of the Tapered Ring and the top of the Collared Coil match.
Strain Gage wires are on the outside of the Aluminum Tapered Ring.
Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring.

A. Gould Technician(s) 9/20/01 Date

- 6.7 Position the Holder Plate with the installed Half Rings (MC-344359), until it contacts the back surface of the Filler Cone.

A. Gould Technician(s) 9/20/01 Date

- 6.8 Attach the Enerpac Hose to the Hydraulic Cylinders (Model RC 106) as per the Collared Coil End Squeezer Assembly (ME-344350).

Note(s):

Face shield must be worn during operation of hydraulic cylinders.

A. Gould Technician(s) 9/20/01 Date

- 6.9 Record Total Coil Starting Resistance 2.308 Ω

A. Gould Technician 9/20/01 Date

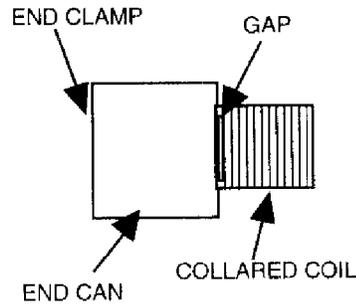
- 6.10 Gradually apply pressure to the End Squeezer Assembly until the Aluminum Tapered Ring covers the Filler Cone. Maximum Pump pressure is to be greater than 4000psi.

Maximum Pump Pressure 6600 psi
A. Gould Technician(s) 9/20/01 Date

- 6.11 Record Total Coil End Resistance 2.309 Ω

A. Gould Technician 9/20/01 Date

- 6.12 Before removing the End Squeezer Assembly, measure the gap between the Filler Cone and the Coil Lamination, as shown below, using a Micrometer.



Q1-.037
 Q2-.020
 Q3-.014
 Q4-.030

37
 20
 14
 30
 101

Gap Measurement 0.025
 Technician(s) [Signature]

Date 9/20/01



- 6.13 Verify that the results in Step 6.12 are acceptable. Approved for next Assembly Procedure.

Responsible Authority/Physicist [Signature]

Date 9-20-01

- 6.14 Remove the End Squeezer Assembly.

Technician(s) [Signature]

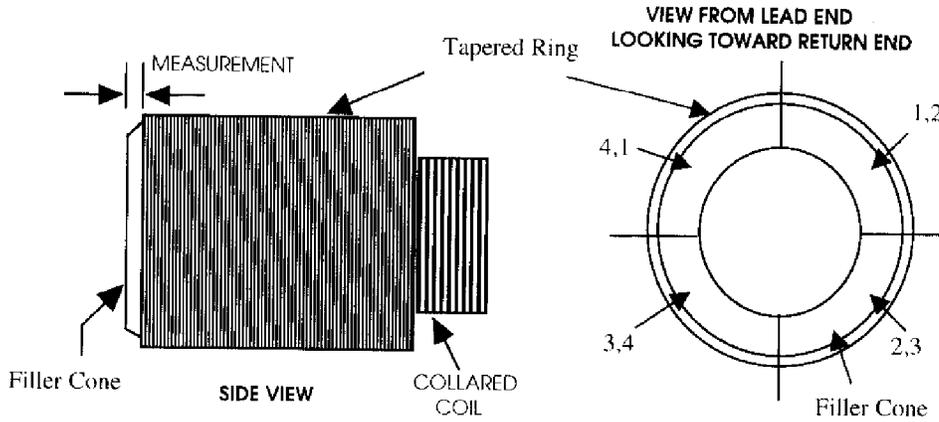
Date 9/20/01

- 6.15 Clean the Filler Cone using Isopropyl Alcohol (Fermi stock 1920-0300) and Kimwipes or equivalent.

Technician(s) [Signature] SVG

Date 9/20/01

6.16 Measure the distance between each Filler Cone and the Tapered Ring, using a Depth Gauge.

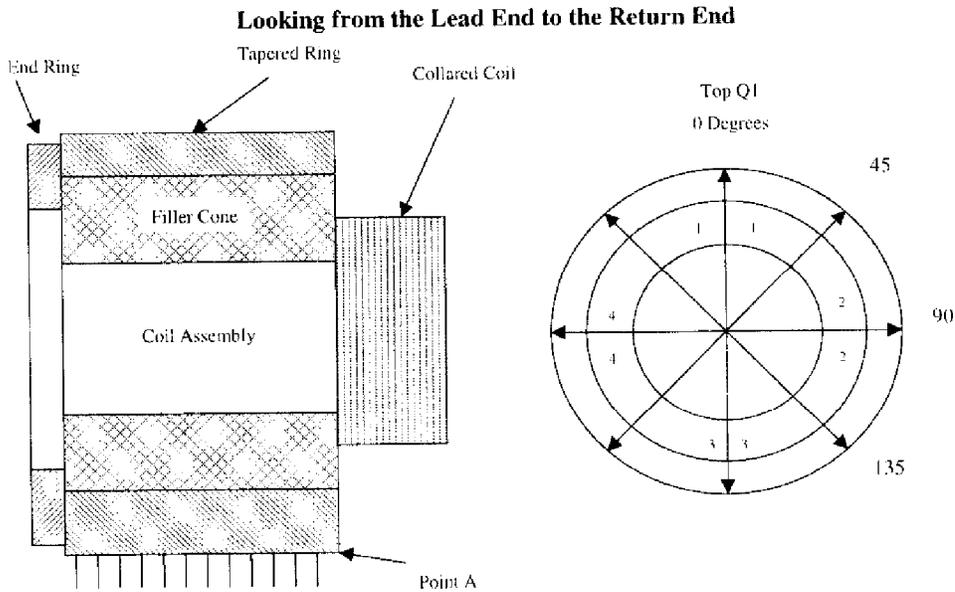


Filler Cone 1,2	<u>.020</u>
Filler Cone 2,3	<u>.007</u>
Filler Cone 3,4	<u>.002</u>
Filler Cone 1,4	<u>.011</u>
AVERAGE	<u>.010</u>

[Signature]
 Technician(s)

9-20-01
 Date

- 6.17 Measure the diameter of the Tapered Ring (MC-344456) in the fully clamped state, at the 0, 45, 90 and 135 Degrees at 1" intervals using a 9"-10" Micrometer and PI Tape.



Distance from the Coil End of the Tapered Ring (A)	0 Degrees	45 Degree	90 Degree	135 Degree	PI Tape
0.00 inches					
1.00 inches					
2.00 inches					
3.00 inches					
4.00 inches					
5.00 inches					
6.00 inches					
7.00 inches					
8.00 inches					
9.00 inches					
9.50 inches					

Technician(s) N/A

Date _____

- 6.18 Perform an Electrical Inspection. Refer to the Valhalla and Leader Free Standing Coil Measurement Procedure ES-292306.

Note(s):

Coils in the free state during an electrical inspection shall be at least 150 mm (6") away from any conductive material (i.e., surface of the coil preparation / storage table).

Electrical connections to the coil leads shall be 305 mm ± 13 mm (12" ± .5") away from the end of the coil to be tested.

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

Caution:

Before applying power to the Valhalla 4300B, ensure that the test current is OFF. During testing, ensure that the test current is off and the disconnect status safe light is lit while connecting and disconnecting test leads from the Coil Assembly. An unsafe signal indicates a test current is still being generated.

Valhalla 4300B settings:

Power must be on for 30 minutes before testing.

Test Current	_____	OFF
Power	_____	ON
Full Scale Voltage	_____	20mv
Amp Selector Knob	_____	.10 mA
Temperature Compensator	_____	ON
Test Current	_____	ON (testing)
Test Current	_____	ON (testing)

Hp 4263B:

Function _____ "Ls-Q" selected

Record the Serial Number of the test equipment used.

Valhalla _____

HP 4263b _____

Resistance Limits		Inner	Outer	Total	Pass	Fail
		XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω	XX.X Ω to XX.X Ω		
Quadrant 1	Inner	.2575				
	Outer		.3190			
	Total			.5763		
Quadrant 2	Inner	.2571				
	Outer		.3189			
	Total			.5760		
Quadrant 3	Inner	.2579				
	Outer		.3200			
	Total			.5779		
Quadrant 4	Inner	.2585				
	Outer		.3192			
	Total			.5776		
Magnet	Limit	XX.X Ω to XX.X Ω		2.305		

Inductance Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X mH	XX.X to XX.X mH	XX.X to XX.X mH		
Quadrant 1	Inner	533.030				
	Outer		870.412			
	Total			2,31664		
Quadrant 2	Inner	531.017				
	Outer		867.245 867.245			
	Total			2,31150		
Quadrant 3	Inner	531.170				
	Outer		863.554			
	Total			2,31021		
Quadrant 4	Inner	533.781				
	Outer		867.089			
	Total			2,31765		
Magnet	Limit	XX.X to XX.X mH		2.305 13.316		

(Q) Limits		Inner	Outer	Total	Pass	Fail
		XX.X to XX.X	XX.X to XX.X	XX.X to XX.X		
Quadrant 1	Inner	3.14				
	Outer		3.07			
	Total			5.34		
Quadrant 2	Inner	3.11				
	Outer		3.04			
	Total			5.31		
Quadrant 3	Inner	3.12				
	Outer		3.04			
	Total			5.30		
Quadrant 4	Inner	3.10				
	Outer		3.03			
	Total			5.28		
Magnet	Limit	XX.X to XX.X		5.94		

A. Gould
Inspector

9/21/01
Date

Electrical Test	Limit	Actual Measurement		Pass	Fail
		A	B		
Heater Strips 1/2 Resistance	XX.X to XX.X Ω	9.417			
Heater Strips 2/3 Resistance	XX.X to XX.X Ω	9.502			
Heater Strips 3/4 Resistance	XX.X to XX.X Ω	9.485			
Heater Strips 4/1 Resistance	XX.X to XX.X Ω	9.405			

Electrical Test	Limit	Actual Measurement	Pass	Fail
Spot Heater 1 Resistance	XX.X to XX.X Ω			
Spot Heater 2 Resistance	XX.X to XX.X Ω			
Spot Heater 3 Resistance	XX.X to XX.X Ω			
Spot Heater 4 Resistance	XX.X to XX.X Ω			

A. Gould
Inspector

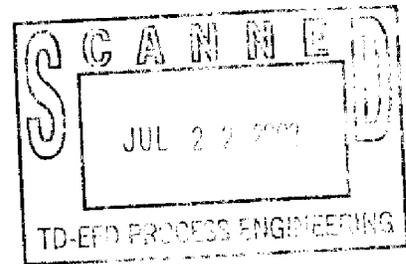
9/21/01
Date

Traveler Title: LHC End Can Installation Traveler	Specification No: 5520-TR-333496	Revision: 	DR No: HGQ-0242
---	--	----------------------	---------------------------

Step No: 9.0	Drawing No: ME-369580	Routing Form No: 	Serial No: MQXBC-001
------------------------	---------------------------------	-----------------------------	--------------------------------

Discrepancy Description:

The inner return end key in Quadrant 3 is protruding into the bore of the magnet.



Originator:
Steve Gould

Date:
8/6/2001

Cause of Nonconformance:

Pieces of Kapton End Ground Wrap (344567 & 344568) were pushed out of place when replaceable key (369098) was inserted. The ground wrap was folded, causing pressure on the key, pushing it into the bore.

Responsible Authority:
Rodger Bossert

Date:
8/6/2001

Disposition:

Remove End Clamp and Outer Key. Remove folded Ground Wrap and replace. Then re-install End Can. (Re-issue Step No. 3.10 & 4.1 to 5.9, omitting steps as necessary)

Responsible Authority:

Rodger Bossert

Date:

8/6/2001

Corrective Action to Prevent Recurrence:

Two pieces of ground wrap (344567 & 344568), .003" and .005" thick, will be replaced with one piece, .008" thick. The new piece will initially be cut long, extending into the magnet body area. This will allow the technicians to observe that the piece of ground wrap has not been pulled out of place while the inner key was inserted. The ground wrap can then be cut to length after the key is installed.

Responsible Authority:

Rodger Bossert

Date:

11/19/2001

Corrective Action/Disposition Verified By:

Rodger Bossert

Date:

11/19/2001

Will Configuration be affected?: YES NO

Identified problem area:

Material Manpower Method Machine Measurement

Reviewed By:

Bob Jensen

Date:

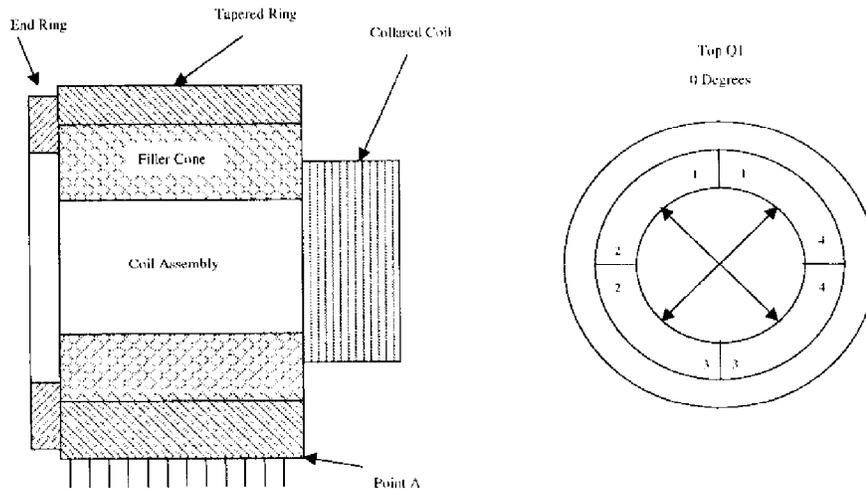
11/20/2001

- 3.4 Position the Filler Cone-Return End (ME-369030) in the Aluminum Tapered Ring (ME-369031). If the Filler Cone is too loose, add shims until it becomes necessary to use a rubber mallet on the partially inserted shims.

 Technician(s) N/A Date _____

- 3.5 Mark with a fine tip marker (not black) and measure the Filler Cone Inner Diameter from the center of Quadrants 1 to 3 and the center of Quadrants 2 to 4, at all intervals marked on table below, using a Telescoping Micrometer and a Dial Caliper. Record data in table below.

View from the Return End looking toward the Lead End



Note(s):
Measure to three digits past the decimal point

Distance from the Coil End of the Tapered Ring (A)	Diameter Filler Cones 1,2 to 3,4	Diameter Filler Cones 2,3 to 1,4
0.25 inches		
1.00 inches		
4.00 inches		
4.75 inches		

 Technician(s) N/A Date _____

- 3.6 Etch the Magnet Serial Number MQXBC-XXX, using .025 to .0375 inch high letters, onto both End Can End Ring (MB-344533) on the Lead and Return Ends. Grind slots into the End Can End Ring (MB-344533) on the Lead and Return Ends to allow for the IORS Volt Tap Wires to pass.

N/A
 Technician(s) _____ Date _____

- 3.7 Score the Inside of the Filler Cone.

N/A
 Technician(s) _____ Date _____

- 3.8 Clean the inside of the Filler Cone with lint free Heavy Duty Wipers (Fermi stock 1660-0150), and Isopropyl Alcohol (Fermi stock 1920-0300) or equivalent.

N/A
 Technician(s) _____ Date _____

- 3.9 Coat the inside of the Aluminum Tapered Ring-Return End (ME-369031), the outside faces and the Preform slots of the Filler Cone-Return End (ME-369030) with Dry Lubricant Spray (Miller Stephenson MS-122N/002). Apply 2nd coat after 5 minutes drying time.

Note(s):

Ensure dry lubricant contacts only the outside, Tapered Ring surfaces and Preform slots of the Filler Cone, and not the Lead End surfaces.

N/A
 Technician(s) _____ Date _____

- 3.10 Pick up the Collared Coil Assembly with Crane (using the LHC Lifting Fixture 318718) and place it into End Squeezer Assembly (ME-344350).

Note(s):

All wires shall be clear of the End Squeezer Assembly (ME-344350) prior to installation. "Peel back" the Strain Gage Wires 24 inches to avoid any pinching or damage to the wires during the end clamp procedure.

[Signature]
 Technician(s) _____ Date 10/10/01

TAKING OFF END CAN R = 2.308

4.0 Return End End Can Installation

4.1 Slide the Tapered Ring-Return End (ME-369031) using a Mylar sleeve, onto the Collared Coil.

[Signature]
Technician(s)

10/15/01
Date

4.2 Bolt the (2) Pusher Plates (MC-369169) with 0.50 inch-13UNC x 13.0 inch Socket Head Cap Screws and 0.50 inch Flat Washers, onto the End Squeezer Assembly (ME-344350).

Note(s):

Pusher Plates must be installed with hydraulic cylinder sides facing towards center of Coil as not to interfere with any wiring involved in Lead End Assembly.

[Signature]
Technician(s)

10/15/01
Date

4.3 Install the Kapton and the Filler Cone (MC-344457) atop the Saddles with Plastic Cable ties.

Caution:

Ensure dry lubricant coating remains intact and free of damage.

Record the amount of Kapton used:

1003

[Signature]
Technician(s)

10-15-01
Date

4.4 Slide the Tapered Ring-Return End (ME-369031) on the Filler Cone-Return End (ME-369030) as per the Collared Coil with Ends (ME-369580).

Note(s):

**Top of the Tapered Ring and the top of the Collared Coil match.
Strain Gage wires are on the outside of the Aluminum Tapered Ring.
Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring.**

[Signature]
Technician(s)

10-15-01
Date

4.5 Position the Holder Plate with the installed Half Rings (MC-344359), until it contacts the back surface of the Filler Cone (ME-369030).

[Signature]
Technician(s)

10-15-01
Date

4.6 Attach the Enerpac Hose to Hydraulic Cylinders (Model RC 106) as per the End Squeezer Assembly (ME-344350).

Note(s):

Face shield must be worn during operation of hydraulic cylinders.

[Signature]
Technician(s)

10-15-01
Date

4.7 Record Total Coil Starting Resistance 2.308 Ω .

[Signature]
Technician

10-15-01
Date

4.8 Gradually apply pressure to the End Squeezer Assembly until the Aluminum Tapered Ring covers the Filler Cone. Maximum pump pressure is to be greater than 4000psi.

Maximum Pump Pressure 2800 psi

[Signature]
Technician(s)

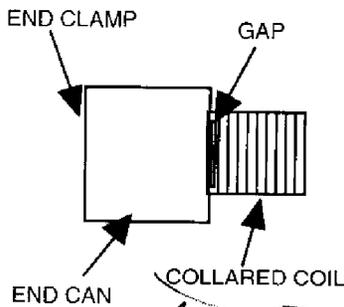
10-15-01
Date

4.9 Record Total Coil End Resistance 2.308 Ω

[Signature]
Technician

10-15-01
Date

4.10 Before removing the End Squeezer Assembly, measure the gap between the Filler Cone and the Coil Lamination, as shown below, using a Micrometer.



Gap Measurement Quad 1 .006

Gap Measurement Quad 2 .028

Gap Measurement Quad 3 .028

Gap Measurement Quad 4 .026

[Signature]
Technician(s)

10-15-01
Date



4.11 Verify that the results in Step 4.10 are acceptable. Approved for next Assembly Procedure.

[Signature]
Responsible Authority/Physicist

10-15-01
Date

4.12 Remove the End Squeezer Assembly.

[Signature]
Technician(s)

10-15-01
Date

5.0 Return End Can Inspection

5.1 Perform a Pi tape measurement on the Tapered Ring at the following locations.

Distance from the Coil End of the Tapered Ring (A)	Pi Tape
0.0 inches	9.852
1.0 inches	9.850
2.0 inches	9.849
3.0 inches	9.849
4.0 inches	9.852
5.0 inches	9.851

[Signature]
 Technician(s)

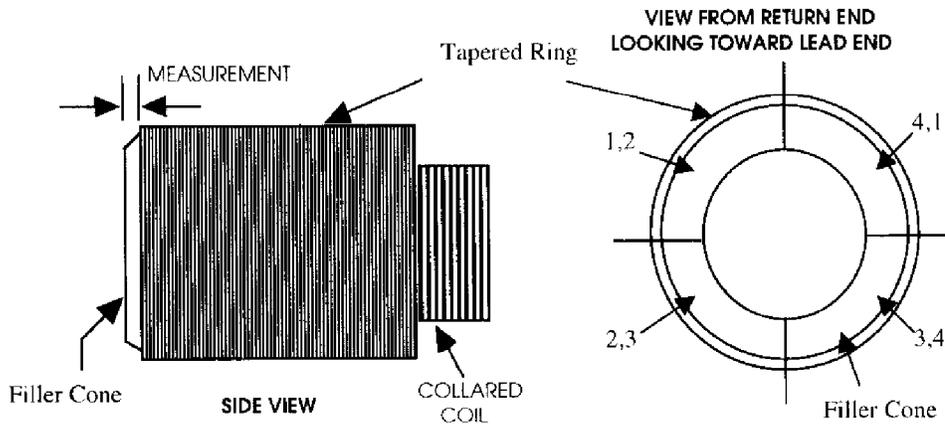
10-15-01
 Date

5.2 Clean the Filler Cone using Isopropyl Alcohol (Fermi stock 1920-0300) Kimwipes (Fermi stock 1660-2600) or equivalent.

[Signature]
 Technician(s)

10-15-01
 Date

5.3 Measure the distance between each Filler Cone and the Tapered Ring, using a Depth Gauge.



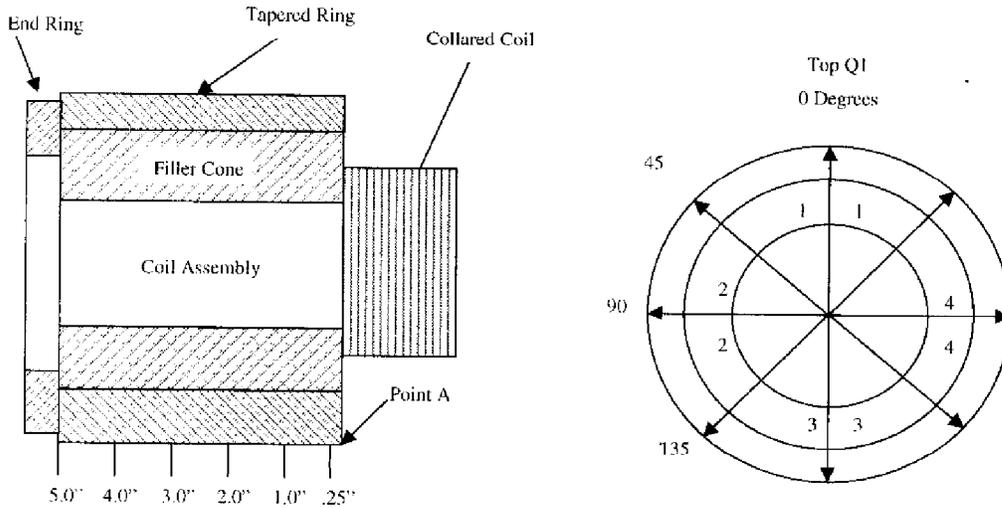
- Filler Cone 1,2 .003
- Filler Cone 2,3 .003
- Filler Cone 3,4 .003
- Filler Cone 1,4 .004
- AVERAGE** .003

[Signature]
 Technician(s)

10-15-01
 Date

- 5.4 Measure the diameter of the Tapered Ring (MC-344456) in the fully clamped state, at 0, 45, 90 and 135 Degrees at 1" intervals using a 9"-10" Micrometer and PI Tape.

View from the Return End looking toward the Lead End



Distance from the Coil End of the Tapered Ring (A)	0 Degree	45 Degree	90 Degree	135 Degree	Pi Tape
0.0 inches					
1.0 inches					
2.0 inches					
3.0 inches					
4.0 inches					
5.0 inches					

N/A
 Technician(s)

_____ Date

5.5 Perform an electrical inspection on each of the individual Inner Coils, Outer Coils, Quadrants and Voltage Taps. 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 288-00912

TRR #1440
"Nominal" Values

Resistance		Inner	Outer	Total	Pass	Fail
Nominal		345 mΩ to 390 mΩ	410 mΩ to 455 mΩ	560 to 585 mΩ		
Quadrant 1	Inner	.2580 mΩ				
	Outer		.3191 mΩ			
	Total			.5768 mΩ		
Quadrant 2	Inner	.2559 mΩ				
	Outer		.3191 mΩ			
	Total			.5750 mΩ		
Quadrant 3	Inner	.2579 mΩ				
	Outer		.3200 mΩ			
	Total			.5778 mΩ		
Quadrant 4	Inner	.2586 mΩ				
	Outer		.3193 mΩ			
	Total			.5778 mΩ		
Total Magnet		Nominal	2.3 Ω	2.310 Ω		

NEED UPDATING-DELETE "PASS/FAIL" COLUMNS?

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	533.539 μ H				
	Outer		870.564 mH			
	Total			2.31407 mH		
Quadrant 2	Inner	530.373 μ H				
	Outer		865.608 mH			
	Total			2.30820 mH		
Quadrant 3	Inner	531.890 μ H				
	Outer		864.702 mH			
	Total			2.3038 mH		
Quadrant 4	Inner	536.329 μ H				
	Outer		869.909 mH			
	Total			2.307 mH		
Total Magnet		Nominal	17 mH	13.0028 mH		

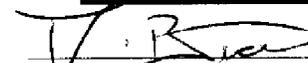
Q-Factor		Inner	Outer	Total	Pass	Fail
Nominal		3.0 to 3.5	4.3 to 5.0	4.5 to 5.2		
Quadrant 1	Inner	3.12				
	Outer		3.06			
	Total			5.33		
Quadrant 2	Inner	3.11				
	Outer		3.04			
	Total			5.31		
Quadrant 3	Inner	3.09				
	Outer		3.04			
	Total			2.350 5.26		
Quadrant 4	Inner	3.13				
	Outer		3.04			
	Total			2.5.26		
Total Magnet		Nominal	4.3	6.0.3		


Inspector

10-15-01
Date

Electrical Test	Limit	Actual Measurement	Pass	Fail
Heater Strips 1/2 Resistance	9.20 to 9.60 Ω	9.390 Ω	✓	
Heater Strips 2/3 Resistance	9.20 to 9.60 Ω	9.476 Ω	✓	
Heater Strips 3/4 Resistance	9.20 to 9.60 Ω	9.454 Ω	✓	
Heater Strips 4/1 Resistance	9.20 to 9.60 Ω	9.369 Ω	✓	

Voltage Taps	Volts (ramp splice) 1/8 Coil Taps	Pass	Fail
Quadrant 1	2580 mV		
Quadrant 2	2559 mV		
Quadrant 3	2579 mV		
Quadrant 4	2586 mV		


Inspector

10-15-01
Date

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

5 KV	Measurement(s)
Heater #1/2 to Ground	1 μ A
Heater #2/3 to Ground	1.2 μ A
Heater #3/4 to Ground	1.2 μ A
Heater #4/1 to Ground	1.2 μ A
Heater #1/2 to All 4 Quadrants	1.2 μ A
Heater #2/3 to All 4 Quadrants	1.0 μ A
Heater #3/4 to All 4 Quadrants	1.1 μ A
Heater #4/1 to All 4 Quadrants	1.2 μ A
All 4 Quadrants to Ground	1.1 μ A

ALL HIPOTS
 DONE AT
 SAME TIME
 HEATER + COIL
 ARE GROUNDED
 CHECKED ON
 10 μ A SCALE
 0.9 μ A

COIL TO
 GROUND
 1.2 μ A

COIL TO COIL 3.0 KV	Measurement(s)
Quadrant 1 to Quadrant 2	1 μ A
Quadrant 2 to Quadrant 3	1 μ A
Quadrant 3 to Quadrant 4	1 μ A
Quadrant 4 to Quadrant 1	1 μ A


 Inspector

10-15-01
 Date



5.6 Verify that the results in Step 5.5 are acceptable.
Approved for next Assembly Procedure.

Responsible Authority/Physicist

10-16-01
Date

5.7 Thread the Voltage Taps, and Heater Strips through the openings of the End Can End Ring (MB-344533).

Technician(s)

10-16-01
Date

5.8 Place the End Can End Ring (MB-344533) onto the Tapered Ring (MC-344456).

Technician(s)

10-16-01
Date

Remove the old Strain Gage Wire RTV from the top and bottom instrumentation slots of the Collared Coil at both Return and Lead ends (only from areas where Strain Gage Wires had originally been "peeled back"). Re-apply Silicone Rubber Primer (Fermi-Stock 1940-1300) or equivalent onto the instrumentation slots and secure Strain Gage Wires into position with a mixture of RTV (Fermi-Stock 1940-0750) or equivalent.

N/A
Technician(s)

Date

TRR to
Remove
Step 5.8
TRR #
1422

TD/ENGINEERING & FABRICATION

PARTS KIT REQUEST

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 JIM RIFE ICB

BUDGET CODE: LQC

COLLARED COIL NUMBER: MOXBC-001

RELEASED BY: T J Gardner

PRODUCTION SIGNATURE: T J Gardner

TODAYS DATE: 7-Jun-01

NEED DATE: 11-Jun-01

ISSUE VERIFICATION: [Signature]

MATERIAL CONTROL SIGNATURE: [Signature]

DATE ISSUED TO STOCKROOM: 6/9/01

THIS KIT LIST IS FOR: ME-369580 B COLLARED COIL WITH ENDS ASSEMBLY

PART NUMBER	REV	DESCRIPTION	REQUIRED QTY/ASSY
344456	G	LE TAPERED RING	1 EA
344533	B	LE FILLER CONE (4 PCS TO A SET)	1 SET
344533	B	END CAN END RING	2 EA
344533	B	RE FILLER CONE (4 PCS TO A SET)	1 SET
369031	D	RETAPERED RING	1 EA
369094	B	AXIAL PRELOAD PLATE	2 EA
369719	B	1/2-13 X 1.5" LG SOCKET HEAD CAP SCREW	16 EA
369272	B	7/16-14 X 3/4" LG FLAT HEAD SCREW	8 EA
369581	B	COLLARED COIL WITHOUT END ASSEMBLY	1B3 HAS

MATERIAL		CONTROL		PROD	SUPT.
QTY ISSUED	ROUTE FORM	DATE AVAIL	DATE AVAIL	VERIFY PART	VERIFY PART
1	74529				
2	74530				
1	74445				
2	72450				
16	369719				
8	71928				

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

TRAVELER NO. TR-333496

KIT IS COMPLETE (PARTS COORDINATOR SIGNATURE): [Signature]

BADGE # 489

STOCKROOM SIGNATURE AND DATE

[Signature]

DATE 6/12/01

369719 LE
752
674692

Traveler Title:

LHC End Can Installation Traveler

Specification No:

5520-TR-333496

Revision:

DR No:

HGQ-0239

Step No:

5.13

Drawing No:

ME-369580

Routing Form No:

Serial No:

MQXBC-001

Discrepancy Description:

Fuji film was not used on the lead end end can installation as per Rodger Bossert.

Originator:

Steve Gould

Date:

7/23/2001

Cause of Nonconformance:

Decision was made to eliminate this step. Production Magnets will not use Fuji Film.

Responsible Authority:

Rodger Bossert

Date:

7/23/2001

Disposition:

Use Magnet as is and skip this step.

Responsible Authority:

Rodger Bossert

Date:

7/23/2001

Corrective Action to Prevent Recurrence:

Modify traveler to reflect Production procedure. (TRR No. 1200 - Matt Cullen 9/28/01)

Responsible Authority:

Rodger Bossert

Date:

7/23/2001

Corrective Action/Disposition Verified By:

Rodger Bossert

Date:

7/23/2001

Will Configuration be affected?: YES NO

Identified problem area:

Material Manpower Method Machine Measurement

Reviewed By:

Jamie Blowers

Date:

8/13/2001

Traveler Title:

LHC End Can Installation Traveler

Specification No:

5520-TR-333496

Revision:

DR No:

HGQ-0240

Step No:

5.20

Drawing No:

ME-369580

Routing Form No:

Serial No:

MQXBC-001

Discrepancy Description:

The gap measured was greater than the .010" allowed.

Originator:

Steve Gould

Date:

7/24/2001

Cause of Nonconformance:

Due to the repair of a ground short, the End Clamp was moved longitudinally to a non-standard position (See DR No. HGQ-0236). Due to the insertion of the Key extension, it may have been more difficult to place the collet quadrants flush with the collars.

Responsible Authority:

Rodger Bossert

Date:

7/24/2001

Disposition:

The gap was still relatively small (~.030 in.), so we should proceed with the magnet.

Responsible Authority:

Rodger Bossert

Date:

7/24/2001

Corrective Action to Prevent Recurrence:

The next magnet will use standard parts, so this problem should not occur. If the gap continues to be larger than .010", but still acceptable, consider changing the traveler limits after MQXB02.

Responsible Authority:

Rodger Bossert

Date:

7/24/2001

Corrective Action/Disposition Verified By:

Rodger Bossert

Date:

7/24/2001

Will Configuration be affected?: YES NO

Identified problem area:

- Material
- Manpower
- Method
- Machine
- Measurement

Reviewed By:

Bob Jensen

Date:

8/20/2001

Traveler Title:

LHC End Can Installation Traveler

Specification No:

5520-TR-333496

Revision:

DR No:

HGQ-0241

Step No:

6.21

Drawing No:

ME-369580

Routing Form No:

Serial No:

MQXBC-001

Discrepancy Description:

IORS tap wires will not fit through the End Ring on the Lead End. IORS = 1/8 coil taps

Originator:

Steve Gould

Date:

7/24/2001

Cause of Nonconformance:

End Ring on End Clamp does not have slots to allow wires to pass through.

Responsible Authority:

Rodger Bossert

Date:

7/24/2001

Disposition:

Grind slots in End Ring and continue.

Responsible Authority:

Rodger Bossert

Date:

7/24/2001

Corrective Action to Prevent Recurrence:

Grind slots again on MQXB02. 1/8 Coil taps will not be used on Magnets after MQXB02.
(TRR No. 1200 - Matt Cullen 10/1/01)

Responsible Authority:

Rodger Bossert

Date:

7/24/2001

Corrective Action/Disposition Verified By:

Rodger Bossert

Date:

7/24/2001

Will Configuration be affected?: YES NO

Identified problem area:

Material Manpower Method Machine Measurement

Reviewed By:

Bob Jensen

Date:

10/1/2001

Traveler Title:

LHC Inner Coil Winding Traveler

Specification No:

5520-TR-333486

Revision:

D

DR No:

HGQ-0243

Step No:

5.16

Drawing No:

MD-369514

Routing Form No:

Serial No:

MQXBj-029

Discrepancy Description:

Cable roped beyond repair during backwinding one turn of the coil to repair a scuff in cable insulation caused by installing Lead End Winding part No. MD-369073.

Originator:

Jim Rife

Date:

8/14/2001

Cause of Nonconformance:

Manual operation of the Spirex Coil Winding Machine for a backwind situation: During backwinding, the spool height travel feature of the machine does not operate automatically and spool height must be adjusted manually. Manually adjusting the pitch of the cable onto the spool caused the cable to ride up and cover the top of the set of cable roller guides used during normal operation.

Responsible Authority:

Rodger Bossert

Date:

8/14/2001

Disposition:

Do not use this cable in a Magnet Coil. Set aside for future bus fabrication.

Responsible Authority:

Rodger Bossert

Date:

8/14/2001

Corrective Action to Prevent Recurrence:

Do not backwind. If necessary, only in manual. First release the cable tension. Manually keep spool alignment.

Responsible Authority:

Rodger Bossert

Date:

8/15/2001

Corrective Action/Disposition Verified By:

Bob Jensen

Date:

8/20/2001

Will Configuration be affected?: YES NO

Identified problem area:

- Material Manpower Method Machine Measurement

Reviewed By:

Bob Jensen

Date:

8/20/2001

Traveler Title: LHC End Can Installation Traveler	Specification No: 5520-TR-333496	Revision: none	DR No: HGQ-0254
---	--	--------------------------	---------------------------

Step No: 9.1	Drawing No: ME-369580	Routing Form No: 	Serial No: MQXBC-001
------------------------	---------------------------------	-----------------------------	--------------------------------

Discrepancy Description:

During warm bore testing the collared coil was found to have a coil to ground short to the lead end end can. Further investigation of the short found that the Q3 voltage tap wire from the inner/outer splice was the cause.

Originator:
Jim Rife

Date:
9/19/2001

Cause of Nonconformance:

Voltage tap wire from 1/8 coil tap was contacting End Can.

Responsible Authority:
Rodger Bossert

Date:
10/5/2001

Disposition:

Remove End Can, re-insulate wire, replace End Can and continue.

Responsible Authority:

Rodger Bossert

Date:

10/5/2001

Corrective Action to Prevent Recurrence:

1/8 Coil taps will be eliminated beginning with MQXB03. MQXB02 1/8 coil taps have already been installed successfully.

Responsible Authority:

Rodger Bossert

Date:

10/5/2001

Corrective Action/Disposition Verified By:

Rodger Bossert

Date:

10/5/2001

Will Configuration be affected?: YES NO

Identified problem area:

Material Manpower Method Machine Measurement

Reviewed By:

Bob Jensen

Date:

10/8/2001

Revision Request Control Number: 1200

Specification Number: 5520 - TR - 333496 Current Revision: None

Traveler or Document Title LHC End Can Installation Traveler

Step #/Description of Revision:

4.2 / 7.2 Tooling is Qty 2 of (MC-369169).
 3.6 / 6.6 Change serial number to MQXB.
 3.10 / 6.10 Use approved lifting fixture.
 4.10 / 7.10 Add space for reading from all 4 quadrants.
 3.0 / 5.0 Deleted steps for Fuji Film.
 3.6 Grind slots on the End Rings to allow for the IORS Volt Tap Wires to pass.
 4.0 Broke step into 3.0, 4.0 and 5.0
 6.0 Broke step into 7.0, 8.0 and 9.0

Damon Bice

Originator

Matt Cullen

Responsible Authority

7/1/2001

Date

Revision Incorporated into the Traveler:

Matt Cullen

Revision Incorporated By

9/28/2001

Date

Process Engineering Final Review:

Bob Jensen

Process Engineering/Designee

9/28/2001

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 initialed 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:

Specification Number: Current Revision:

Traveler or Document Title

Step #/Description of Revision:

- 8.5 Modified Step. Changed HiPot Table. Heaters grounded for Coil to Ground check.
Coil grounded for Heaters to Ground check. Added Pictures. DR No. HGQ-0282.
- 10.1 Modified Step. Thick wall of plate should be on the INSIDE.
- 10.2 Modified Step. Thick wall of plate should be on the INSIDE.
- 11.2 Added Step. Perform a Ring as per (ES-344799).

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:

Specification Number: Current Revision:

Traveler or Document Title

Step #/Description of Revision:

5.9 Delete Step. No Strain Gauge Wires.

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 initialed 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: 1422

Specification Number: 5520 - TR - 333496 Current Revision: D

Traveler or Document Title LHC End Can Installation Traveler

Step #/Description of Revision:

- 3.3 Modified Step. Changed First Column Header of Table to "Distance from the Collar Side of the Tapered Ring (A)".
- 3.5 Modified Step. Changed First Column Header of Table to "Distance from the Collar Side of the Tapered Ring (A)".
- 3.8 Modified Step. Changed "Dry Lubricant" to "DRYFILM DF250/IPA or equivalent" in Step and in Note(s) section.
- 3.9 Modified Step. Removed Strain Gauge comments from Note(s) section.
- 4.2 Modified Step. Removed Note: "Note(s): Pusher Plates must be installed with hydraulic cylinder sides facing towards center of Coil as not to interfere with any wiring involved in Lead End Assembly." Note is Obsolete.
- 4.4 Modified Step. Removed Note "Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring." No Voltage Taps as of MQXB03.
- 5.3 Modified Step. Changed "Depth Gauge" to "Gauge Block and Feeler Gauges".
- 5.4 Modified Step. Removed "and the Procedure for Electrical Inspection of Voltage Taps (ES-301383)." No Voltage Taps as of MQXB03. Changed First Column Header of Table to "Distance from the Collar Side of the Tapered Ring (A)". Changed Resistance, Inductance and Q factor Tables to record Total values only. Changed Full scale voltage to 2V.
- 6.3 Modified Step. Changed First Column Header of Table to "Distance from the Collar Side of the Tapered Ring (A)".
- 6.5 Modified Step. Changed First Column Header of Table to "Distance from the Collar Side of the Tapered Ring (A)".
- 6.6 Modified Step. Deleted "Grind slots into the End Can End Ring (MB-344533) on the Lead End to allow for the IORS Volt Tap Wires to pass." No Volt Tap wires as of MQXB03.
- 6.9 Modified Step. Changed "Dry Lubricant" to "DRYFILM DF250/IPA or equivalent" in Step and in Note(s) section.
- 7.3 Added Step. "Slide the Tapered Ring (MC-344456) using a Mylar sleeve, onto the Collared Coil."
- 7.6 Modified Step. Removed Note "Voltage Tap Wires are extended through the inside of the Aluminum Tapered Ring." No Voltage Taps as of MQXB03.
- 7.12 Modified Step. Deleted last sentence "The gap should be no more than 10 mils."
- 8.1 Removed Step. "Perform a Pi tape measurement on the Tapered Ring at the following locations." Performed in Step 8.4
- 8.3 Modified Step. Changed "Depth Gauge" to "Gauge Block and Feeler Gauges".
- 8.5 Modified Step. Changed Resistance, Inductance and Q factor Tables to record Total values only. Changed Full scale voltage to 2V.

Damon Bice

Originator

Jim Rife

Responsible Authority

2/26/2002

Date

Revision Incorporated into the Traveler:

John J. Spetz

Revision Incorporated By

2/27/02

Date

Process Engineering Final Review:

Bob Jones

Process Engineering/Designee

2/27/02

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 initialed 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:

Specification Number: Current Revision:

Traveler or Document Title

Step #/Description of Revision:

- 5.4 Modified Step. Changed Heater Strip Resistance Limits. DR No. HGQ-0306.
- 8.5 Modified Step. Changed Heater Strip Resistance Limits. DR No. HGQ-0306.
- 12.0 Added Step. Moved Step 7.0 from Collaring & Keying Traveler.

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 initialed 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.