



4. Room Temperature Electrical
Checkout

DFLX-01

Note: Save the shipping container for storing and moving the leads around TD and after the test is complete to ship them to the DFBX manufacturer.

Performed by DAN EDDY (Name typed) [Signature] (Signature)

Date & time 3/20/03 10:00 A.M.

Pos. Power Lead 7500 A DFLX 02 and Neg. Power Lead 7500 A DFLX 01

When checkout is complete, make sure you place the original and a copy of this document in the Traveler Binder.

3.1 Voltage segment and drop measurement.

Apply 10 Amps between the copper flag on Positive Lead and the copper flag on Negative Lead.

Record the applied current 10 A

Use HP3458 DVM, set it to 40-line cycle integration time.

Measure the voltages between the following pins:

Positive Lead

Voltage tap Connector 1 (Primary) (Fisher DEE104A06)

Pin 1 - pin 2 (160uv) <u>165</u> V	Pin 2 - pin 3 (450uv) <u>465</u> V
Pin 1 - pin 3 (610uv) <u>630</u> V	Pin 3 - pin 4 (480uv) <u>451</u> V
Pin 1 - pin 4 (1.1mv) <u>1.08</u> V	Pin 4 - pin 5 (3.5mv) <u>3.89</u> V
Pin 1 - pin 5 (4.7mv) <u>4.98</u> V	Pin 5 - pin 6 (float) <u>FLOAT</u> V
Pin 1 - pin 6 (float) <u>FLOAT</u> V	

Voltage tap Connector 2 (Redundant) (Fisher DEE104A06)

Pin 1 - pin 2 (160uv) <u>165</u> V	Pin 2 - pin 3 (450uv) <u>463</u> V
Pin 1 - pin 3 (610uv) <u>630</u> V	Pin 3 - pin 4 (480uv) <u>556</u> V
Pin 1 - pin 4 (1.1mv) <u>1.19</u> V	Pin 4 - pin 5 (3.5mv) <u>3.79</u> V
Pin 1 - pin 5 (4.7mv) <u>4.98</u> V	Pin 5 - pin 6 (float) <u>FLOAT</u> V
Pin 1 - pin 6 (float) <u>FLOAT</u> V	

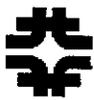
Negative Lead

Voltage tap Connector 2 (Primary) (Fisher DEE104A06)

Pin 1 - pin 2 (-160uv) <u>-165</u> V	Pin 2 - pin 3 (-450uv) <u>-473</u> V
Pin 1 - pin 3 (-600uv) <u>-638</u> V	Pin 3 - pin 4 (-480uv) <u>-499</u> V
Pin 1 - pin 4 (-1.1mv) <u>-1.13</u> V	Pin 4 - pin 5 (-3.5mv) <u>-3.71</u> V
Pin 1 - pin 5 (-4.7mv) <u>-4.95</u> V	Pin 5 - pin 6 (float) <u>FLOAT</u> V
Pin 1 - pin 6 (float) <u>FLOAT</u> V	

Voltage tap Connector 2 (Redundant) (Fisher DEE104A06)

Pin 1 - pin 2 (-160uv) <u>-166</u> V	Pin 2 - pin 3 (-450uv) <u>-469</u> V
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Pin 1 - pin 3 (-600uv) -633 V Pin 3 - pin 4 (-480uv) -494 V
 Pin 1 - pin 4 (-1.1mv) -1.12 V Pin 4 - pin 5 (-3.5mv) -3.72 V
 Pin 1 - pin 5 (-1.5mv) -4.85 V Pin 5 - pin 6 (float) FLOAT V
 Pin 1 - pin 6 (float) FLOAT V

3.2 Using 2 Vtap cables: Connection 1-one vtap cable to the primary of each lead
 Connection 2- one vtap cable to the redundant of each lead

Connection 1 (Primary)

Positive Lead Pin 1 - Negative Lead pin 5 (3.7mv) 3.89 V
 Positive Lead Pin 1 - Negative Lead pin 4 (7.3mv) 7.41 V
 Positive Lead Pin 1 - Negative Lead pin 3 (7.7mv) 8.10 V
 Positive Lead Pin 1 - Negative Lead pin 2 (8.2mv) 8.57 V
 Positive Lead Pin 1 - Negative Lead pin 1 (8.3mv) 8.74 V

Connection 2 (Redundant)

Positive Lead Pin 1 - Negative Lead pin 5 (3.7mv) 3.89 V
 Positive Lead Pin 1 - Negative Lead pin 4 (7.3mv) 7.41 V
 Positive Lead Pin 1 - Negative Lead pin 3 (7.7mv) 8.10 V
 Positive Lead Pin 1 - Negative Lead pin 2 (8.2mv) 8.57 V
 Positive Lead Pin 1 - Negative Lead pin 1 (8.3mv) 8.74 V

3.3 Temperature sensor resistance measurements.

3.3.1 Two wire measurement on connector 3 of Positive Lead (Fisher DEE104Z086):

Resistance between Pin 1 and pin 2 (.800) .930 Ω
 Resistance between Pin 1 and pin 3 (109) 109.07 Ω
 Resistance between Pin 1 and pin 4 (109) 109.07 Ω
 Resistance between Pin 2 and pin 3 (109) 109.04 Ω
 Resistance between Pin 2 and pin 4 (109) 109.04 Ω
 Resistance between Pin 3 and pin 4 (.800) .900 Ω
 Pins 1-4 resistance to lead ∞ Ω Pins 1-4 resistance to flange ∞ Ω

Resistance between Pin 5 and pin 6 (.800) .809 Ω
 Resistance between Pin 5 and pin 7 (109) 109.02 Ω
 Resistance between Pin 5 and pin 8 (109) 109.02 Ω
 Resistance between Pin 6 and pin 7 (109) 109.03 Ω
 Resistance between Pin 6 and pin 8 (109) 109.03 Ω
 Resistance between Pin 7 and pin 8 (.800) .806 Ω
 Pins 5-8 resistance to lead ∞ Ω Pins 5-8 resistance to flange ∞ Ω



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Resistance between Pin 9 and pin 10 (.800) .727 Ω
 Resistance between Pin 9 and pin 11 (109) 109.06 Ω
 Resistance between Pin 9 and pin 12 (109) 109.06 Ω
 Resistance between Pin 10 and pin 11 (109) 109.05 Ω
 Resistance between Pin 10 and pin 12 (109) 109.05 Ω
 Resistance between Pin 11 and pin 12 (.800) .704 Ω
 Pins 9-12 resistance to lead ∞ Ω Pins 9-12 resistance to flange ∞ Ω

3.3.2 Using HP3458 DVM measure temperature sensor resistance with the four wire measurement technique:

Resistance of T1 108.24 Ω(108.5)(I+ at pin 1,U+ at pin 2,I- at pin 3,U- at pin 4)
 Resistance of T2 108.22 Ω(108.5) (I+ at pin 5, U+ at pin 6, I- at pin 7, U- at pin 8)
 Resistance of T3 108.34 Ω(108.5)(I+ at pin 9,U+ at pin 10,I- at pin 11,U- at pin 12)

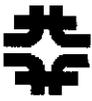
3.3.3 Two wire measurement on connector 3 of Negative Lead (Fisher DEE104Z086):

Resistance between Pin 1 and pin 2 (.800) .835 Ω
 Resistance between Pin 1 and pin 3 (109) 109.09 Ω
 Resistance between Pin 1 and pin 4 (109) 109.09 Ω
 Resistance between Pin 2 and pin 3 (109) 109.07 Ω
 Resistance between Pin 2 and pin 4 (109) 109.06 Ω
 Resistance between Pin 3 and pin 4 (.800) .809 Ω
 Pins 1-4 resistance to lead ∞ Ω Pins 1-4 resistance to flange ∞ Ω

Resistance between Pin 5 and pin 6 (.800) .822 Ω
 Resistance between Pin 5 and pin 7 (109) 109.05 Ω
 Resistance between Pin 5 and pin 8 (109) 109.05 Ω
 Resistance between Pin 6 and pin 7 (109) 109.06 Ω
 Resistance between Pin 6 and pin 8 (109) 109.06 Ω
 Resistance between Pin 7 and pin 8 (.800) .815 Ω
 Pins 5-8 resistance to lead ∞ Ω Pins 5-8 resistance to flange ∞ Ω

Resistance between Pin 9 and pin 10 (.800) .744 Ω
 Resistance between Pin 9 and pin 11 (109) 109.11 Ω
 Resistance between Pin 9 and pin 12 (109) 109.11 Ω
 Resistance between Pin 10 and pin 11 (109) 109.09 Ω
 Resistance between Pin 10 and pin 12 (109) 109.09 Ω
 Resistance between Pin 11 and pin 12 (.800) .715 Ω
 Pins 9-12 resistance to lead ∞ Ω Pins 9-12 resistance to flange ∞ Ω

3.3.4 Using HP3458 DVM measure temperature sensor resistance with the four wire measurement technique:



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Resistance of T1 109.26 Ω (108.5) (I+ at pin 1, U+ at pin 2, I- at pin 3, U- at pin 4)
Resistance of T2 109.23 Ω (108.5) (I+ at pin 5, U+ at pin 6, I- at pin 7, U- at pin 8)
Resistance of T3 109.37 Ω (108.5) (I+ at pin 9, U+ at pin 10, I- at pin 11, U- at pin 12)

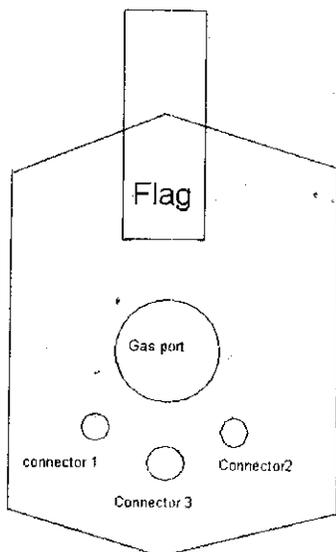
3.4 Connect all dewar rtd's and liquid level. Connect three 19-pin top plate cables labeled "dewar 0, dewar 1, and dewar inlet HE te/II". Also connect N2 shield rtd and outlet HE rtd's (one for each lead). All of these should be read out on cryo computer. All should read room temperature that is approximately 295 K. Any problems list in space provided below:

*T1 507-3A READS 280(K) → 4 WIRE MEASUREMENT (64.313 OHMS)
ALL OTHERS AROUND 295(K)*

3.5 Check the liquid level by connecting the test box into J1 of liquid level meter. As you adjust meter from 0 to 12 inches, the cryo computer liquid level should read the same. Do a resistance measurement on liquid level probe. The resistance should read about 160 Ω . The liquid level is connected to pins 9,10,11,12 of "dewar inlet HE te/II" connector. OK NOT OK

BOTH 12" & 30"

4.0 Using a Droege HV power supply, hi-pot the flag of the positive lead to 1000v.



Looking from the top of the lead down where the LTS cable is located.
Connector 2= Redundant, Connector 1= Primary and Connector 3= RTD.

CHECKOUT OF LIQUID LEVEL PROBE

1. RED \rightarrow BLUE = 5 OHMS (APPROX.)
2. BLUE \rightarrow YELLOW = 13.75 \times ACTIVE LENGTH
3. YELLOW \rightarrow BLACK = .7 OHMS
4. RED \rightarrow BLACK = (RED \rightarrow BLUE + BLUE \rightarrow YELLOW)

12" PROBE @ J1 CONN.

4 WIRE @ J1 = 163.72

1. 6.055
 2. 165.550 (13.75 \times 12) = 165
 3. 2.239
 4. 170.292 (6.055 + 165.550 = 171.605)
-

30" PROBE @ J1 CONN.

1. 6.348

4 WIRE @ J1 = 403.0

2. 404.42 (13.75 \times 30 = 412.50)

3. 1.361

4. 409.31 (404.42 + 6.34 = 410.76)



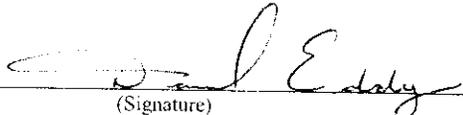
FERMILAB
Technical
Division

7500A HTS Power leads for the LHC DFBX

Doc. No.
Rev. No.
Date: January 31, 2003
Page 1 of 4
Author: Fred Lewis

4. Room Temperature Electrical
Checkout

Note: Save the shipping container for storing and moving the leads around TD and after the test is complete to ship them to the DFBX manufacturer.

Performed by IAN EDDY (Name typed)  (Signature)

Date & time 2/26/03 11:00 A.M.

Power Lead 7500 A DFLX 02 and Power Lead 7500 A DFLX 01

When checkout is complete, make sure you place the original and a copy of this document in the Traveler Binder.

3.1 Voltage segment and drop measurement.

Apply 10 Amps between the copper flag on Positive Lead and the copper flag on Negative Lead.

Record the applied current 10 A

Use HP3458 DVM, set it to 40-line cycle integration time.

Measure the voltages between the following pins:

Positive Lead

Voltage tap Connector 1 (Primary) (Fisher DEE104A06)

Pin 1 - pin 2 (160uv) 160uv V Pin 2 - pin 3 (450uv) 448uv V
Pin 1 - pin 3 (600uv) 610uv V Pin 3 - pin 4 (480uv) 240uv V
Pin 1 - pin 4 (1.1mv) 852uv V Pin 4 - pin 5 (400uv) 392mv V
Pin 1 - pin 5 (1.5mv) 4.78mv V Pin 5 - pin 6 (float) FLUAT V
Pin 1 - pin 6 (float) FLUAT V

Voltage tap Connector 2 (Redundant) (Fisher DEE104A06)

Pin 1 - pin 2 (160uv) 160uv V Pin 2 - pin 3 (250uv) 449uv V
Pin 1 - pin 3 (600uv) 609uv V Pin 3 - pin 4 (480uv) 536uv V
Pin 1 - pin 4 (1.1mv) 1.14mv V Pin 4 - pin 5 (400uv) 3.63mv V
Pin 1 - pin 5 (1.5mv) 4.78mv V Pin 5 - pin 6 (float) FLUAT V
Pin 1 - pin 6 (float) FLUAT V

Negative Lead

Voltage tap Connector 2 (Primary) (Fisher DEE104A06)

Pin 1 - pin 2 (-160uv) -160uv V Pin 2 - pin 3 (-450uv) -455uv V
Pin 1 - pin 3 (-600uv) -615uv V Pin 3 - pin 4 (-480uv) -479uv V
Pin 1 - pin 4 (-1.1mv) -1.09mv V Pin 4 - pin 5 (-400uv) -3.55mv V
Pin 1 - pin 5 (-1.5mv) -4.64mv V Pin 5 - pin 6 (float) FLUAT V
Pin 1 - pin 6 (float) FLUAT V

Voltage tap Connector 2 (Redundant) (Fisher DEE104A06)

Pin 1 - pin 2 (-160uv) -160uv V Pin 2 - pin 3 (-250uv) -450uv V



4. Room Temperature Electrical Checkout

Pin 1 - pin 3 (-600uv) $\underline{-610\mu V}$ V Pin 3 - pin 4 (-480uv) $\underline{-478\mu V}$ V
 Pin 1 - pin 4 (-1.1mv) $\underline{-1.08mv}$ V Pin 4 - pin 5 (-400uv) $\underline{-3.55mv}$ V
 Pin 1 - pin 5 (-1.5mv) $\underline{-4.64mv}$ V Pin 5 - pin 6 (float) \underline{FLOAT} V
 Pin 1 - pin 6 (float) \underline{FLOAT} V

3.2 Using 2 Vtap cables: Connection 1-one vtap cable to the primary of each lead
 Connection 2- one vtap cable to the redundant of each lead

Connection 1 (Primary)

Positive Lead Pin 1 - Negative Lead pin 5 (800uv) $\underline{3.74mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 4 (1.2mv) $\underline{7.29mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 3 (1.6mv) $\underline{7.77mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 2 (1.8mv) $\underline{8.22mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 1 (2mv) $\underline{8.38mv}$ V

Connection 2 (Redundant)

Positive Lead Pin 1 - Negative Lead pin 5 (800uv) $\underline{3.74mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 4 (1.2mv) $\underline{7.30mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 3 (1.6mv) $\underline{7.77mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 2 (1.8mv) $\underline{8.22mv}$ V
 Positive Lead Pin 1 - Negative Lead pin 1 (2mv) $\underline{8.38mv}$ V

3.3 Temperature sensor resistance measurements.

3.3.1 Two wire measurement on connector 3 of Positive Lead (Fisher DEE104Z086):

Resistance between Pin 1 and pin 2 $\underline{.825}$ Ω
 Resistance between Pin 1 and pin 3 $\underline{109.30}$ Ω
 Resistance between Pin 1 and pin 4 $\underline{109.29}$ Ω
 Resistance between Pin 2 and pin 3 $\underline{109.28}$ Ω
 Resistance between Pin 2 and pin 4 $\underline{109.27}$ Ω
 Resistance between Pin 3 and pin 4 $\underline{802}$ Ω
 Pins 1-4 resistance to lead $\underline{\infty}$ Ω Pins 1-4 resistance to flange $\underline{\infty}$ Ω

Resistance between Pin 5 and pin 6 $\underline{.808}$ Ω
 Resistance between Pin 5 and pin 7 $\underline{109.24}$ Ω
 Resistance between Pin 5 and pin 8 $\underline{109.26}$ Ω
 Resistance between Pin 6 and pin 7 $\underline{109.26}$ Ω
 Resistance between Pin 6 and pin 8 $\underline{109.27}$ Ω
 Resistance between Pin 7 and pin 8 $\underline{.804}$ Ω
 Pins 5-8 resistance to lead $\underline{\infty}$ Ω Pins 5-8 resistance to flange $\underline{\infty}$ Ω



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Resistance between Pin 9 and pin 10 .727 Ω
 Resistance between Pin 9 and pin 11 109.19 Ω
 Resistance between Pin 9 and pin 12 109.20 Ω
 Resistance between Pin 10 and pin 11 109.19 Ω
 Resistance between Pin 10 and pin 12 109.18 Ω
 Resistance between Pin 11 and pin 12 .704 Ω
 Pins 9-12 resistance to lead ∞ Ω Pins 9-12 resistance to flange ∞ Ω

3.3.2 Using HP3458 DVM measure temperature sensor resistance with the four wire measurement technique:

Resistance of T1 108.47 Ω (I+ at pin 1, U+ at pin 2, I- at pin 3, U- at pin 4)
 Resistance of T2 108.46 Ω (I+ at pin 5, U+ at pin 6, I- at pin 7, U- at pin 8)
 Resistance of T3 108.47 Ω (I+ at pin 9, U+ at pin 10, I- at pin 11, U- at pin 12)

3.3.3 Two wire measurement on connector 3 of Negative Lead (Fisher DEE104Z086):

Resistance between Pin 1 and pin 2 .831 Ω
 Resistance between Pin 1 and pin 3 109.29 Ω
 Resistance between Pin 1 and pin 4 109.28 Ω
 Resistance between Pin 2 and pin 3 109.26 Ω
 Resistance between Pin 2 and pin 4 109.26 Ω
 Resistance between Pin 3 and pin 4 .812 Ω
 Pins 1-4 resistance to lead ∞ Ω Pins 1-4 resistance to flange ∞ Ω

Resistance between Pin 5 and pin 6 .824 Ω
 Resistance between Pin 5 and pin 7 109.24 Ω
 Resistance between Pin 5 and pin 8 109.25 Ω
 Resistance between Pin 6 and pin 7 109.25 Ω
 Resistance between Pin 6 and pin 8 109.25 Ω
 Resistance between Pin 7 and pin 8 .814 Ω
 Pins 5-8 resistance to lead ∞ Ω Pins 5-8 resistance to flange ∞ Ω

Resistance between Pin 9 and pin 10 .744 Ω
 Resistance between Pin 9 and pin 11 109.23 Ω
 Resistance between Pin 9 and pin 12 109.22 Ω
 Resistance between Pin 10 and pin 11 109.22 Ω
 Resistance between Pin 10 and pin 12 109.21 Ω
 Resistance between Pin 11 and pin 12 .716 Ω
 Pins 9-12 resistance to lead ∞ Ω Pins 9-12 resistance to flange ∞ Ω

3.3.4 Using HP3458 DVM measure temperature sensor resistance with the four wire measurement technique:



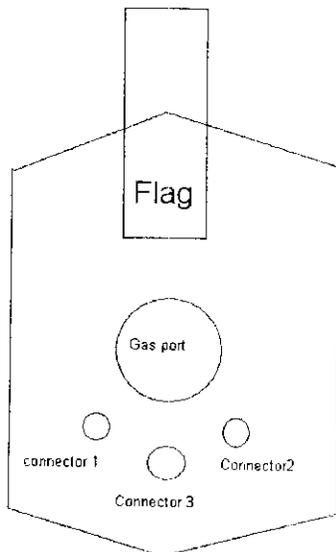
4. Room Temperature Electrical Checkout

Resistance of T1 108.49 Ω (I- at pin 1, U+ at pin 2, I- at pin 3, U- at pin 4)
Resistance of T2 108.43 Ω (I- at pin 5, U+ at pin 6, I- at pin 7, U- at pin 8)
Resistance of T3 108.45 Ω (I+ at pin 9, U+ at pin 10, I- at pin 11, U- at pin 12)

3.4 Connect all dewar rtd's and liquid level. Connect three 19-pin top plate cables labeled "dewar 0, dewar 1, and dewar inlet HE te/II". Also connect N2 shield rtd and outlet HE rtd's (one for each lead). All of these should be read out on cryo computer. All should read room temperature that is approximately 295 K. Any problems list in space provided below:

3.5 Check the liquid level by connecting the test box into J1 of liquid level meter. As you adjust meter from 0 to 12 inches, the cryo computer liquid level should read the same. OK NOT OK

4.0 Using a Droege HV power supply, hi-pot the flag of the positive lead to 1000v.



Looking from the top of the lead down where the LTS cable is located.
Connector 2= Redundant, Connector 1= Primary and Connector 3= RTD.



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7500A HTS Power leads for the LHC DFBX

Doc. No.
Rev. No.
Date: March 5, 2003
Page 1 of 1
Author: Dan Eddy

4. Room Temperature Hi-pot In HE Gas Environment

Note: Save the shipping container for storing and moving the leads around TD and after the test is complete to ship them to the DFBX manufacturer.

Performed by Dan Eddy (Name typed) [Signature] (Signature)

Date & time 3/5/03 11:30 A.M.

Pos. Power Lead 7500 A DFLX 02 and Neg. Power Lead 7500 A DFLX 01

This hi-pot should be performed after room temp electrical checkout is complete. When both checkouts are complete, make sure you place the original and a copy of these documents in the Traveler Binder.

3.1 Hi-pot the leads at room temperature in a HE gas environment to 1500V (1.3 Bar) using a droege. Connect the positive to one lead and the negative to ground. **Be sure to disconnect the redundant voltage taps on both leads and the power connections (one on each lead) from kepcio power supply.**

Record breakdown voltage (if any) _____ V.
Record current > 1.42 A.
Record approximate temp 295 K.



1. Unpacking Check Out Form

Performed by SUDHIR GHANTA (name typed) [Signature] (signature)
Date & time 1/8/03 5PM

Note: Save the shipping container for storing and moving the leads around TD and after the test is complete to ship them to the DFBX manufacturer.

1.1 Container Identification: 7500 A DFLX ___ 7500 A DFLX ___
(Leads serial numbers are on one side of the container) ID MISSING ON BOX

1.2 Note condition of shipping container
No damage Slight damage Massive damage

1.3 Examine condition of g-load indicators
a. Each side of the box are Shock Watch-s are installed
Not tripped Tripped (red) Remark: _____
Not tripped Tripped (red) Remark: _____

b. Each leads have a Shock Watch installed onto their body
Not tripped Tripped (red) Remark: INSTALLED ON FLAG OF LEADS
Not tripped Tripped (red) Remark: INSTALLED ON FLAG OF LEADS

c. Each leads have another "10G DROP" devices installed on the flag of the leads
Not tripped Tripped (Black) Remark: MISSING
Not tripped Tripped (Black) Remark: MISSING

1.4 Container content:
a. Power leads: 7500 A DFLX 01 ; 7500 A DFLX 02
b. Travel document for each lead in an envelope
c. In a plastic box:

1. One clamp: Item No. C105-12-401; Description NW16/10 Clamping ring
ST/STEEL PK1
2. One valve made by "precision Cryogenic System"
3. One O-ring seal with brass insert

PART NAME : 7.5 KA CURRENT LEAD ASSY (LBNL01)
 REV NUMBER :
 SER NUMBER :
 STATS COUNT : 1

7520A DFLX 01

WITH INSULATOR

1-1

MM	DIM CYL -A-DIA= LOCATION OF CYLINDER CYL -A-						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
D	99.000	0.200	0.200	98.831	-0.169	0.000	

MM	DIM -A-= ROUNDNESS OF CYLINDER CYL -A-						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	0.000	0.200	0.000	0.103	0.103	0.000	

MM	DIM -B-= FLATNESS OF PLANE PLN -B-						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	0.000	0.050	0.000	0.006	0.006	0.000	

MM	DIM PERP1= PERPEND OF PLANE PLN -B- TO CYLINDER CYL -A- EXTEND=0.000						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	0.000	0.130	0.000	0.080	0.080	0.000	

MM	DIM PERP2= PERPEND OF PLANE LRG FLANGE TO CYLINDER CYL -A- EXTEND=50						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	0.000	0.130	0.000	1.248	1.248	1.118	

MM	DIM -C- DIA= LOCATION OF CYLINDER -C-						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
D	80.000	0.200	0.200	80.106	0.106	0.000	

MM	DIM CONCEN2=CONCENTRICITY FROM CYLINDER -C- TO CYLINDER CYL -A-						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	0.000	0.250	0.000	0.898	0.898	0.648	

MM	DIM RND2= ROUNDNESS OF CYLINDER -C-						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	0.000	0.200	0.000	0.101	0.101	0.000	

MM	DIM DIST1= 2D DISTANCE FROM PLANE PLN -B- TO PLANE LRG FLANGE PAR TO						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	561.000	1.000	1.000	561.576	0.576	0.000	

MM	DIM LOC5= TRUE POSITION OF CIRCLE CIR2						
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
X	0.000				0.000	0.000	
Z	123.571				123.964	0.393	
DF	16.000	0.200	0.200		17.968	1.968	1.768
TP	RFS	0.400		0.000		0.786	0.386

MM DIM LOC10= TRUE POSITION OF CIRCLE CIR3							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
X	-78.890				-78.808	0.082	
Z	95.047				95.056	0.009	
DF	16.000	0.200	0.200		17.966	1.966	1.766
TP	RFS	0.400		0.000		0.165	0.000

MM DIM LOC11= TRUE POSITION OF CIRCLE CIR4							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
X	78.890				79.082	0.192	
Z	95.047				95.850	0.803	
DF	16.000	0.200	0.200		17.978	1.978	1.778
TP	RFS	0.400		0.000		1.652	1.252

MM DIM LOC12= TRUE POSITION OF CIRCLE CIR5							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
X	78.890				80.025	1.135	
Z	-95.047				-94.217	0.830	
DF	16.000	0.200	0.200		17.942	1.942	1.742
TP	RFS	0.400		0.000		2.812	2.412

MM DIM LOC13= TRUE POSITION OF CIRCLE CIR6							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
X	-78.890				-77.866	1.024	
Z	-95.047				-95.006	0.041	
DF	16.000	0.200	0.200		17.947	1.947	1.747
TP	RFS	0.400		0.000		2.051	1.651

MM DIM LOC09= TRUE POSITION OF CIRCLE ID1							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				89.785	-0.765	
PA	-153.000				-152.745	0.255	
DF	8.407	0.200	0.200		8.570	0.163	0.000
TP	RFS	0.080		0.000		1.728	1.648

MM DIM LOC20= TRUE POSITION OF CIRCLE ID2							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				89.815	-0.734	
PA	-171.000				-170.872	0.128	
DF	8.407	0.200	0.200		8.578	0.170	0.000
TP	RFS	0.080		0.000		1.523	1.443

MM DIM LOC31= TRUE POSITION OF CIRCLE ID3							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				89.893	-0.657	
PA	-135.000				-134.615	0.385	
DF	8.407	0.200	0.200		8.575	0.168	0.000
TP	RFS	0.080		0.000		1.789	1.709

MM DIM LOC1= TRUE POSITION OF CIRCLE ID4							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				89.906	-0.644	
PA	171.000				170.970	-0.030	
DF	8.407	0.200	0.200		8.568	0.160	0.000
TP	RFS	0.080		0.000		1.291	1.211

MM DIM LOC2= TRUE POSITION OF CIRCLE ID5							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				90.064	-0.486	
PA	153.000				152.863	-0.137	
DF	8.407	0.200	0.200		8.556	0.148	0.000
TP	RFS	0.080		0.000		1.064	0.984

MM DIM LOC3= TRUE POSITION OF CIRCLE ID6							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				90.289	-0.261	
PA	135.000				134.824	-0.176	
DF	8.407	0.200	0.200		8.552	0.145	0.000
TP	RFS	0.080		0.000		0.763	0.683

MM DIM LOC4= TRUE POSITION OF CIRCLE ID7							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				90.544	-0.006	
PA	117.000				116.795	-0.205	
DF	8.407	0.200	0.200		8.536	0.128	0.000
TP	RFS	0.080		0.000		0.649	0.569

MM DIM LOC6= TRUE POSITION OF CIRCLE ID8							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				90.759	0.209	
PA	99.000				98.853	-0.147	
DF	8.407	0.200	0.200		8.537	0.130	0.000
TP	RFS	0.080		0.000		0.625	0.545

MM DIM LOC7= TRUE POSITION OF CIRCLE ID9							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				91.093	0.544	
PA	81.000				80.904	-0.096	
DF	8.407	0.200	0.200		8.533	0.125	0.000
TP	RFS	0.080		0.000		1.130	1.050

MM DIM LOC8= TRUE POSITION OF CIRCLE ID10							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				91.210	0.660	
PA	63.000				63.045	0.045	
DF	8.407	0.200	0.200		8.524	0.117	0.000
TP	RFS	0.080		0.000		1.328	1.248

MM DIM LOC14= TRUE POSITION OF CIRCLE ID11							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				91.270	0.720	
PA	45.000				45.190	0.190	
DF	8.407	0.200	0.200		8.604	0.196	0.000
TP	RFS	0.080		0.000		1.562	1.482

MM DIM LOC15= TRUE POSITION OF CIRCLE ID12							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				91.336	0.786	
PA	27.000				27.321	0.321	
DF	8.407	0.200	0.200		8.535	0.127	0.000
TP	RFS	0.080		0.000		1.874	1.794

MM DIM LOC16= TRUE POSITION OF CIRCLE ID13							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				91.250	0.701	
PA	9.000				9.456	0.456	
DF	8.407	0.200	0.200		11.049	2.641	2.441
TP	RFS	0.080		0.000		2.015	1.935

MM DIM LOC17= TRUE POSITION OF CIRCLE ID14							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				91.071	0.521	
PA	-9.000				-8.453	0.547	
DF	8.407	0.200	0.200		8.547	0.140	0.000
TP	RFS	0.080		0.000		2.022	1.942

MM DIM LOC18= TRUE POSITION OF CIRCLE ID16							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL
PR	90.550				90.900	0.350	
PA	-27.000				-26.343	0.657	
DF	8.407	0.200	0.200		8.546	0.138	0.000
TP	RFS	0.080		0.000		2.196	2.116

MM DIM 1450= 2D DISTANCE FROM LINE FRT END TO LINE LIN2 PAR TO YAXIS							
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	1450.000	0.400	0.400	1452.700	2.700	2.300	

MM DIM 130.0DIA= LOCATION OF CIRCLE OD1							
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
D	130.000	0.200	0.200	129.917	-0.083	0.000	

MM DIM 502 COOLING HOLE= 2D DISTANCE FROM CIRCLE ID15 TO PLANE LRG FLAP							
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
M	502.000	0.400	0.400	502.232	0.232	0.000	

MM DIM X LOC OF COOLING HOLE= LOCATION OF CIRCLE ID15							
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
X	0.000	0.200	0.200	-8.920	-8.920	8.720	

1-5

PART NUMBER=7.5 KA CURRENT LEAD ASSY (LBNL01) DATE=1/9/2003 TIME=8:29:02 AM

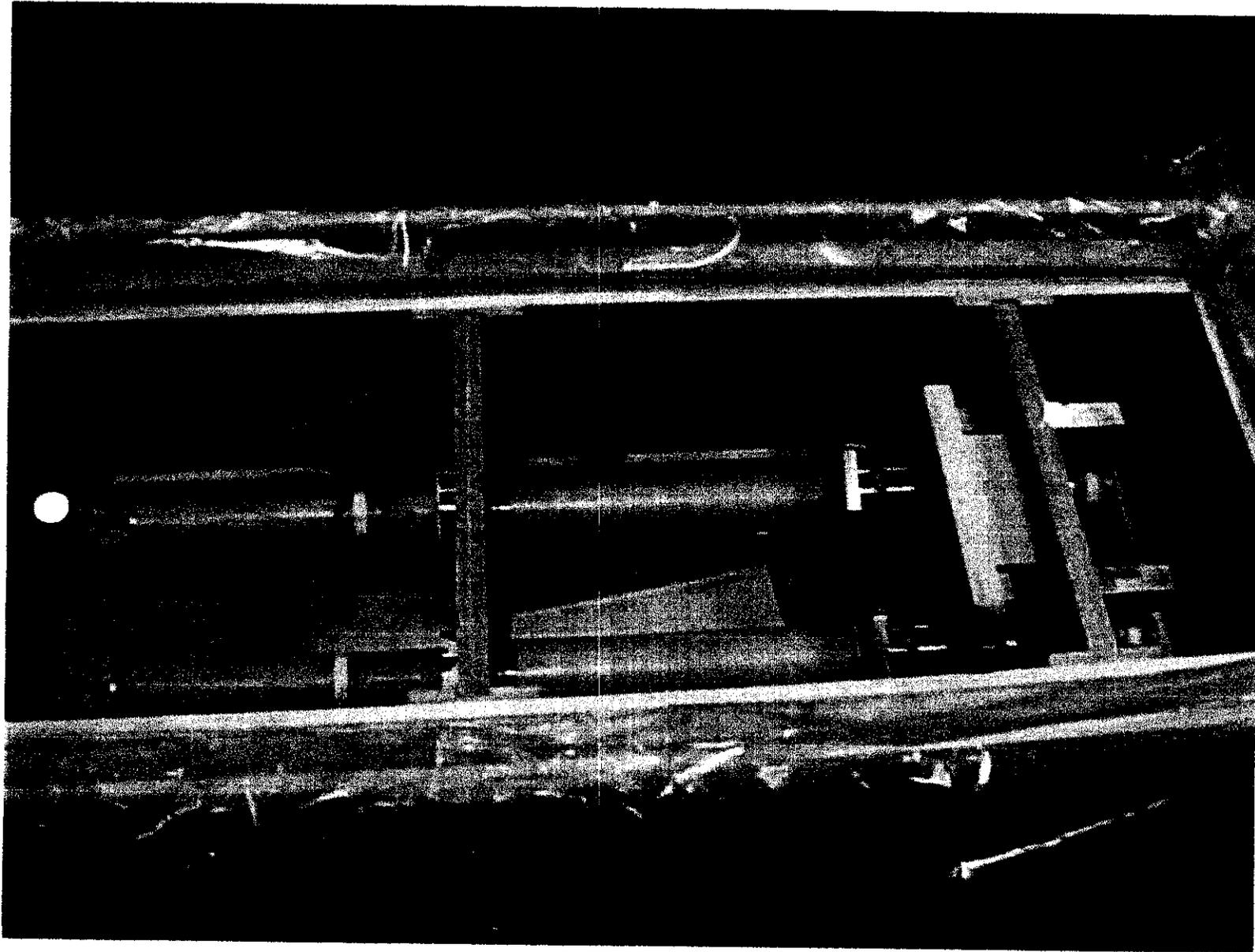
DEG	DIM WARM TERMINAL= 3D ANGLE (TRUE) FROM PLANE PLN2 TO ZAXIS					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
A	0.000	0.100	0.100	0.325	0.325	0.225

IN	DIM X LOC OF WARM TERM= LOCATION OF PLANE MID PLN					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
X	0.000	0.100	0.100	0.065	0.065	0.000

IN	DIM POLAR ANGLE OF COOLING HOLE= LOCATION OF CIRCLE ID15					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
PA	90.000	0.500	0.500	99.562	9.562	9.062

MM	DIM 442.5= 2D DISTANCE FROM LINE FRT END TO PLANE PLN -B- PAR TO YAY					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	442.500	0.400	0.400	444.453	1.953	1.553

7500 A DEFLEX 01, 02
WITH INSULATORS





4. Initial Electrical Checkout

Note: Save the shipping container for storing and moving the leads around TD and after the test is complete to ship them to the DFBX manufacturer.

Performed by DAN EDDY (name typed) *Dan Eddy* (signature)

Date & time 1/22/03 1:35 P.M.

Power Lead 7500 A DFLX 01

3.1 Voltage segment and drop measurement.

Apply 5 Amps between the copper flag and the LTS cable.

Record the applied current 5 A

Use HP3458 DVM, set it to 40 line cycle integration time.

Measure the voltages between the following pins:

Voltage tap Connector 1 (Fisher DEE104A06)(PRIMARY)

Pin 1 - pin 2	<u>80 u</u>	V	Pin 2 - pin 3	<u>232 u</u>	V
Pin 1 - pin 3	<u>313 u</u>	V	Pin 3 - pin 4	<u>240 u</u>	V
Pin 1 - pin 4	<u>555 u</u>	V	Pin 4 - pin 5	<u>FLCOT</u>	V
Pin 1 - pin 5	<u>FLCOT</u>	V	Pin 5 - pin 6	<u>FLCOT</u>	V
Pin 1 - pin 6	<u>FLCOT</u>	V			

Voltage tap Connector 2 (Fisher DEE104A06)(REDUNDANT)

Pin 1 - pin 2	<u>80 u</u>	V	Pin 2 - pin 3	<u>229 u</u>	V
Pin 1 - pin 3	<u>310 u</u>	V	Pin 3 - pin 4	<u>245 u</u>	V
Pin 1 - pin 4	<u>557 u</u>	V	Pin 4 - pin 5	<u>FLCOT</u>	V
Pin 1 - pin 5	<u>FLCOT</u>	V	Pin 5 - pin 6	<u>FLCOT</u>	V
Pin 1 - pin 6	<u>FLCOT</u>	V			

3.2 Verify that between pin 5 and the coiled wire at the bottom of the lead has continuity:

Connector 1: between pin 5 and the end of the wire continuity is OK not OK

Connector 2: between pin 5 and the end of the wire continuity is OK not OK

3.3 Temperature sensor resistance measurements.

3.3.1 Two wire measurement on connector 3 (Fisher DEE104Z086):

Resistance between Pin 1 and pin 2	<u>.815</u>	Ω
Resistance between Pin 1 and pin 3	<u>108.23</u>	Ω
Resistance between Pin 1 and pin 4	<u>108.22</u>	Ω
Resistance between Pin 2 and pin 3	<u>108.21</u>	Ω
Resistance between Pin 2 and pin 4	<u>108.21</u>	Ω
Resistance between Pin 3 and pin 4	<u>.797</u>	Ω
Pin 1,2,3,4 resistance to lead	<u>∞</u>	Ω
Pin 1,2,3,4 resistance to flange	<u>∞</u>	Ω

Resistance between Pin 5 and pin 6	<u>.809</u>	Ω
Resistance between Pin 5 and pin 7	<u>108.19</u>	Ω



4. Initial Electrical Checkout

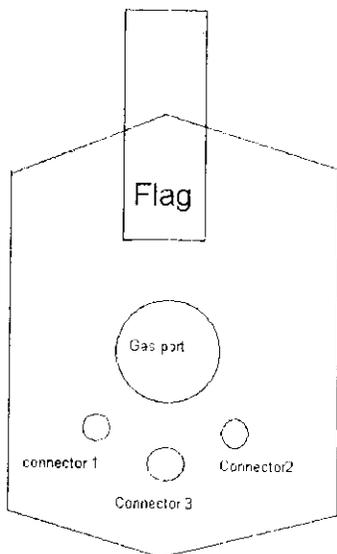
Resistance between Pin 5 and pin 8 $\frac{108.19}{\Omega}$
 Resistance between Pin 6 and pin 7 $\frac{108.20}{\Omega}$
 Resistance between Pin 6 and pin 8 $\frac{108.20}{\Omega}$
 Resistance between Pin 7 and pin 8 $\frac{.802}{\Omega}$
 Pin 5,6,7,8 resistance to lead $\frac{\infty}{\Omega}$
 Pin 5,6,7,8 resistance to flange $\frac{\infty}{\Omega}$

Resistance between Pin 9 and pin 10 $\frac{.730}{\Omega}$
 Resistance between Pin 9 and pin 11 $\frac{108.12}{\Omega}$
 Resistance between Pin 9 and pin 12 $\frac{108.12}{\Omega}$
 Resistance between Pin 10 and pin 11 $\frac{108.11}{\Omega}$
 Resistance between Pin 10 and pin 12 $\frac{108.11}{\Omega}$
 Resistance between Pin 11 and pin 12 $\frac{.706}{\Omega}$
 Pin 9,10,11,12 resistance to lead $\frac{\infty}{\Omega}$
 Pin 9,10,11,12 resistance to flange $\frac{\infty}{\Omega}$

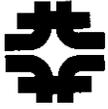
3.3.2 Using HP3458 DVM measure temperature sensor resistance with the four wire measurement technique:

Resistance of T1 _____ Ω (I+ at pin 3, I- at pin 4, U+ at pin 1, U- at pin 2)
 Resistance of T2 _____ Ω (I+ at pin 7, I- at pin 8, U+ at pin 5, U- at pin 6)
 Resistance of T3 _____ Ω (I+ at pin 11, I- at pin 12, U+ at pin 9, U- at pin 10)

Resistance of T1 $\frac{107.41}{\Omega}$ (I+ at pin 1, I- at pin 3, U+ at pin 2, U- at pin 4)
 Resistance of T2 $\frac{107.39}{\Omega}$ (I+ at pin 5, I- at pin 7, U+ at pin 6, U- at pin 8)
 Resistance of T3 $\frac{107.39}{\Omega}$ (I+ at pin 9, I- at pin 11, U+ at pin 10, U- at pin 12)



Looking from the top of the lead down where the LTS cable is located



FERMILAB
Technical Division
Development & Test

**7500 A HTS Power Leads for the
LHC DFBX:
5. Mechanical Installation
Procedure**

Doc. No.
Rev. 1 (RJR)
Rev. Date: February 7, 2003
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**FERMILAB
Technical Division**

**Stand 3 LHC-HTS Lead Testing:
Mechanical Installation Procedure**

Lead Pair

Negative Lead: DFLX01

Positive Lead: DFLX03

Signed ROGER TABEHL / CHARLIE HESS Date FEB. 11, 2003

*Roger Tabehl
C. Hess*



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1. Mechanical Integration of Current Leads in Test Facility

- 1.1 Using wedges, tilt the insert by 10° so that the power leads will be vertical when installed.
- 1.2 Clean sealing surfaces inside the chimneys with acetone and/or alcohol wipe.
- 1.3 Position the upper insulator in each chimney according to Figure 1.3.
- 1.4 Position the PEEK seal in each chimney according to Figure 1.3.
- 1.5 Position the lower insulator in each chimney according to Figure 1.3.

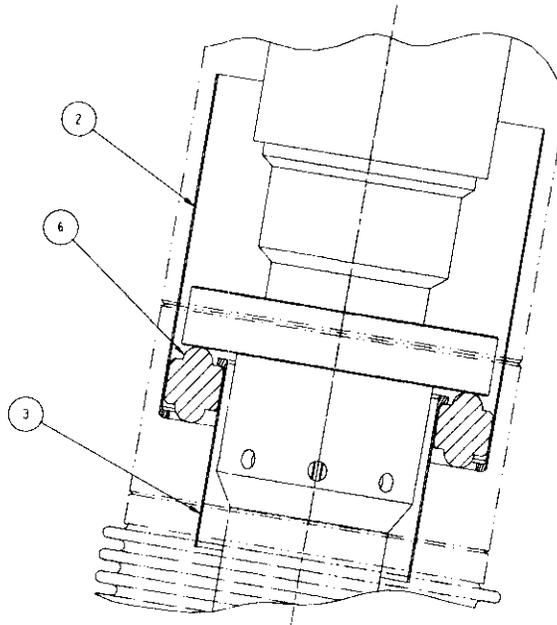


Figure 1.3 2 – Upper Insulator, 3 – Lower Insulator, 6 – PEEK Seal

- 1.6 Attach the lifting/insertion tool to the lead flag as shown in Figure 1.6 and remove the lead from the shipping container.



7500 A HTS Power Leads for the LHC DFBX: 5. Mechanical Installation Procedure

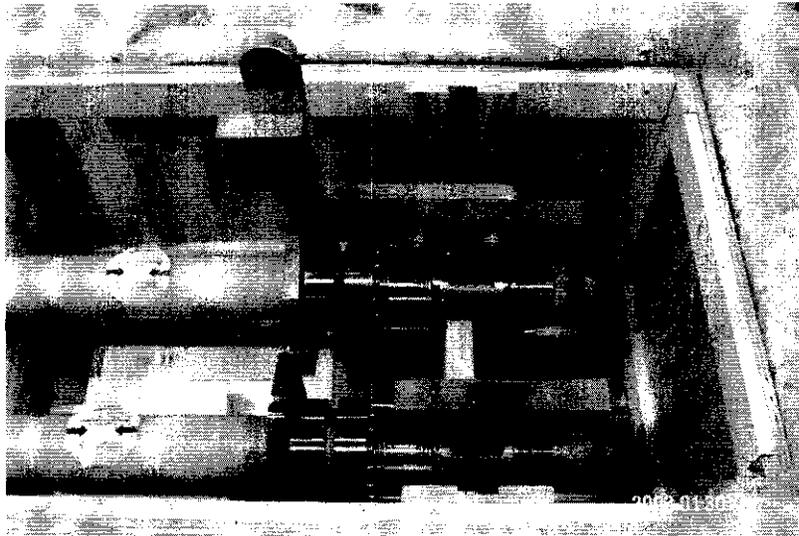


Figure 1.6 The lifting/insertion tool bolted to a power lead in preparation for removing it from the shipping container.

- 1.7 Remove the plastic plug from the 4-20 K gas inlet on the lead body.
- 1.8 Remove the protective covers from the lower and upper flanges.
- 1.9 With alcohol, clean the lower flange and the upper flange knife edge and sealing surface.
- 1.10 Clamp the end support around the lower flange with the rounded portion on the bottom so that it will sit in a V-block.
- 1.11 Set the lead in V-blocks on the steel table.
- 1.12 Prepare to install the power lead baffle by removing the short threaded rods to open the baffle.
- 1.13 Install the baffle on the lead with the pointed tips of the threaded rods pointing toward the bottom of the lead. An installed baffle is shown in Figure 1.13.

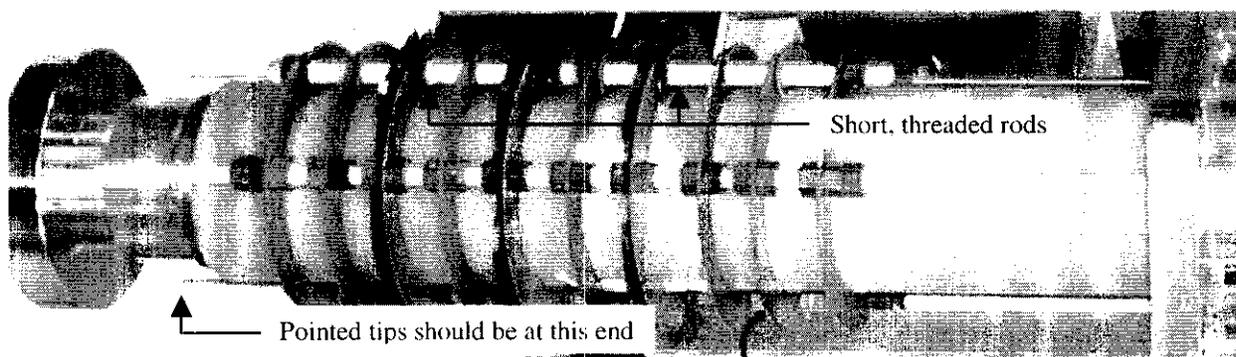


Figure 1.13 A baffle installed on a power lead.

- 1.14 Clean the top plate Conflat flange knife edge and copper gasket. Install the gasket on the top plate Conflat flange.



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- 1.15 Align the top plate rotatable Conflat flange to the orientation shown on Figure 1.15, where the leak check grooves on the flange align with the middle tensioning studs.

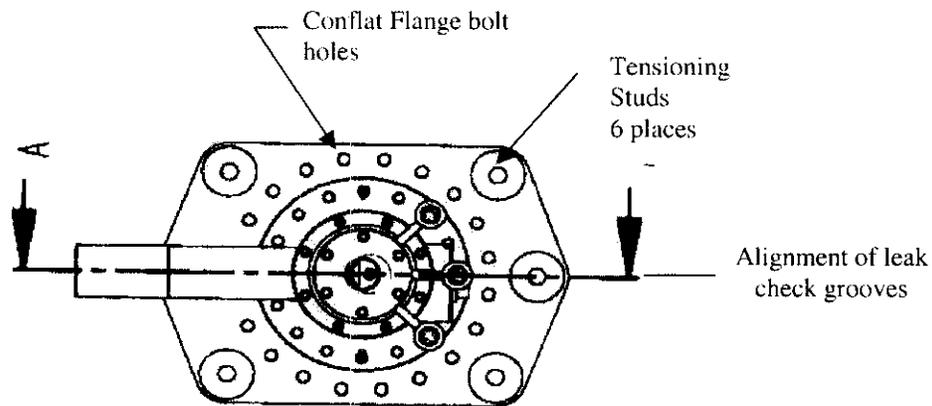


Figure 1.15 The 20-hole Conflat bolt pattern is bisected by center tensioning studs.

- 1.16 Back down the nuts on the tensioning studs.
1.17 Swing the lifting/insertion tool 180 degrees as shown in Figure 1.17 in preparation for lifting the power lead into the vertical position.

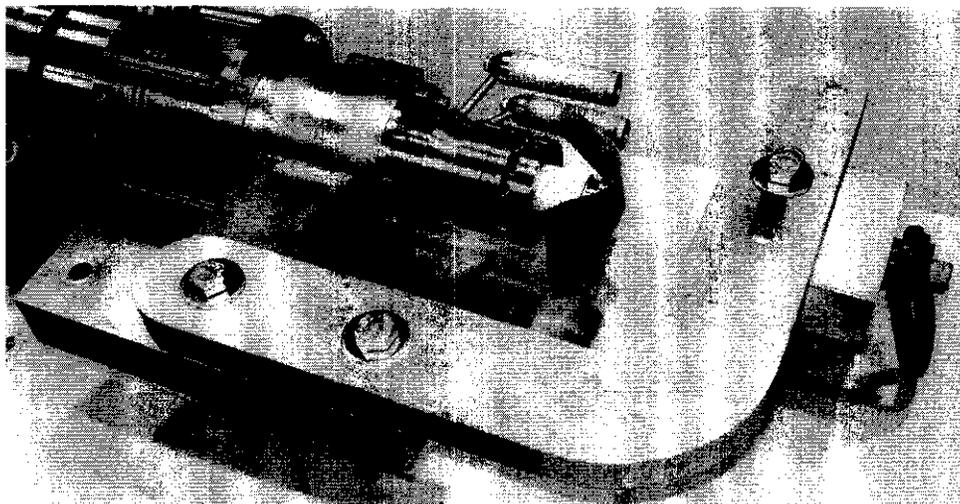


Figure 1.17 The lifting/insertion tool in position to lift the power lead into a vertical position.

- 1.18 Strapping the overhead crane to the lifting/insertion tool and manually guiding the lower end support, lift the lead and position it vertically while not allowing any loading on the bottom end of the lead.



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- 1.19 Remove the lower end support.
- 1.20 Tie a weighted string to the LTS bus to help guide it through the chimney during installation.
- 1.21 Install the lead in the chimney per Figure 1.21a until the lower sealing flange bottoms out. The flag should be toward the bayonet connections on the insert. The negative lead is installed on the left hand side, and the positive lead is installed on the right hand side as shown in Figure 1.21b.

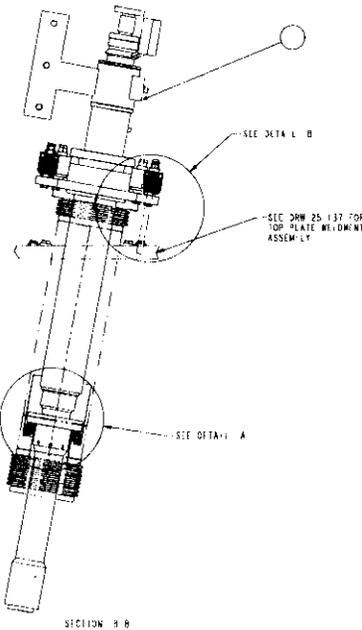
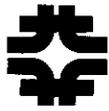


Figure 1.21a HTS Lead in Test Chimney. Note: CERN chimneys do not have bellows.



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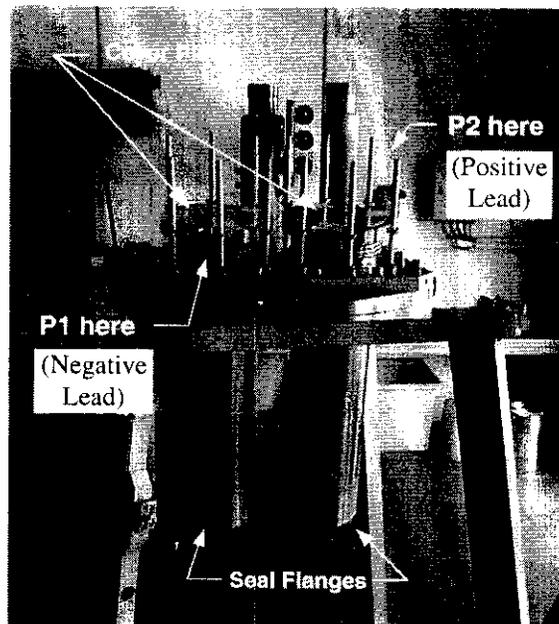


Figure 1.21b Locations of the negative and positive leads.

1.22 Raise the nuts on the tensioning studs to hold the lead in place, as shown in Figure 1.22.

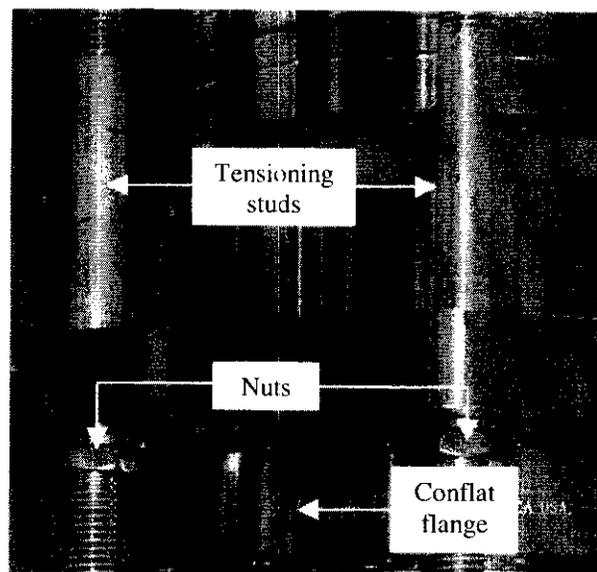
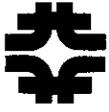


Figure 1.22 The positions of the tensioning studs, nuts, and top plate Conflat flange as the 20 Conflat bolts are tightened.

1.23 On the power lead flange, number the Conflat bolt holes 1 through 20 as indicated by Figure 1.25.



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- 1.24** If there is a gap between the top plate Conflat flange and the Pirelli flange, pull the bellows up to close the gap using bolts 1 through 4.
- 1.25** Use a 5/16 12-point socket to tighten the 20 Conflat bolts. The tightening must be made gradually in 1/4 turn increments to a final torque of 15 ft-lbf (180 in-lbf). The tightening sequence is given by Fig. 1.25.

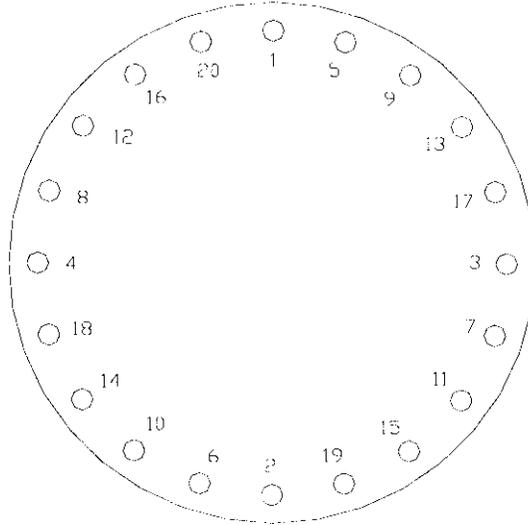


Figure 1.25 Tightening sequence for the 20 Conflat bolts.

- 1.26** Unbolt the lifting/insertion tool from the installed power lead.
- 1.27** Install Belleville Washer Assemblies on each tensioning stud per Figures 1.27a and 1.27b. A spherical washer must be placed below the Belleville washer holder on each stud. In the figures: Items 11 (10 each) are Belleville Washers, arranged as shown; Items 6 (2 each) are flat washers; Items 4 and 5 are the Belleville Washer Holder; Item 10 are Spherical Washers for above and below the washer holder; Item 9 is a loading nut; and Item 8 is a jam nut.



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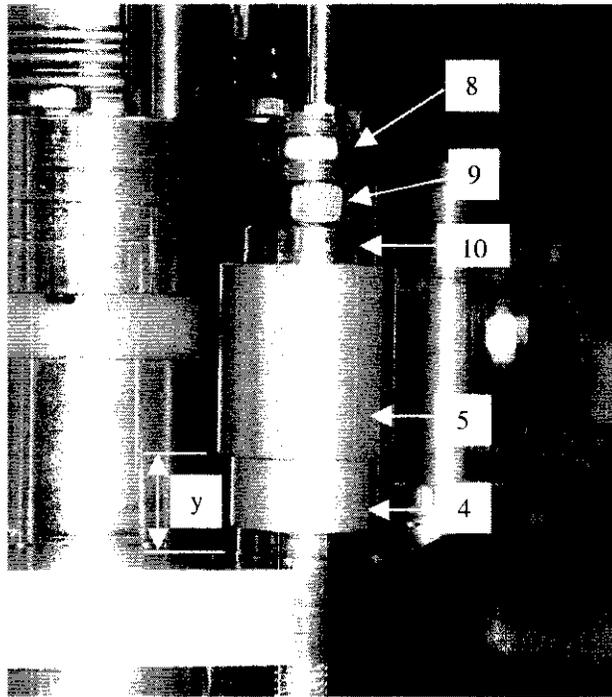


Figure 1.27a An installed Belleville Washer Assembly.

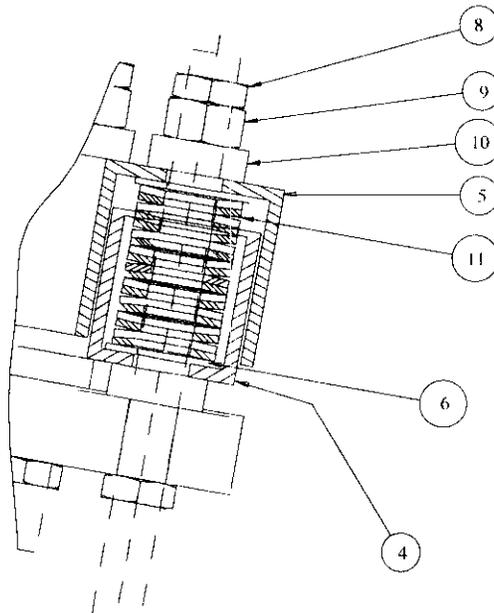


Figure 1.27b An installed Belleville Washer Assembly.

1.28 Tighten the 6 Belleville Washer Assemblies to apply load to the PEEK seal.

1.28.1 Washers for Negative Lead



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- 1.28.1.1 Ensure that the tensioning rod nuts used in 1.22 have a gap of about 5 mm below the lead flange.
- 1.28.1.2 Center the lower end of the lead in the chimney using two Teflon centering rings. The inner Teflon centering ring goes between the power lead and the lower insulator. The outer Teflon centering ring goes between the lower insulator and the chimney. A small rubber mallet may be used to help install the Teflon centering rings. The installed Teflon centering rings are shown in Figure 1.28.1.2.

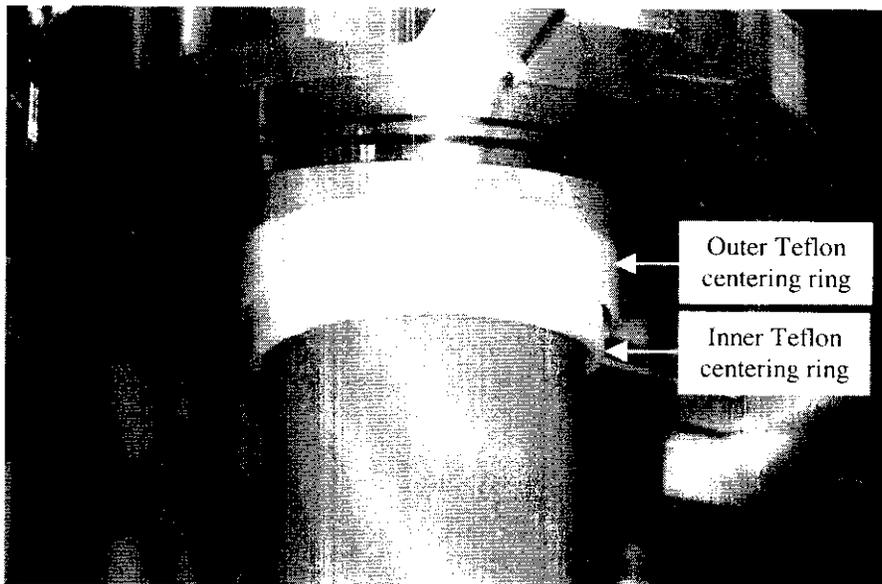


Figure 1.28.1.2 The installed Teflon centering rings.

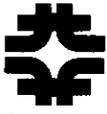
- 1.28.1.3 Tighten the 6 loading nuts finger-tight. With adjustable parallels, measure and record the gap "y" indicated in Figure 1.27a between Item 5 and the current lead top flange at the 6 locations specified in Figure 1.28.1.5. Units are mm.

23.87
A ~~24.15~~ B 23.83 C 24.56 D ~~23.87~~ E 24.11 F 24.15

- 1.28.1.4 For each of the six studs: remove the adjustable parallel, adjust it for 1.8 mm of compression, and return the adjustable parallel into position under the Belleville washer holder. Record the adjusted heights of the adjustable parallels. Units are mm.

22.07
A ~~22.35~~ B 22.03 C 22.76 D 22.07 E 22.31 F 22.35

- 1.28.1.5 Using the sequence A through F in Figure 1.28.1.5, tighten the loading nuts ¼ turn until the total compression is 1.8 mm at each of the six locations. As each loading nut is tightened ¼ turn, check off the appropriate line.



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A B C D E F
 A B C D E F
 A B C D E F
 A B C D E F
 A B C D E F
 A B C D E F
 A B C D E F
 A _____ B _____ C _____ D _____ E _____ F _____

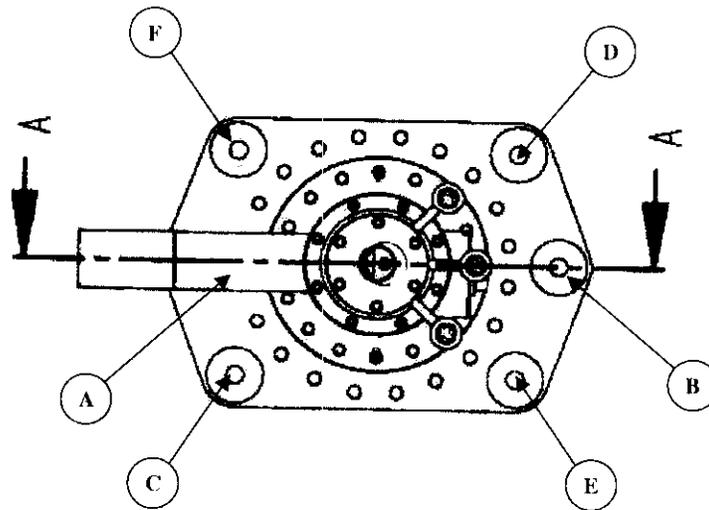


Figure 1.28.1.5 The specified sequence for tightening the Belleville Washer Assemblies.

1.28.1.6 Record the final measured gaps 'y' in Figure 1.27a. Units are mm.

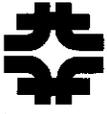
A 22.15 B 22.01 C 22.56 D 21.83 E 22.30 F 22.28

1.28.1.7 Remove the Teflon centering rings from the installed power lead.

1.28.2 Washers for Positive Lead

1.28.2.1 Ensure that the nuts used in 1.22 have a gap of about 5 mm below the lead flange.

1.28.2.2 Center the lower end of the lead in the chimney using two Teflon centering rings. One Teflon centering ring goes between the power lead and the lower insulator. The



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second Teflon centering ring goes between the lower insulator and the chimney. A small rubber mallet may be used to help install the Teflon centering rings.

- 1.28.2.3** Tighten the 6 loading nuts finger-tight. With adjustable parallels, measure and record the gap "y" indicated in Figure 1.27a between Item 5 and the current lead top flange at the 6 locations specified in Figure 1.28.1.5. Units are mm.

A _____ B _____ C _____ D _____ E _____ F _____

- 1.28.2.4** For each of the six studs: remove the adjustable parallel, adjust it for 1.8 mm of compression, and return the adjustable parallel into position under the Belleville washer holder. Record the adjusted heights of the adjustable parallels. Units are mm.

A _____ B _____ C _____ D _____ E _____ F _____

- 1.28.2.5** Using the sequence A through F in Figure 1.28.1.5, tighten the loading nuts ¼ turn until the total compression is 1.8 mm at each of the six locations. As each of the loading nuts is turned ¼ turns, check off the appropriate line.

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

A _____ B _____ C _____ D _____ E _____ F _____

- 1.28.2.6** Record the final measured gaps 'y' in Figure 1.27a. Units are mm.

A _____ B _____ C _____ D _____ E _____ F _____

- 1.28.2.7** Remove the Teflon centering rings from the installed power lead.



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- 1.29 On both power leads, tighten down the jam nuts to secure the loading nuts on the installed Belleville Washer Assemblies.
- 1.30 Tighten the nuts on the underside of the current lead top plate against the plate to provide stability during transportation.

2. Pressure Test

- 2.1 Follow the procedure specified in the document entitled, "Stand 3 LHC-HTS Lead Testing: Pressure Test Procedure.

3. Leak Check

- 3.1 Follow the procedure specified in the document entitled, "Stand 3 LHC-HTS Lead Testing: Leak Check Procedure.

4. Electrical Integration of Current Leads in Test Facility

- 4.1 Make connection to LTS pigtails. Use a "Praying Hands" type joint 120 mm-long as shown in Figures 4.1a and 4.1b. The ends of the LTS pigtails are individually pretinned for about 120 mm by Pirelli, and the joint is a mechanical connection with indium foil (supplied by LBNL) between the cables to ensure good electrical connection. The conductors are arranged in a spiral path so the NbTi cables in the joint are facing each other, with the copper cables against the stainless steel mechanical clamp.



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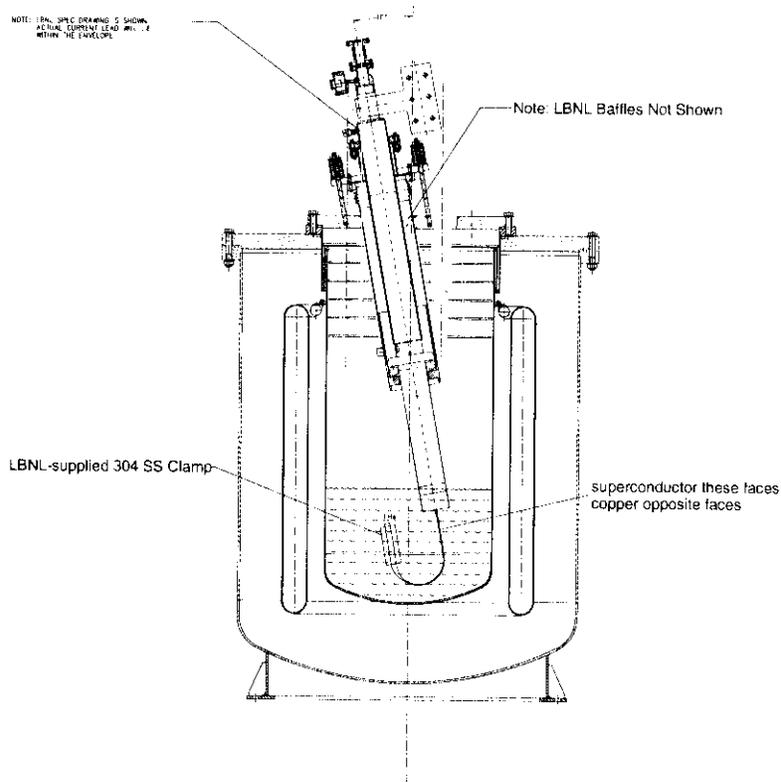
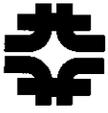


Figure 4.1a Side View of Lead in Cryostat with the LTS cables connected in a "Praying Hands" Type Joint.



**7500 A HTS Power Leads for the
LHC DFBX:
5. Mechanical Installation
Procedure**

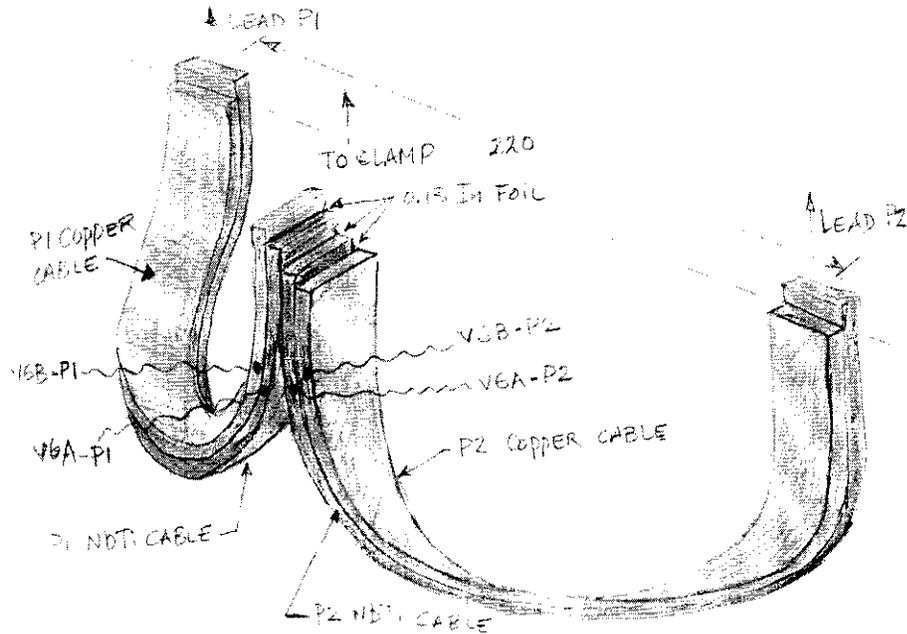
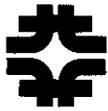


Figure 4.1b Illustration of LTS Pigtail Routing to Praying Hands Joint.

- 4.2 Attach the G-10 clamshell clamp at the bottoms of the power leads, and install the splice block support.
- 4.3 Attach the voltage tap wires labeled "V6" to the LTS cables as indicated on Figure 4.1b.
- 4.4 Insulate the conductor as needed with Kapton tape, and secure it with Kevlar string and/or G-10 support plates.
- 4.5 Install He space temperature sensors and LHe liquid level probes.
- 4.6 Adjust position of the LHe level sensor so the level can be controlled with respect to the maximum and minimum LHe levels marked on the current leads
- 4.7 Install assembly into test dewar.

5. Cooldown

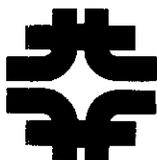
- 5.1 Before cooldown, loosen the nuts on the underside of the lead plate that were tightened in 1.29 at least 0.5 mm below the top plate.
- 5.2 Complete the Stand 3 LHC-HTS Lead Testing: Pre-Cooldown Checklist.
- 5.3 Cool down the test system using the Stand 3 LHC-HTS Lead Testing: Cooldown Procedure.



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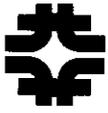
Lead Pair

Negative Lead: DFLX01

Positive Lead: DFLX03

Signed CHARLIE HESS / ROGER RABEHL Date FEB. 13, 2003

Roger Rabehl
C. E. Hess Jr.



6. Pressure Test Procedure

1. Preparation for Pressurization

- 1.1 Install the bayonet plug into the 4-20 K supply bayonet on the top plate. Tie it down.
- 1.2 On the 4-20 K female bayonet vacuum jacket, cap off one of the 1/4 inch compression fittings. Connect the test gauge and associated tubing to the second 1/4 inch compression fitting.
- 1.3 Install Conflat blankoffs on the vents of the installed power leads.
- 1.4 Put the cover cans over each lead vent and tie them down.
- 1.5 Connect a nitrogen bottle to the pressure test tubing.

2. Pressurization

- 2.1 Pressurize the 4-20 K circuit to 65 psia (50 psig) and record the initial pressure from the test gauge.

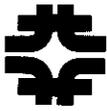
Initial pressure: 66.1 psia

- 2.2 Wait five minutes and record the final pressure from the test gauge.

Final pressure: 65.6 psia

3. Release of Pressure

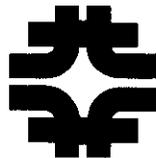
- 3.1 Isolate the nitrogen bottle.
- 3.2 Release the pressure by opening the hand valve on the pressure test tubing.
- 3.3 Disconnect the pressure test tubing from the top plate/insert.



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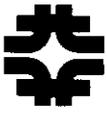
Lead Pair

Negative Lead: DFLX01

Positive Lead: DFLX03

Signed CHARLIE HESS/ROGER RABEHL Date FEB. 13, 2003

Roger Rabehl
C.H. Hess Jr.



**7500 A HTS Power Leads for the
LHC DFBX:
7. Leak Check Procedure**

1. Preparation for Leak Checking

- 1.1 Cap/plug the two 1/4 inch compression fittings on the 4-20 K female bayonet vacuum jacket.
- 1.2 Remove the Conflat blankoff from one of the lead vents and install the modified Conflat with a vacuum pumpout.
- 1.3 Attach a leak detector to the vacuum pumpout installed on the top of one of the power leads.

2. Leak Check

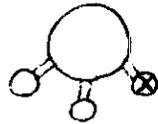
- 2.1 Pump out the 4-20 K circuit with the leak detector.
- 2.2 Record the baseline reading from the leak detector.

Baseline: 64 DIV x 50 SCALE

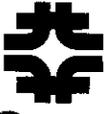
- 2.3 Spray all joints with He and watch for a signal from the leak detector
- 2.4 Record the maximum leak detector reading.

Maximum reading: 62 DIV x 5000 SCALE

NOTE: FOUND ON CONNECTOR INDICATED BELOW



LEAK RATE IS ABOUT 5.8×10^{-5} atm cc/s. THIS IS
WITH THE LEAK DETECTOR ROUGHING PUMP OPEN,
SO LEAK RATE MAY BE TWICE THAT LISTED.



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**7500 A HTS Power Leads for the LHC DFBX:
7. Leak Check Procedure**

Lead Pair

Negative Lead: DFLX-01

Positive Lead: DFLX-02

Signed

C.E. Howard

Date

02/24/03



**7500 A HTS Power Leads for the
LHC DFBX:
7. Leak Check Procedure**

1. Preparation for Leak Checking

- 1.1 Cap/plug the two 1/4 inch compression fittings on the 4-20 K female bayonet vacuum jacket.
- 1.2 Remove the Conflat blankoff from one of the lead vents and install the modified Conflat with a vacuum pumpout.
- 1.3 Attach a leak detector to the vacuum pumpout installed on the top of one of the power leads.

2. Leak Check

- 2.1 Pump out the 4-20 K circuit with the leak detector.
- 2.2 Record the baseline reading from the leak detector.

Baseline: 84.6 d X 10 scale

- 2.3 Spray all joints with He and watch for a signal from the leak detector
- 2.4 Record the maximum leak detector reading.

Maximum reading: 85.7 d X 10 scale w/o/Roughing Pump

w/Roughing Pump Baseline 39 d X 5 scale, Max 39.7 d X 5 scale



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Lead Pair

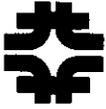
Negative Lead: DFLX01

Positive Lead: DFLX02

Signed

Roger Rubell
C.F. Khan Jr

Date APRIL 29, 2003



1. Preparation for Pressurization

- 1.1 Install the bayonet plug into the 4-20 K supply bayonet on the top plate. Tie it down.
- 1.2 On the 4-20 K female bayonet vacuum jacket, cap off one of the 1/4 inch compression fittings. Connect the test gauge and associated tubing to the second 1/4 inch compression fitting.
- 1.3 Install Conflat blankoffs on the vents of the installed power leads.
- 1.4 Put the cover cans over each lead vent and tie them down.
- 1.5 Connect a nitrogen bottle to the pressure test tubing.

2. Pressurization

- 2.1 Pressurize the 4-20 K circuit to 65 psia (50 psig) and record the initial pressure from the test gauge.

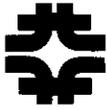
Initial pressure: 65.2 psia

- 2.2 Wait five minutes and record the final pressure from the test gauge.

Final pressure: 65.2 psia

3. Release of Pressure

- 3.1 Isolate the nitrogen bottle.
- 3.2 Release the pressure by opening the hand valve on the pressure test tubing.
- 3.3 Disconnect the pressure test tubing from the top plate/insert.



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Lead Pair

Negative Lead: DFLX01

Positive Lead: DFLX02

Signed (SEE PAGE 2) Date _____



**7500 A HTS Power Leads for the
LHC DFBX:
7. Leak Check Procedure**

1. Preparation for Leak Checking

- 1.1 Cap/plug the two 1/4 inch compression fittings on the 4-20 K female bayonet vacuum jacket.
- 1.2 Remove the Conflat blankoff from one of the lead vents and install the modified Conflat with a vacuum pumpout.
- 1.3 Attach a leak detector to the vacuum pumpout installed on the top of one of the power leads.

2. Leak Check

- 2.1 Pump out the 4-20 K circuit with the leak detector.
- 2.2 Record the baseline reading from the leak detector.

DFLX-02

Baseline: 920 X 50 scale

- 2.3 Spray all joints with He and watch for a signal from the leak detector
- 2.4 Record the maximum leak detector reading.

05.02.03

Maximum reading: 920 X 50 scale $\approx 3.3 \times 10^{-7}$ atm cc sec

DFLX-01

2.2

Baseline 210 X 50 scale

05.02.03

2.4

Maximum Reading 210 X 50 scale $\approx 7.7 \times 10^{-8}$ atm cc sec

C.P. Hess Jr