Document ID: 3506

LHC Q3 LQXC Cryostat Final Assembly Traveler

333730 / Rev. A

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**

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LQXC02-0

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Job No.:

248

Project/Task No.

300/1.1.1.6.2

Series:

LQXC

Serial No:

LQXC02

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0

Specification No.:

333730

Revision:

A

LQXC02-0

Fermi National Accelerator Laboratory
Batavia, IL 60510

LARGE HADRON COLLIDER
Q3 - LQXC
CRYOSTAT FINAL ASSEMBLY TRAVELER

Reference Drawing(s):
Q3 Cryostat General Assembly (ME-390132)
Q3 Cryostat Assembly Internal Piping (ME-390213)

Project/Task Number:

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

Date Issued: *12/22/2004 2:17:34 PM* **Scanned Pages:** ~~49~~ 51

Prepared by: J. Szostak

Title	Signature	Date
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TD / LHC Program Manager	*Jim Kerby* Jim Kerby / Designee	*12/15/04*

Revision Page

Revision	Step No.	Revision Description	TRR No.	Date
None	N/A	Initial Release	N/A	9/10/04
A	4.4	Modified Step. Changed Qty of Pipe Supports (MD-390092) from 2 to 3 per LQXC01.	1689	12/15/04
	5.1	Added Step. "Install the Threaded Rods (Tie Rod Assembly) (MC-390638). See copy of step 19.9 (Q3 Module Assembly Traveler, TR-333729) in designated book, for the distance between the Suspension Rings. Record the previously recorded measurements below." per TR-333730, LQXC01 and Tom Page.		
	5.8	Moved Step. "Install the Cold Mass Insulation Mounting Lug Blankets (MC-390496)." per TR-333730, LQXC01 and Tom Page. New Step 5.2.		
	5.10	Modified Step. Added "Ensure the shield is not sagging prior to the final tightening of the shield screws." New Step 5.11. **DR No. HGQ-0509.**		
	7.2	Modified Step. Added Picture of Corrector Bus Leads. Modified Table.		

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 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.

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.

J. Ayastat
Process Engineering/Designee

12/22/04
Date

3.0 Vacuum Vessel Preparation and Painting

3.1 Record the Vacuum Vessel Serial Number.

Q3-4

Technician(s) Date 1/18/05

3.2 Inspect the transition area between the Support Sections and Tube Sections. Grind smooth if necessary.

Technician(s) Date 1/18/05

3.3 Clean the Vacuum Vessel (ME-390133) using a vacuum cleaner or equivalent.

Technician(s) Date 1-18-05

NO LONGER AT LAB! E.

3.4 Leak Check the Vacuum Vessel Assembly (ME-390133) per ES-107240 and record results in table below.

Part No.		DETERMINATION OF DETECTABLE LEAK							
PART NO.		SCALE UNITS BEFORE HELIUM PROBE	SCALE UNITS WHILE ENCLOSURE FLOODING	Q3-4 DETERMINATION OF MINIMUM DETECTABLE LEAK					
DATE TIME	OPERATOR'S LAST NAME			MDS	(Response - Bckgnd)	Leak Value		MDL	
12/4/02	[illegible]	22	26	2	30	28	4.71E-6	[illegible]	

TRR# 1711 QA

Inspector N/A Date

3.5 Prepare the outside of the Vacuum Vessel (ME-390133) for painting. Clean using Ethyl Alcohol (Fermi stock 1920-0550) and Kimwipes (Fermi stock 1660-2500) or equivalent.

Technician(s) _____ Date 1-18-05

3.6 Mask the Stainless Steel Components of the Vacuum Vessel for painting.

Technician(s) _____ Date 1-18-05

3.7 Prime the Vacuum Vessel using Rust-o-leum (Fermi stock 1825-4000).

Technician(s) _____ Date 1-18-05

3.8 Verify that the Screws (MA-393036) will thread easily into the appropriate holes in the Vacuum Vessel (ME-390133). If necessary, tap out holes with M10 – 1.5 Tap. Move Vacuum Vessel (ME-390133) to Table.

Lead Person _____ Date 1/18/05

3.9 Paint the Vacuum Vessel using Flambeau Red (Fermi stock 1825-3710).

Technician(s) _____ Date 1-19-05

4.0 Piping Assembly

Note(s):

Do not use a Strap Wrench on the Pipes.

4.1 Place the Cold Mass Assembly on the Insertion Rail System.

Technician(s) _____ Date 2-4-05

4.2 Clean the Pipe Supports with Ethyl Alcohol (Fermi stock 1920-0550) and Kimwipes (Fermi stock 1660-2500) or equivalent.

Technician(s) _____ Date _____

4.3 Install Cold Mass Insulation per Q3 Cold Mass Magnet Insulation Installation (ME-390527).

Technician(s) _____ Date 2/5/05

4.4 Install the Pipe Supports (MD-390092) (Qty. 3) on the Cold Mass per Q3 Cryostat Assembly Internal Piping (ME-390213).

Note(s):

A Tie Bar may be disconnected, if necessary, from the Fixed Support Assembly to install the central two pipe supports.

PIPE SUPPORT ASSEMBLY

Technician(s) _____ Date 2/5/05

4.5 Install Pipe Anchor (MC-390486) on the Cold Mass per Q3 Cryostat Assembly - Internal Piping (ME-390213).

Technician(s) _____ Date 2/5/05

4.6 Using Pipe Supports (MD-390092) as a template, cut the blankets around the Pipe Support Feet and slit blankets circumferentially at the Pipe Supports.

Technician(s) _____ Date 2/5/05

BLANKETS MARKED FROM WEST END TO EAST 1W, 2W, 3W ETC...

4.7 Remove Pipe Supports (MD-390092), Pipe Anchor (MC-390486) and blankets. Wrap blankets in plastic bag to keep clean for later use. Label blankets as they are removed for later positioning.

Technician(s) _____ Date 2/5/05

4.8 Install Pipe Supports (MD-390092) and Pipe Anchor (MC-390486) to same locations as in step 4.4 and 4.5 respectively.

Technician(s) _____ Date 2/5/05

4.9 Clean the Cold Mass and the Retainer Clips (MA-390103) with Ethyl Alcohol (Fermi stock 1920-0550) and Kimwipes (Fermi stock 1660-2500) or equivalent.

Technician(s) _____ Date 2/5/05

4.10 Weld the Retainer Clips (MA-390103) to the Cold Mass Outer Shell as per the Q3 Cryostat Internal Piping Assembly (ME-390213).

Weldor(s) _____ Date 2-5-05

4.11 Install Q3 Installation Tie Rod Assembly (MC-390638) and Tie Bar Retaining Clamp (MB-390136) as per Q3 Cryostat Internal Piping Assembly (ME-390213).

Technician(s) _____ Date 2-5-05

4.12 Clean the Q3 Heat Exchanger Outer Shell (MD-390385), Q3 Pumping Line (MB-390224) and the Q3 Cool Down Line (MB-390225) with Ethyl Alcohol (Fermi stock 1920-0550) and Kimwipes (Fermi stock 1660-2500) or equivalent.

Technician(s) _____ Date 2/5/05

4.13 Clean the Pumping Line End Flange (MB-390032), the Cool Down Line End Flange (MB-390033) and the Heat Exchanger Corrugated Tube Flange (MB-390030) with Ethyl Alcohol (Fermi stock 1920-0550) and Kimwipes (Fermi stock 1660-2500) or equivalent.

Technician(s) _____ Date 2/7/05

4.14 Slide the Heat Exchanger Outer Shell (ME-390385) through all five supports.

Note(s):

Ensure the cross over hole in the Heat Exchanger Pipe is lined up with the elbow on the End Dome.

Technician(s) _____ Date 2/7/05

4.15 Position the Q3 Pipe Anchor (MC-390486).

Technician(s) _____ Date 2/7/05

4.16 Position the Heat Exchanger Weld Connector Adapter (MC-390278).

Technician(s) _____ Date 2/7/05

4.17 Position the Heat Exchanger Outer Shell (ME-390385).

Technician(s) _____ Date 2/7/05

4.18 Position the Q3 Cool Down Line (MB-390225).

Technician(s) _____ Date 2/8/05

DR No. 4146 → 4.19 Weld the Heat Exchanger Corrugated Tube Flange (MB-390030) to the Heat Exchanger Outer Shell (ME-390385) as per Q3 Heat Exchanger Assembly (ME-390214).

Weldor(s) _____ Date 2/9/05

→ 4.20 Weld the Cool Down Line End Flange (MB-390033) to the Q3 Cool Down Line (MB-390225) as per Q3 Cryostat Internal Piping Assembly (ME-390213).

D. WATKINS

Weldor(s) _____ Date 2/9/05

DR No. 4147

TRR NEEDED #1765

4.21 Assemble the Q3 Heat Exchanger Corrugated Tube Assembly (ME-390216).

Technician(s) _____ Date 2-8-05

4.22 Insert the Q3 Heat Exchanger Corrugated Tube Assembly (ME-390216).

Technician(s) _____ Date 2-8-05

4.23 Position Q3 Heat Exchanger Corrugated Tube Assembly (ME-390216).

Technician(s) _____ Date 2-8-05

4.24 Position the Heat Exchanger Flat End Cap (MD-390178).

Technician(s) _____ Date 2-8-05

4.25 Purge the Assembly using Argon (Ar) gas.

Technician(s) _____ Date 2-8-05

→ 4.26 Weld the Heat Exchanger Outer Shell (ME-390385 of Q3 Heat Exchanger Assembly ME-390214) to the Heat Exchanger Weld Connector Adapter (MC-390278) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

→ 4.27 Weld the IP End Dome 90° Elbow (MC-390220 of Non-IP End Dome Weldment MD-390219) to the Heat Exchanger Weld Connector Adapter (MC-390278) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

→ 4.28 Weld the Heat Exchanger Flat End Cap (MD-390178) to the Outer Shell Weldment (MD-390385) as per Q3 Heat Exchanger Outer Shell Weldment (ME-390385).

Weldor(s) _____ Date 2/9/05

4.29 Position the Q3 Heat Exchanger Corrugated Tube Assembly (ME-390216).

Technician(s) _____ Date 2/8/05

→ 4.30 Weld the Q3 Heat Exchanger Corrugated Tube Assembly (ME-390216) to the Outer Shell Weldment (ME-390385) as per Q3 Heat Exchanger Assembly (ME-390214).

Weldor(s) _____ Date 2/9/05

4.31 Weld the Cool Down Line (MC-390225) and the Heat Exchanger Outer Shell (ME-390385) to the Q3 Pipe Anchor (MC-390486) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

→ 4.32 Weld the Q3 Pipe Anchor (MC-390486) to the Q3 Cold Mass Assembly (ME-390528) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

→ 4.33 Weld the Pumping Line End Flange (MB-390032) to the Corrugated Tube Assembly (ME-390216) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

TRR# 1711 WELD THE PIPE EXTENSIONS 390650, 390663, AND 390679.

WELDER _____ DATE 2/9/05

4.34 Insert the Q3 Pumping Line (MB-390224).

Technician(s) _____ Date 2/8/05

4.35 Insert Q3 4.5k Intercept Line Pipes (MB-390226) as per Q3 Heat Exchanger Assembly (ME-390214).

Technician(s) _____ Date 2-8-05

4.36 Weld the Pumping Line End Flange (MB-390032) to the Q3 Pumping Line (MB-390224) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

4.37 Position the Q3 Pumping Line (MB-390224).

Technician(s) _____ Date 2-8-05

4.38 Purge the Cold Mass Assembly, using Argon, including the Q3 4.5k Intercept Line Pipes (MB-390226).

Technician(s) _____ Date 2-8-05

4.39 Weld the Q3 Pumping Line (MB-390224) to the Q3 Pipe Anchor (MC-390486) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

4.40 Ensuring that the Q3 4.5k Intercept Line Pipes (MB-390226) have been purged, weld the Intercept Line Pipe Stops (MA-390379) as per Q3 Cryostat Assembly Internal Piping (ME-390213).

Weldor(s) _____ Date 2/9/05

4.41 Prepare Cold Mass Assembly for Pressure Test at 363 psi.

Technician(s) _____ Date 2/10/05

4.42 Verify Cold Mass Assembly is ready for Pressure Test at 363 psi.

Responsible Authority/Physicist _____ Date 2/10/05

4.43 Perform a Pressure Test of the Cold Mass Assembly at 363 psi Nitrogen per Section 5034 of the Fermilab ES&H Manual and UG-100 of the Code.

Warning:

The test is to be performed after normal working hours and only personnel directly involved with the test will be present.

Responsible Authority/Physicist _____ Date 2/10/05

4.44 Leak Check the Cold Mass Assembly. (This will include the Outer Shell (MD-390385)).

Part No. Cold Mass assem. LQXC02-0	DETERMINATION OF DETECTABLE LEAK						
	M.D.S. ÷ ((Response – Background) ÷ Leak value) = MDL						
OPERATOR'S LAST NAME	SCALE UNITS BEFORE HELIUM PROBE	SCALE UNITS WHILE ENCLOSURE FLOODING	MDS	Response	Background	Leak Value	MDL
Wilson	80X1	80X1	2	36X5	80X1	9.85 xE-8	5.7 xE-10

Technician(s) 2-15-05 Date

4.45 Leak check Q3 4.5k Intercept Lines (MB-390226). leak ✓ stickers in bag by Steve Gould for intercept line and Pumping line.

Part No. Q3 pumping line	DETERMINATION OF DETECTABLE LEAK						
	M.D.S. ÷ ((Response – Background) ÷ Leak value) = MDL						
OPERATOR'S LAST NAME	SCALE UNITS BEFORE HELIUM PROBE	SCALE UNITS WHILE ENCLOSURE FLOODING	MDS	Response	Background	Leak Value	MDL
Wilson	30X1	30X1	2	46X5	30X1	3.91 xE-8	3.91 xE-10

Technician(s) 2/14/05 Date

step added for Q3 Pumping Line

PART NO. Q3 LQXC02-0 Pumping line		SCALE UNITS BEFORE HELIUM PROBE	SCALE UNITS WHILE ENCLOSURE FLOODING	DETERMINATION OF MINIMUM DETECTABLE LEAK				
				MDS ÷ ((Response - Bckgnd) ÷ Leak Value) = MDL				
DATE TIME	OPERATOR'S LAST NAME							
2/14/05	Wilson	30X1	30X1	2	46X5	30X1	3.91X10-8	3.91X10-10

TRR #1711

5.0 Shield Assembly

5.1 Install the Threaded Rods (Tie Rod Assembly) (MC-390638). See copy of step 19.9 (Q3 Module Assembly Traveler, TR-333729) in designated book, for the distance between the Suspension Rings. Record the previously recorded measurements below.

Non-IP North to IP North 164 7/8 = 4187.82 mm

Non-IP South to IP South 164 7/8 = 4187.82 mm

Technician(s) Date 2-16-05

5.2 Install the Cold Mass Insulation Mounting Lug Blankets (MC-390496).

Technician(s) Date 2/16/05

5.3 Lift the Cold Mass Assembly and place the (IP End) Q3 End Section (ME-390439) and (Non-IP End) Q3 End Section (ME-390439) on the Insertion Rails. Lower the Cold Mass back onto the rails ensuring the holes in the Shield Sections line up with Support Rollers.

Technician(s) Date 2/16/05

5.4 Insert the Mid Section (ME-390435) and the Support Bands (MD-390083).

Technician(s) Date 2-17-05

5.5 Assemble the bottom half of the shield. Leave all bolts loose. Spray all screw threads with Molybdenum.

Technician(s) Date 2-17-05

5.6 Assemble the Cooling Tubes (MD-390437) to the Bottom Half of the Shield.

Technician(s) Date 2-17-05

5.7 Lift the Cold Mass and place the Shield Inner and Outer MLI Blankets (ME-390489 & ME-390490) onto the Insertion Rails in the correct orientation.

Note(s):

Place the Outer Blanket (ME-390490) on the Rails first.

Technician(s) Date 2-17-05

5.8 Lower the Cold Mass onto the rails. Ensure the slits in the blankets line up with Support Rollers.

Technician(s) _____ Date 2-17-05

5.9 Install the Cold Mass MLI Blankets per (ME-390527) and in the same position as Step 4.6.

Technician(s) _____ Date 2-17-05

5.10 Cut and install the pipe MLI blankets per Q3 Piping Assembly Insulation Installation (ME-390545).

Technician(s) _____ Date 2-18-05

5.11 Install the Upper Shield per Q3 Thermal Shield Assembly (ME-390436). Spray all screw threads with Molybdenum. Ensure the shield is not sagging prior to the final tightening of the shield screws.

Technician(s) _____ Date 2-18-05

5.12 Install the Shield Blankets (ME-390489 & ME-390490).

Technician(s) _____ Date 2-18-05

6.0 Cold Mass Insertion into the Vacuum Vessel

6.1 Install Green Putty between the Vacuum Vessel and the Insertion Rails.

Technician(s) _____ Date 2-21-05

6.2 Install the Cold Mass Pull-in Tooling.

Technician(s) _____ Date 2-21-05

6.3 Mount the Pneumatic Winch to floor on the West side of the Vacuum Vessel.

Technician(s) _____ Date 2-21-05

6.4 Connect the cable to the Pull-in Tooling.

Technician(s) _____ Date 2-21-05

6.5 Pull the Cold Mass Assembly into the Vacuum Vessel.

Technician(s) _____ Date 2-21-05

6.6 When the Cold Mass is fully inserted, install the Suspension System Adjusting Screws (MB-390039).

Technician(s) _____ Date 2-22-05

6.7 Adjust the Suspension System Adjusting Screw (MB-390039) as needed to center the Cold Mass in the Vacuum Vessel.

Technician(s) _____ Date 2-22-05

6.8 Install Conflat Flanges (MA-390374) w/ Copper Gaskets (MA-390375) and Bolt Set (MA-390376) to Cryostat as per Q3 Cryostat General Assembly (ME-390132).

Technician(s) _____ Date 2-22-05

Done as per S. Gourd 11/18/05

6.9 Install Target Holders (Right, MD-390539), (Left, MD-390540) and (MD-390211) as per Q3 Cryostat General Assembly (ME-390132).

Technician(s) _____ Date 1-18-05

6.10 Install Reference Socket Cup (MA-390426) as per Q3 Cryostat General Assembly (ME-390132).

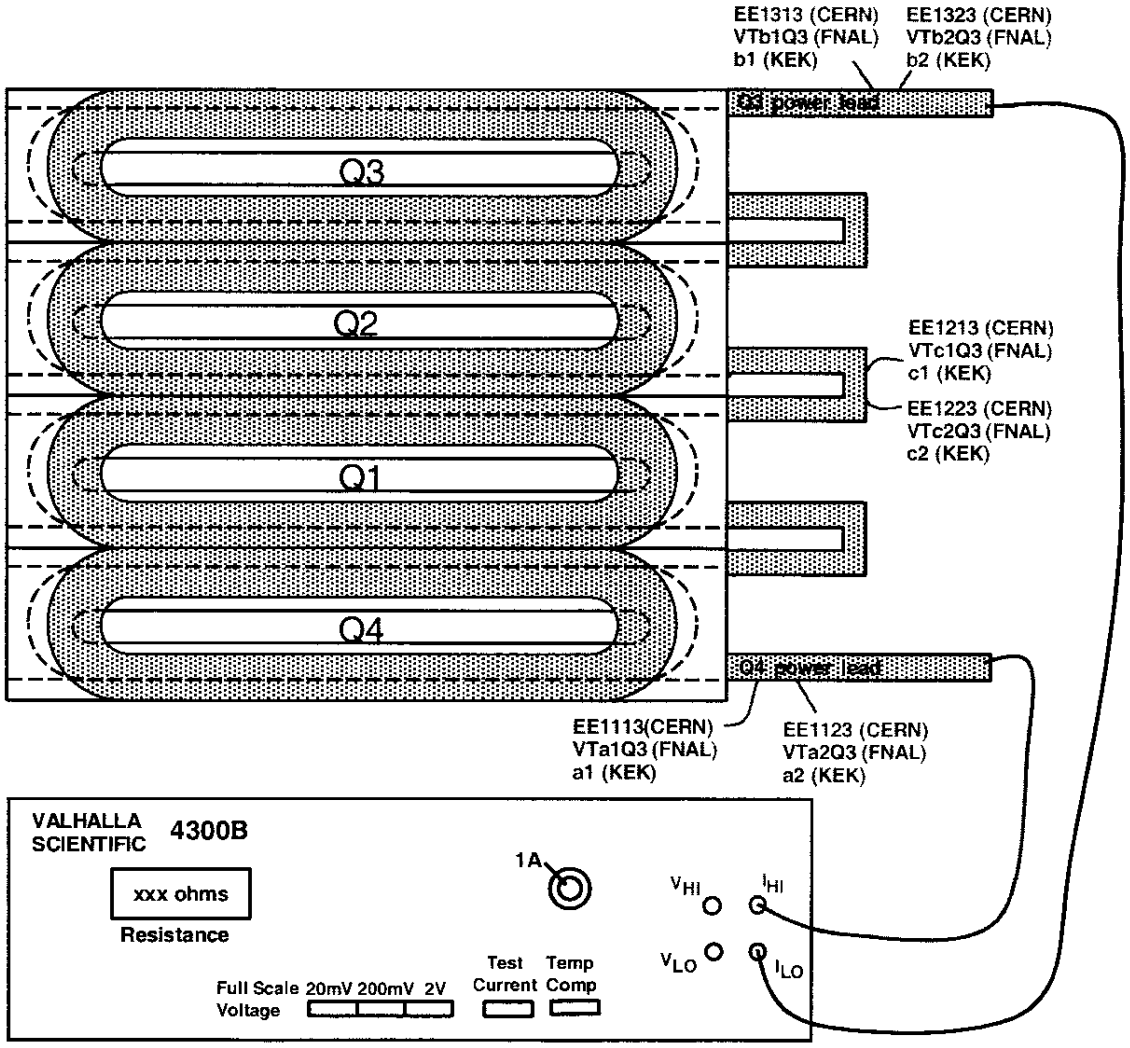
Technician(s) _____ Date 1-18-05

7.0 Final Electrical Inspection

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

To measure the Resistance of a Q3 Cold Mass:

1. Use Valhalla Scientific 4300B digital micro-ohmmeter.
2. Set Test Current to 0.1 amp.
3. Set Scale to 2V full scale.
4. Turn temperature compensation on.
5. Turn test current off.
6. Connect I_{HI} to Q4 inner power lead as shown in figure.
7. Connect I_{LO} to Q3 inner power lead as shown in figure.
8. Turn test current on.
9. Connect V_{HI} and V_{LO} to voltage taps as shown in resistance table.
10. To measure Total with leads, connect V_{HI} to Q4 power lead and V_{LO} to Q3 power lead.
11. Read resistance and record in traveler.



(Q3) Resistance				Nominal 3.35 to 3.45 Ω
Voltage Tap Serial Numbers				Total Resistance
Connect	Fermi	CERN	KEK	
V_{HI}	VTa1Q3	EE1113	a1	3.396 Ω
V_{LO}	VTc1Q3	EE1213	c1	
V_{HI}	VTc1Q3	EE1213	c1	3.392 Ω
V_{LO}	VTb1Q3	EE1313	b1	
V_{HI}	VTa1Q3	EE1113	a1	6.787 Ω
V_{LO}	VTb1Q3	EE1313	b1	

		Total Resistance with Leads
		Nominal 6.75 to 6.85 Ω
V_{HI}	Q4 Power Lead	6.804 Ω
V_{LO}	Q3 Power Lead	

A Gould
Technician(s)

2/23/05
Date

Check resistance of Redundant Voltage Taps.

Q3 Redundant Voltage Taps				Nominal 3.35 to 3.45 Ω
Connect	Fermi	CERN	KEK	Resistance
V_{HI}	VTa2Q3	EE1123	a2	3.396 Ω
V_{LO}	VTc2Q3	EE1223	c2	
V_{HI}	VTc2Q3	EE1223	c2	3.391 Ω
V_{LO}	VTb2Q3	EE1323	b2	

A Gould
Technician(s)

2/23/05
Date

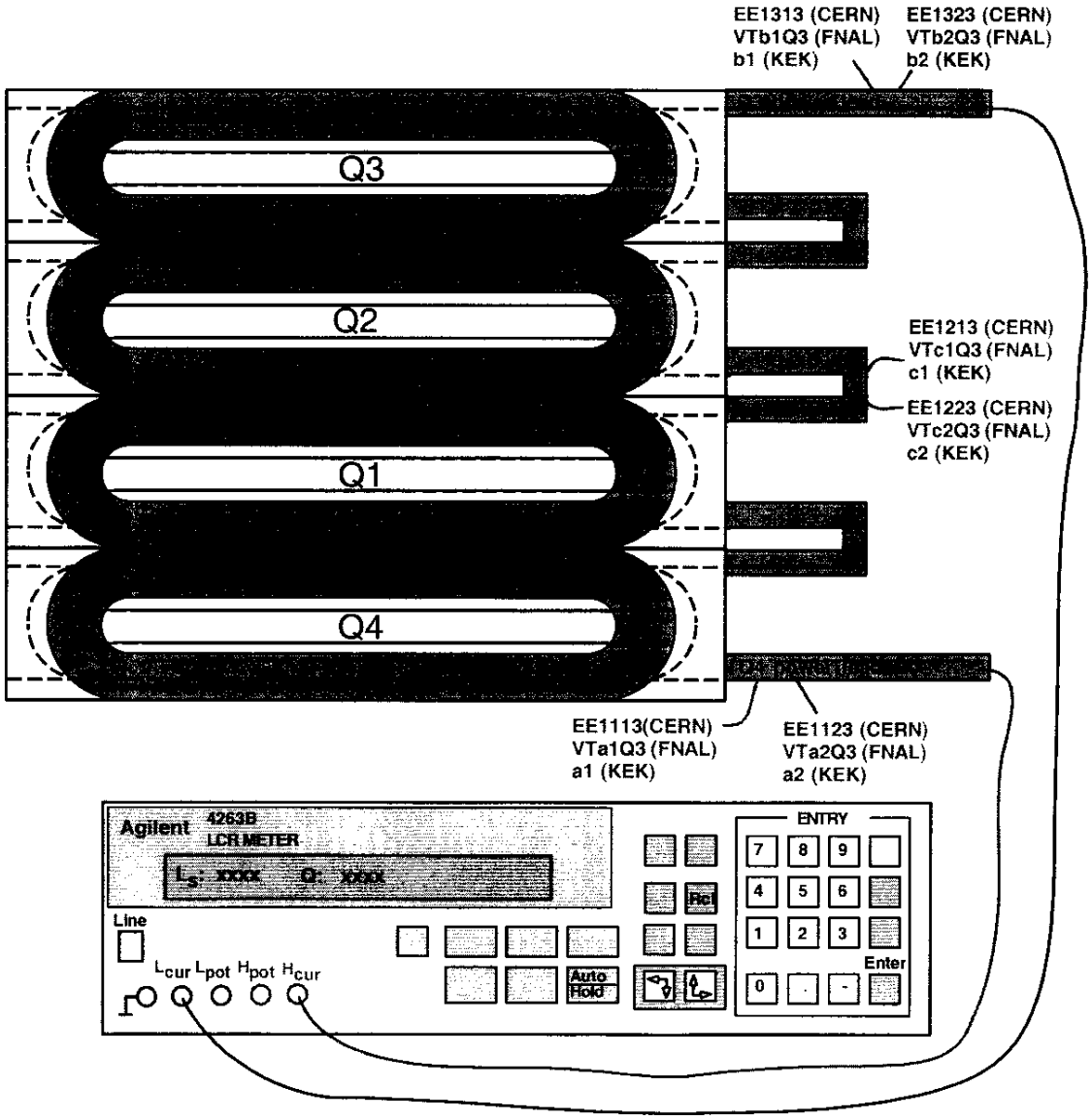
To measure Ls and Q of a Q3 Cold Mass:

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), then push #1, then push Enter.
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 H_{cur} to Quadrant 4 power lead as shown in figure.
7. Connect L_{cur} to Quadrant 3 power lead as shown in figure.
8. Connect H_{pot} and L_{pot} buttons to voltage taps as shown below.

To measure Q3:

- To measure Quadrants 1&4, connect H_{pot} to VTa1 (EE1113 for Q3), and L_{pot} to VTc1 (EE1213 for Q3).
- To measure Quadrants 2&3, connect H_{pot} to VTc1 (EE1213 for Q3), and L_{pot} to VTb1 (EE1313 for Q3).
- To measure total, connect H_{pot} to VTa1 (EE1113 for Q3), and L_{pot} to VTb1 (EE1313 for Q3).

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



(Q3) Inductance				Nominal 15 to 16 mH
Voltage Tap Serial Numbers				Total Inductance
Connect	Fermi	CERN	KEK	
H_{POT}	VTa1Q3	EE1113	a1	15.201 mH
L_{POT}	VTc1Q3	EE1213	c1	
H_{POT}	VTc1Q3	EE1213	c1	15.218 mH
L_{POT}	VTb1Q3	EE1313	b1	

				Nominal 30 to 32 mH
				Total Inductance
H_{POT}	VTa1Q3	EE1113	a1	30.413 mH
L_{POT}	VTb1Q3	EE1313	b1	

(Q3) Q-Factor				Nominal 1.0 to 1.2
Voltage Tap Serial Numbers				Total Q
Connect	Fermi	CERN	KEK	
H_{POT}	VTa1Q3	EE1113	a1	1.1
L_{POT}	VTc1Q3	EE1213	c1	
H_{POT}	VTc1Q3	EE1213	c1	1.1
L_{POT}	VTb1Q3	EE1313	b1	

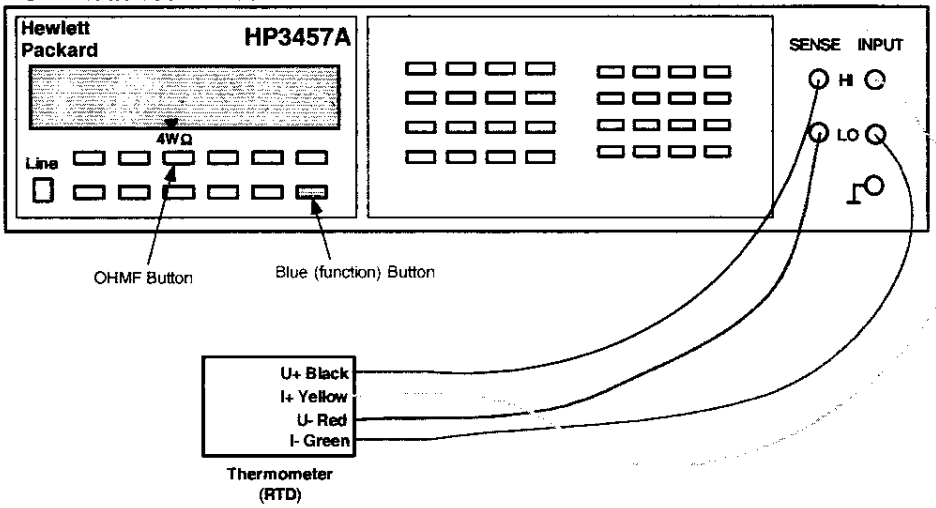
				Nominal 1.0 to 1.2
				Total Inductance
H_{POT}	VTa1Q3	EE1113	a1	1.1
L_{POT}	VTb1Q3	EE1313	b1	

A Gould
Technician(s)

2/23/05
Date

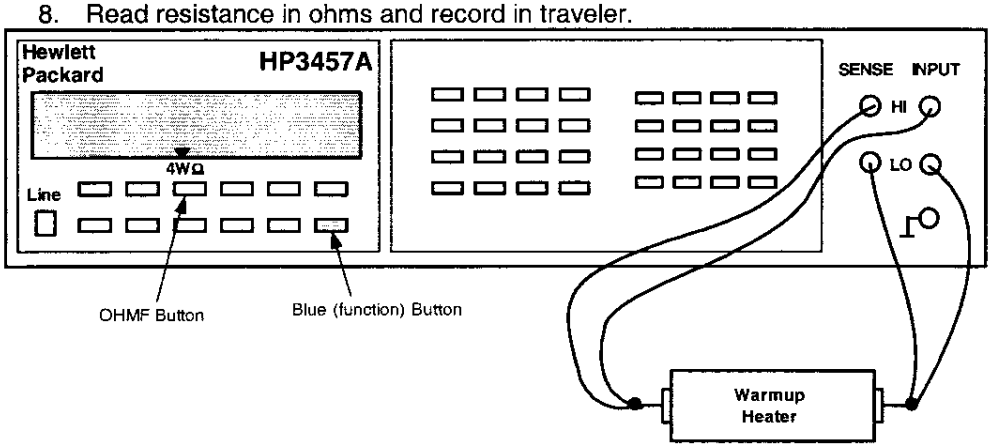
To measure the resistance of a Thermometer (RTD):

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.
   U+ (Black) to Sense HI
   I+ (Yellow) to Input HI
   U- (Red) to Sense LO
   I- (Green) to Input LO
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).
8. 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.



Q3 - RTD's and Cryogenic (warm-up) Heaters				
Temperature of Building (± 5°): 68°				
Component	**Fermi**	**CERN**	**Range**	**Resistance**
Q3 RTD, primary	TaQ3	TT8313	**60 to 70 Ω**	68.093 Ω
Q3 RTD, redundant	TbQ3	TT8323	**60 to 70 Ω**	66.951 Ω
Q3 Cryogenic (warm-up) Heater (LE) - wire at top (CERN #1 I+)	W1aQ3	EH8313+	**16 to 18.5 Ω**	17.7605 Ω
Q3 Cryogenic (warm-up) Heater (LE) - wire at bottom (CERN #1 I-)	W2aQ3	EH8313-		
Q3 Cryogenic (warm-up) Heater (Non-LE) - wire at top (CERN #2 I+)	W1bQ3	EH8323+	**16 to 18.5 Ω**	17.4447 Ω
Q3 Cryogenic (warm-up) Heater (Non-LE) - wire at bottom (CERN #2 I-)	W2bQ3	EH8323-		

ORIGINAL
66.128
64.761

A Gould
Technician(s)

2/23/05
Date

Using the Hewlett Packard HP3457A digital multimeter, measure the Protection (Strip) Heater Resistance for Q3.

Q3 Protection (Strip) Heater Resistance					
Fermi	**CERN**	**KEK**	**Description**	**Limit**	**Resistance**
H1aQ3	**YT1113+**	**HA1**	**Circuit A**	**28 to 32 Ω**	30.134 Ω
H2aQ3	**YT1113-**	**HA2**			
H1bQ3	**YT1123+**	**HB1**	**Circuit B**	**28 to 32 Ω**	30.224 Ω
H2bQ3	**YT1123-**	**HB2**			

A Gould
Technician(s)

2/23/05
Date

7.2 Using the Valhalla 4300B, connect 10mA applied voltage thru the corrector Power Leads. Measure Resistance and record in the table below.

Corrector Bus Leads

	V3A	V3B	H3A	H3B	B3A	B3B	B6A	B6B	
	V2A	V2B	H2A	H2B	B4A	B4B	A4A	A4B	
	V1A	V1B	H1A	H1B	A2A	A2B	A3A	A3B	

(View Looking from DFBX into Q3)

Corrector Assembly	Corrector Element	Readout Labels		Power Labels	Resistance
MQSX	MQSX	A2A	EE8223	A2A, A2B	.06
		EE8223	A2B		7.56
		A2A	A2B		7.61
MCBXA	MCBXV	V3A	EE8113	V3A, V3B	.02
		EE8113	V3B		17.36
		V3A	V3B		17.37
	MCBXH	H3A	EE8123	H3A, H3B	.01
		EE8123	H3B		21.31
		H3A	H3B		21.32
	MCTX	B6A	EE8613	B6A, B6B	.02
		EE8613	B6B		97.93
		B6A	B6B		97.95
	MCSX	B3A	EE8313	B3A, B3B	.02
		EE8313	B3B		27.73
		B3A	B3B		27.75
MCSOX	MCOSX	A4A	EE8423	A4A, A4B	.01
		EE8423	A4B		11.81
		A4A	A4B		11.82
	MCOX	B4A	EE8413	B4A, B4B	.01
		EE8413	B4B		12.81
		B4A	B4B		12.82
	MCSSX	A3A	EE8323	A3A, A3B	.01
		EE8323	A3B		13.36
		A3A	A3B		13.37

Technician(s) — Date: 2/23/05

LHC Q3 – LQXC Cryostat Final Assembly

LHC Serial No.: LQXC02-0

Notes:

8.0 Final Preparations

8.1 Prepare the Power Leads to be cut by measuring and marking the appropriate cutoff location as per Q3 Module Assembly (ME-369900). Remove any Kapton insulation from the end of the lead to approximately 4 inches beyond the cutoff mark. Clamp the Leads, individually, using the "Lead Clamp Block Tooling".

Technician(s) _____ Date 2/24/05

8.2 Cut the Power Leads as per Q3 Module Assembly (ME-369900).

Technician(s) _____ Date 2/24/05

8.3 Fuse the Ends of the Leads.

Weldor(s) _____ Date 2/24/05

8.4 Remove Clamps when fusing is complete and it is safe to do so.

Technician(s) _____ Date 2/24/05

Done in Shipping Travelers TRR# 1711

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

Technician(s) _____ Date 2/24/05

Final W/ Press Cold Mass		Before purring Helium	Helium Probends		Resp	B.G.	Leg Valve	MDL
Date								
3/23/05	Wilson	40X1	40X1	2	30X5	40X1	3.91X10-8	1.0X10

Tech _____ 3-23-05 Date

9.0 Production Complete

9.1 Process Engineering verify that the LHC Q3 Cryostat Assembly Traveler (5520-TR-333730) is accurate and complete. This shall include a review of all steps to ensure that all operations have been completed and signed off. Ensure that all Discrepancy Reports, Nonconformance Reports, Repair/Rework Forms, Deviation Index and dispositions have been reviewed by the Responsible Authority for conformance before being approved.

Comments:

Process Engineering/Designee

5/16/06
Date

TD - Engineering Fabr' ion Component Kit List

ORIGINAL

Process Engineering

Component Serial No.	LQXC02	
Kit submitted by:	John Szostak	Ext. 2003
Fermi ID No.	02943C	
Date submitted:	5-Nov-04	
Need date:	15-Nov-04	
Deliver to:	ICB	
Use with Traveler No.	333730	
Job No.	248	
M&S task number:	300	1.1.1.3.4
Drawing Title:	Q3 CRYOSTAT GENERAL ASSEMBLY	
Drawing No.	ME-390132	Rev. E

Material Control

Parts available

Verified by:	M. Schmidt
Fermi ID No.	04223N
Date submitted to stockroom:	9-Nov-04

Parts issued

Issued by:	
Fermi ID No.	12698
Date issued:	11/18/04
Parts received by E&F:	
Fermi ID No.	02943C
Date received by E&F:	11/18/04

	Description	Dwg Size	Number	Rev	Unit	Quantity Required	Location	Quantity Issued	E&F Verified	Routing Form Number	Spares Number / Comment
1	ADJUSTING SCREW	MB	390039	C	EA	8	IB4 Bin	8		81596	99 pcs.
2	VACUUM VESSEL ASSEMBLY	ME	390133	E		ICB HAS					
3	TARGET HOLDER	MD	390211	B	EA	4	R10,1,1	4		74751	44 pcs.
4	Blank Non-Rotatable Conflat Flange, 4.62" OD 304 SS	MA	390374	*	EA	8	R8,3,4	8		78987	116 pcs.
5	COPPER GASKET	MA	390375	*	EA	8	IB4 Bin	8		78429	127 pcs.
6	BOLT SET, HEX HEAD, 5/16 - 24 x 1.25 w/ WASHER	MA	390376	*	EA	80	IB4 Bin	80		72306	1164 pcs.
7	WASHER .656" ID x 1.38" OD x .13" THK, STN STEEL	MA	390377	*	EA	8	IB4 Bin	8		77866	118 pcs.
8	REFERENCE SOCKET CUP (Furnished by CERN)	MA	390426	*	EA	8	R1,3,5	8		77884	124 pcs.
9	VINYL FLANGE COVER FOR 75 MM FLANGE	MA	390491	*	EA	6	IB4 Bin	6		78835	207 pcs.
10	VINYL FLANGE COVER FOR 114 MM FLANGE	MA	390492	*	EA	4	IB4 Bin	4		78836	207 pcs.

TD - Engineering Fabr tion Component Kit List

ORIGINAI

	Description	Dwg Size	Number	Rev	Unit	Quantity Required	Location	Quantity Issued	E&F Verified	Routing Form Number	Spares Number / Comment
11	VINYL FLANGE COVER FOR 134 MM FLANGE	MA	390493	*	EA	7	IB4 Bin	7		78837	283 pcs.
12	VINYL FLANGE COVER FOR 201 MM FLANGE	MA	390494	*	EA	1	IB4 Bin	1		78834	86 pcs.
13	ALIGNMENT FIDUCIAL COVER	MA	390495	*	EA	8	IB4 Bin	8		78957	202 pcs.
14	TARGET HOLDER, RIGHT	MD	390539	*	EA	2	R8,S1,L3	2		79556	30 pcs.
15	TARGET HOLDER, LEFT	MD	390540	*	EA	2	R8,S1,L5	2		79555	30 pcs.
16	M16-2 x 70.0 mm LG HEX SHCS, 18-8 STN STEEL	MA	393021	*	EA	8	IB4 Bin	8		N/A	153 pcs.
17	M6 FLAT WASHER, 18-8 STN STEEL	MA	393024	*	EA	32	IB4 Bin	32		78841	468 pcs.
18	M10-1.5 x 25mm LG HEX SHCS 18-8 STN STEEL	MA	393036	*	EA	24	IB4 Bin	24		77849	390 pcs.
19	M6-1.0 x 35mm LG HEX SHCS 18-8 STN STEEL	MA	393045	*	EA	16	IB4 Bin	16		78886	248 pcs.
20	M8 x 30mm LG HEX SPRING PIN 18-8 STN STEEL	MA	393048	*	EA	8	IB4 Bin	8		78887	138 pcs.
21	M10 LOCK WASHER, 18-8 STN STEEL	MA	393220	*	EA	24	IB4 Bin	24		80024	512 pcs.
22	STD. SPRING PIN SLOTTED M4 x 20mm LG. PLAIN STEEL	MA	393360	E	EA	16	R2,2,3	16		81763	240 pcs.
INSULATED SHIELD AND PIPING ASSEMBLY		ME	390212	A		1					
23	Q3 SHIELD MLI INNER BLANKET	ME	390489	*	EA	1	Site 38	1		79871	8 pcs.
24	Q3 SHIELD MLI OUTER BLANKET	ME	390490	*	EA	1	Site 38	1		79872	8 pcs.
Q3 THERMAL SHIELD ASSEMBLY		ME	390436	C	EA	1					
25	SUPPORT BAND	ME	390083	A	EA	4	P/N	4		77146	60 pcs.
26	RETAINER	MA	390086	*	EA	16	IB4 Bin	16		78914	258 pcs.

ORIGINAL

TD - Engineering Fabr tion Component Kit List

	Description	Dwg Size	Number	Rev	Unit	Quantity Required	Location	Quantity Issued	E&F Verified	Routing Form Number	Spares Number / Comment
27	ALUMINUM SPACER	MA	390373	*	EA	32	IB4 Bin	32		79001	555 pcs.
28	RETAINING WASHER	MA	390378	*	EA	240	IB4 Bin	240		79002	3682 pcs.
29	Q1 & Q3 SHIELD MID-SECTION SECTION	ME	390435	*	EA	2	P/N	2		79382	26 pcs.
30	Q3 COOLING TUBE WELDMENT	MD	390437	A	EA	2	P/N	2		N/A	16 pcs.
31	Q3 END SECTION	ME	390439	*	EA	4	P/N	4		79622	32 pcs.
32	COOLING PIPE BRACKET	MD	390783	*	EA	4	R7,1,4	4		81981	72 pcs.
33	BUTTON HEAD CAP SCREW, M5 x 16.0 LG.	MA	393028	*	EA	240	IB4 Bin	240		79003	3591 pcs.
	Q3 INTERNAL PIPING ASSEMBLY	ME	390213	B	EA	1					
34	PUMPING LINE END FLANGE	MB	390032	B	EA	1	IB4 Bin	1		77210	57 pcs.
35	COOLDOWN LINE END FLANGE	MB	390033	B	EA	1	IB4 Bin	1		77208	40 pcs.
36	Q1 / Q3 PIPE SUPPORT ASSEMBLY	MD	390092	A	EA	3	P/N	3		76617	39 pcs.
37	RETAINING CLIP	MA	390103	*	EA	12	IB4 Bin	12		76785	188 pcs.
38	TIE BAR RETAINING CLAMP	MB	390136	*	EA	4	IB4 Bin	4		77132	57 pcs.
39	Q3 PUMPING LINE	MB	390224	*	EA	1	P/N	1		80217	7 pcs.
40	Q3 COOLDOWN LINE	MB	390225	A	EA	1	P/N	1		81685	8 pcs.
41	Q3 4.5K INTERCEPT LINE TUBE	MB	390226	*	EA	3	Site 38	3		81303	24 pcs.
42	WELD CONNECTOR ADAPTER	MC	390278	*	EA	1	R1,S1,L3	1		79471	13 pcs.
43	INTERCEPT LINE PIPE STOP	MA	390379	A	EA	6	IB4 Bin	6		78894	143 pcs.

ORIGINAL

TD - Engineering Fabr tion Component Kit List

	Description	Dwg Size	Number	Rev	Unit	Quantity Required	Location	Quantity Issued	E&F Verified	Routing Form Number	Spares Number / Comment
44	Q1 / Q3 PIPE ANCHOR	MC	390486	*	EA	1	R8,S1,L4	1	N/A	79387	14 pcs.
45	Q3 COLD MASS ASSEMBLY	ME	390528	A		ICB HAS					
46	Q3 PUMPING LINE NON-IP END EXTENSION SPOOL	MD	390650	*	EA	1	R10,1,3	1	N/A	82452	8 pcs.
47	Q3 COOLDOWN LINE NON-IP END EXTENSION SPOOL	MC	390663	*	EA	1	R7,1,2	1	N/A	82453	8 pcs.
48	4.5K INTERCEPT LINE NON-IP END EXTENSION WELDMENT	MD	390679	*	EA	3	R1,3,2	3	N/A	82454	6 pcs.
49	M6 x 45.0mm LG HEX SHCS, 18-8 STN STEEL	MA	393017	*	EA	4	IB4 Bin	4	N/A	77846	16 pcs.
50	M6 HEX NUT, 18-8 STN STEEL	MA	393022	A	EA	4	IB4 Bin	4	N/A	78236	18 pcs.
51	M6 FLAT WASHER 18-8 STN STEEL	MA	393024	*	EA	4	IB4 Bin	4	N/A	78841	468 pcs.
52	M6 LOCK WASHER 18-8 STN STEEL	MA	393026	*	EA	4	IB4 Bin				APR
	Q3 HEAT EXCHANGER ASSEMBLY	ME	390214	A	EA	1					
53	CORRUGATED TUBE FLANGE	MB	390030	A	EA	1	IB4 Bin	1	N/A	77207	51 pcs.
	OUTER SHELL WELDMENT	MD	390385	A	EA	1					
54	FLAT END CAP	MD	390178	*	EA	1	R1,2,3	1	N/A	79644	13 pcs.
55	PIPE	MD	390215	*	EA	1	P/N	1	N/A	N/A	8 pcs.
56	EXTENSION SPOOL	MD	390659	*	EA	1	R10,1,3	1	N/A	81007	8 pcs.
57	EXTENSION WELD FITTING	MD	390661	*	EA	1	IB4 Bin	1	N/A	80832	12 pcs.
	CORRUGATED TUBE ASSEMBLY	ME	390216	A	EA	1					
58	CORRUGATED TUBE SUPPORT	MC	390028	*	EA	6	R9,S1,L4	6	N/A	78144	47 pcs.

ORIGINAL

TD - Engineering Fabr tion Component Kit List

	Description	Dwg Size	Number	Rev	Unit	Quantity Required	Location	Quantity Issued	E&F Verified	Routing Form Number	Spares Number / Comment
59	CORRUGATED TUBE RESTRICTOR	MC	390029	*	EA	1	R9,S1,L4	1		77724	49 pcs.
60	CORRUGATED TUBE WELDMENT	ME	390395	A	EA	1	P/N	1		79283	8 pcs.
61	EXTENSION ADAPTER	MD	390658	*	EA	1	R7,1,4	1		81006	8 pcs.
	Q3 PIPING ASSEMBLY INSULATION INSTALLATION	ME	390545	A	EA	1					
62	Q1 / Q3 MLI END BLANKET	ME	390542	*	EA	1	2 ~~NEEDED~~ Site 38	1		79877	22 pcs.
63	Q1 / Q3 MLI MID BLANKET	ME	390543	*	EA	1	Site 38	1		79878	12 pcs.
	Q1 & Q3 INSTALLATION TIE ROD ASSEMBLY	MC	390638	*	EA	2					
64	Q1 & Q3 INSTALLATION TIE-ROD SHORT THREADED ROD	MA	390639	*	EA	2	R2,2,2	2		81098	14 pcs.
65	JAM NUT (LH)	MA	393046	*	EA	4	IB4 Bin	4		80074	66 pcs.
66	STD ANSI HEX THIN JAM NUT 1/2-13 UNC	MA	393225	*	EA	8	IB4 Bin	8		80073	164 pcs.
67	STD HEX COUPLING NUT 1/2-13 UNC (RH-LH)	MA	393226	*	EA	4	IB4 Bin	4		80075	60 pcs.
68	THREADED ROD 1/2-13 UNC - 24 x 6 FT LONG	MA	393227	*	EA	2	R7,2,4	2		80061	30 pcs.
69	THREADED ROD 1/2-13 UNC - 24 (LH) x 3 FT LONG	MA	393228	*	EA	2	R1,2,3	2		80072	28 pcs.
	Q3 SUSPENSION SYSTEM INSTALLATION	ME	390528	*	EA	1					
70	TIE BAR SHIM, 6.4 mm	MB	390118	*	EA	4	IB4 Bin	4		77204	13 pcs.
71	TIE BAR SHIM, 2.4 mm	MB	390119	*	EA	4	IB4 Bin	4		77203	12 pcs.
72	TIE BAR SHIM, 0.8 mm	MB	390120	*	EA	4	IB4 Bin	4		77202	10 pcs.
73	SUSPENSION MTG BRACKET	MD	390279	*	EA	4	R9,S1,L1	4		77180	52 pcs.

ORIGINAL

TD - Engineering Fabr tion Component Kit List

	Description	Dwg Size	Number	Rev	Unit	Quantity Required	Location	Quantity Issued	E&F Verified	Routing Form Number	Spares Number / Comment
74	Q1 / Q3 TIE BAR ASSEMBLY	MC	390400	*	EA	2	P/N	2		78086 / 77976	26 pcs.
75	Q3 COLD MASS WELDED ASSEMBLY	ME	390529	B		ICB HAS	—				
76	M8 x 50.0 mm LG SHCS 18-8 STN STEEL	MA	393020	*	EA	12	IB4 Bin	12		82378	0
77	M8 HEX NUT, 18-8 STN STEEL	MA	393023	*	EA	12	IB4 Bin	12		78890.	106 pcs.
78	M8 FLAT WASHER, 18-8 STN STEEL	MA	393025	*	EA	12	IB4 Bin	12		76745	848 pcs.
79	M8 LOCK WASHER, 18-8 STN STEEL	MA	393027	*	EA	12	IB4 Bin	12		76744	867 pcs.
	FIXED SUPPORT ASSEMBLY	ME	390041	C	EA	1	—				
80	SUSPENSION SYSTEM SUPPORT RING ASSEMBLY	ME	390043	B	EA	1	NT02409	1		76906	7 pcs.
81	SUSPENSION SYSTEM SUPPORT PIN	MB	390047	A	EA	2	R8,S2,L1	2		76914	62 pcs.
82	SUSPENSION SYSTEM SUPPORT PIN SHIM - 1mm	MA	390275	A	EA	8	ICB Has	—			
83	SUSPENSION SYSTEM SUPPORT PIN SHIM - 0.5mm	MA	390276	*	EA	8	ICB Has	—			
84	SUSPENSION SYSTEM SUPPORT PIN BOLTS	MA	390277	*	EA	8	IB4 Bin	8		76913	240 pcs.
85	TWO PIECE CLAMP ON COLLAR	MA	390321	A	EA	4	IB4 Bin	4		76912	56 pcs.
86	SUSPENSION SYSTEM SUPPORT PIN SHIM 0.13 mm	MA	390480	*	EA	8	R2,S2,L4	8		79121	233 pcs.
87	SUSPENSION SYSTEM SUPPORT SHIM 0.25 mm	MA	390481	*	EA	12	R2,S2,L4	12		79122	357 pcs.
	SLIDING SUPPORT ASSEMBLY	ME	390042	C	EA	1	—				
88	SUSPENSION SYSTEM SUPPORT RING ASSEMBLY	ME	390043	B	EA	1	NT02409	1		76906	7 pcs.
89	SUSPENSION SYSTEM SUPPORT PIN	MB	390047	A	EA	2	R8,S2,L1	2		76914	62 pcs.

ORIGINAL

TD - Engineering Fabr tion Component Kit List

	Description	Dwg Size	Number	Rev	Unit	Quantity Required	Location	Quantity Issued	E&F Verified	Routing Form Number	Spares Number / Comment
90	SUSPENSION SYSTEM SUPPORT PIN SHIM - 1mm	MA	390275	A	EA	8	ICB Has	—	—		
91	SUSPENSION SYSTEM SUPPORT PIN SHIM - 0.5mm	MA	390276	*	EA	8	ICB Has	—	—		
92	SUSPENSION SYSTEM SUPPORT PIN BOLTS	MA	390277	*	EA	8	IB4 Bin	8	[illegible]	76913	240 pcs.
93	SUSPENSION SYSTEM SUPPORT PIN SHIM 0.13 mm	MA	390480	*	EA	8	R2,S2,L4	8	[illegible]	79121	233 pcs.
94	SUSPENSION SYSTEM SUPPORT SHIM 0.25 mm	MA	390481	*	EA	12	R2,S2,L4	12	[illegible]	79122	357 pcs.
	Q3 MAGNET INSULATION INSTALLATION	ME	390527	B	EA	1	—	—	—		
95	MOUNTING LUG BLANKET	MC	390496	*	EA	8	Site 38	8	[illegible]	79873	191 pcs.
96	Q1/Q3 END BLANKET	ME	390521	*	EA	2	Site 38	2	[illegible]	79874	20 pcs.
97	Q1/Q3 MID BLANKET	ME	390522	*	EA	1	Site 38	1	[illegible]	79875	12 pcs.

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TECHNICAL DIVISION PARTS ROUTING FORM

82603

Part Number	MD 390663	Revision		Date	Dec 15, 2004
P.O. Number	VMS	QC Task#	300.1.1.1.3.4		
Identifier #	MSV-1764	Amount of part received		1	
Requisitioner	Intials	Description			
MS	DK	Q3 COOL DOWN LINE NON IP END EXTENSION SPOOL			

Inspect? **Yes** Verify? Cert No Rework? Yes Ref: QCR# 25561

Number of Packages 1 Type of Container BOX Location Insp. Shelf

Disposition ~~STOCK~~ To Welding for production

Notes LHC CRTOSTAT Q3

Sign Off Person A Gould ID # 496T Date 2/8/05

TO INSPECTION

Date Inspected 12/21/04 Mech. Insp. Init Sullivan Leak Chk. Init 2/8/05 Per T. Page - no leak check req'd

Amount of part accepted 1 Amount of rejected due to deviation 0

PART REJECTED BY INSPECTION

Deviation report attached ☐ Date _____

Project Engineer(designee): accepts amount _____ rejects amount _____

QCR # _____ MMR # _____

PARTS DISPOSITION

Amount _____ Date _____

Completed by: _____ Location _____

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TECHNICAL DIVISION PARTS ROUTING FORM

82605

Part Number	MD 390650	Revision		Date	Dec 15, 2004
P.O. Number	VMS	QC Task#	300.1.1.1.3.4		
Identifier #	MSV-1764	Amount of part received		1	
Requisitioner	Intials	Description			
MS	DK	Q3 NON-IP END EXT. SPOOL			

Inspect? **Yes** Verify? Cert No Rework? Yes Ref: QCR# 25660

Number of Packages 1 Type of Container BOX Location Insp. Shelf

Disposition ~~STOCK~~ To Stock for production

Notes LHC CRTOSTAT Q3

Sign Off Person [signature] ID # 4965 Date 2/8/05

TO INSPECTION

Date Inspected 12/22/04 Mech. Insp. Init [signature] Leak Chk. Init [signature]

Amount of part accepted 0 Amount of rejected due to deviation 1

PART REJECTED BY INSPECTION

Deviation report attached ☑ Date 2/8/05

Project Engineer(designee): accepts amount 1 rejects amount 0

QCR # 25588 MMR # N/A

PARTS DISPOSITION

Amount _____ Date _____

Completed by: _____ Location _____

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TECHNICAL DIVISION PARTS ROUTING FORM

82604

Part Number MD 390679 Revision Date Dec 15, 2004

P.O. Number VMS QC Task# 300.1.1.1.3.4

Identifier # MSV-1764 Amount of part received 3

Requisitioner MS Intials DK

Description Q3 NON-IP END EXT. WELDMENT

Inspect? **Yes** Verify? Cert No Rework? Yes Ref: QCR#

Number of Packages 1 Type of Container BOX Location Insp. Shelf

Disposition ~~STOCK~~ To S. Gould for production

Notes LHC CRTOSTAT Q3

Sign Off Person S Gould ID # 4965 Date 2/8/05

TO INSPECTION

Date Inspected 12/23/04 Mech. Insp. Init Sudhir Leak Chk. Init 1/8/05 Per T. Page - no leak check req'd

Amount of part accepted 3 Amount of rejected due to deviation 0

PART REJECTED BY INSPECTION

Deviation report attached ☐ Date

Project Engineer(designee): accepts amount rejects amount

QCR # MMR #

PARTS DISPOSITION

Amount Date

Completed by: Location

ADDITIONAL PARTS REQUEST

HOT

HOT

ADDITIONAL PARTS REQUEST FORM SHALL BE USED TO ACCESS ALL ITEMS FROM INVENTORY WITH THE EXCEPTION OF PARTS KITS.

THIS FORM MUST BE SIGNED BY AN ACQUISITIONER BEFORE BRINGING TO THE STOCKROOM

MAGNET OR COIL # *LHC Cryostat*

REQUESTED BY *M. Schmidt*

DATE REQUESTED *2/8/05*

DELIVER TO *S. Gould ICB*

BUDGET CODE *300/1.1.1.3.4*

NEED BY DATE *2/8/05*

JOB TICKET #

MMR #

MACHINE SHOP REQ. #

PO #

PURCHASE RELEASE #

OTHER

PARTS STATUS (CHECK ONE)

☐ DEFECTIVE PARTS ISSUED ☐ PARTS SCRAPPED ☐ A/R ITEMS

☐ DEFECTIVE ASSEMBLY ☐ MISSING FROM KIT ALREADY ISSUED

☒ INDIVIDUAL PARTS ☐ CONSUMABLES ☐ PARTS LOST

ACQUISITIONER SIGNATURE [signature] **ID#** 4223 **DATE** 2/8/05

PLEASE INDICATE REVISION REQUIRED

stk 7

LOCATION	PART #	REV	QTY	UOM	DESCRIPTION	RF #	SIR #
R7,1,2	*MB 390663*	-	*1*	*Each*	*Q3 NonIP Ext.Spool*	82563	

STOCKROOM SIGNATURE [signature] **ID#** 12693 **DATE** 2/8/05

PARTS DELETED FROM DATABASE **ID#** **DATE**

A COPY OF THIS FORM IS TO BE INCLUDED IN WITH THE TRAVELER

PARTS RECEIVED BY [signature] **ID#** 4965 **DATE** 2/8/05

ADDITIONAL PARTS REQUEST

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MAGNET OR COIL # *LQXC02*

REQUESTED BY *Steve Gould*

DATE REQUESTED *2/17/05*

DELIVER TO *ICB*

BUDGET CODE *300/1.1.1.3.4(LCD)*

NEED BY DATE *2/17/05*

JOB TICKET # _____

MMR # _____

MACHINE SHOP REQ. # _____

PO # _____

PURCHASE RELEASE # _____

OTHER _____

PARTS STATUS (CHECK ONE)

- ☐ DEFECTIVE PARTS ISSUED
- ☐ PARTS SCRAPPED
- ☐ A/R ITEMS
- ☐ DEFECTIVE ASSEMBLY
- ☐ MISSING FROM KIT ALREADY ISSUED
- ☒ INDIVIDUAL PARTS
- ☐ CONSUMABLES
- ☐ PARTS LOST

ACQUISITIONER SIGNATURE Marsha Schmidt **ID#** 422 **DATE** 2/17/05

PLEASE INDICATE REVISION REQUIRED

LOCATION	PART #	REV	QTY	UOM	DESCRIPTION	RF #	SIR #
IN STOCK 24	*R1.1.B*	*390808*		*2*	*Q1/Q3 Fiducial Mtg Blk*	82260	

STOCKROOM SIGNATURE [illegible] **ID#** 12792 **DATE** 2-17-05

PARTS DELETED FROM DATABASE _____ **ID#** _____ **DATE** _____

A COPY OF THIS FORM IS TO BE INCLUDED IN WITH THE TRAVELER

PARTS RECEIVED BY [illegible] **ID#** 12814 **DATE** 2-17-05

ADDITIONAL PARTS REQUEST

ADDITIONAL PARTS REQUEST FORM SHALL BE USED TO ACCESS ALL ITEMS FROM INVENTORY WITH THE EXCEPTION OF PARTS KITS.

THIS FORM MUST BE SIGNED BY AN ACQUISITIONER BEFORE BRINGING TO THE STOCKROOM

MAGNET OR COIL # *LHC*

REQUESTED BY *Steve Gould*

DATE REQUESTED *4/8/05*

DELIVER TO *ICB*

BUDGET CODE *300/1.1.1.3.4(LCD)*

NEED BY DATE *4/8/05*

JOB TICKET # _____

MMR # _____

MACHINE SHOP REQ. # _____

PO # _____

PURCHASE RELEASE # _____

OTHER _____

PARTS STATUS (CHECK ONE)

☐ DEFECTIVE PARTS ISSUED ☐ PARTS SCRAPPED ☐ A/R ITEMS

☐ DEFECTIVE ASSEMBLY ☒ MISSING FROM KIT ALREADY ISSUED

☒ INDIVIDUAL PARTS ☐ CONSUMABLES ☐ PARTS LOST

ACQUISITIONER SIGNATURE [signature] **ID#** 4223 **DATE** 4/8/05

PLEASE INDICATE REVISION REQUIRED

LOCATION	PART #	REV	QTY	UOM	DESCRIPTION	RF #	SIR #
IN STOCK 16 R7,1,4	390652		4	Each	Q3 Shield line ext.	81005	

STOCKROOM SIGNATURE [signature] **ID#** 12304 **DATE** 4/07/05

PARTS DELETED FROM DATABASE _____ **ID#** _____ **DATE** _____

A COPY OF THIS FORM IS TO BE INCLUDED IN WITH THE TRAVELER

PARTS RECEIVED BY [signature] **ID#** 4965 **DATE** 4/8/05

Revision Request Control Number: 1711

Specification Number: 5520 - TR - 333730 Current Revision: A

Traveler or Document Title LHC Q3 LQXC Cryostat Final Assembly Traveler

Step #/Description of Revision:

1.6 Added Step. "Protect the bellows during all stages of production." DR No. HGQ-0500.
3.4 Modified Step. Changed to "Attach the Leak Check sticker for the Vacuum Vessel Assembly (ME-390133) per ES-107240 to the table below." Per DR No. HGQ-0469.
4.0 Modified Step. Added, removed and re-arranged sequence of steps per marked up traveler from LHC Production Engineer.
4.41 Added Step. "Install the Fiducial Mounting Blocks (MB-390808) per Q3 Cold Mass Welded Assembly (ME-390529)."
4.42 Added Step. "Weld the Fiducial Mounting Blocks (MB-390808) per Q3 Cold Mass Welded Assembly (ME-390529)."
4.45 Modified Step. Added more Leak Check boxes for all three 4.5k Intercept Line Leak Checks. Added picture showing locations of each and numbering.
4.46 Added Step. "Leak check the Cooldown Line (MD-390225)." per production request.
4.47 Added Step. "Leak check the Pumping Line (MB-390224)." per production request.
4.66 Modified Step. Added pictures showing each of the three 4.5k Intercept Lines (MB-390226).
4.67 Added Step. "Leak check the Cooldown Line (MD-390225)."
4.68 Added Step. "Leak check the Pumping Line (MB-390224)."
8.5 Removed Step. "Install the Vinyl Flange Covers (MA-390491), (MA-390492), (MA-390493), (MA-390494), & the Alignment Fiducial Covers (MA-390495)." Moved to Shipping Traveler per production request.
8.5 Added Step. "Perform a pressurized Leak Check of the Cryostat Assembly." Per LQXC02.

John Szostak	Jim Rife	1/26/2005
Originator	Responsible Authority	Date
Revision Incorporated into the Traveler:	John Szostak	5/19/2005
	Revision Incorporated By	Date
Process Engineering Final Review:	Bob Jensen	5/19/2005
	Process Engineering/Designee	Date

Instructions for the completion of the Revision Request Form

Note(s):

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

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Revision Request Control Number: 1765

Specification Number: 5520 - TR - 333730 Current Revision: C

Traveler or Document Title LHC Q3 LQXC Cryostat Final Assembly Traveler

Step #/Description of Revision:

4.20 Modified Step. Removed one leak check sticker. Only need one.
4.39 Added Step. "Verify that the Q3 Heat Exchanger Corrugated Tube Assembly (ME-390216) is perpendicular to the Outer Shell Weldment (ME-390385) as per Q3 Heat Exchanger Assembly (ME-390214)." Per DR No. 4270.
4.44 Removed Step. "Position the Cooldown Line Tube (MB-390225)." Per production request. (Duplicated)
4.45 Removed Step. "Position the Pumping Line Tube (MB-390224)." Per production request. (Duplicated)
4.40 Removed Step. "Weld the Heat Exchanger Outer Shell Extension Spool (MD-390659) per Q3 Heat Exchanger Outer Shell Weldment (ME-390385)." (Same as step 4.37)
4.55 Modified Step. "Weld the Q3 Pipe Anchor (MC-390486) to the Cold Mass Assembly (ME-390528) as per Q3 Cryostat Assembly Internal Piping (ME-390213)." Moved step to new step 4.33 per production request.
5.13 Added Step. "Weld the Non IP Extension Spools (ME-390652, part of ME-390437) per Q3 Thermal Shield Cooling Tube Weldment (ME-390437)." Per production request.
5.14 Added Step. "Perform a Leak Check on the Q3 Thermal Shield Cooling Tube Weldment (ME-390437)." Per production request.
6.7 Modified Step. Changed to "Using Lower Suspension System Adjusting Screws, raise Cold Mass two (2) full turns." Per Damon Bice.
6.8 Added Step. "Ensure Cold Mass has been adjusted in the Vacuum Vessel and that all eight (8) Adjusting Screw Holes are aligned with threaded holes of Suspension System." (Crew Chief Signoff) Per Damon Bice.
6.8 Removed Step. "Install Conflat Flanges (MA-390374) w/ Copper Gaskets (MA-390375) and Bolt Set (MA-390376) to Cryostat as per Q3 Cryostat General Assembly (ME-390132)." Moved to after Final Cryostat Pipe Survey Measurement. New Step 8.8. Per Damon Bice.
6.11 Added Step. "Install the Support Bracket Assemblies (Qty. 4) (MD-390783) as per Q1 Thermal Shield Assembly (ME-390429)." Per Damon Bice.
7.1 Modified Step. Changed Q3 Resistance table. Moved KEK label resistance check a1-b1 to Nominal resistance group 6.75 Ω to 6.85 Ω. Added MFR Ω column to RTD Table, per Damon Bice.
8.1 Modified Step. Changed to "Prepare the Power Leads and corrector bus to be cut by measuring and marking the appropriate cutoff location as per Q3 Module Assembly (ME-369900)."
8.2 Added Step. "Verify the mark has been placed at the appropriate cutoff location as per Q1 Module Assembly (ME-369894)."

John Szostak	Jim Rife	8/8/2005
Originator	Responsible Authority	Date

Revision Incorporated into the Traveler:

	Revision Incorporated By	Date

Process Engineering Final Review:

	Process Engineering/Designee	Date

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Traveler Title:	Specification No:	Revision:	DR No:
LHC Q3 LQXC Cryostat Final Assembly Traveler	333730	A	4147

Step No:	Drawing No:	Routing Form No:	Serial No:	Rework ID:
4.20	390213		LQXC02	0

Discrepancy Description:

The Q3 cooldown line extension spool (390663) is too big to insert into the cooldown line (390225).

Originator: Steve Gould

Date: 2/8/2005

Cause of Nonconformance:

Part too big.

Responsible Authority: Thomas Page

Date: 9/6/2005 8:28:23 AM

Disposition:

Make parts smaller. All parts have been modified.

Responsible Authority: Thomas Page

Date: 9/6/2005

Corrective Action to Prevent Recurrence:

Done.

Responsible Authority: Thomas Page

Date: 9/6/2005

Corrective Action/Disposition Verified By: John Szostak

Date: 9/16/2005 1:26:22 PM

Will Configuration be affected?: ☐ YES ☑ NO

Identified problem area:

☑ Material ☐ Manpower ☐ Method ☐ Machine ☐ Measurement

Reviewed By: Bob Jensen

Date: 9/16/2005

Traveler Title:	Specification No:	Revision:	DR No:
LHC Q3 LQXC Cryostat Final Assembly Traveler	333730	A	4146

Step No:	Drawing No:	Routing Form No:	Serial No:	Rework ID:
4.19	390214		LQXC02	0

Discrepancy Description:

While welding the Q3 heat exchanger corrugated tube flange (390030) to the tube, an arc from the weldor went across the sealing surface of the flange.

Originator: Steve Gould

Date: 2/8/2005

Cause of Nonconformance:

An arc caused a mark in the sealing surface of the flange.

Responsible Authority: Thomas Page

Date: 2/8/2005

Disposition:

Remove the arc mark from the flange using a fine stone. Stone the flange in a radial direction. The flange will be inspected after stoning.

Responsible Authority: Thomas Page

Date: 2/8/2005

Corrective Action to Prevent Recurrence:

None at this time. No Traveler Change.

Responsible Authority: Thomas Page

Date: 2/8/2005

Corrective Action/Disposition Verified By: John Szostak

Date: 4/6/2005

Will Configuration be affected?: ☐ YES ☑ NO

Identified problem area:

☐ Material ☐ Manpower ☑ Method ☐ Machine ☐ Measurement

Reviewed By: Bob Jensen

Date: 4/20/2005

Revision Request Control Number: 1805

Specification Number: 5520 - TR - 333730 Current Revision: D

Traveler or Document Title LHC Q3 LQXC Cryostat Final Assembly Traveler

Step #/Description of Revision:

4.19 Change sign-off from Technicians to Weldor
4.37 Remove step. Same as 4.40
Step 4.37a Weld Heat Exchanger Outer Shell Extension Spool.
4.39 Ensure the pipe is perpendicular to the end cap when tack welding the pipe to the end cap
4.40 Remove step. Same as 4.37
4.44 Remove step.
4.45 Remove step.
4.55 Move step to 4.32
5.14 Reverse with 5.15
8.2 Step to be verified by Lead Person
8.7 Now Step 8.5
8.8 Now Step 8.6
8.5 Now Step 8.7
8.6 Now Step 8.8

Bob Jensen	Bob Jensen	1/26/2006
Originator	Responsible Authority	Date

Revision Incorporated into the Traveler:

	Revision Incorporated By	Date

Process Engineering Final Review:

	Process Engineering/Designee	Date

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