Document ID:

7882

LHC Q2 LQXB Cryostat Shipping Traveler

333732 / Rev. B

Job No:	**248**
E + F Project/Task No.:	**300/1.1.1.6.2**
M + S Project/Task No.:	**300/1.1.1.6.2**

Place This Side Down For Scanning!!!

LQXB08-1

Document ID: 7882

Job No.: 248

Project/Task No. 300/1.1.1.6.2

Series: LQXB

Serial No: LQXB08

Rework ID: 1

Specification No.: 333732

Revision: B

LQXB08-1

Fermi National Accelerator Laboratory
Batavia, IL 60510

LARGE HADRON COLLIDER
Q2 - LQXB
SHIPPING TRAVELER

Reference Drawing(s):
Q2 Shipping Fixture Final Assembly
(ME-390686)
Q2 Magnet Shipping Assembly
(ME-390710)

Project/Task Number: *300/1.1.1.6.2*

Released By: *John Szostak* **Magnet/Device Series:** *LQXB*

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Prepared by: B. Jensen, J. Szostak

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Revision Page

Revision	Step No.	Revision Description	TRR No.	Date
None	N/A	Initial Release	N/A	6/28/04
A	3.8	Added Quadrant #3 Lead above 13 Ka lead	1650	7/12/04
	4.1	Remove 13 Ka lead and added Quadrant #3 lead		
	6.0	Split step. One for Q2A and one for Q2B Ls & Q readings. Updated Table 6.0.1, 6.0.2, 6.0.3, 6.0.4 VPot to LPot & HPot. Updated diagram/test procedure from HP to Agilent Meter		
	7.0	Updated diagram/test procedure from HP to Agilent Meter Updated Nominal values in Table 7.0.5, 7.0.6, 7.0.7, & 7.0.8		
	12.5	Deleted Step		
	12.6	Deleted Step		
	12.7	Updated Step to install Bellows Protectors instead of Velco		
	12.8	Updated Step to include Kapton MA-106723 ½ lapped on leads		
B	1.6	Added Step. "Protect the bellows during all stages of production." **DR No. HGQ-0500.**	1708	3/24/05
	3.0 – 15.0	Modified Steps. Arranged and modified steps per production.		
	10.7	Modified Step. Changed to "Install the Vinyl Flange Covers (MA-390491), (MA-390492), (MA-390493), (MA-390494), & the Alignment Fiducial Covers (MA-390495)."		
	12.11	Modified Step. Changed to "Are Accelerometers (Shock Recorders) available for installation? ☐Yes - Install Accelerometers as per Responsible Authority and Figure 8.10-A. below. ☐No - Accelerometers are NOT available for installation." **DR No. HGQ-0512.**		

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 All steps that require a sign-off shall include the Technician/Technician(s)s first initial and full last name.

1.2 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.

1.3 All Discrepancy Reports and Traveler Revision Requests issued shall be recorded in the left margin next to the applicable step.

1.4 Personnel shall perform all tasks in accordance with current applicable ES&H guidelines and those specified within the step.

1.5 Cover the product/assembly with Green Herculite (Fermi stock 1740-0100) when not being serviced or assembled.

1.6 Protect the Bellows during all stages of production.

2.0 Parts Kit List

2.1 Attach the completed Parts Kit for this production operation to this traveler. Ensure that the serial number on the Parts Kit matches the serial number of this traveler. Verify that the Parts Kit received is complete.

_____ _____

Process Engineering/Designee Date

3.0 Post MTF Magnet Preparation Non-IP Magnet End

3.1 Does magnet require a purge of compressed dry nitrogen (N_2)?

☐ YES, PURGE REQUIRED, Proceed to Step 3.2

☐ NO, PURGE NOT REQUIRED, Proceed to Step 4.0

Responsible Authority/Physicist _____ Date _____

3.2 If YES box was checked in Step 3.1, perform a required purge for a minimum of 2.5 days (3 days maximum) at a flow rate of 5 CFH of N_2.

	Purge Time	Purge Date	Purge Flow Rate
Start			
Finish			

Technician(s) _____ Date _____

3.3 Compress the bellows on the Non-IP End using Bellows Compression Tool.

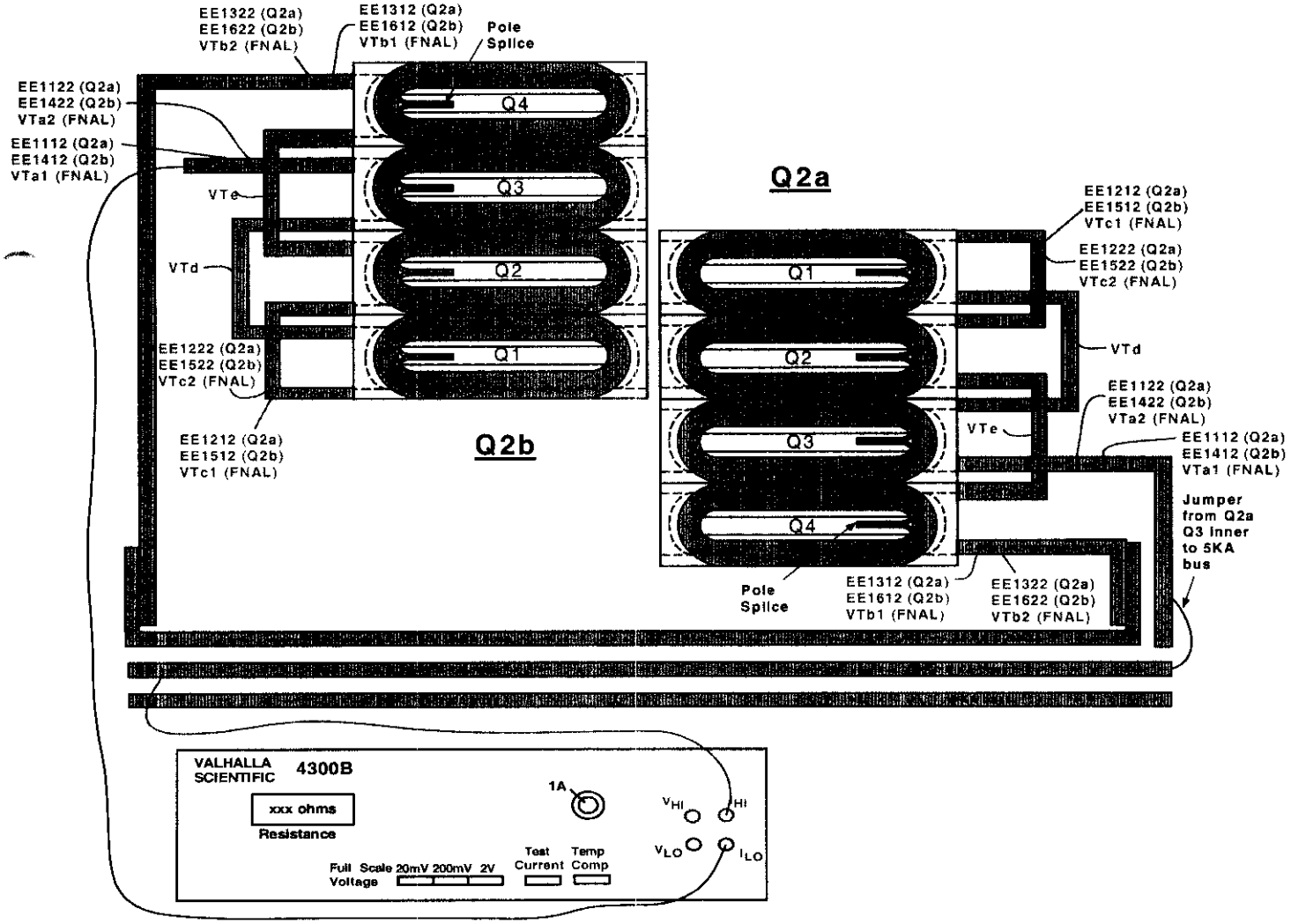
Technician(s) _____ Date _____

4.0 Final Resistance Electrical Inspection

4.1 Perform an electrical inspection on each of the Individual Quadrants and the Cold Masses. Refer to the Valhalla and Leader Free Standing Coil Measurement Procedure (ES-292306).

To measure the resistance of a bussed Q2:

1. Use Valhalla Scientific 4300B digital micro-ohmmeter.
2. Set Test Current to 1 amp.
3. Set Scale to 2V full scale.
4. Turn temperature compensation on.
5. Turn test current off.
6. Put jumper between Q2a Quadrant #3 inner power lead and 5 KA bus as shown in figure.
7. Connect I_{HI} to the 5KA bus (Q2a Quadrant #3 inner power lead) as shown in figure.
8. Connect I_{LO} to the Q2b Quadrant #3 inner power lead as shown in figure.
9. Turn test current on.
10. Connect V_{HI} and V_{LO} buttons to voltage taps as shown below.
11. Read resistance and record in traveler.



Note(s):

Sign of resistance reading should always be positive. If negative readings notify production supervisor.

TABLE 4.0.1				
(Q2a) Resistance				Nominal ~ 560 to 585 mΩ
Voltage Tap Serial Numbers				Quadrant Total Resistance
Connect	Fermi	CERN	Quadrant	Fermi
VHI	VTdQ2a	EMPTY	Quadrant 1	mΩ
VLO	VTc1Q2a	EE1212		
VHI	VTc1Q2a	EE1212	Quadrant 2	mΩ
VLO	VTeQ2a	EMPTY		
VHI	VTa1Q2a	EE1112	Quadrant 3	mΩ
VLO	VTdQ2a	EMPTY		
VHI	VTeQ2a	EMPTY	Quadrant 4	mΩ
VLO	VTb1Q2a	EE1312		

Note(s):

Sign of resistance reading should always be positive. If negative readings notify production supervisor.

TABLE 4.0.2				
				Fermi
VHI	VTa1Q2a	EE1112	Quadrant #3 & #1	mΩ
VLO	VTc1Q2a	EE1212		Nominal ~ 1120 mΩ
VHI	VTc1Q2a	EE1212	Quadrant #2 & #4	mΩ
VLO	VTb1Q2a	EE1312		Nominal ~ 1120 mΩ
VHI	VTa1Q2a	EE1112	Total Cold Mass	mΩ
VLO	VTb1Q2a	EE1312		Nominal ~ 2.305 Ω

_____ _____

Technician(s) Date

Check resistance of Redundant Voltage Taps.

TABLE 4.0.3			
Q2a Redundant Voltage Taps Resistance			
			Fermi
Connect	Fermi	CERN	Nominal ~1120 mΩ
V_{HI}	VTa2Q2a	EE1122	
V_{LO}	VTc2Q2a	EE1222	mΩ
V_{HI}	VTc2Q2a	EE1222	
V_{LO}	VTb2Q2a	EE1322	mΩ

Technician(s) Date

TABLE 4.0.4				
(Q2b) Resistance				Nominal ~ 560 to 585 mΩ
Voltage Tap Serial Numbers				Quadrant Total Resistance
Connect	Fermi	CERN	Quadrant	Fermi
V_{HI}	VTc1Q2b	EE1512	Quadrant 1	
V_{LO}	VTdQ2b	EMPTY		mΩ
V_{HI}	VTeQ2b	EMPTY	Quadrant 2	
V_{LO}	VTc1Q2b	EE1512		mΩ
V_{HI}	VTdQ2b	EMPTY	Quadrant 3	
V_{LO}	VTa1Q2b	EE1412		mΩ
V_{HI}	VTb1Q2b	EE1612	Quadrant 4	
V_{LO}	VTeQ2b	EMPTY		mΩ

Technician(s) Date

TABLE 4.0.5				
				Fermi
V_{HI}	VTc1Q2b	EE1512	Quadrant	
V_{LO}	VTa1Q2b	EE1412	#1 & #3	Nominal ~ 1120 m Ω
V_{HI}	VTb1Q2b	EE1612	Quadrant	
V_{LO}	VTc1Q2b	EE1512	#4 & #2	Nominal ~ 1120 m Ω
V_{HI}	VTb1Q2b	EE1612	Total Cold	
V_{LO}	VTa1Q2b	EE1412	Mass	Nominal ~ 2.305 Ω

Technician(s) Date

Check the resistance of the Redundant Voltage Taps.

TABLE 4.0.6			
Q2b Redundant Voltage Taps			
			Resistance
Connect	**Fermi**	**CERN**	**Fermi**
V_{HI}	VTc2Q2b	EE1522	
V_{LO}	VTa2Q2b	EE1422	Ω
V_{HI}	VTb2Q2b	EE1622	
V_{LO}	VTc2Q2b	EE1522	Ω

Technician(s) Date

5.0 Q2A Final Inductance and Q Electrical Inspection

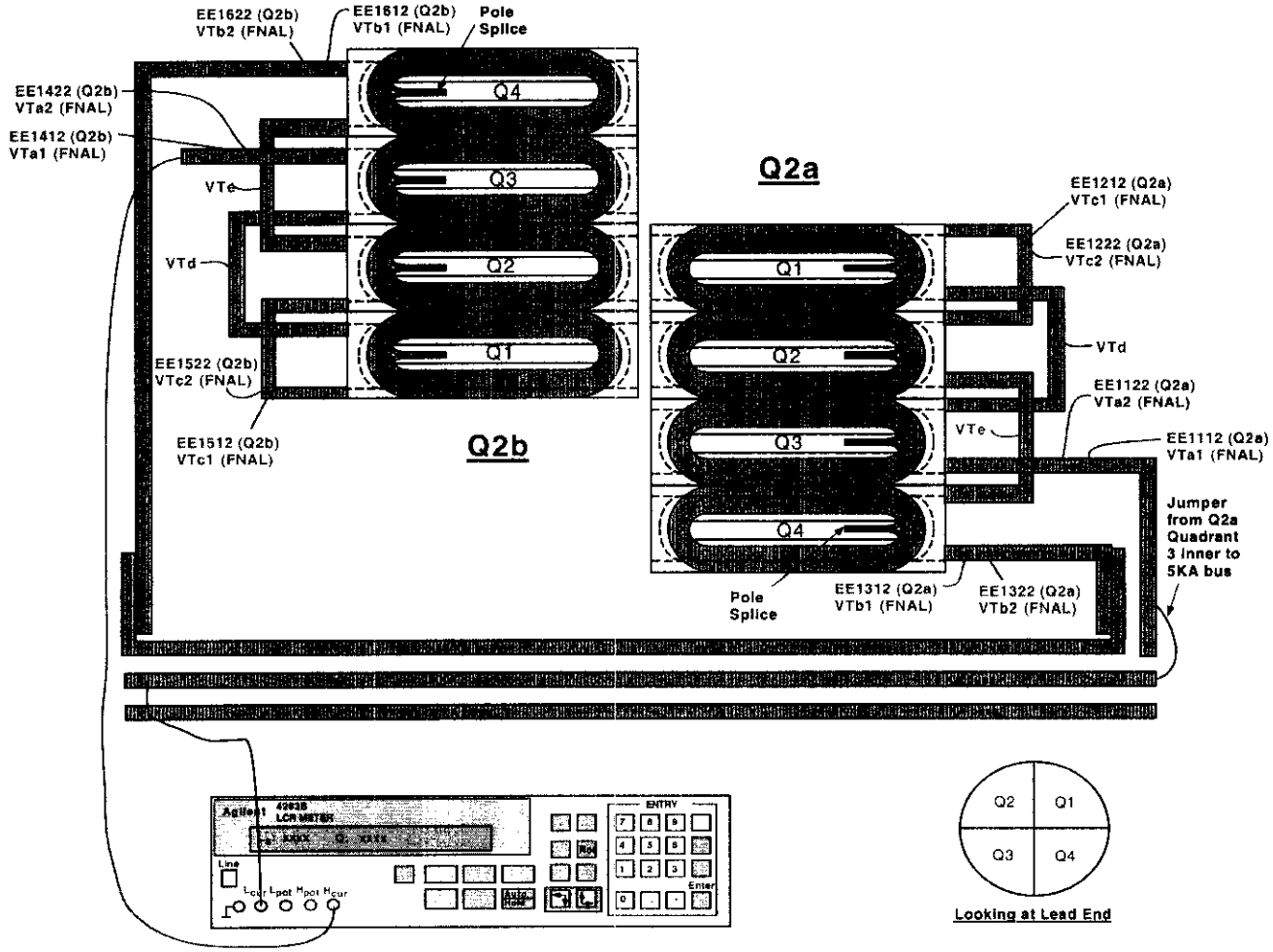
To measure Ls and Q of a Bussed Q2a:

1. Use Agilent 4263B LCR Meter.
2. Turn power on by pushing line button. Wait 30 seconds until display screen is lit.
3. Recall program #1. To do this, push recall (Rcl) button, then push the #1 button, then push the Enter button.
4. Push Auto/Hold button to release hold.
5. Verify that the frequency displayed in the upper right corner of the display screen is 1000 Hz and the level recorded in the lower right corner of the display screen is 1V or 1000 mV.
6. Connect jumper between Q2a/Quadrant 3 inner power lead and 5KA bus as shown in figure.
7. Connect H_{cur} to Q2b/Quadrant 3 inner power lead as shown in figure.
8. Connect L_{cur} to 5KA bus as shown in figure.
9. Connect H_{pot} and L_{pot} buttons to voltage taps as shown below.

To measure Q2a:

- To measure Q1, connect H_{pot} to VTc1 (EE1212 for Q2a), and L_{pot} to VTd.
- To measure Q2, connect H_{pot} to VTe, and L_{pot} to VTc1 (EE1212 for Q2a).
- To measure Q3, connect H_{pot} to VTd and L_{pot} to VTa1 (EE1112 for Q2a).
- To measure Q4, connect H_{pot} to VTb1 (EE1312 for Q2a), and L_{pot} to VTe.
- To measure total, connect H_{pot} to VTb1 (EE1312 for Q2a),and L_{pot} to VTa1 (EE1112 for Q2a).

10. Read Ls and Q from display and record in traveler.



Note(s):

All Inductance readings are taken at 1KHz.

TABLE 5.0.1				
(Q2a) Inductance				Nominal ~ 3.34 to 3.48 mH
Voltage Tap Serial Numbers				Quadrant Total Inductance
Connect	Fermi	CERN	Quadrant	Fermi
LPOT	VTdQ2a	EMPTY	Quadrant 1	
HPOT	VTc1Q2a	EE1212		mH
LPOT	VTc1Q2a	EE1212	Quadrant 2	
HPOT	VTeQ2a	EMPTY		mH
LPOT	VTa1Q2a	EE1112	Quadrant 3	
HPOT	VTdQ2a	EMPTY		mH
LPOT	VTeQ2a	EMPTY	Quadrant 4	
HPOT	VTb1Q2a	EE1312		mH

TABLE 5.0.2				
				Nominal ~ 13.28 to 13.78 mH
				Fermi
LPOT	VTa1Q2a	EE1112	Total Cold	
HPOT	VTb1Q2a	EE1312	Mass	mH

Technician(s) _____ Date _____

TABLE 5.0.3				
(Q2a) Q-Factor				Nominal ~ 3.7 – 4.0
Voltage Tap Serial Numbers				Quadrant Total Q
Connect	Fermi	CERN	Quadrant	Fermi
LPOT	VTdQ2a	EMPTY	Quadrant 1	
HPOT	VTc1Q2a	EE1212		
LPOT	VTc1Q2a	EE1212	Quadrant 2	
HPOT	VTeQ2a	EMPTY		
LPOT	VTa1Q2a	EE1112	Quadrant 3	
HPOT	VTdQ2a	EMPTY		
LPOT	VTeQ2a	EMPTY	Quadrant 4	
HPOT	VTb1A2a	EE1312		

TABLE 5.0.4				
				Nominal ~ 3.7 – 4.0
				Fermi
LPOT	VTa1Q2a	EE1112	Total Cold Mass	
HPOT	VTb1Q2a	EE1312		

Technician(s) _____ Date _____

6.0 Q2B Final Inductance and Q Electrical Inspection

To measure Ls and Q of a Bussed Q2b:

1. Use Agilent 4263B LCR Meter.
2. Turn power on by pushing line button. Wait 30 seconds until display screen is lit.
3. Recall program #1. To do this, push recall (Rcl) button, then push the #1 button, then push the Enter button.
4. Push Auto/Hold button to release hold.
5. Verify that the frequency displayed in the upper right corner of the display screen is 1000Hz and the level recorded in the lower right corner of the display screen is 1V or1000 mV.
6. Connect jumper between Q2a/Quadrant 3 inner power lead and 5KA bus as shown in figure.
7. Connect H_{cur} to 5KA bus as shown in figure.
8. Connect L_{cur} to Q2b/Quadrant 3 inner power lead as shown in figure.
9. Connect H_{pot} and L_{pot} buttons to voltage taps as shown below.

To measure Q2b:

- To measure Q1, connect H_{pot} to VTc1 (EE1512 for Q2b), and L_{pot} to VTd.
- To measure Q2, connect H_{pot} to VTe and L_{pot} to VTc1 (EE1512 for Q2b).
- To measure Q3, connect H_{pot} to VTd and L_{pot} to VTa1 (EE1412 for Q2b).
- To measure Q4, connect H_{pot} to VTb1 (EE1612 for Q2b) and L_{pot} to VTe.
- To measure total, connect H_{pot} to VTb1 (EE1612 for Q2b) and L_{pot} to VTa1 (EE1412 for Q2b).

10. Read Ls and Q from display and record in traveler.

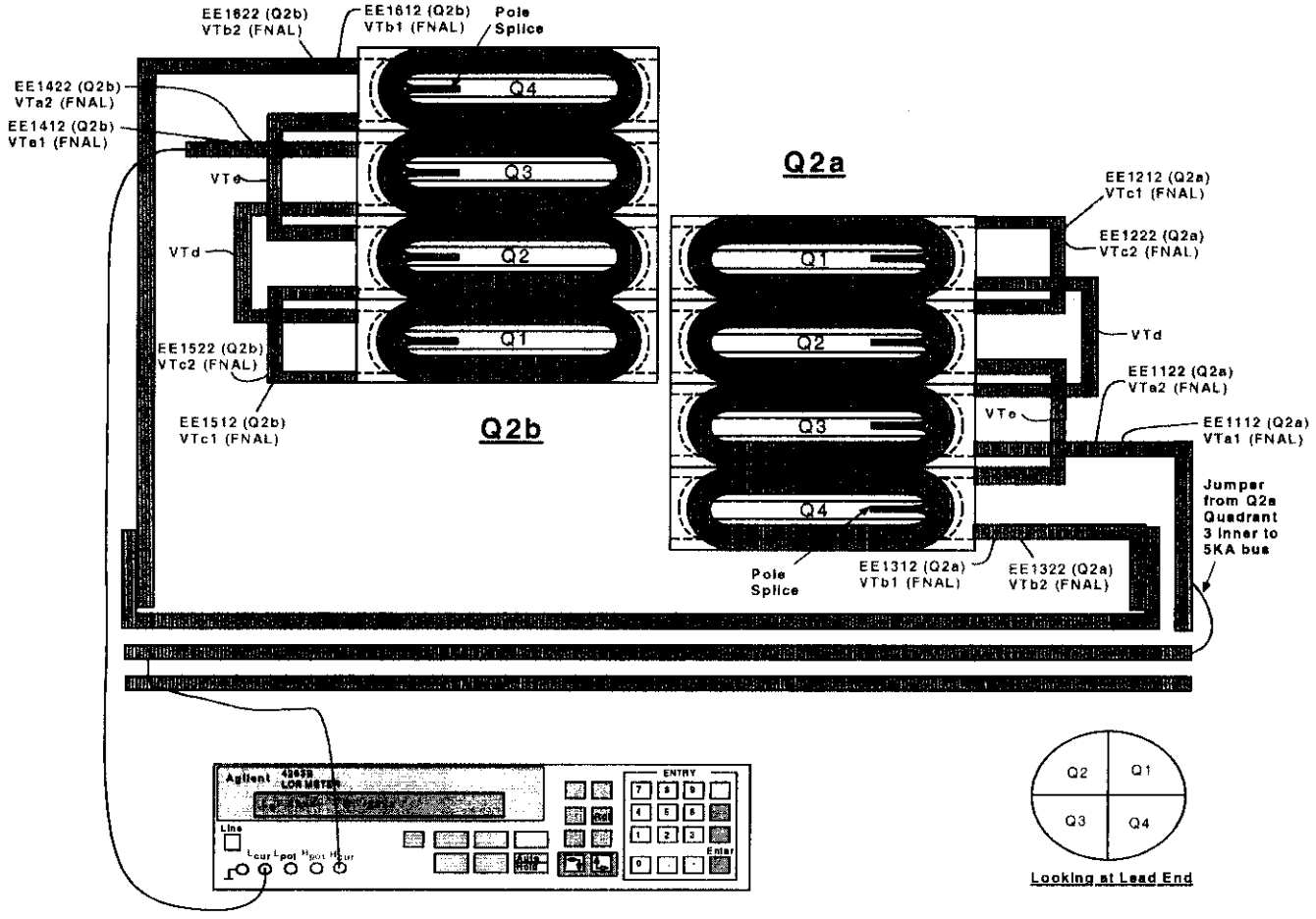


TABLE 6.0.1				
(Q2b) Inductance				Nominal ~ 3.34 to 3.48 mH
Voltage Tap Serial Numbers				Quadrant Total Inductance
Connect	Fermi	CERN	Quadrant	Fermi
H_{POT}	VTc1Q2b	EE1512	Quadrant 1	mH
L_{POT}	VTdQ2b	EMPTY		
H_{POT}	VTeQ2b	EMPTY	Quadrant 2	mH
L_{POT}	VTc1Q2b	EE1512		
H_{POT}	VTdQ2b	EMPTY	Quadrant 3	mH
L_{POT}	VTa1Q2b	EE1412		
H_{POT}	VTb1Q2b	EE1612	Quadrant 4	mH
L_{POT}	VTeQ2b	EMPTY		

TABLE 6.0.2				
				13.28 to 13.78 mH
				Fermi
H_{Pot}		EE1612	Total Cold Mass	mH
L_{Pot}	VTa1Q2b	EE1412		

Technician(s)

Date

TABLE 6.0.3				
(Q2b) Q-Factor				Nominal ~ 3.7 – 4.0
Voltage Tap Serial Numbers				Quadrant Total Q
Connect	Fermi	CERN	Quadrant	Fermi
H_{POT}	VTc1Q2b	EE1512	Quadrant 1	
L_{POT}	VTdq2b	EMPTY		
H_{POT}	VTeQ2b	EMPTY	Quadrant 2	
L_{POT}	VTc1Q2b	EE1512		
H_{POT}	VTdQ2b	EMPTY	Quadrant 3	
L_{POT}	VTa1Q2b	EE1412		
H_{POT}	VTb1Q2b	EE1612	Quadrant 4	
L_{POT}	VTeQ2b	EMPTY		

TABLE 6.0.4				
				Nominal ~ 3.7 to 4.0
				Fermi
H_{POT}	VTb1Q2b	EE1612	Total Cold Mass	
L_{POT}	VTa1Q2b	EE1412		

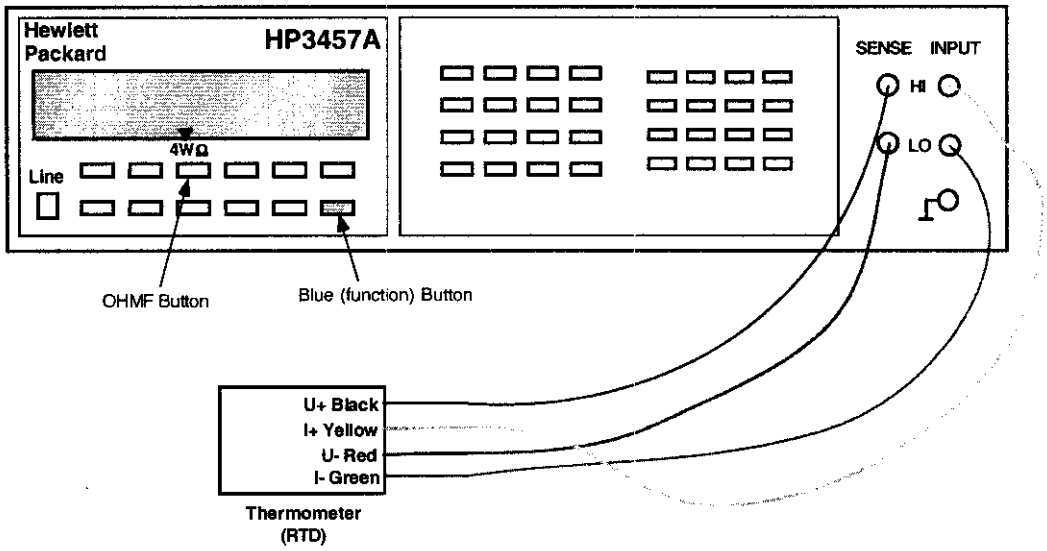
Technician(s) _____ Date _____

7.0 Final Thermometer and Heater Electrical Inspection

To measure the resistance of a Thermometer (RTD):

Use Hewlett Packard HP3457A digital multimeter.

1. Record temperature of building within +/- 5 degrees.
2. Press line button to turn line on.
3. Connect wires as shown in Figure below.
   - U+ (Black) to Sense HI
   - I+ (Yellow) to Input HI
   - U- (Red) to Sense LO
   - I- (Green) to Input LO
4. Push blue button (function key) once.
5. Push OHMF button.
6. Verify arrow in readout is above the 4WΩ (meaning a 4 wire resistance measurement).
7. Read resistance in ohms and record in traveler.



To measure the resistance of a Cryogenic (Warm-up) Heater

1. Use Hewlett Packard HP3457A digital multimeter.
2. Record temperature of building within +/- 5 degrees.
3. Press line button to turn line on.
4. Connect wires as shown in Figure below.
5. Push blue button (function key) once.
6. Push OHMF button.
7. Verify arrow in readout is above the 4WΩ (meaning a 4 wire resistance measurement).
   Note: Although this is technically a 4 wire measurement, it is effectively a 2 wire measurement, since there are only 2 wires connected to each heater.
8. Read resistance in ohms and record in traveler.

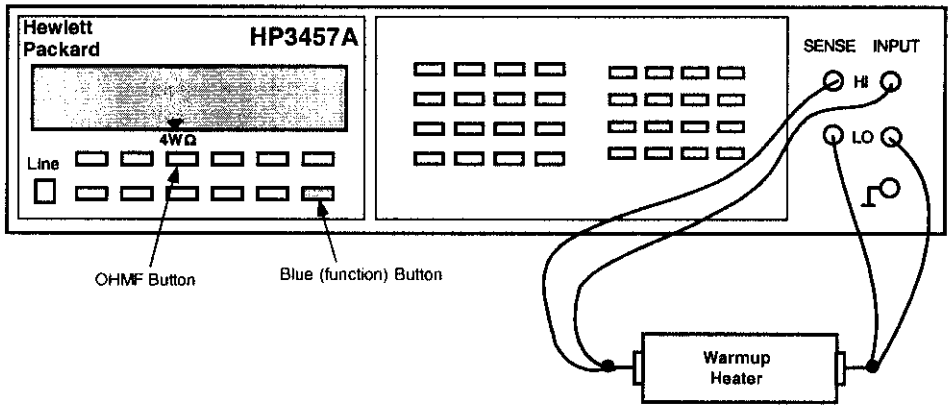


Table 7.0.1

Q2a – RTD's and Cryogenic (warm-up) Heaters

Temperature of Building (+/-5°):	[redacted]		Fermi F°/C°	
Component	Fermi	CERN	Resistance	Resistance to Ground
Q2A RTD, Primary Serial # Original Resistance: Ω	**TaQ2a**	**TT8312**	**Ω**	**MΩ >20 MOhms**
Q2a RTD, redundant Serial # Original Resistance: Ω	**TbQ2a**	**TT8322**	**Ω**	**MΩ >20 MOhms**
Q2A Cryogenic (warm-up) Heater (LE) – wire toward cold mass end plate (CERN #11+)	**W1aQ2A**	**EH8312+**		
Q2A Cryogenic (warm-up) Heater (LE) – wire toward cold mass mag center (CERN #11-)	**W2aQ2A**	**EH8312-**	**Ω**	**MΩ >20 MOhms**
Q2A Cryogenic (warm-up) Heater (Non-LE) – wire toward cold mass end plate (CERN #21+)	**W1bQ2A**	**EH8322+**		
Q2A Cryogenic (warm up) Heater (Non-LE) – wire toward cold mass mag center (CERN #21-)	**W2bQ2A**	**EH8322-**	**Ω**	**MΩ >20 MOhms**

Technician(s) _____ Date _____

Table 7.0.2				
Q2b – RTD's and Cryogenic (warm-up) Heaters				
Temperature of Building (+/-5°):			Fermi	
			F°/C°	
Component	Fermi	CERN	Resistance	Resistance to Ground
Q2b RTD, Primary Serial # Original Resistance: Ω	TaQ2b	TT8332	Ω	MΩ >20 MOhms
Q2b RTD, redundant Serial # Original Resistance: Ω	TbQ2b	TT8342	Ω	MΩ >20 MOhms
Q2B Cryogenic (warm-up) Heater (LE) – wire toward cold mass end plate (CERN #11+)	W1aQ2b	EH8332+	Ω	MΩ >20 MOhms
Q2B Cryogenic (warm-up) Heater (LE) – wire toward cold mass mag center (CERN #11-)	W2aQ2b	EH8332-		
Q2B Cryogenic (warm-up) Heater (Non-LE) – wire toward cold mass end plate (CERN #21+)	W1bQ2b	EH8342+	Ω	MΩ >20 MOhms
Q2B Cryogenic (warm up) Heater (Non-LE) – wire toward cold mass mag center (CERN #21-)	W2bQ2b	EH8342-		

Using the Hewlett Packard HP3457A digital multimeter, measure the Strip Heater Resistance for Q2a and Q2b.

TABLE 7.0.3				
Q2a Strip Heater Resistance				
Fermi	**CERN**	**Description**	**Limit**	**Fermi Resistance**
H1aQ2a	YT1112+	Circuit A	18.20 to 21Ω	Ω
H2aQ2a	YT1112-			
H1bQ2a	YT1122+	Circuit B	18.20 to 21Ω	Ω
H2bQ2a	YT1122-			

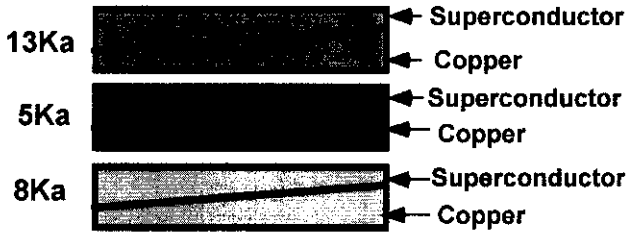
TABLE 7.0.4				
Q2b Strip Heater Resistance				
Fermi	**CERN**	**Description**	**Limit**	**Fermi Resistance**
H1aQ2b	YT1132+	Circuit A	18.20 to 21Ω	Ω
H2aQ2b	YT1132-			
H1bQ2b	YT1142+	Circuit B	18.20 to 21Ω	Ω
H2bQ2b	YT1142-			

Technician(s) Date

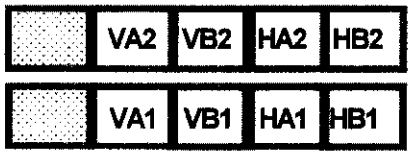
8.0 Final Power Lead Electrical Inspection

8.1 Using the HP3457A, connect power thru the connector Power Leads (HA2 and HB2 to measure Q2-H2 or VA2 and VB2 to measure Q2-V2). Connect the Sense Leads as shown in table below and record resistance.

(Magnet Bus Leads)



(Corrector Bus Leads)



(View Looking into Q2b)

TABLE 8.0.1			
MCBX Corrector Coil Taps			
Component	Fermilab Label	CERN Label	Fermi Resistance Nominal 0.040 Ω
Q2-H2	VTH2	EE8122	
	HA2	N/A	Ω
Q2-V2	VTV2	EE8112	
	VA2	N/A	Ω

Technician(s) _____ Date _____

8.2 Check Q1 Instrumentation Bus Wires for Continuity.

TABLE 8.0.2

Module	Pin	Fermi	CERN	KEK	Description	Fermi Done
M2	1	VTa1Q1	EE1111	a1	Q1 Lead Voltage Tap "a", primary	
M2	2	VTa2Q1	EE1121	a2	Q1 Lead Voltage Tap "a", redundant	
M2	3	VTc1Q1	EE1211	c1	Q1 Center Voltage Tap "c", primary	
M2	4	VTc2Q1	EE1221	c2	Q1 Center Voltage Tap "c", redundant	
M2	5	VTb1Q1	EE1311	b1	Q1 Lead Voltage Tap "b", primary	
M3	5	VTb2Q1	EE1321	b2	Q1 Lead Voltage Tap "b", redundant	
M5	1	VTH1	EE8121		Corrector voltage tap Q1-H1 (skew dipole) (on MCBX, MCBXH, A+ lead)	
M5	2	VTV1	EE8111		Corrector voltage tap Q1-V1 (normal dipole) (on MCBX, MCBXV A+ lead)	
M7	1	W1aQ1	EH8311+		Q1 Cryogenic Heater lead end - wire at top (CERN #1 I+)	
M7	2	W2aQ1	EH8311-		Q1 Cryogenic Heater lead end - wire at bottom (CERN #1 I-)	
M7	3	W1bQ1	EH8321+		Q1 Cryogenic Heater non-lead end - wire at top (CERN #2 I+)	
M7	4	W2bQ1	EH8321-		Q1 Cryogenic Heater non-lead end - wire at bottom (CERN #2 I-)	
M9	1	H1aQ1	YT1111+	HA1	Q1 Protection (Strip) Heater, ("a" circuit) (CERN lead #1+)	
M9	3	H2aQ1	YT1111-	HA2	Q1Protection (Strip) Heater, ("a" circuit) (CERN lead #1-)	
M9	5	H1bQ1	YT1121+	HB1	Q1 Protection (Strip) Heater, ("b" circuit) (CERN lead #2+)	
M10	4	H2bQ1	YT1121-	HB2	Q1 Protection (Strip) Heater, ("b" circuit) (CERN lead #2-)	
M12	1	TaQ1_I+	TT8311 I+		Q1 RTD, primary Wire color: Yellow	
M12	2	TaQ1_I-	TT8311 I-		Q1 RTD, primary Wire color: Green	
M12	3	TaQ1_V+	TT8311 U+		Q1 RTD, primary Wire color: Black	
M12	4	TaQ1_V-	TT8311 U-		Q1 RTD, primary Wire color: Red	
M12	5	TbQ1_I+	TT8321 I+		Q1 RTD, primary Wire color: Yellow	
M12	6	TbQ1_I-	TT8321 I-		Q1 RTD, primary Wire color: Green	
M12	11	TbQ1_V+	TT8321 U+		Q1 RTD, primary Wire color: Black	
M12	10	TbQ1_V-	TT8321 U-		Q1 RTD, primary Wire color: Red	

Technician(s) _____ Date _____

8.3 Hipot according to table below. Hipot to 1500V. Ramp Rate 3V/second. Dwell Time 30 seconds. Maximum leakage is 3μA.

Have Crew Chief verify setup and sign below before continuing.

Crew Chief _____ Date _____

Hipot Heaters to Coil and Ground

TABLE 8.0.3			
High Potential	**Grounded**	**Floating**	**Fermi Leakage**
All Strip Heaters	Coils, Yoke, Q1 Instrumentation Bus, Lead and Corrector Coil Busses, RTD's and Warm-up Heaters	Nothing	**A**

Hipot Coil to Heaters and Ground.

TABLE 8.0.4			
High Potential	**Grounded**	**Floating**	**Fermi Leakage**
All Coils	Strip Heaters, Yoke, Q1 Instrumentation Bus, 8kA and 5kA Lead Busses and Corrector Coil Busses, RTD's and Warm-up Heaters	Nothing	**A**

Technician(s) _____ Date _____

Responsible Authority/Physicist _____ Date _____

8.4 Locate and identify the 13 kA Bus Leads.

Technician(s) Date

8.5 Verify the 13 kA Bus Leads have been properly identified.

Lead Person Date

8.6 Verify the 13 kA Bus Leads have been proper identified.

Responsible Authority/Physicist Date

8.7 Cut the 13 kA Bus Leads within 1" of the conductor connector.

Technician(s) Date

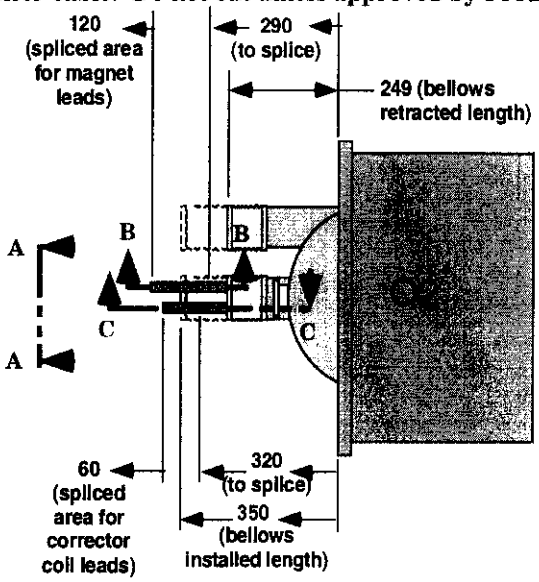
8.8 Insulate the 13 kA Bus Leads using approved methods.

Technician(s) May 9, 2005
Date

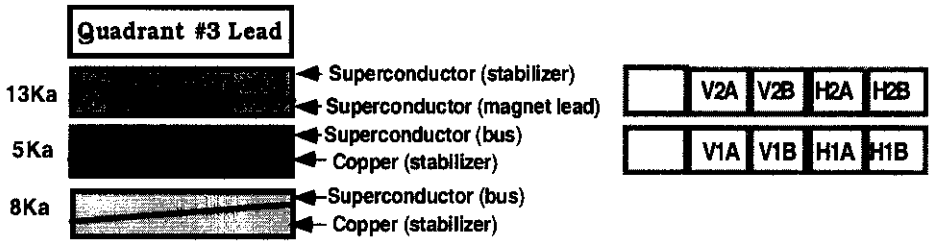
8.9 Separate, identify, and label the Non-IP Magnet End Corrector leads as per (ME-369895) and figure below.

Note(s):

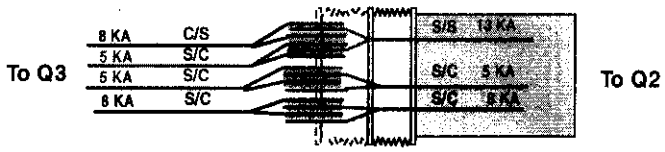
120 Spliced area dimension for magnet leads does not include an approximate 40mm of extra buffer cable. Do not cut unless approved by Production Supervisor.



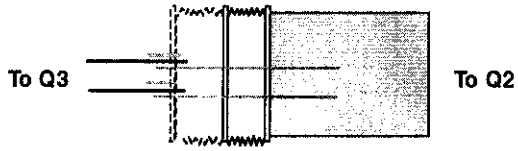
Top (plan) view of non-IP end of Q2



View A-A (Q2 Lead Configuration)



Section B-B (Magnet Lead Configuration)



Section C-C (Corrector Bus Lead Configuration)

Note(s):

These leads must be insulated using approved methods (refer to Lead Installation ES-XXXXXX), first as an individual lead, then insulated as a pair to prevent 'shorting' to the other leads.

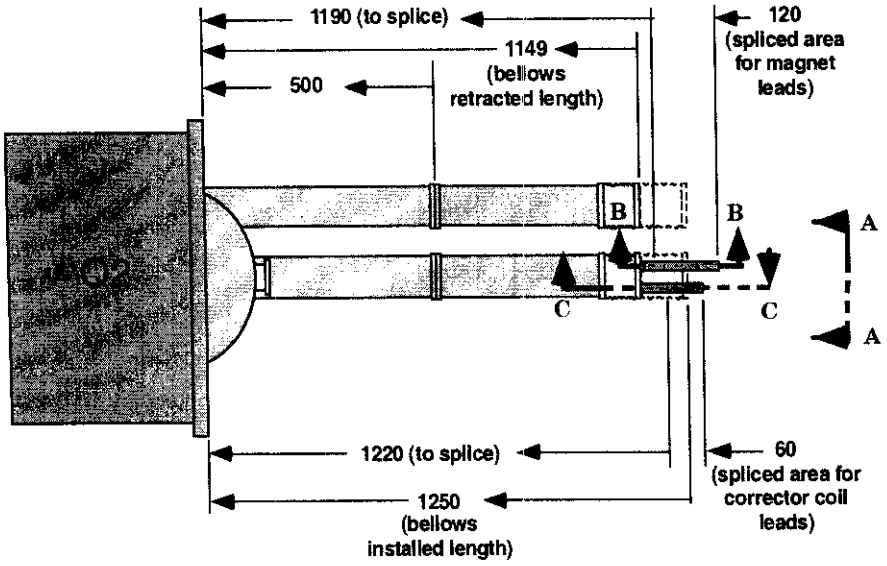
Technician(s) _____ Date _____

9.0 Post MTF Magnet Preparation IP Magnet End

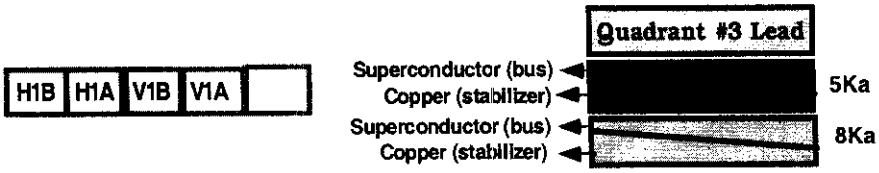
9.1 Separate, identify, and label the IP Magnet End Corrector leads as per Q2 Module Assembly (ME-369895) and figure below.

Note(s):

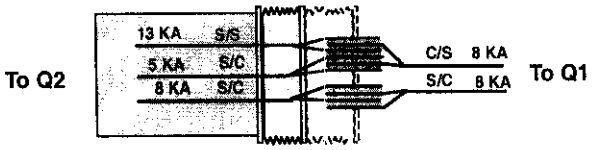
120 Spliced area dimension for magnet leads does not include an approximate 40mm of extra buffer cable. Do not cut unless approved by Production Supervisor.



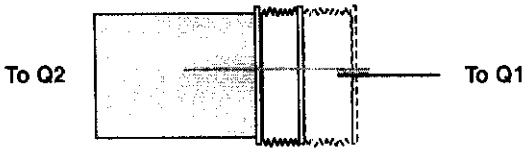
Top (plan) view of IP end of Q2



View A-A (Q2 Lead Configuration)



Section B-B (Magnet Lead Configuration)



Section C-C (Corrector Bus Lead Configuration)

Note(s):

This lead must be insulated using approved methods to prevent 'shorting' to the other leads.

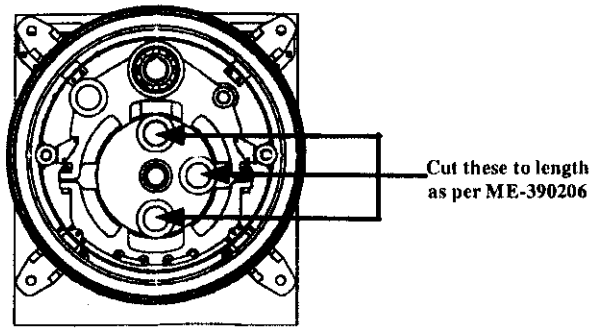
Technician(s) Date

9.2 Remove the Bellows Compression Tooling.

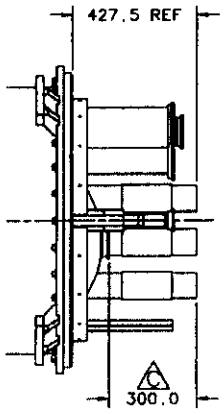
Technician(s) _____ Date _____

9.3 Secure bellows with Bellow Restraint/Protective Cover (MA-390153) using Screws (MA-390180).

Technician(s) O. Frias Date 5 9 05



9.4 Measure and mark the tubes for cutting as per IP END AS-SHIP DETAIL VIEW of Q2 Cryostat General Assembly (ME-390206).



IP END
Side View

Technician(s) _____ Date _____

9.5 Verify that the proper tubes have been measured and marked correctly and are acceptable for cutting.

Responsible Authority/Physicist _____ Date _____

9.6 Cut the proper tubes using approved methods.

Technician(s) _____ Date _____

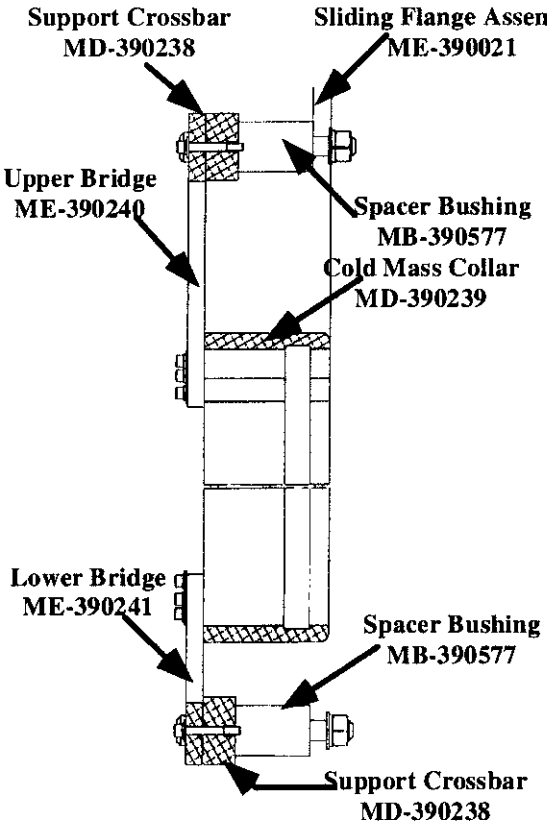
9.7 Verify the tubes have been properly cut.

Lead Person _____ Date _____

9.8 Verify that the Bellows End Sliding Flange Assembly (ME-390021) was installed correctly using Bolts on both the Non-IP and IP Magnet Ends.

Lead Person _____ Date _____

10.0 Magnet End Preparation



Shipping Restraint
ME-390249
Side View

10.1 Acquire Q2 Shipping Restraint Assembly (ME-390249)(2 ea)

_____ _____

Technician(s) Date

10.2 Install the Shipping Restraint on the Non- IP Magnet end.

Note(s):

Installation Shipping Restraint bolts should be only finger tight until complete assembly is installed.

10.2.1 Install Cold Mass Collar (ME-390239) and secure using Socket Head Cap Screws (MA-393191), Plain Washers (MA-393060) and Lock Washers (MA-393061) per Q2 Shipping Restraint Assembly (ME-390249).

10.2.2 Install Upper Support Cross Bar (MD-390238)(1 ea) with Spacer Bushing (MB-390577) (2 ea) using Bolt (MA-393183 (2 ea), Lock Washer (MA-393186) (4 ea), Plain Washer (MA-393185) (4 ea), and Nut (MA-393184)(2 ea).

10.2.3 Install Lower Support Cross Bar (MD-390238)(1 ea) with Spacer Bushing (MB-390577) (2 ea) using Bolt (MA-393183 (2 ea), Lock Washer (MA-393186) (4 ea), Plain Washer (MA-393185) (4 ea), and Nut (MA-393184)(2 ea).

10.2.4 Install the Upper Bridge (ME-390240) to the Upper Support Bar using Bolt (MA-393187) (7 ea), Lock Washer (MA-393061) (7ea), and Flat Washer (MA-393060) (7ea).

10.2.5 Install the Lower Bridge (ME-390241) to the Lower Support Bar using Bolt (MA-393187) (7 ea), Lock Washer (MA-393061) (7ea), and Flat Washer (MA-393060) (7ea).

10.2.6 Secure Upper Bridge to Cold Mass Collar with Bolt (MA-393191) (6 ea), Lock Washer (MA-393061) (6 ea), and Plain Washer (MA-393060) (6 ea).

10.2.7 Secure Upper Bridge to Cold Mass Collar with Bolt (MA-393191) (6 ea), Lock Washer (MA-393061) (6 ea), and Plain Washer (MA-393060) (6 ea).

10.2.8 Tighten all the Shipping Restraint Bolts.

_____ _____

Technician(s) Date

10.3 Install the Shipping Restraint on the IP Magnet end.

Note(s):

Installation Shipping Restraint bolts should be only finger tight until complete assembly is installed.

10.3.1 Install Cold Mass Collar (ME-390239) and secure using Socket Head Cap Screws (MA-393191), Plain Washers (MA-393060) and Lock Washers (MA-393061) per Q2 Shipping Restraint Assembly (ME-390249).

10.3.2 Install Upper Support Cross Bar (MD-390238)(1 ea) with Spacer Bushing (MB-390577) (2 ea) using Bolt (MA-393183 (2 ea), Lock Washer (MA-393186) (4 ea), Plain Washer (MA-393185) (4 ea), and Nut (MA-393184)(2 ea).

10.3.3 Install Lower Support Cross Bar (MD-390238)(1 ea) with Spacer Bushing (MB-390577) (2 ea) using Bolt (MA-393183 (2 ea), Lock Washer (MA-393186) (4 ea), Plain Washer (MA-393185) (4 ea), and Nut (MA-393184)(2 ea).

10.3.4 Install the Upper Bridge (ME-390240) to the Upper Support Bar using Bolt (MA-393187) (7 ea), Lock Washer (MA-393061) (7ea), and Flat Washer (MA-393060) (7ea).

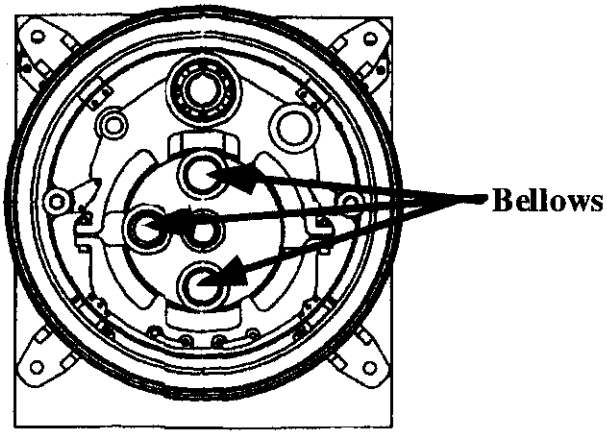
10.3.5 Install the Lower Bridge (ME-390241) to the Lower Support Bar using Bolt (MA-393187) (7 ea), Lock Washer (MA-393061) (7ea), and Flat Washer (MA-393060) (7ea).

10.3.6 Secure Upper Bridge to Cold Mass Collar with Bolt (MA-393191) (6 ea), Lock Washer (MA-393061) (6 ea), and Plain Washer (MA-393060) (6 ea).

10.3.7 Secure Upper Bridge to Cold Mass Collar with Bolt (MA-393191) (6 ea), Lock Washer (MA-393061) (6 ea), and Plain Washer (MA-393060) (6 ea).

10.3.8 Tighten all the Shipping Restraint Bolts.

Technician(s) _____ Date _____



Q2 Magnet Non-IP End

10.4 Install Electrical Bus Shipping Restraint Short End Cover (MD-390752) into Lower Cold Mass Pipe to protect the Bus Wire.

Technician(s) _____ Date _____

10.5 Install Protective End onto PVC Bus Protector Tube.

Technician(s) 5-9-05 Date

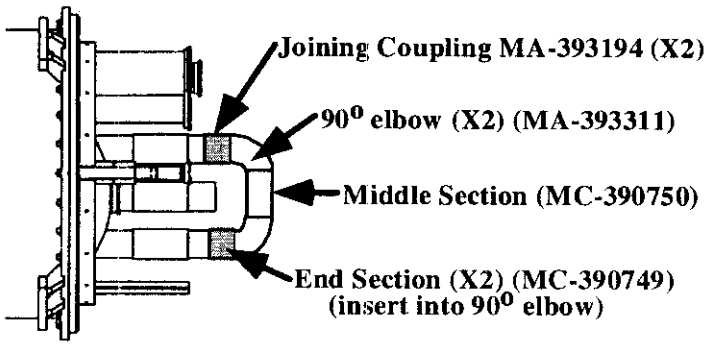
10.6 Install Electrical Bus Shipping Restraint Assembly (MD-390748).

Note(s):

Magnet wires must be inserted into the Shipping Restraint Assembly during installation.

Note(s):

Shipping Restraint Assembly is to be dry fit assembled, NOT GLUED!!!



IP Magnet End
Side View

Technician(s) 5-9-05 Date

10.7 Install the Vinyl Flange Covers (MA-390491), (MA-390492), (MA-390493), (MA-390494), & the Alignment Fiducial Covers (MA-390495).

Technician(s) 5-9-05 Date

11.0 Shipping the Magnet

11.1 Acquire the Shipping Frame Assembly (ME-390686).

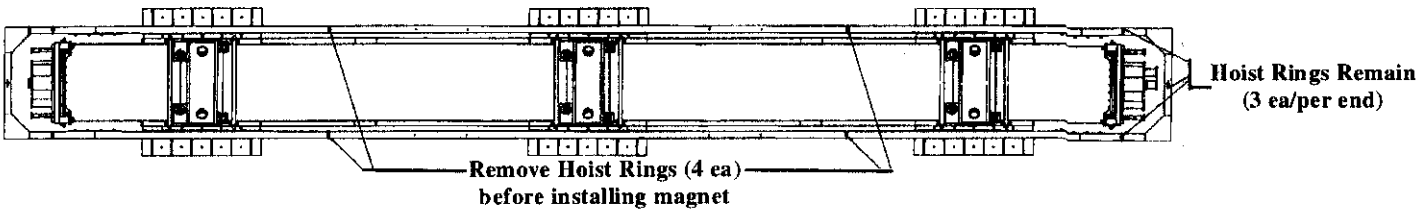
Technician(s) Date

11.2 Acquire the following shipping hardware:

Eyebolt	**McMaster-Carr 3016T87**	**6 ea**
[redacted]		
Hex Nut	**MA-393328**	**24 ea**
[redacted]		
Lock Washer	**MA-393329**	**12 ea**
[redacted]		
Mounting Bolts	**MA-393321**	**9 ea**
[redacted]		
Lock Washer	**MA-393322**	**9 ea**
[redacted]		

Technician(s) Date

11.3 Remove the Hoist Rings (4 ea) from the Outer Frame as per Q2 Magnet Shipping Assembly (ME-390710).



Technician(s) Date

11.4 Install the Shock Indicators onto the Shipping restraints. Are Accelerometers (Shock Recorders) available for installation?

☐ **Yes - Install Accelerometers as per Responsible Authority and Figure 11.4-A. below.**

Shock Recorder Serial No. : _____

☐ **No - Accelerometers are NOT available for installation.**

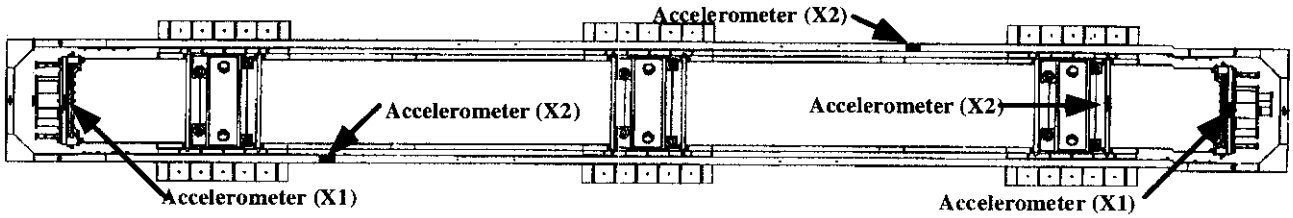
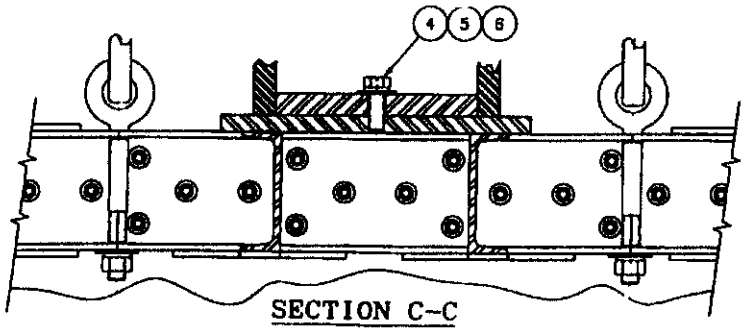


Figure 11.4-A

_____ _____
Technician(s) Date

12.0 Magnet to Shipping Frame/Platform Installation

12.1 Transport the magnet to the Magnet Shipping Fixture and install using Bolt (MA-393321)(9 ea), Flat Washer (MA-393323)(9 ea), and Lock Washer (MA-393322)(9 ea).
Torque bolts to XX FT/LBS.



Q2 Shipping Assembly
ME-390710

Note(s):

Apply a small amount of Anti-Seize to all of the bolt threads prior to installing the bolts.

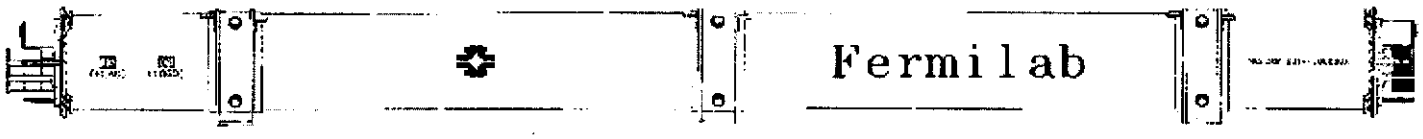
Technician(s) _____ Date _____

12.2 Install Magnet Identification Labels as per Q2 Identification Labeling Layout (ME-390760).

Example:

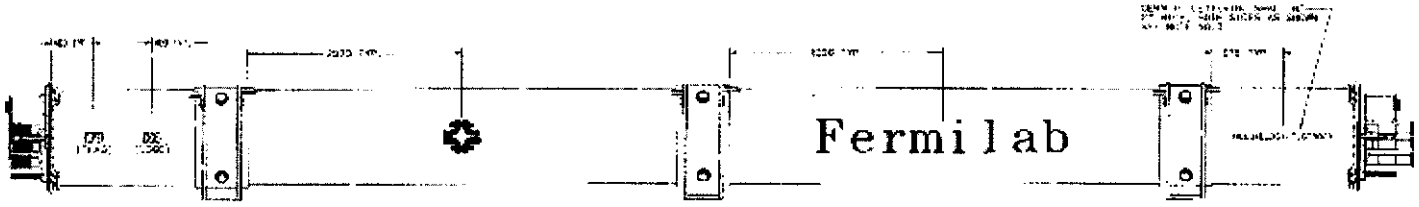
If Serial No. at bottom of Traveler is: LQXB09

Stencil Serial No. should be:HCLQXB_001-FL000009



IP END **NON-IP END**

OPPOSITE SIDE VIEW



NON-IP END **IP END**

SIDE VIEW

Q2 Identification Labeling Layout (ME-390760)

Technician(s) Date

12.3 Verify Magnet has been properly labeled/stenciled, and serial number matches the bottom of this traveler and as per (ME-390760).

Example:

If Serial No. at bottom of Traveler is: LQXB09

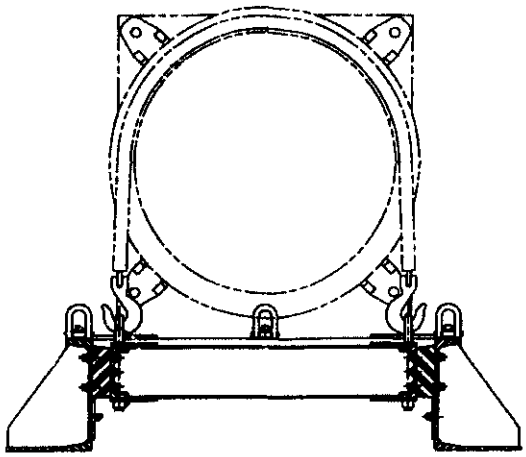
Stencil Serial No. should be: HCLQXB_001-FL000009

Lead Person Date

12.4 Install Eyebolts, McMaster-Carr #3016T85 (6 ea), Eyebolts, McMaster Carr #3016T87 (6 ea), Flat Washer (MA-393328)(12 ea), and Lock Washer (MA-393329)(12 ea) into Shipping Fixture.

Note(s):

Install all Eyebolts #3016T85 on one side of the shipping fixture. Eyebolts #3016T87 go on the opposite side.



12.5 Install Lift All Pukka Wear Pad Protectors (MA-393345) onto magnet prior to installing Chain Sling.

_____ _____
Technician(s) Date

12.6 Install chain sling w/2 hooks (MA-390702) (6 ea) into eyebolts.

_____ _____
Technician(s) Date

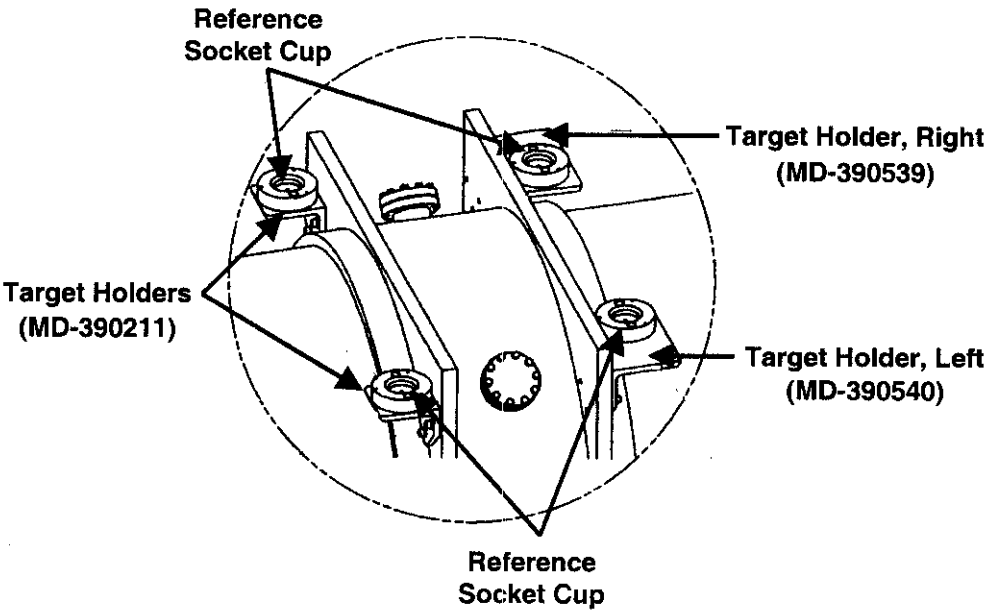
12.7 Tighten eyebolts until chains are snug.

_____ _____
Technician(s) Date

12.8 Install an additional nut (double nutting) on each eyebolt and tighten.

_____ _____
Technician(s) Date

13.0 Final Inspection/Installation



13.1 Verify Target Holder (MD-390211) (6 ea), Target Holder, Right (MD-390539) (3 ea), and Target Holder, Left (MD-390540) (3 ea) with Reference Socket Cup (MA-390426) (12 ea) and Protective Covers (MA-390495) are installed.

_____ _____
Lead Person Date

13.2 Verify that the Target Holder had been pinned using Spring Pins (MA-393048) as per Q2 Cryostat General Assembly (ME-390206).

_____ _____
Crew Chief Date

13.3 Verify that the ID plates are installed on the Vacuum Vessel.

_____ _____
Crew Chief Date

14.0 Documentation Update

14.1 Perform the following:

- ☐ **Update DSR Keywords.**
- ☐ **Location.**
- ☐ **Location Verified Date.**
- ☐ **Status.**
- ☐ **Make entry regarding work performed.**

_____ _____

TD/E&F Production Supervisor/designee Date

15.0 Production Complete

15.1 Process Engineering verify that the Traveler 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:

_____

_____

_____

_____

_____

_____

_____

J. Strait — JUN 0 2 2005

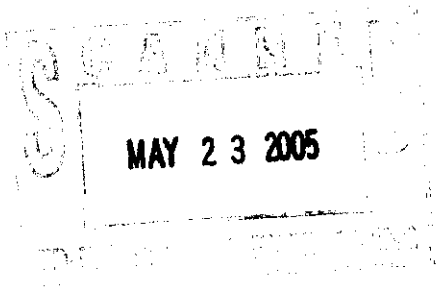
Process Engineering/Designee — Date

Traveler Title:	Specification No:	Revision:	DR No:
N/A Not Related to any specific operation	1620-TR-111111	None	HGQ-0566

Step No:	Drawing No:	Routing Form No:	Serial No:	Rework ID:
1.0	ME-390710		LQXB08	0

Discrepancy Description:

Magnet did not have pipe referencing done in IB#1, therefore parts of shipping traveler had to be undone to accommodate this.



Originator: Damon Bice

Date: 5/9/2005

Cause of Nonconformance:

Part of the final survey was not completed at MTF.

Responsible Authority: Thomas Page

Date: 5/9/2005

Disposition:

The final measurements have been taken. Start the shipping traveler. (Re-issue LQXB08 Q2 Shipping Traveler 333732 - pink - John Szostak 5/9/05)

Responsible Authority: Thomas Page

Date: 5/9/2005

Corrective Action to Prevent Recurrence:

None.

Responsible Authority: Thomas Page

Date: 5/9/2005

Corrective Action/Disposition Verified By: John Szostak

Date: 5/13/2005

Will Configuration be affected?: ☐ YES ☑ NO

Identified problem area:

☐ Material ☐ Manpower ☑ Method ☐ Machine ☐ Measurement

Reviewed By: Bob Jensen

Date: 5/23/2005