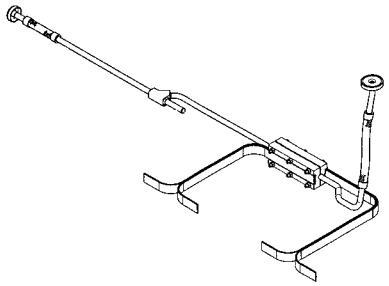
Fermi National Accelerator Laboratory
Batavia, IL 60510

LHC DFBX INSTRUMENT DUCT (MBX2) WELDMENT & WIRING ASSEMBLY



Reference Drawing(s):
LHC DFBX Instrument Duct Weldment & Wiring Assembly ME-418185

Project # / Task #:	**Job #:**
Released by:	**Magnet/Device Series:**
Date:	**Scan Pages:**
Prepared by: B. Jensen	

Title	Signature	Date
TD / E&F Process Engineering	***Bob Jensen*** **Bob Jensen / Designee**	**1/9/04**
TD / D&T Assembly	***Dan Eddy*** **Dan Eddy / Designee**	**1/12/04**
TD / D&T Fabrication Manager	***Fred Lewis*** **Fred Lewis / Designee**	**1/9/04**
TD / D&T Project Engineer	***Clark Reid*** **Tom Peterson / Designee**	**1/13/04**

Revision Page

Revision	Step No.	Revision Description	TRR No.	Date
None	N/A	Initial Release	N/A	1/9/04

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

1.0 General Notes

1.1 White (Lint Free) Gloves (Fermi stock 2250-1800) or Surgical Latex Gloves (Fermi stock 2250-2494) shall be worn by all personnel when handling all product parts after the parts have been prepared/cleaned.

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

1.3 No erasures or white out will be permitted to any documentation. All incorrectly entered data shall be corrected by placing a single line through the error, initial and date the error before adding the correct data.

1.4 All Discrepancy Reports issued shall be recorded in the left margin next to the applicable step.

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

2.0 Parts Kit List

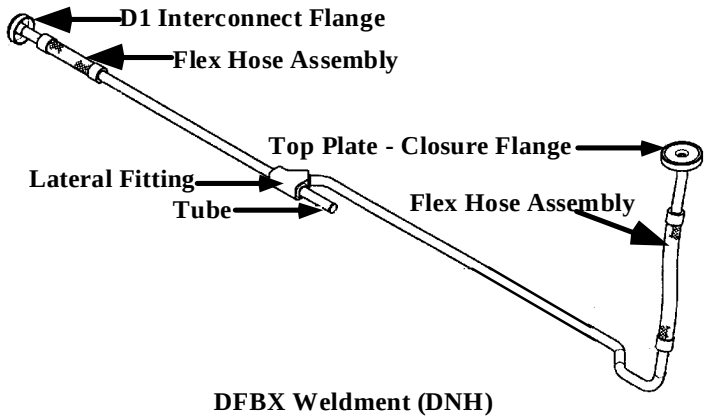
2.1 No Parts Kit required.

3.0 Assembly & Welding

3.1 Acquire the following components and complete the assembly by welding components together in accordance with Dwg ME-418185.

Note: All components must be thoroughly cleaned with Isopropyl Alcohol (Fermi stock 1920-0300) or approved equivalent prior to welding.

MB-418174	Top Plate – Closure Flange	1 ea
MC-418171	Flex Hose Assembly (MQX2)(1 of 2)	1 ea
MB-418169	½' Tube Lateral Fitting	1 ea
MB-418172	Flex Hose Assembly (MBX2)(2 of 2)	1 ea
MB=418176	D1 Interconnect Flange	1 ea
Item #6	Tube, 1/2" O.D. x 0.049" x 2 1/2" long	1 ea
Item #7	Blank-Off	1 ea



DFBX Weldment (DNH)
(Show without wires for clarity)
(Show without Thermal Intercept Block)

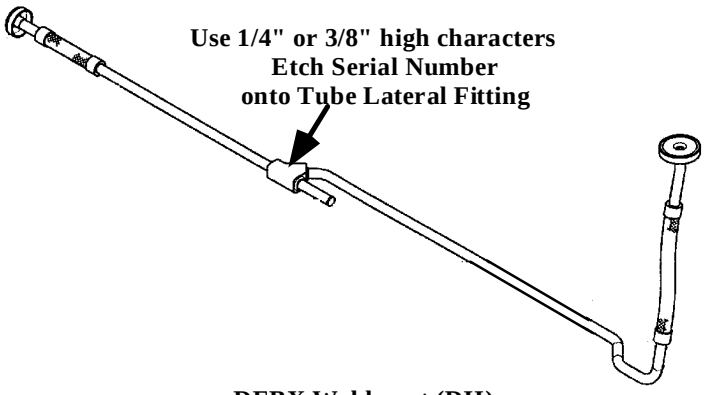
Technician(s) Date

3.2 Perform a Vacuum Leak Check of the DFBX Tube Assembly and record results below.

PART NO.		SCALE UNITS BEFORE HELIUM PROBE	SCALE UNITS WHILE ENCLOSURE FLOODING	DETERMINATION OF MINIMUM DETECTABLE LEAK				
DATE TIME	OPERATOR'S LAST NAME			MDS 4 ((Response -Bckgnd) 4 Leak Value) = MDL				

Inspector Date

3.3 Stamp the serial number on the bottom of this traveler using approved methods onto the DFBX Instrument Duct Weldment & Wiring Assembly as shown below.



DFBX Weldment (DH)
(Show without wires for clarity)
(Show without Thermal Intercept Block)

Technician(s) Date

4.0 Wire Harness Assembly

4.1 Process and assemble the following wire packages in accordance with Dwg ME-418185.

Note: Each individual wire must be labeled prior to assembly as per attached spreadsheet. Labeling should be half way from D1 Interconnect Flange to the end of the wire bundle. Labeling should be half way from Top Plate-Closure Flange and end of wire bundle after wire bundle is inserted into Instrument Duct. (See Step 4.4 & 6.1)

Note: ~ 1 twist/ 3 in –individual cables are **12** feet in length prior to twisting.

Item	Color	Gauge	Description	Wire Count	Spares	Completed by Technician
#10	Red	20	Quench Protection Twisted	4 wires (2 twisted pairs)	1 pair	
#11	Orange	26	Warm-Up Heaters Twisted	4 wires (2 twisted pairs)	2 wires	
#12	Orange	26	Dipole Voltage Taps Twisted	6 wires (3 wires twisted)		
#13	Gold	30	Temperature Sensors	8 wires (2 pairs)	1 wire	

The below list is for labeling of the wires.

	MBX2	Technician	Techncian
CERN Label	Description	Top Plate Closure Flange	D1 Interconnect Flange
EE111	Voltage Tap		
EE112	Voltage Tap		
EE131	Voltage Tap		
EE132	Voltage Tap		
EE151	Voltage Tap		
EE152	Voltage Tap		
YT111+	Cryo Heaters		
YT111-	Cryo Heaters		
YT112+	Cryo Heaters		
YT112-	Cryo Heaters		
EH831+	Warm-up Heaters		
EH831-	Warm-up Heaters		
EH832+	Warm-up Heaters		
EH832-	Warm-up Heaters		
TT831	RTDS		
TT832			

Technician(s) Date

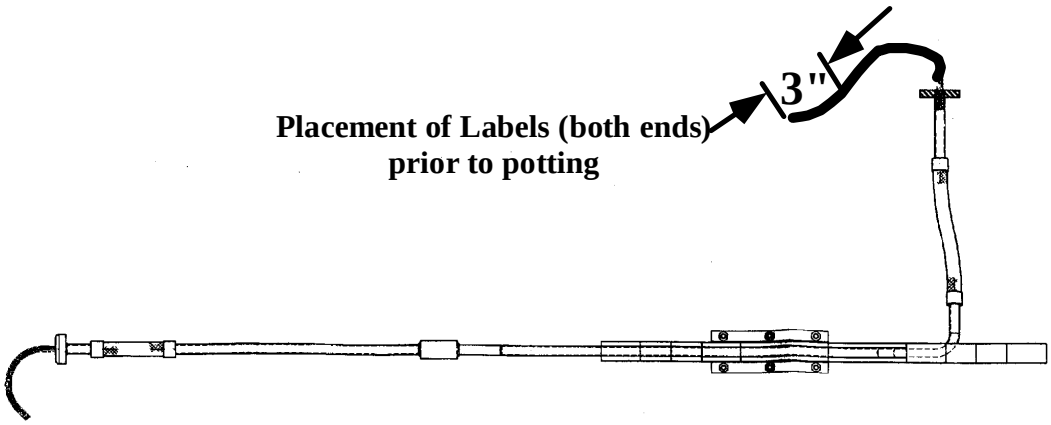
4.2 Assemble the wire packages and secure into a bundle.

Technician(s) Date

4.3 Install wire package into DFBX Duct Assembly.

Technician(s) Date

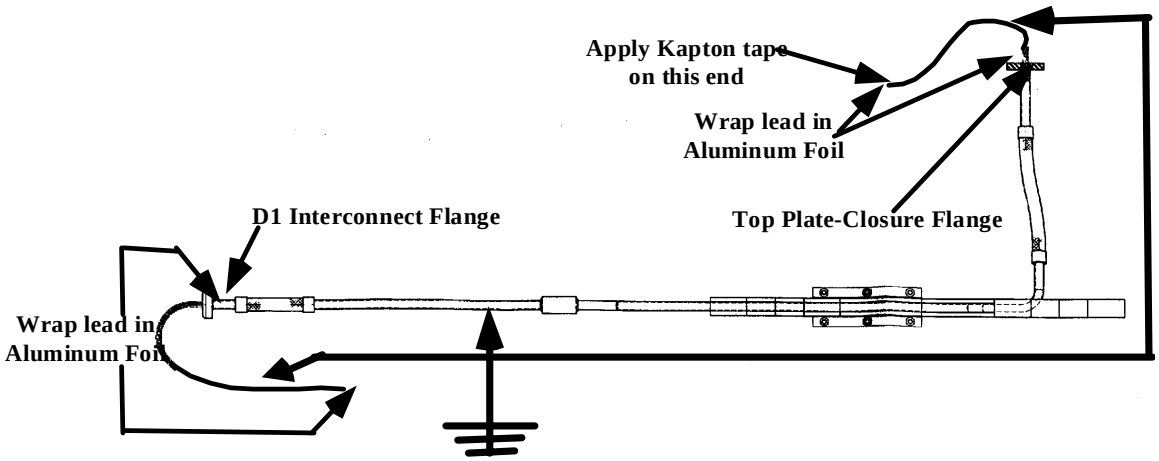
4.4 Labels on individual wire on both ends should be 3 inches from the end of the wires prior to potting. Also, put tape around wire bundle after labeling.



Note: See Step 4.1 for labeling spreadsheet.

Technician(s) Date

4.5 Prepare the wire bundle for hipotting by performing the following:



4.5.1	Check for continuity between all wire and for shorts between RTD wires.	❒
4.5.2	Place Kapton Tape on wire ends to prevent shorting.	❒
4.5.3	Wrap entire lengths of excess wire extending out from both ends of the tube with aluminum foil.	❒
4.5.4	Wrap wire around both ends of the tube extending over the foil to make a connection between foil and tube.	❒
4.5.5	Follow Hipot Form until all Hipots are completed (See Step 4.5).	❒
4.5.6	If wire(s) fail Hipot, determine which one(s) are bad, remove from the tube and install new one(s).	❒
4.5.7	After Hipot is determined good, remove aluminum foil and attach wire.	❒
4.5.8	Put glass tape around the labels on the non-connector end to protect them.	❒

_____ _____

Technician(s) Date

4.6 Electrically check the wire bundle by performing a hipot and record results below.

Hipot	All Others Grounded	All Other Floating	Trip Voltage	5.0 Kv/Current	Comments
VTAPS	**X**				
VTAPS		**X**			
RTD's **(to 300V**)	**X**				
RTD's **(to 300V)**		**X**			
CRYO HEATERS (Warm-Up Heaters)	**X**				
CRYO HEATERS (Warm-Up Heaters)		**X**			
Strip Heaters (Potted In Pairs)					
Pair #1	**X**				
Pair #2	**X**				
Strip Heaters (Potted In Pairs)					
Pair #1		**X**			
Pair #2		**X**			
Spare VTAP Wire(2)	**X**				
Spare VTAP Wire (2)		**X**			
Spare Heater Wires (1 pair)	**X**				
Spare Heater Wires (1 pair)		**X**			
Spare RTD Wire (1)	**X**				
Spare RTD Wire (1)		**X**			

Technician(s) Date

5.0 Material Development Lab

5.1 Prepare DFBX Instrument Duct for Pre-Cast Dam and Epoxy Plug. Process Pre-Cast Dam and Epoxy Lug in accordance with ME-418185 and other approved methods.

Note: Ensure proper Wire Bundle Length of **39**" is maintained from Wire Bundle ends and DFBX Instrument Duct Weldment Assy as per Dwg ME-418185.

Technician(s) Date

6.0 Final Assembly

6.1 Move wire labels on both ends to ~ half way between wire ends and flanges. ❒

6.2 Check each wire for continuity including spares. ❒

Technician(s) Date

6.3 Perform a hipot check.

Hipot	All Others Grounded	All Other Floating	Trip Voltage	5.0 Kv/Current	Comments
VTAPS	**X**				
VTAPS		**X**			
RTD's **(to 300V**)	**X**				
RTD's **(to 300V)**		**X**			
CRYO HEATERS (Warm-Up Heaters)	**X**				
CRYO HEATERS (Warm-Up Heaters)		**X**			
Strip Heaters (Potted In Pairs)					
Pair #1	**X**				
Pair #2	**X**				
Strip Heaters (Potted In Pairs)					
Pair #1		**X**			
Pair #2		**X**			
Spare VTAP Wire(2)	**X**				
Spare VTAP Wire (2)		**X**			
Spare Heater Wires (1 pair)	**X**				
Spare Heater Wires (1 pair)		**X**			
Spare RTD Wire (1)	**X**				
Spare RTD Wire (1)		**X**			

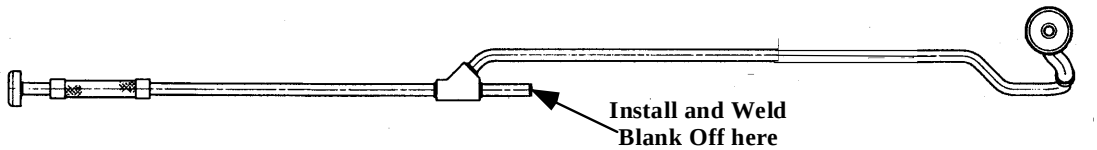
_____ _____
Technician(s) Date

6.4 Bend the DFBX Instrument Duct Assembly as per Dwg ME-418185.

_____ _____
Technician(s) Date

6.5 Acquire the Blank Off (Item #7 – Dwg ME-418185) and weld onto tube.

Note: All components must be thoroughly cleaned with Isopropyl Alcohol (Fermi stock 1920-0300) or approved equivalent prior to welding.



DFBX Insturment Duct
(Top View)
(Shown without wire for clarity)

Technician(s) Date

6.6 Perform a Vacuum Leak Check of the DFBX Tube Assembly and record results below.

PART NO.		SCALE UNITS BEFORE HELIUM PROBE	SCALE UNITS WHILE ENCLOSURE FLOODING	DETERMINATION OF MINIMUM DETECTABLE LEAK				
DATE TIME	OPERATOR'S LAST NAME			MDS 4 ((Response -Bckgnd) 4 Leak Value) = MDL				

Inspector Date

6.7 Electrically check the wire bundle by performing a hipot and record results below.

Note: See Step 4.4 for proper preparations for Hipot.

Hipot	All Others Grounded	All Other Floating	Trip Voltage	5.0 Kv/Current	Comments
VTAPS	**X**				
VTAPS		**X**			
RTD's **(to 300V**)	**X**				
RTD's **(to 300V)**		**X**			
CRYO HEATERS (Warm-Up Heaters)	**X**				
CRYO HEATERS (Warm-Up Heaters)		**X**			
Strip Heaters (Potted In Pairs)					
Pair #1	**X**				
Pair #2	**X**				
Strip Heaters (Potted In Pairs)					
Pair #1		**X**			
Pair #2		**X**			
Spare VTAP Wire(2)	**X**				
Spare Heater Wires (1 pair)	**X**				
Spare RTD Wire (1)	**X**				

_____ _____

Technician(s) Date

6.8 Prepare the DFBX Instrument Duct/Wiring Assembly for shipment by performing the below:

6.8.1 Tape the wire bundle to the Instrument Duct Tube on both ends. ❒

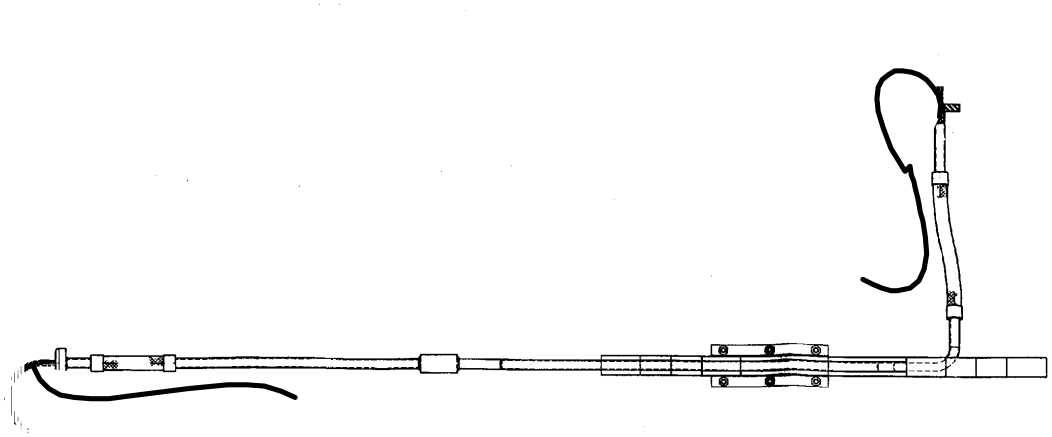


Figure 1

_____ _____

Technician(s) Date

7.0 Production Complete

7.1 Process Engineering verify that the LHC DFBX Instrument Duct Assembly 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:

Process Engineering/Designee Date