

MQXB

Job No.:



335

Project/Task No.



300/1.1.3.1.8

Series:



MQXB

Serial No.:



MQX2003

Rework ID:



0

Specification No.:



333756

Revision:



None

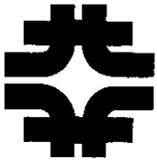
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MQX2003-0

MQXB

LHC DFBX
Instrument Duct
Weldment & Wiring
Assembly
333756 /Rev. None

MQX2003-0



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

**LHC DFBX INSTRUMENT DUCT (MQX2)
WELDMENT & WIRING
ASSEMBLY**

**Reference Drawing(s):
LHC DFBX Instrument Duct
Weldment & Wiring Assembly
ME-418180**

Project # / Task #: 300/1.1.3.1.8

Job #: 335

Released by: Bob Jensen

Magnet/Device Series: MQXB

Date: 1/15/04 8:30:03 AM

Scan Pages: 25

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

| <u>Revision</u> | <u>Step No.</u> | <u>Revision Description</u> | <u>TRR No.</u> | <u>Date</u> |
|-----------------|-----------------|-----------------------------|----------------|-------------|
| None | N/A | Initial Release | N/A | 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

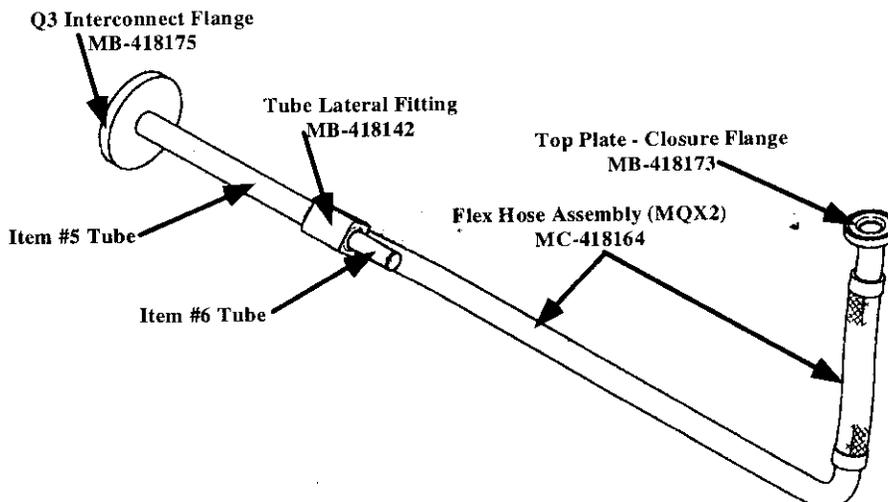
- 2.1 No Parts Kit required.

3.0 Assembly & Welding

3.1 Acquire the following components and complete the assembly by welding components together in accordance with Dwg ME-418180.

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

| | | |
|-----------|--|------|
| MB-418173 | Top Plate - Closure Flange | 1 ea |
| MC-418164 | Flex Hose Assembly (MQX2) | 1 ea |
| MB-418142 | Lateral Fitting | 1 ea |
| MB-418175 | Q3 Interconnect Flange | 1 ea |
| Item #5 | Tube, 1" O.D. x 0.049" x 9 13/16" long | 1 ea |
| Item #6 | Tube 3/4" O.D. x 0.049" x 2 1/2" long | 1 ea |



Note: Clark Reid took the conduit piping parts and drawings to the village weld shop where they were welded up as an assembly. Tom Peterson, March 19, 2004

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 ÷ ((Response -Bckgnd) ÷ Leak Value) = MDL | | | |
| | Mazensill | | | | | | |
| | | Good | | | | | |

*Cold Shocked
11-18-04*

[Handwritten Signature]
Inspector

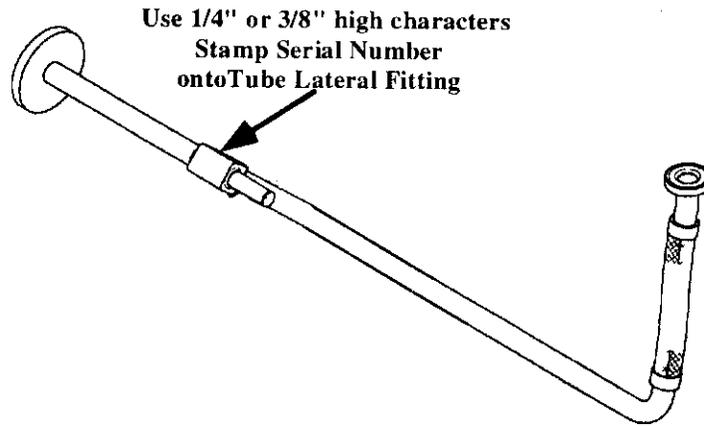
Date

LHC DFBX Instrument Duct Assembly

Device Serial No. MQX2003-0

Notes:

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



Technician(s)  Date 1-14-04

4.0 Wire Harness Assembly

4.1 Process and assemble the following wire packages in accordance with Dwg ME-418180.

Note: Each individual wire must be labeled prior to assembly into Q3-DFBX connector, as per attached spreadsheet.
 Labeling should be ~ 3" from connector.
 Labeling should be ~14" from non-connector end and installed after wire bundle is inserted into Instrument Duct. (See Step 4.5)

Note: ~ 1 twist/ 3 in –individual cables are 9 foot in length prior to twisting.

| Item | Color | Gauge | Description | Wire Count | Spares | Completed by Technician |
|------|--------|-------|--|--------------------------------------|----------|-------------------------|
| #11 | Red | 20 | Quench Protection Twisted | 16 wires (8 – Twisted Pairs) | 2 pair | Dan W. |
| #12 | Red | 20 | Warm-Up Heaters Twisted | 16 wires (8 – Twisted Pairs) | None | Dan W. |
| #13 | Orange | 26 | Quad Voltage Taps Twisted | 24 wires (Twisted as bundle) | 2 spares | Dan W. |
| #14 | Orange | 26 | Corrector Voltage Taps (Not Twisted) | 12 wires (1 bundle – not twisted) | 2 spare | Dan W. |
| #15 | Gold | 30 | Temperature Sensors Twisted 4 wire Pairs | 32 wires (8 – bundles) | 1 spare | Dan W. |

Q3 connector (non-ip, or non-lead end) for Q3-DFBX connection. Completed 11-20-03.

| Module | Pin | CERN Label | Description | Technician Connector End | Technician Non Connector End |
|--------|-----|------------|---|--------------------------|------------------------------|
| M1 | 1 | | Blank Module | | |
| M1 | 2 | | | | |
| M1 | 3 | | | | |
| M1 | 4 | | | | |
| M1 | 5 | | | | |
| M2 | 1 | EE1111 | Q1 Lead Voltage Tap "a", primary | ✓ | ✓ |
| M2 | 2 | EE1121 | Q1 Lead Voltage Tap "a", redundant | ✓ | ✓ |
| M2 | 3 | EE1211 | Q1 Center Voltage Tap "c", primary | ✓ | ✓ |
| M2 | 4 | EE1221 | Q1 Center Voltage Tap "c", redundant | ✓ | ✓ |
| M2 | 5 | EE1311 | Q1 Lead Voltage Tap "b", primary | ✓ | ✓ |
| M3 | 1 | EE1222 | Q2a Center Voltage Tap "c", redundant | ✓ | ✓ |
| M3 | 2 | EE1212 | Q2a Center Voltage Tap "c", primary | ✓ | ✓ |
| M3 | 3 | EE1122 | Q2a Lead Voltage Tap "a", redundant | ✓ | ✓ |
| M3 | 4 | EE1112 | Q2a Lead Voltage Tap "a", primary | ✓ | ✓ |
| M3 | 5 | EE1321 | Q1 Lead Voltage Tap "b", redundant | ✓ | ✓ |
| M4 | 1 | EE1312 | Q2a Lead Voltage Tap "b", primary | ✓ | ✓ |
| M4 | 2 | EE1322 | Q2a Lead Voltage Tap "b", redundant | ✓ | ✓ |
| M4 | 3 | EE1612 | Q2b Lead Voltage Tap "b", primary | ✓ | ✓ |
| M4 | 4 | EE1622 | Q2b Lead Voltage Tap "b", redundant | ✓ | ✓ |
| M4 | 5 | EE1512 | Q2b Center Voltage Tap "c", primary | ✓ | ✓ |
| M5 | 1 | EE1123 | Q3 Lead Voltage Tap "a", redundant | ✓ | ✓ |
| M5 | 2 | EE1113 | Q3 Lead Voltage Tap "a", primary | ✓ | ✓ |
| M5 | 3 | EE1422 | Q2b Lead Voltage Tap "a", redundant | ✓ | ✓ |
| M5 | 4 | EE1412 | Q2b Lead Voltage Tap "a", primary | ✓ | ✓ |
| M5 | 5 | EE1522 | Q2b Center Voltage Tap "c", redundant | ✓ | ✓ |
| M6 | 1 | EE1213 | Q3 Center Voltage Tap "c", primary | ✓ | ✓ |
| M6 | 2 | EE1223 | Q3 Center Voltage Tap "c", redundant | ✓ | ✓ |
| M6 | 3 | EE1313 | Q3 Lead Voltage Tap "b", primary | ✓ | ✓ |
| M6 | 4 | EE1323 | Q3 Lead Voltage Tap "b", redundant | ✓ | ✓ |
| M6 | 5 | Empty | No connection | | |
| M7 | 1 | | Blank Module | | |
| M7 | 2 | | | | |
| M7 | 3 | | | | |
| M7 | 4 | | | | |
| M7 | 5 | | | | |
| M8 | 1 | EE8121 | Corrector voltage tap Q1-H1 (skew dipole) (on MCBX, MCBXH, A+ lead) | ✓ | ✓ |
| M8 | 2 | EE8111 | Corrector voltage tap Q1-V1 (normal dipole) (on MCBX, MCBXV A+ lead) | ✓ | ✓ |
| M8 | 3 | EE8122 | Corrector voltage tap Q2-H2 (skew dipole) (on MCBX, MCBXH, A+ lead) | ✓ | ✓ |
| M8 | 4 | EE8112 | Corrector voltage tap Q2-V2 (normal dipole) (on MCBX, MCBXV, A+ lead) | ✓ | ✓ |
| M8 | 5 | Empty | No connection | | |
| M9 | 1 | EE8123 | Corrector voltage tap Q3-H3 (skew dipole) (on MCBXA, MCBXH, A+ lead) | ✓ | ✓ |
| M9 | 2 | EE8113 | Corrector voltage tap Q3-V3 (normal dipole) (on MCBXA, MCBXV, A+ lead) | ✓ | ✓ |
| M9 | 3 | EE8223 | Corrector voltage tap Q3-A2 (skew quadrupole) (on MQSX, MQSX, A+ lead) | ✓ | ✓ |
| M9 | 4 | EE8323 | Corrector voltage tap Q3-A3 (skew sextupole) (on MCSOX, MCSOX, A+ lead) | ✓ | ✓ |
| M9 | 5 | Empty | No Connection | | |

Q3 connector (non-ip, or non-lead end) for Q3-DFBX connection. Completed 11-20-03.

| Module | Pin | CERN Label | Description | Technician Connector End | Technician Connector End |
|--------|-----|------------|--|--------------------------|--------------------------|
| M10 | 1 | EE8313 | Corrector voltage tap Q3-B3 (normal sextupole)(on MCBXA, MCSX, A+ lead) | ✓ | ✓ |
| M10 | 2 | EE8423 | Corrector voltage tap Q3-A4 (skew octupole) (on MCSOX, MCOSX, A+ lead) | ✓ | ✓ |
| M10 | 3 | EE8413 | Corrector voltage tap Q3-B4 (normal octupole) (on MCSOX, MCOX, A+ lead) | ✓ | ✓ |
| M10 | 4 | EE8613 | Corrector voltage tap Q1-B6 (normal dodecapole) (on MCBXA, MCTX, A+ lead) | ✓ | ✓ |
| M10 | 5 | Empty | No Connection | | |
| M11 | 1 | | Blank Module | | |
| M11 | 2 | | | | |
| M11 | 3 | | | | |
| M11 | 4 | | | | |
| M11 | 5 | | | | |
| M12 | 1 | EH8311+ | Q1 Cryogenic Heater lead end - wire at top (CERN #1 I+) | ✓ | ✓ |
| M12 | 2 | EH8311- | Q1 Cryogenic Heater lead end - wire at bottom (CERN #1 I-) | ✓ | ✓ |
| M12 | 3 | EH8321+ | Q1 Cryogenic Heater non-lead end - wire at top (CERN #2 I+) | ✓ | ✓ |
| M12 | 4 | EH8321- | Q1 Cryogenic Heater non-lead end - wire at bottom (CERN #2 I-) | ✓ | ✓ |
| M12 | 5 | Empty | No Connection | | |
| M13 | 1 | EH8312+ | Q2A Cryogenic Heater lead end - wire toward cold mass end plate (CERN #1 I+) | ✓ | ✓ |
| M13 | 2 | EH8312- | Q2A Cryogenic Heater lead end - wire toward cold mass mag center (CERN #1 I-) | ✓ | ✓ |
| M13 | 3 | EH8322+ | Q2A Cryogenic Heater non-lead end- wire toward cold mass end plate (CERN #2 I+) | ✓ | ✓ |
| M13 | 4 | EH8322- | Q2A Cryogenic Heater non-lead end- wire toward cold mass mag center (CERN #2 I-) | ✓ | ✓ |
| M13 | 5 | Empty | No connection | | |
| M14 | 1 | EH8332+ | Q2B Cryogenic Heater lead end - wire toward cold mass end plate (CERN #1 I+) | ✓ | ✓ |
| M14 | 2 | EH8332- | Q2B Cryogenic Heater lead end - wire toward cold mass mag center (CERN #1 I-) | ✓ | ✓ |
| M14 | 3 | EH8342+ | Q2B Cryogenic Heater non-lead end- wire toward cold mass end plate (CERN #2 I+) | ✓ | ✓ |
| M14 | 4 | EH8342- | Q2B Cryogenic Heater non-lead end- wire toward cold mass mag center (CERN #2 I-) | ✓ | ✓ |
| M14 | 5 | Empty | No connection | | |
| M15 | 1 | EH8313+ | Q3 Cryogenic Heater lead end - wire at top (CERN #1 I+) | ✓ | ✓ |
| M15 | 2 | EH8313- | Q3 Cryogenic Heater lead end - wire at bottom (CERN #1 I-) | ✓ | ✓ |
| M15 | 3 | EH8323+ | Q3 Cryogenic Heater non-lead end - wire at top (CERN #2 I+) | ✓ | ✓ |
| M15 | 4 | EH8323- | Q3 Cryogenic Heater non-lead end - wire at bottom (CERN #2 I-) | ✓ | ✓ |
| M15 | 5 | Empty | No Connection | | |
| M16 | 1 | | Blank Module | | |
| M16 | 2 | | | | |
| M16 | 3 | | | | |
| M16 | 4 | | | | |
| M16 | 5 | | | | |
| M17 | 1 | YT1111+ | Q1 Protection (Strip) Heater, ("a" circuit) (CERN lead #1+) | ✓ | ✓ |
| M17 | 2 | Empty | No connection | | |
| M17 | 3 | YT1111- | Q1 Protection (Strip) Heater, ("a" circuit) (CERN lead #1-) | ✓ | ✓ |
| M17 | 4 | Empty | No connection | | |
| M17 | 5 | YT1121+ | Q1 Protection (Strip) Heater, ("b" circuit) (CERN lead #2+) | ✓ | ✓ |
| M18 | 1 | Empty | No connection | | |
| M18 | 2 | YT1112+ | Q2a Protection (Strip) Heater, 1-4 & 2-3 circuit (FNAL lead A+) (CERN lead #1+) | ✓ | ✓ |
| M18 | 3 | Empty | No connection | | |
| M18 | 4 | YT1121- | Q1 Protection (Strip) Heater, ("b" circuit) (CERN lead #2-) | ✓ | ✓ |
| M18 | 5 | Empty | No connection | | |

Q3 connector (non-ip, or non-lead end) for Q3-DFBX connection. Completed 11-20-03.

| Module | Pin | CERN Label | Description | Technician Connector End | Technician Non Connector End |
|--------|-----|------------|---|--------------------------|------------------------------|
| M19 | 1 | YT1112- | Q2a Protection (Strip) Heater, 1-4 & 2-3 circuit (FNAL lead A-) (CERN lead #1-) | ✓ | ✓ |
| M19 | 2 | Empty | No connection | | |
| M19 | 3 | YT1122+ | Q2a Protection (Strip) Heater, 1-2 & 3-4 circuit (FNAL lead B+) (CERN lead#2+) | ✓ | ✓ |
| M19 | 4 | Empty | No connection | | |
| M19 | 5 | YT1122- | Q2a Protection (Strip) Heater, 1-2 & 3-4 circuit (FNAL lead B-) (CERN lead #2-) | ✓ | ✓ |
| M20 | 1 | Empty | No connection | | |
| M20 | 2 | YT1132- | Q2b Protection (Strip) Heater, 1-4 & 2-3 circuit (FNAL lead A-) (CERN lead #1-) | ✓ | ✓ |
| M20 | 3 | Empty | No connection | | |
| M20 | 4 | YT1132+ | Q2b Protection (Strip) Heater, 1-4 & 2-3 circuit (FNAL lead A+) (CERN lead #1+) | ✓ | ✓ |
| M20 | 5 | Empty | No connection | | |
| M21 | 1 | YT1142+ | Q2b Protection (Strip) Heater, 1-2 & 3-4 circuit (FNAL lead B+) (CERN lead#2+) | ✓ | ✓ |
| M21 | 2 | Empty | No connection | | |
| M21 | 3 | YT1142- | Q2b Protection (Strip) Heater, 1-2 & 3-4 circuit (FNAL lead B-) (CERN lead #2-) | ✓ | ✓ |
| M21 | 4 | Empty | No Connection | | |
| M21 | 5 | YT1113+ | Q3 Protection (Strip) Heater, ("a" circuit) (CERN lead #1+) | ✓ | ✓ |
| M22 | 1 | Empty | No Connection | | |
| M22 | 2 | YT1123+ | Q3 Protection (Strip) Heater, ("b" circuit) (CERN lead #2+) | ✓ | ✓ |
| M22 | 3 | Empty | No Connection | | |
| M22 | 4 | YT1113- | Q3 Protection (Strip) Heater, ("a" circuit) (CERN lead #1-) | ✓ | ✓ |
| M22 | 5 | Empty | No Connection | | |
| M23 | 1 | YT1123- | Q3 Protection (Strip) Heater, ("b" circuit) (CERN lead #2-) | ✓ | ✓ |
| M23 | 2 | Empty | No Connection | | |
| M23 | 3 | Empty | No Connection | | |
| M23 | 4 | Empty | No Connection | | |
| M23 | 5 | Empty | No Connection | | |
| M24 | 1 | | Blank Module | | |
| M24 | 2 | | | | |
| M24 | 3 | | | | |
| M24 | 4 | | | | |
| M24 | 5 | | | | |
| M25 | 1 | TT8311 I+ | Q1 RTD, primary Wire color: Yellow | ✓ | ✓ |
| M25 | 2 | TT8311 I- | Q1 RTD, primary Wire color: Green | ✓ | ✓ |
| M25 | 3 | TT8311 U+ | Q1 RTD, primary Wire color: Black | ✓ | ✓ |
| M25 | 4 | TT8311 U- | Q1 RTD, primary Wire color: Red | ✓ | ✓ |
| M25 | 5 | TT8321 I+ | Q1 RTD, redundant: Wire color: Yellow | ✓ | ✓ |
| M25 | 6 | TT8321 I- | Q1 RTD, redundant: Wire color: Green | ✓ | ✓ |
| M25 | 11 | TT8321 U+ | Q1 RTD, redundant: Wire color: Black | ✓ | ✓ |
| M25 | 10 | TT8321 U- | Q1 RTD, redundant: Wire color: Red | ✓ | ✓ |
| M25 | 9 | TT8312 I+ | Q2a RTD, primary Wire color: Yellow | ✓ | ✓ |
| M25 | 8 | TT8312 I- | Q2a RTD, primary Wire color: Green | ✓ | ✓ |
| M25 | 7 | TT8312 U+ | Q2a RTD, primary Wire color: Black | ✓ | ✓ |
| M25 | 12 | TT8312 U- | Q2a RTD, primary Wire color: Red | ✓ | ✓ |
| M25 | 13 | TT8322 I+ | Q2a RTD, redundant: Wire color: Yellow | ✓ | ✓ |
| M25 | 14 | TT8322 I- | Q2a RTD, redundant: Wire color: Green | ✓ | ✓ |
| M25 | 15 | TT8322 U+ | Q2a RTD, redundant: Wire color: Black | ✓ | ✓ |
| M25 | 16 | TT8322 U- | Q2a RTD, redundant: Wire color: Red | ✓ | ✓ |
| M25 | 17 | Empty | No connection | | |

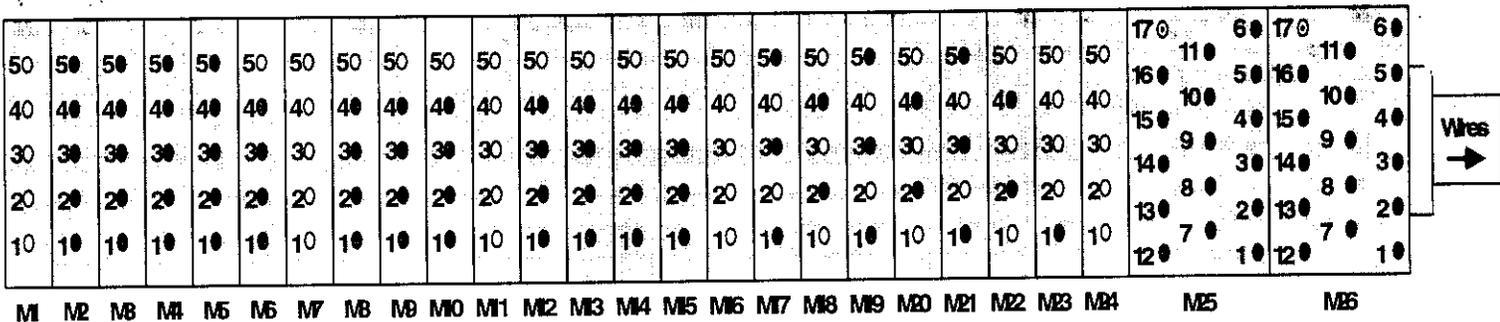
Note:
Pin numbers of module M25 are not listed in numerical order

Q3 connector (non-ip, or non-lead end) for Q3-DFBX connection. Completed 11-20-03.

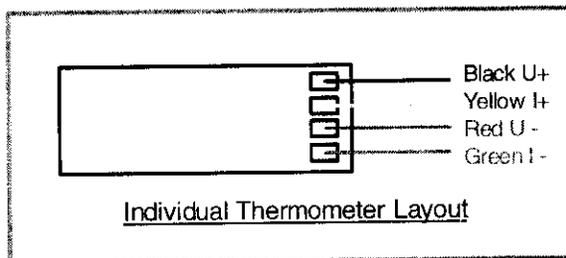
| Module | Pin | CERN Label | Description | Technician Connector End | Technician on Connector End |
|--------|-----|------------|--|--------------------------|-----------------------------|
| M26 | 1 | TT8332 I+ | Q2b RTD, primary Wire color: Yellow | ✓ | ✓ |
| M26 | 2 | TT8332 I- | Q2b RTD, primary Wire color: Green | ✓ | ✓ |
| M26 | 3 | TT8332 U+ | Q2b RTD, primary Wire color: Black | ✓ | ✓ |
| M26 | 4 | TT8332 U- | Q2b RTD, primary Wire color: Red | ✓ | ✓ |
| M26 | 5 | TT8342 I+ | Q2b RTD, redundant: Wire color: Yellow | ✓ | ✓ |
| M26 | 6 | TT8342 I- | Q2b RTD, redundant: Wire color: Green | ✓ | ✓ |
| M26 | 11 | TT8342 U+ | Q2b RTD, redundant: Wire color: Black | ✓ | ✓ |
| M26 | 10 | TT8342 U- | Q2b RTD, redundant: Wire color: Red | ✓ | ✓ |
| M26 | 9 | TT8313 I+ | Q3 RTD, primary Wire color: Yellow | ✓ | ✓ |
| M26 | 8 | TT8313 I- | Q3 RTD, primary Wire color: Green | ✓ | ✓ |
| M26 | 7 | TT8313 U+ | Q3 RTD, primary Wire color: Black | ✓ | ✓ |
| M26 | 12 | TT8313 U- | Q3 RTD, primary Wire color: Red | ✓ | ✓ |
| M26 | 13 | TT8323 I+ | Q3 RTD, redundant: Wire color: Yellow | ✓ | ✓ |
| M26 | 14 | TT8323 I- | Q3 RTD, redundant: Wire color: Green | ✓ | ✓ |
| M26 | 15 | TT8323 U+ | Q3 RTD, redundant: Wire color: Black | ✓ | ✓ |
| M26 | 16 | TT8323 U- | Q3 RTD, redundant: Wire color: Red | ✓ | ✓ |
| M26 | 17 | Empty | No connection | | |

Note:
Pin numbers of module M26 are not listed in numerical order

**Hypertronics Connector Pin Locations Q3 non-lead (non-ip) end.
VIEW: Female (pin) solder cup side**



- Hole filled in grey: Wire soldered to pin.
- ⊙ Hole with dot in center: Pin exists but no wire soldered to it.
- Hole filled in white: No pin. Hole is drilled out.



Jan W.
Technician(s)

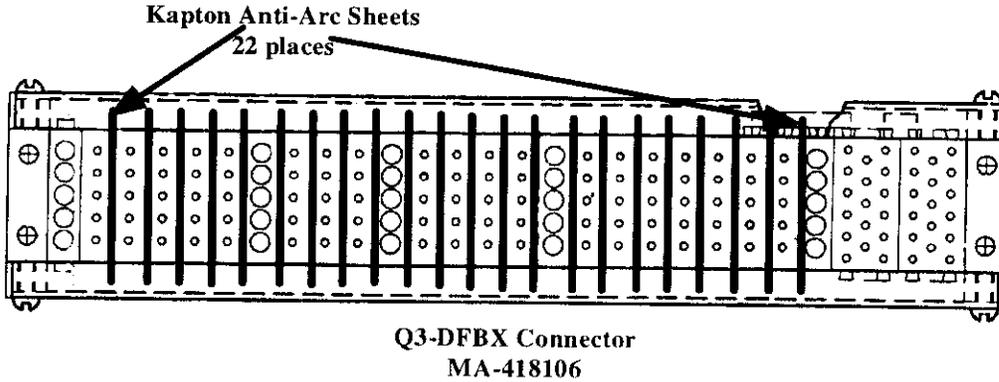
1-21-04
Date

4.2 Assemble the wire packages and secure into a bundle.

Dan W.
Technician(s)

1-21-04
Date

4.3 Terminate ends of the wire bundle and install them into the Q3-DFBX Connector – 28 unit (MB-418106) using the following parts:



| | | |
|-----------|-------------------------|-------|
| MA-418097 | Blank 5 Pin #LAHT | 5 ea |
| MA-418095 | Female 5 Pin #LAMSTH | 19 ea |
| MA-419099 | Female 17 Pin #LDMSTH | 2 ea |
| MA-418103 | Plastic Block #YHD0027 | 50ea |
| MA-418104 | End Part #YEC0076C | 2 ea |
| MA-418102 | Mounting Rail #YSR0028Z | 2 ea |
| MA-418195 | Screw, M-3 | 4 ea. |

Note: Install Kapton Anti-Arc Sheets in position noted above as wires are being terminated to connector.

Dan W.
Technician(s)

1-21-04
Date

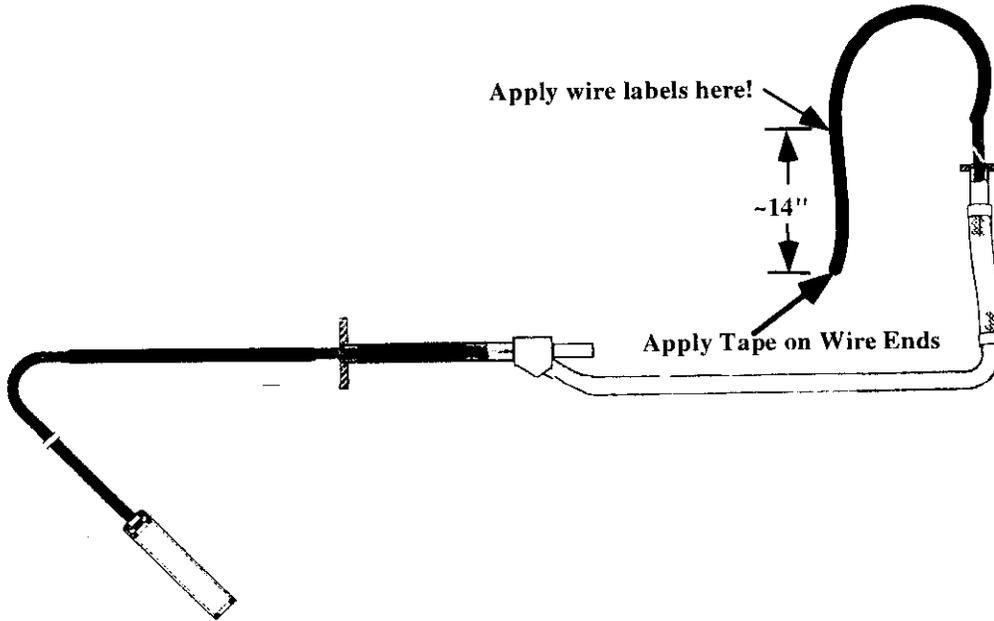
4.4 Install wire package into DFBX Duct Assembly.

Dan W.
Technician(s)

1-21-04
Date

4.5 Label the non-connector end wires ~ 14" from the end of each wire.

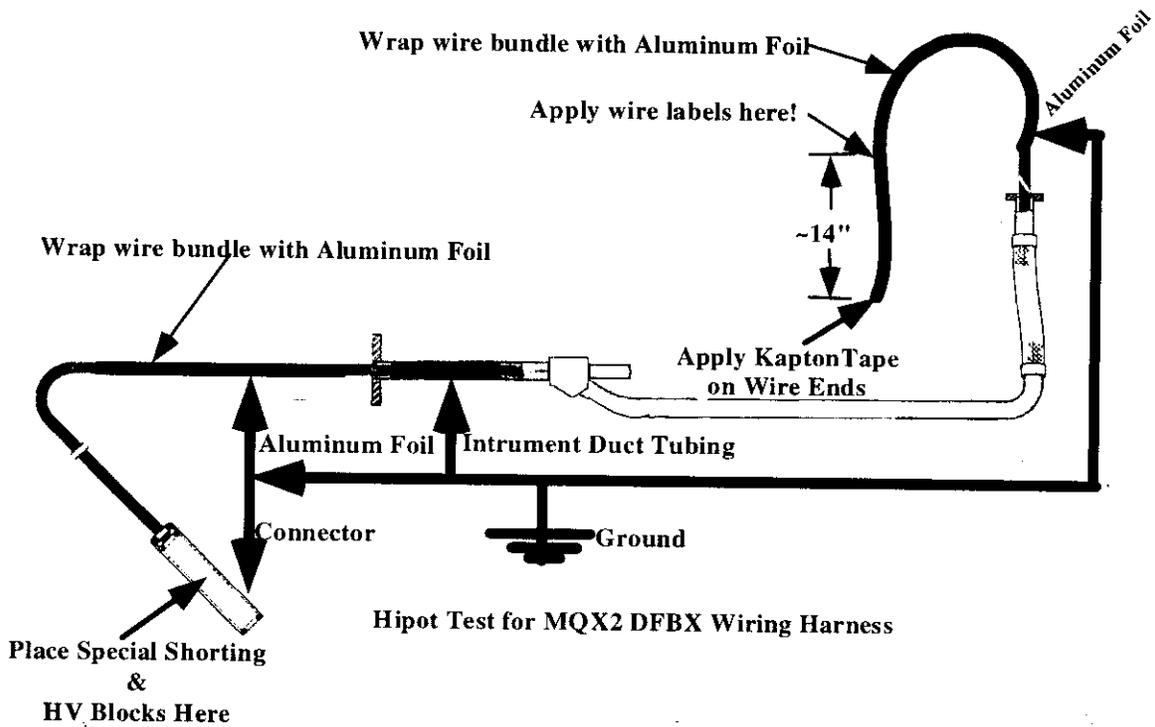
Note: See Step 4.1 for labeling spreadsheet.



Dan W.
Technician(s)

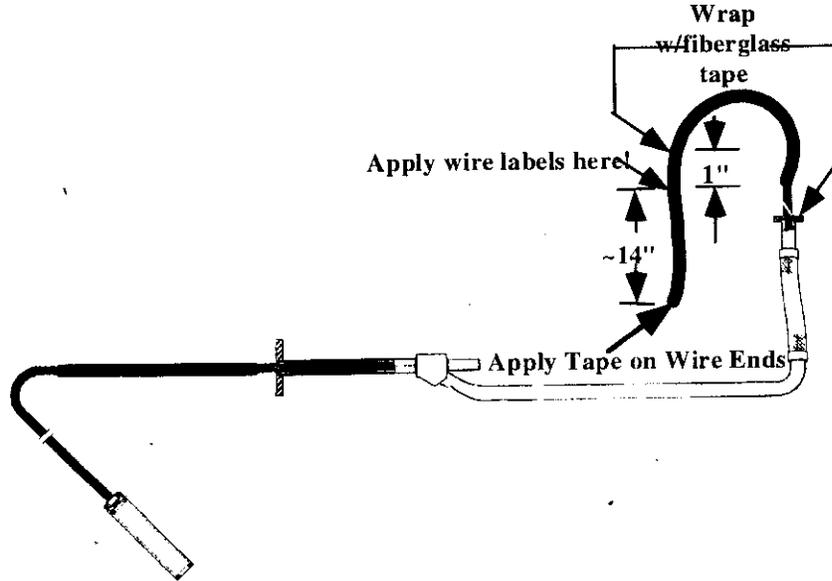
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Date

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



- 4.6.1 Check for continuity between all wire and for shorts between each pin and all other pins of the RTD's.
- 4.6.2 Ground Outer Tube
- 4.6.3 Place Kapton Tape on wire ends to prevent shorting.
- 4.6.4 Install Connector & Access Cover (MB-418067).
- 4.6.5 Wrap entire lengths of excess wire extending out from both ends of the tube with aluminum foil.
- 4.6.6 Wrap wire around both ends of the tube extending over the foil to make a connection between foil and tube.
- 4.6.7 Using the special Hypertronic HV Modules and Hipot Form, attach High Voltage from HV Power Supply to First set or group of wires to be tested.
- 4.6.8 Follow Hipot Form until all Hipots are completed (See Step 4.5).
- 4.6.9 If wire(s) fail Hipot, determine which one(s) are bad, remove from the tube and install new one(s).
- 4.6.10 After Hipot is determined good, remove aluminum foil and attach wire.

-
-
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-
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-



4.6.11 Put glass tape one inch from the labels on the non-connector end to keep them from sliding off.

 Dan W.
Technician(s)

 1-21-04
Date

4.7 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 | | | .04 μ A | |
| VTAPS | | X | | .04 μ A | |
| CCOIL | X | | | .04 μ A | |
| CCOIL | | X | | .04 μ A | |
| RTD's (to 300V) | X | | | .01 μ A | |
| RTD's (to 300V) | | X | | .01 μ A | |
| CRYO HEATERS (Warm-Up Heaters) | X | | | .04 μ A | |
| CRYO HEATERS (Warm-Up Heaters) | | X | | .04 μ A | |
| Strip Heaters (Potted In Pairs) | | | | | |
| Pair #1 | X | | | .04 μ A | |
| Pair #2 | X | | | .04 μ A | |
| Pair #3 | X | | | .04 μ A | |
| Pair #4 | X | | | .04 μ A | |
| Pair #5 | X | | | .04 μ A | |
| Pair #6 | X | | | .04 μ A | |
| Pair #7 | X | | | .04 μ A | |
| Pair #8 | X | | | .04 μ A | |
| Strip Heaters (Potted In Pairs) | | | | | |
| Pair #1 | | X | | .04 μ A | |
| Pair #2 | | X | | .04 μ A | |
| Pair #3 | | X | | .04 μ A | |
| Pair #4 | | X | | .04 μ A | |
| Pair #5 | | X | | .04 μ A | |
| Pair #6 | | X | | .04 μ A | |
| Pair #7 | | X | | .04 μ A | |
| Pair #8 | | X | | .04 μ A | |
| Spare VTAP Wire(4) | X | | | .04 μ A | |
| Corrector Voltage Taps | | X | | .04 μ A | |
| Spare Heater Wires (2 pair) | X | | | .04 μ A | |
| | | X | | .04 μ A | |
| Spare RTD Wire (1) | X | | | .01 μ A | |
| | | X | | .01 μ A | |

 Dan W.
Technician(s)

 1-21-04
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-418180 and other approved methods.

Note: Ensure proper Wire Bundle Length of 24" is maintained from Wire Bundle Connector and DFBX Instrument Duct Weldment Assy as per Dwg ME-418180.

Note: Dave Burk at the Materials Testing and Development Lab in the village processed the pre-cast epoxy dam and epoxy plug for all the conduits.
Tom Peterson, March 19, 2004

6.0 Final Assembly

6.1 Check each wire for continuity including spares.

6.2 Check each wire for shorting to adjacent wire within each pin connector.

Dan W.
Technician(s)

1-21-04
Date

6.3 Perform an hipot check with the Capillary Tube to ground.

| Hipot | All Others Grounded | All Other Floating | Trip Voltage | 5.0 Kv/Current | Comments |
|---------------------------------|---------------------|--------------------|--------------|----------------|----------|
| VTAPS | X | | | .04uA | |
| VTAPS | | X | | .04uA | |
| CCOIL | X | | | .04uA | |
| CCOIL | | X | | .04uA | |
| RTD's (to 300V) | X | | | .01uA | |
| RTD's (to 300V) | | X | | .01uA | |
| CRYO HEATERS (Warm-Up Heaters) | X | | | .04uA | |
| CRYO HEATERS (Warm-Up Heaters) | | X | | .04uA | |
| Strip Heaters (Potted In Pairs) | | | | | |
| Pair #1 | X | | | .04uA | |
| Pair #2 | X | | | .04uA | |
| Pair #3 | X | | | .04uA | |
| Pair #4 | X | | | .04uA | |
| Pair #5 | X | | | .04uA | |
| Pair #6 | X | | | .04uA | |
| Pair #7 | X | | | .04uA | |
| Pair #8 | X | | | .04uA | |
| Strip Heaters (Potted In Pairs) | | | | | |
| Pair #1 | | X | | .04uA | |
| Pair #2 | | X | | .04uA | |
| Pair #3 | | X | | .04uA | |
| Pair #4 | | X | | .04uA | |
| Pair #5 | | X | | .04uA | |
| Pair #6 | | X | | .04uA | |
| Pair #7 | | X | | .04uA | |
| Pair #8 | | X | | .04uA | |
| Spare VTAP Wire(4) | X | | | .04uA | |
| Corrector Voltage Taps | | X | | .04uA | |
| Spare Heater Wires (2 pair) | X | | | .04uA | |
| | | X | | .04uA | |
| Spare RTD Wire (1) | X | | | .01uA | |
| | | X | | .01uA | |

Dan W.
Technician(s)

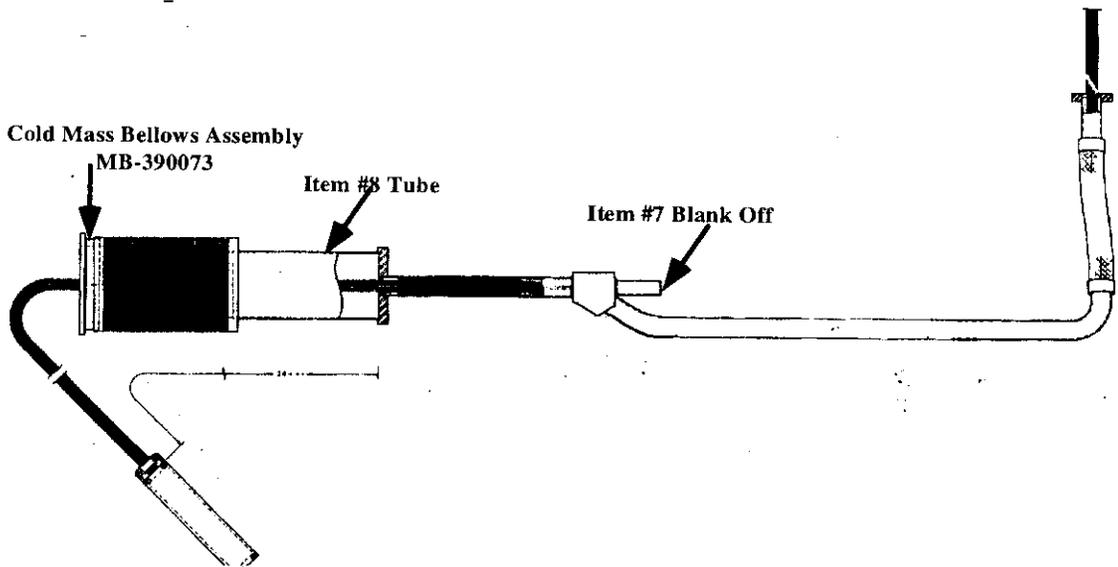
1-21-04
Date

6.4 Acquire the following components and complete the assembly by welding components together in accordance with Dwg ME-418180.

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

Note: Protect the Wire Bundle from touching the weld areas until welding heat has been dissipated to prevent damage to Wire Bundle.

| | | |
|-----------|---|------|
| Item #7 | Blank Off | 1 ea |
| Item #8 | Tube, 3 1/2" O.D. x 0.065" x 7.28" long | 1 ea |
| MB-390073 | Cold Mass Bellows Assembly | 1 ea |



Note: Clark Reid took the conduit piping parts and drawings to the village weld shop where they were welded up as an assembly. Tom Peterson, March 19, 2004

6.5 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 ÷ ((Response - Bckgnd) ÷ Leak Value) = MDL | | | |
| 1-14-04 | Massewicz | 68x1 | 68x1 | 28x5 | 50x1 | | |
| | | | | | | | |

[Handwritten Signature]
Inspector

1-14-04
Date

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

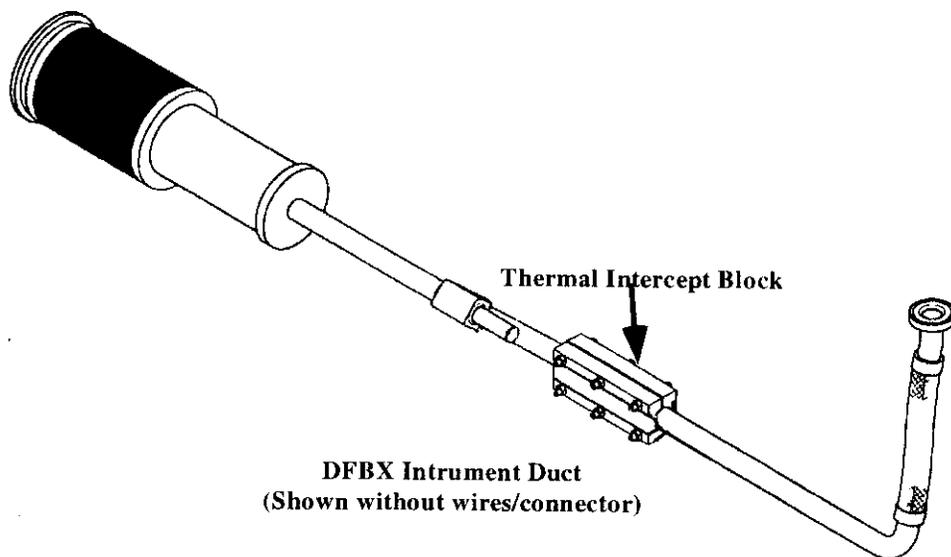
Note: See Step 4.4 for proper preparations for Hipot.

| Hipot | All Others Grounded | All Other Floating | Trip Voltage | 5.0 Kv/Current | Comments |
|---------------------------------|---------------------|--------------------|--------------|----------------|----------|
| VTAPS | X | | | .04uA | |
| VTAPS | | X | | .04uA | |
| CCOIL | X | | | .04uA | |
| CCOIL | | X | | .04uA | |
| RTD's (to 300V) | X | | | .01uA | |
| RTD's (to 300V) | | X | | .01uA | |
| CRYO HEATERS (Warm-Up Heaters) | X | | | .04uA | |
| CRYO HEATERS (Warm-Up Heaters) | | X | | .04uA | |
| Strip Heaters (Potted In Pairs) | | | | | |
| Pair #1 | X | | | .04uA | |
| Pair #2 | X | | | .04uA | |
| Pair #3 | X | | | .04uA | |
| Pair #4 | X | | | .04uA | |
| Pair #5 | X | | | .04uA | |
| Pair #6 | X | | | .04uA | |
| Pair #7 | X | | | .04uA | |
| Pair #8 | X | | | .04uA | |
| Strip Heaters (Potted In Pairs) | | | | | |
| Pair #1 | | X | | .04uA | |
| Pair #2 | | X | | .04uA | |
| Pair #3 | | X | | .04uA | |
| Pair #4 | | X | | .04uA | |
| Pair #5 | | X | | .04uA | |
| Pair #6 | | X | | .04uA | |
| Pair #7 | | X | | .04uA | |
| Pair #8 | | X | | .04uA | |
| Spare VTAP Wire(4) | X | | | .04uA | |
| Corrector Voltage Taps | | X | | .04uA | |
| Spare Heater Wires (2 pair) | X | | | .04uA | |
| | | X | | .04uA | |
| Spare RTD Wire (1) | X | | | .01uA | |
| | | X | | .01uA | |
| | | X | | | |

Jan W.
Technician(s)

1-21-04
Date

- 6.7 Install Thermal Intercept Block (MB-418184) using Hex Head Cap Screw (1/4" -20" X 2 1/4" long) and Hex Nut (1/4" -20) in accordance with Dwg ME-418180.



Note: The thermal intercept block is not installed at Fermilab, but has been provided separately to Meyer Tool. Tom Peterson, March 19, 2004

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

- 6.8.1 On the connector end, fold over the spare wires and tape to the wire bundle with white fiberglass tape. See Figure #1 below.
- 6.8.2 Coil the connector end wire bundle and insert into the bellows assembly. Ensure the Connector is pointing outward after insertion into bellows assy.
- 6.8.3 Wrap the bellows assembly with cardboard and secure with tape.
- 6.8.4 Insert Plastic Cover, Red, into cardboard protector and secure with tape.
- 6.8.5 Fold over spare wires and tape to the non-connector end wire bundle. Only 1/2" up to the labels. See Figure #1 & Figure #2 below.
- 6.8.6 Tape the non-connector end wire bundle to the Instrument Duct Tube.

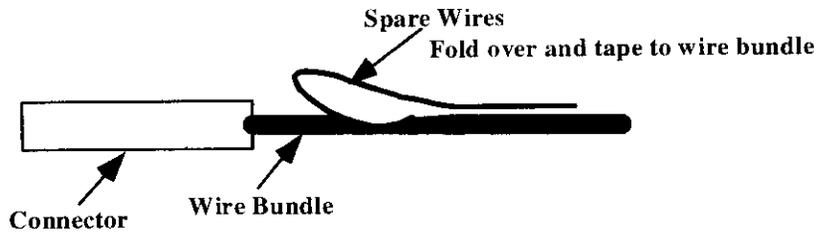


Figure 1

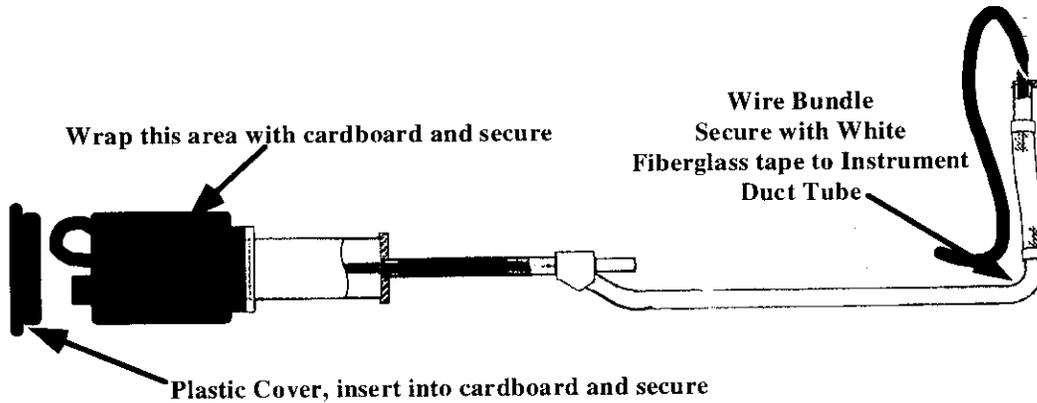


Figure 2

Dan W.
Technician(s)

1-21-04
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:

MOX2003 was delivered to Meyer Hall on June 20, 2004
Tom Peterson

Bob Olms
Process Engineering/Designee

4/15/04
Date