FERMILAB Technical Division	**7500A HTS Power leads for the LHC DFBX**	Doc. No. Rev. No. Date:January 6, 2003 Page 1 of 1 Author: Sandor Feher
	0. Cover Sheet for Check Out Form	DFLX 12

Power leads being tested: 7500 A DFLX 12 7500 A DFLX 13

Task #	Responsible	Task	Received Date,time		Performed Date,time	
1	Inspection	Unpack the leads				
2	Inspection	IB4 mech. & Tolerances				
3	Mechanical	Move the leads to MTF			6/19	1005
4	Electrical	Initial electrical check out				
5	Mechanical	Installation of the current leads			6/24	
5a	Mechanical	Preliminary leak check Procedure			6/23	1315
6	Mechanical	Pressure test			6/24	
7	Mechanical	Leak check			6/26	10:00
7a	Mechanical	Top plate insertion into the dewar	6/26		6/26	10:30
8	M. Tartaglia	Configuration of the DAQ system			6/25	1645
9&9.1	Electrical	Room temp. electrical test	6/26	11:00	6/25	13:00
10	Mechanical	Installation of the top plate	6/26	14:30		
12	Mechanical	Cool down			6/27	0800
13	Electrical	Electrical & instrumentation test	6/27		6/27	11:20
14	Mechanical	Connect the leads to the Power Supply & configure			6/27	1200
15	Electrical	Electrical & instrumentation test			6/27	1615
16	M. Thompson	Cold test of the power lead			6/27	
17	Mechanical	Perform a Thermal cycle			7/1	
18	M. Thompson	Cold test of the power lead			7/1	
19	Mechanical	Warm up			7/2	
20	Electrical	Electrical & instrumentation test	7/10	14:00	6/10	15:00
21	Mechanical	Remove the top plate			7/11	12:00
22	Mechanical	Remove the leads from the top plate			7/15	10:00
23	Mechanical	Pack and move the leads			7/15	10:30

FERMILAB Technical Division	7500A HTS Power leads for the LHC DFBX	Doc. No. Rev. No. Date:January 6, 2003 Page 1 of 1 Author: Sandor Feher
	1. Unpacking Check Out Form	

Performed by SANDOR FEHER (name typed) Feher Sandor (signature)

Date & time 1/06/03 15:00-15:30

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 12 7500 A DFLX 13
(Leads serial numbers are on one side of the container)

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: _____
Not tripped ☐ Tripped (red) ☐ Remark: _____

c. Each leads have another "10G DROP" devices installed on the flag of the leads
Not tripped ☐ Tripped (Black) ☐ Remark: _____
Not tripped ☐ Tripped (Black) ☑ Remark: Arrow pointing towards the Lead on DFLX 13

1.4 Container content:
a. Power leads: 7500 A DFLX 12 ; 7500 A DFLX 13
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

7500A Of 4x 12

MM	DIM CYL -A-DIA= LOCATION OF					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
D	99.000	0.200	0.200	99.025	0.025	0.000

MM	DIM -A-= ROUNDNESS OF CYLINDER CYL -A-					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	0.000	0.200	0.000	0.031	0.031	0.000

MM	DIM -B-= FLATNESS OF PLANE PLN -B-					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	0.000	0.050	0.000	0.003	0.003	0.000

MM	DIM PERP1= PERPEND OF PLANE PLN -B- TO CYLINDER CYL -A- EXTEND=0.00(					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	0.000	0.130	0.000	0.326	0.326	0.196

MM	DIM PERP2= PERPEND OF PLANE LRG FLANGE TO CYLINDER CYL -A- EXTEND=5(					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	0.000	0.130	0.000	0.556	0.556	0.426

MM	DIM DIA= LOCATION OF					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
D	80.000	0.200	0.200	80.000	0.000	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	1.020	1.020	0.770

MM	DIM RND2= ROUNDNESS OF CYLINDER -C-					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	0.000	0.200	0.000	0.111	0.111	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	561.739	0.739	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				123.888	0.317		
DF	16.000	0.200	0.200		17.980	1.980	1.780	
TP	RFS	0.400		0.000		0.635	0.235	

PART NUMBER=7.5 KA CURRENT LEAD ASSY (LBNL01) DATE=1/7/2003 TIME=11:07:48 AM

MM	DIM LOC10= TRUE POSITION OF CIRCLE CIR3							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
X	-78.890				-78.912	-0.022		
Z	95.047				95.271	0.224		
DF	16.000	0.200	0.200		17.979	1.979	1.779	
TP	RFS	0.400		0.000		0.451	0.051	

MM	DIM LOC11= TRUE POSITION OF CIRCLE CIR4							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
X	78.890				78.979	0.089		
Z	95.047				95.481	0.434		
DF	16.000	0.200	0.200		17.979	1.979	1.779	
TP	RFS	0.400		0.000		0.886	0.486	

MM	DIM LOC12= TRUE POSITION OF CIRCLE CIR5							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
X	78.890				79.245	0.355		
Z	-95.047				-94.602	0.444		
DF	16.000	0.200	0.200		17.969	1.969	1.769	
TP	RFS	0.400		0.000		1.137	0.737	

MM	DIM LOC13= TRUE POSITION OF CIRCLE CIR6							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
X	-78.890				-78.651	0.239		
Z	-95.047				-94.808	0.238		
DF	16.000	0.200	0.200		17.973	1.973	1.773	
TP	RFS	0.400		0.000		0.675	0.275	

MM	DIM LOC09= TRUE POSITION OF CIRCLE ID1							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.262	-0.288		
PA	-153.000				-153.099	-0.099		
DF	8.407	0.200	0.200		8.619	0.211	0.011	
TP	RFS	0.080		0.000		0.656	0.576	

MM	DIM LOC20= TRUE POSITION OF CIRCLE ID2							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.378	-0.171		
PA	-171.000				-171.117	-0.117		
DF	8.407	0.200	0.200		8.604	0.197	0.000	
TP	RFS	0.080		0.000		0.505	0.425	

MM	DIM LOC31= TRUE POSITION OF CIRCLE ID3							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.206	-0.344		
PA	-135.000				-134.989	0.011		
DF	8.407	0.200	0.200		8.613	0.205	0.005	
TP	RFS	0.080		0.000		0.689	0.609	

PART NUMBER=7.5 KA CURRENT LEAD ASSY (LBNL01) DATE=1/7/2003 TIME=11:07:49 AM

MM	DIM LOC1= TRUE POSITION OF CIRCLE ID4							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.495	-0.054		
PA	171.000				170.852	-0.148		
DF	8.407	0.200	0.200		8.609	0.202	0.002	
TP	RFS	0.080		0.000		0.479	0.399	

MM	DIM LOC2= TRUE POSITION OF CIRCLE ID5							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.563	0.013		
PA	153.000				152.842	-0.158		
DF	8.407	0.200	0.200		8.602	0.195	0.000	
TP	RFS	0.080		0.000		0.500	0.420	

MM	DIM LOC3= TRUE POSITION OF CIRCLE ID6							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.666	0.116		
PA	135.000				134.861	-0.139		
DF	8.407	0.200	0.200		8.603	0.196	0.000	
TP	RFS	0.080		0.000		0.499	0.419	

MM	DIM LOC4= TRUE POSITION OF CIRCLE ID7							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.802	0.252		
PA	117.000				116.916	-0.084		
DF	8.407	0.200	0.200		8.610	0.202	0.002	
TP	RFS	0.080		0.000		0.569	0.489	

MM	DIM LOC6= TRUE POSITION OF CIRCLE ID8							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.839	0.290		
PA	99.000				98.927	-0.073		
DF	8.407	0.200	0.200		8.621	0.213	0.013	
TP	RFS	0.080		0.000		0.624	0.544	

MM	DIM LOC7= TRUE POSITION OF CIRCLE ID9							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.844	0.295		
PA	81.000				81.035	0.035		
DF	8.407	0.200	0.200		8.604	0.196	0.000	
TP	RFS	0.080		0.000		0.599	0.519	

MM	DIM LOC8= TRUE POSITION OF CIRCLE ID10							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.860	0.310		
PA	63.000				63.108	0.108		
DF	8.407	0.200	0.200		8.621	0.214	0.014	
TP	RFS	0.080		0.000		0.709	0.629	

PART NUMBER=7.5 KA CURRENT LEAD ASSY (LBNL01) DATE=1/7/2003 TIME=11:07:50 AM

MM	DIM LOC14= TRUE POSITION OF CIRCLE ID11							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.883	0.333		
PA	45.000				45.141	0.141		
DF	8.407	0.200	0.200		8.619	0.212	0.012	
TP	RFS	0.080		0.000		0.802	0.722	

MM	DIM LOC15= TRUE POSITION OF CIRCLE ID12							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.805	0.255		
PA	27.000				27.208	0.208		
DF	8.407	0.200	0.200		8.607	0.199	0.000	
TP	RFS	0.080		0.000		0.833	0.753	

MM	DIM LOC16= TRUE POSITION OF CIRCLE ID13							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.681	0.132		
PA	9.000				9.309	0.309		
DF	8.407	0.200	0.200		10.740	2.332	2.132	
TP	RFS	0.080		0.000		1.013	0.933	

MM	DIM LOC17= TRUE POSITION OF CIRCLE ID14							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.613	0.063		
PA	-9.000				-8.695	0.305		
DF	8.407	0.200	0.200		8.599	0.192	0.000	
TP	RFS	0.080		0.000		0.973	0.893	

MM	DIM LOC18= TRUE POSITION OF CIRCLE ID16							
AX	NOMINAL	+TOL	-TOL	BONUS	MEAS	DEV	OUTTOL	
PR	90.550				90.459	-0.091		
PA	-27.000				-26.698	0.302		
DF	8.407	0.200	0.200		8.621	0.213	0.013	
TP	RFS	0.080		0.000		0.970	0.890	

~~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~~	~~1672.195~~	~~222.195~~	~~221.795~~	

MISSING

MM	DIM 130.0DIA= LOCATION OF CIRCLE OD1						
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL	
D	130.000	0.200	0.200	129.955	-0.045	0.000	

MM	DIM 502 COOLING HOLE= 2D DISTANCE FROM CIRCLE ID15 TO PLANE LRG FLAT					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	502.000	0.400	0.400	502.159	0.159	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	-6.388	-6.388	6.188

12-5

PART NUMBER=7.5 KA CURRENT LEAD ASSY (LBNL01) DATE=1/7/2003 TIME=11:07:51 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	-0.911	-0.911	0.811

X wrong

IN	DIM LOC19= LOCATION OF CIRCLE ID15					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
PA	90.000	0.000	0.000	97.371	7.371	7.371

POLAR ANGLE of COOLING HOLE

MM	DIM 442.5= 2D DISTANCE FROM LINE FRT END TO PLANE PLN -B- PAR TO YAX					
AX	NOMINAL	+TOL	-TOL	MEAS	DEV	OUTTOL
M	442.500	0.400	0.400	445.309	2.809	2.409

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	3. Form for moving power leads	

Power leads need to be moved from NW8 to MTF are:
7500 DFLX 12 & 7500 DFLX 13
Approved by _____ SandorFeher _____ Feher Sandor
(name typed) (signature)
Date & time 6/16/03 10:20

The request should go through Marsha Schmidt who is responsible keeping track of whereabouts of the power leads.

Requested by ROGER RABEHL Roger Rabehl
(name typed) (signature)
Date & time 6/18/03 14:45

Delivered by GARY VECCHI
(name typed) (signature)
Date & time 10/19/03 10:05

Received by Charles Hess
(name typed) (signature)
Date & time 06.19.03 10:05

The next person _____ responsible to perform Checkout form #4 has been

Notified by _____
(name typed) (signature)
Date & time _____

This form should be copied and each copy should be placed into the folders of both of the power leads

FERMILAB
Technical Division

7500 A HTS Power Leads for the LHC DFBX: 5a. Preliminary Leak Check Procedure

Lead Number: DFLX 12

Signed Roger Rabehl Date 6/23/03

1. **Preparation for Leak Checking**
   - **1.1** Put the power lead on the steel table, with the power lead lower flange resting in the end support clamp.
   - **1.2** Plug the 4-20 K inlet.
   - **1.3** Attach an adapter to the top of the power lead so that a leak detector can be connected.

2. **Leak Check-Lead Number** DFLX12
   - **2.1** Pump out the power lead with the leak detector.
   - **2.2** Record the baseline reading from the leak detector.

Baseline: 2.7×10^{-8} atm cc/s

   - **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: 2.7×10^{-8} atm·cc/s

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Technical Division

Stand 3 LHC-HTS Lead Testing:
5. Installation of the Current Leads

Lead Pair
Negative Lead: DFLX12
Positive Lead: DFLX13

NOTE: VOLTAGE TAP SOLDER JOINTS LOOK COLD (SOLDER DID NOT FLOW WELL) ON BOTH LEADS

Signed C.E. Hess Jr. Date 6/24/03

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.

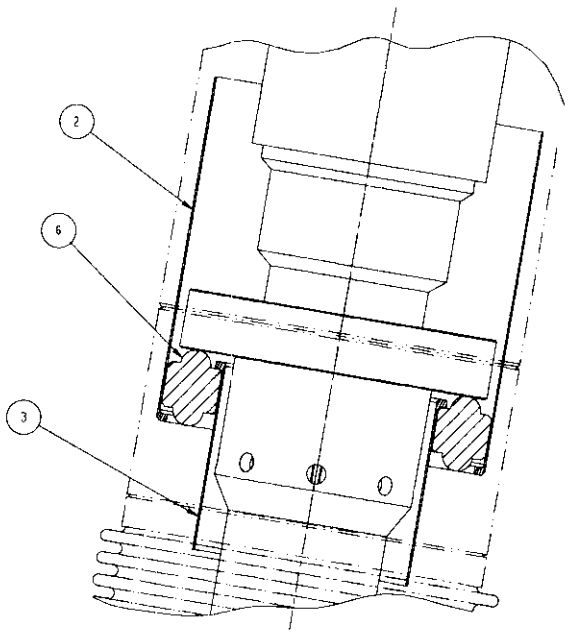


Figure 1.3 2 – Upper Insulator, 3 – Lower Insulator, 6 – PEEK Seal

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.

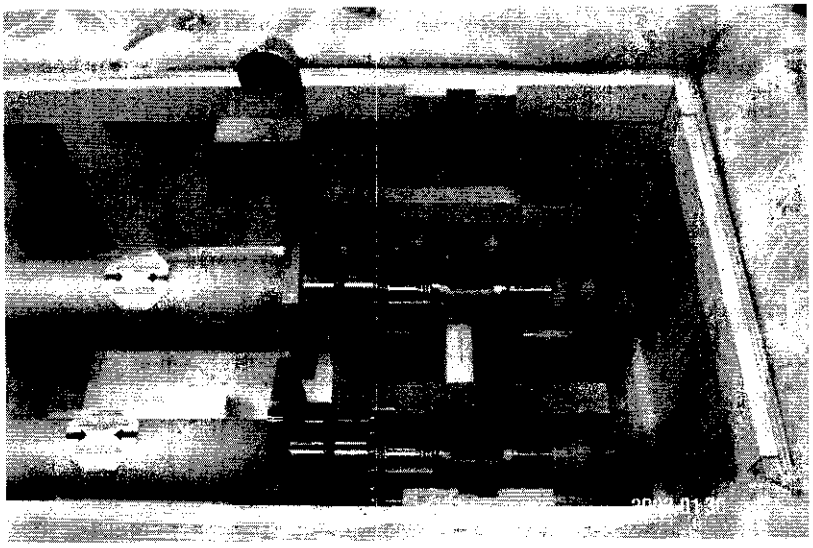


Figure 1.6 The lifting/insertion tool bolted to a power lead in preparation for removing it from the shipping container.

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.

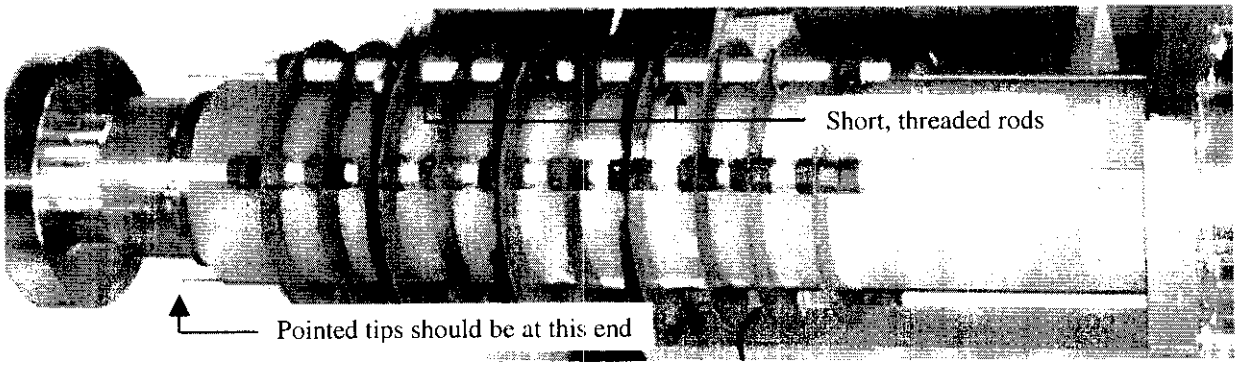


Figure 1.13 A baffle installed on a power lead.

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

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.

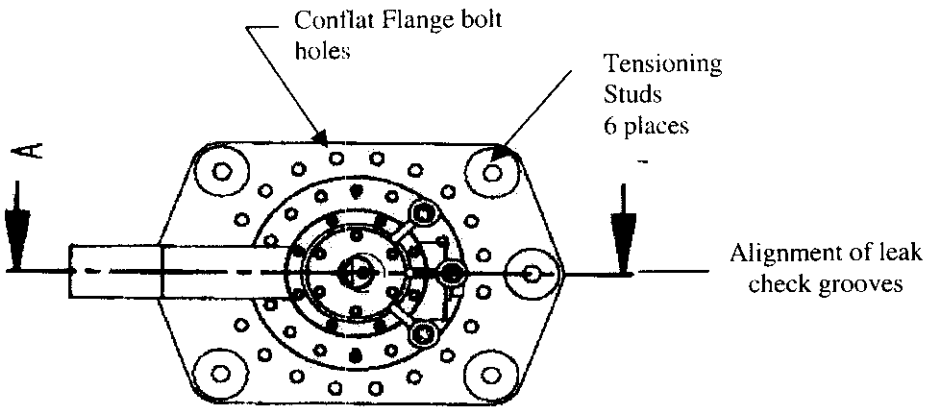


Figure 1.15 The 20-hole Conflat bolt pattern is bisected by center tensioning studs.

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.

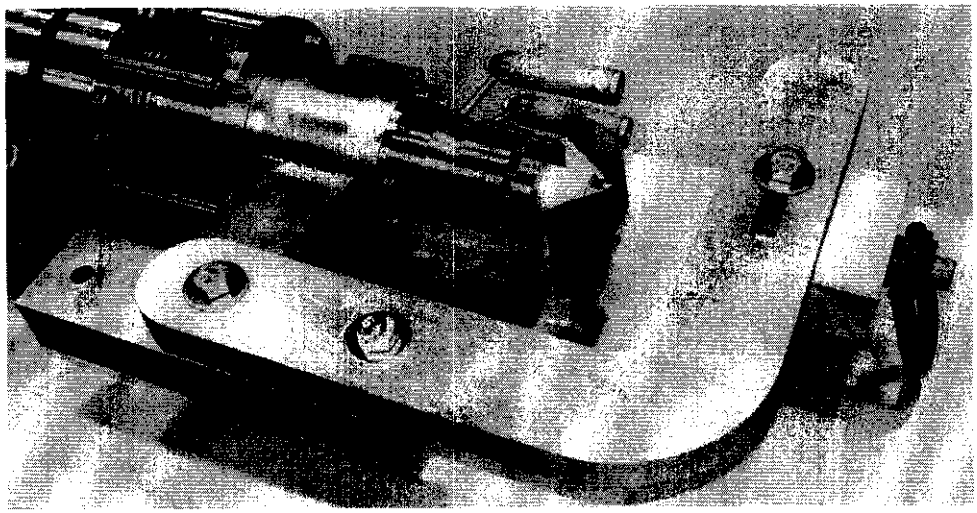


Figure 1.17 The lifting/insertion tool in position to lift the power lead into a vertical position.

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.

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.

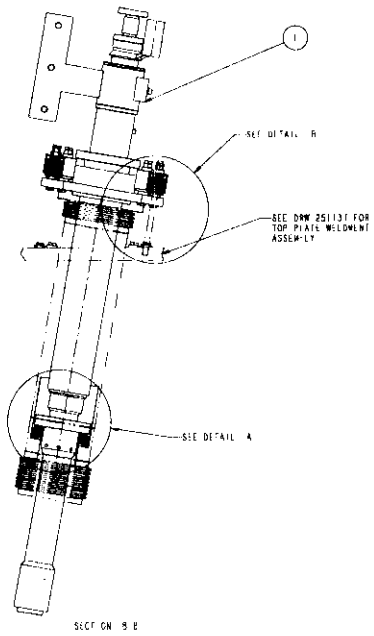


Figure 1.21a HTS Lead in Test Chimney. Note: CERN chimneys do not have bellows.

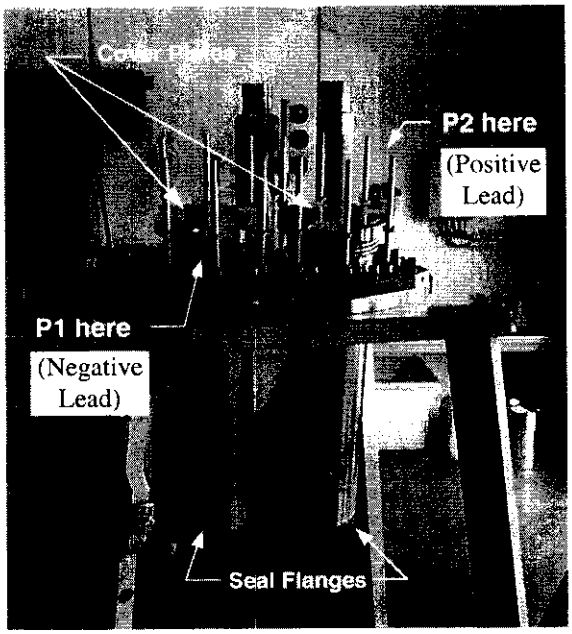


Figure 1.21b Locations of the negative and positive leads.

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

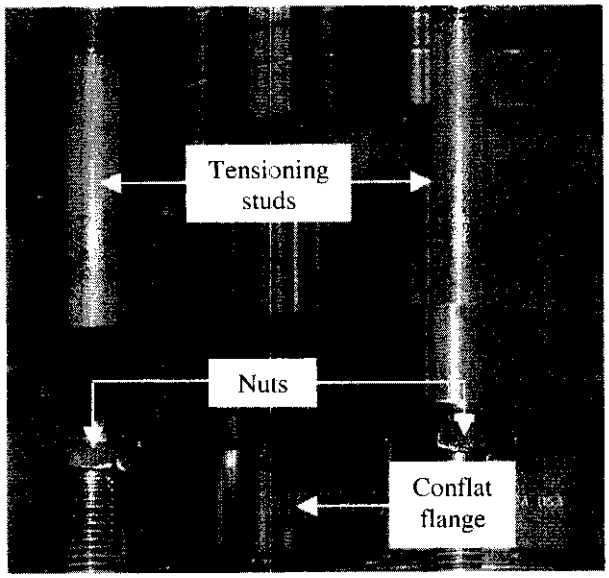


Figure 1.22 The positions of the tensioning studs, nuts, and top plate Conflat flange as the 20 Conflat bolts are tightened.

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

Negative lead DFLX 12 Positive lead DFLX 13

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 ¼ turn increments to a final torque of 15 ft-lbf (180 in-lbf). The tightening sequence is given by Fig. 1.25.

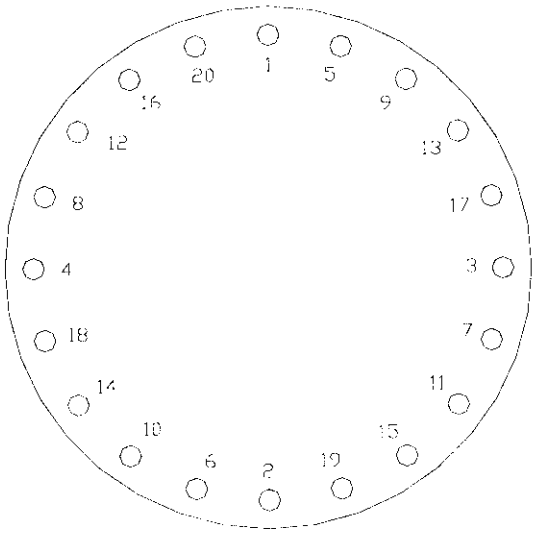


Figure 1.25 Tightening sequence for the 20 Conflat bolts.

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.

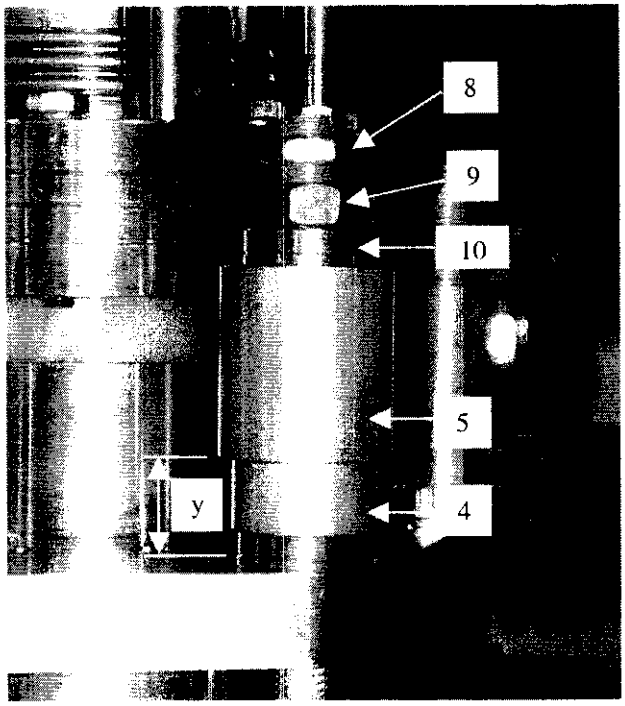


Figure 1.27a An installed Belleville Washer Assembly.

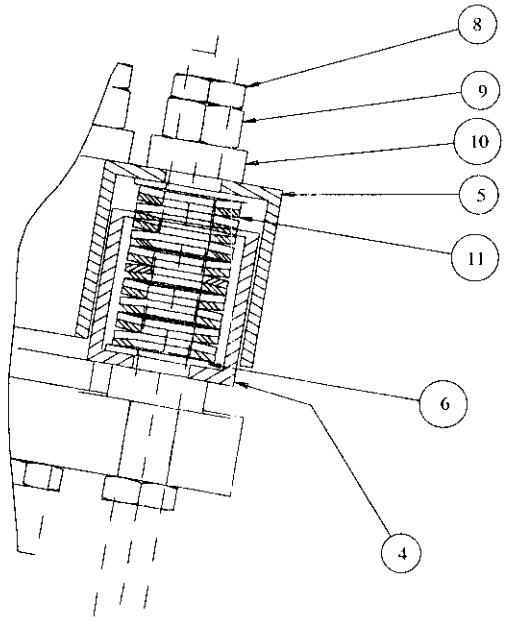


Figure 1.27b An installed Belleville Washer Assembly.

1.28 Tighten the 6 Belleville Washer Assemblies to apply load to the PEEK seal.
1.28.1 Washers for Lead **DFLX** 12

Negative lead DFLX 12 Positive lead DFLX 13

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 the centering shim blocks. The Teflon inner centering shim blocks are labeled with an 'I' and go between the power lead and the lower insulator. The Teflon outer centering shim blocks are labeled with an 'O' and go between the lower insulator and the chimney. The installed Teflon centering shim blocks are shown in Figure 1.28.1.2.

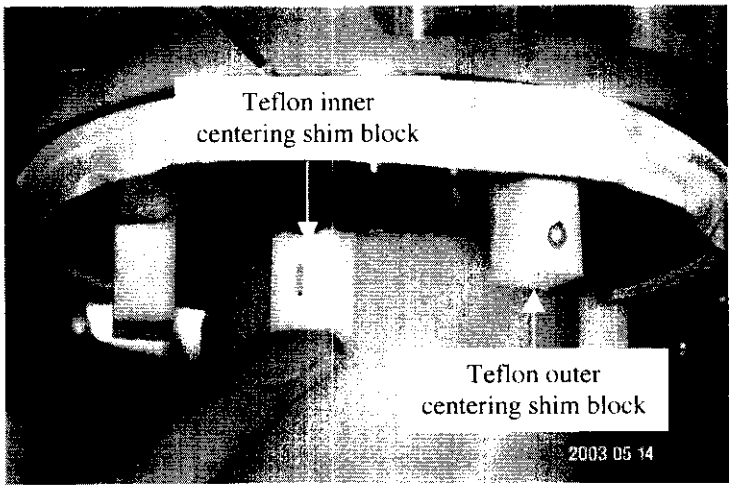


Figure 1.28.1.2 The installed Teflon centering shim blocks.

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.

A 23.92 B 24.55 C 23.56 D 23.70 E 23.78 F 24.03

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.

A 22.12 B 22.75 C 21.76 D 21.90 E 21.98 F 22.23

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.

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 ____

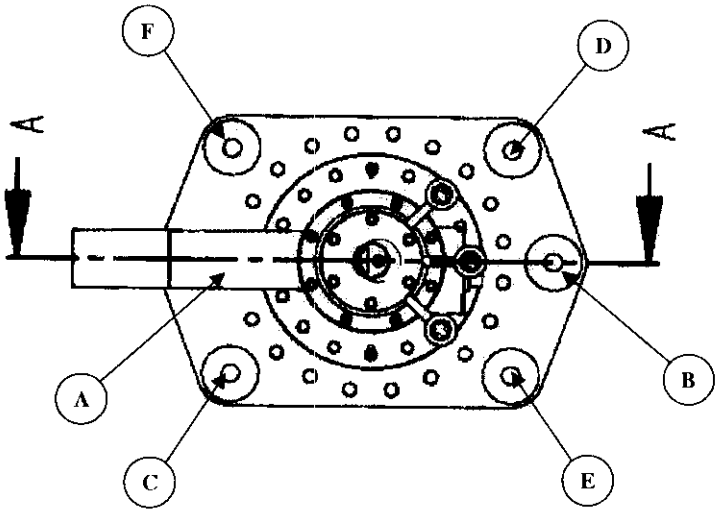


Figure 1.28.1.5 The specified sequence for tightening the Belleville Washer Assemblies.

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

A 22.12 B 22.76 C 21.77 D 21.90 E 21.99 F 22.28

1.28.1.7 Remove the Teflon centering shim blocks from the installed power lead.

1.28.2 Washers for Lead **DFLX** 13

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 the centering shim blocks. The Teflon inner centering shim blocks are labeled with an 'I' and go between the power lead and the lower insulator. The Teflon outer centering shim blocks are labeled with an 'O' and go between the lower insulator and the chimney. The installed Teflon centering shim blocks are shown in Figure 1.28.1.2.

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 24.43 B 24.18 C 24.03 D 24.06 E 24.37 F 23.78

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 22.63 B 22.38 C 22.23 D 22.26 E 22.57 F 21.98

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 22.86 B 22.04 C 22.23 D 22.27 E 22.57 F 21.87

1.28.2.7 Remove the Teflon centering shim blocks from the installed power lead.

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, "7500 A HTS Power Leads for the LHC DFBX: 6. Pressure Test Procedure."

3. Leak Check

3.1 Follow the procedure specified in the document entitled, "7500 A HTS Power Leads for the LHC DFBX: 7. Leak Check Procedure."

4. Electrical Integration of Current Leads in Test Facility

4.1 Attach the G-10 clamshell clamp at the bottoms of the power leads, and install the clamp support.

4.2 Make connection to LTS pigtails. The joint is a mechanical connection with a stainless steel clamp (supplied by LBNL) and indium foil between the cables to ensure good electrical contact. Figure 4.1a shows a rendition of the installed power leads. Figure 4.1b shows the G-10 clamshell clamp, the clamp support, and the mechanical clamp.

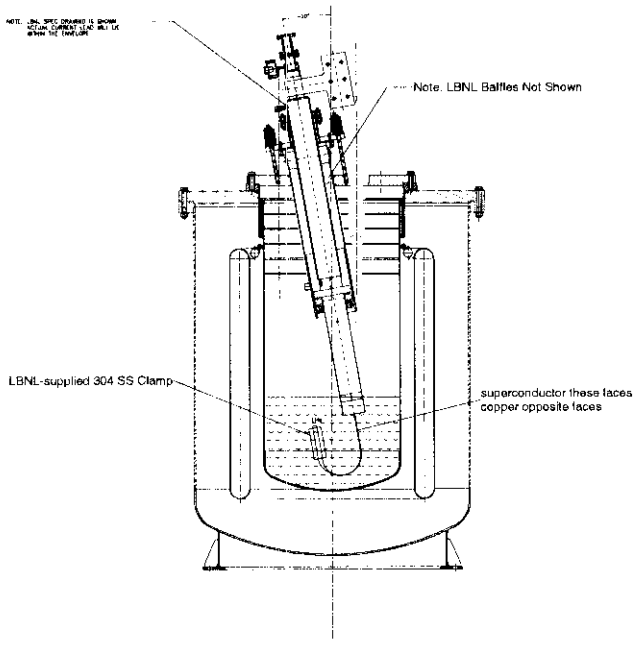


Figure 4.1a Side View of Lead in Cryostat with the LTS cables connected.

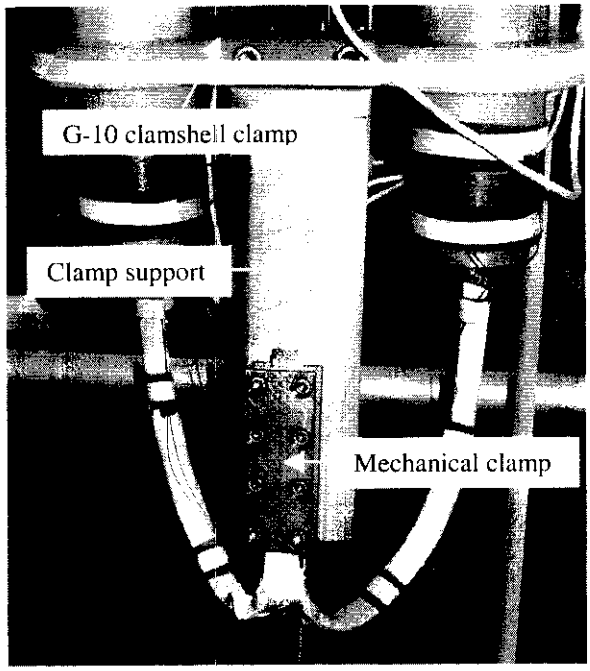


Figure 4.1b Electrical integration of the LTS sections.

4.3 Clamp a piece of bus wire and a little indium to the LTS cable. Solder the two V5 voltage tap wires to the bus wire. Wind excess voltage tap wire around the bottom of the lead, securing it with Kapton and glass tape.

4.4 Insulate the superconducting cable with Kapton and glass tape.

4.5 Install He space temperature sensors and LHe liquid level probes.

4.6 Install the bottom fill tube.

4.7 Bolt the heaters to each power lead. Use grease at the interface to improve the thermal contact between the heater and power lead.

4.8 Measure and record dimensions required for the insert map.

FERMILAB
Technical Division

7500 A HTS Power Leads for the LHC DFBX: 6. Pressure Test Procedure

Lead Pair

Negative Lead: DFLX-12

Positive Lead: DFLX-13

Signed C.E. Hess Jr. Date 06.24.03

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: 65.1 psia

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

Final pressure: 65.1 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.

FERMILAB
Technical Division

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

Lead Pair

Negative Lead: DFLX-12

Positive Lead: DFLX-13

Signed C.E. Ross Jr. Date 06.26.03

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: 2.75 e^{-7} atm·cc/s

   - **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: 2.75 e^{-7} atm·cc/s

Negative Lead DFLX 12 Positive Lead DFLX 13

FERMILAB
Technical Division

7500 A HTS Power Leads for the LHC DFBX: 7a. Top Plate Insertion into the Dewar

Lead Pair

Negative Lead: DFLX-12

Positive Lead: DFLX 13

Signed C.E. Kerr Jr. Date 06.26.03

✓ **1.** Grease and install an o-ring on the top flange of the dewar extension.

✓ **2.** Remove the 10 degree blocks from under the top plate.

✓ **3.** Lift the top plate and insert from the roll-around cart and set them onto the dewar extension. The leads must be on the south side of the test dewar.

Negative Lead DFLX 12 Positive Lead DFLX 13

9. 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 Dan Eddy (Name typed) Dan Eddy (Signature)

Date & time 6/26/03

Pos. Power Lead 7500 A DFLX 13 and Neg. Power Lead 7500 A DFLX 12

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

Before beginning checkout, be sure that all 4-pin hypertronic connectors in dewar have been connected and taped up with fiberglass tape. Also install positive and negative lead heaters. Be sure to put thermal compound on back of heaters before attaching.

3.1 Voltage segment and drop measurement. Connect Kepco power supply cable to the leads. On stand 4, be sure that power supply box is switched to stand 3 and HFU kepco. Under stand 4 platform, connect stand 3 trim cable to shunt current monitor. Turn on kepco and set for 10 amps. Set up function generator for square wave. You should see current go from +10A to –10A. Frequency should be set at .01 (approx. 100 seconds). Check the cryo computer numerical display for trim to verify approx. 10A on leads. Record the applied current 10 A

Connect both primary and redundant vtap cables to positive and negative lead. Go to the back of vtap distribution box and disconnect both primary and redundant vtap cables for the positive and negative lead. Using a breakout box and these cables measure the voltages between the following pins:
Use HP3458 DVM, set it to 40-line cycle integration time.

Positive Lead

Voltage tap Connector 1 (Primary) (Fisher DEE104A06)

Pin 1 - pin 2 **(160uv)** 165 V Pin 2 - pin 3 **(450uv)** 412 V
Pin 1 - pin 3 **(610uv)** 657 V Pin 3 - pin 4 **(480uv)** 504 V
Pin 1 - pin 4 **(1.1mv)** 1.16 V Pin 4 - pin 5 **(3.5mv)** 3.49 V
Pin 1 - pin 5 **(4.7mv)** 4.64 V Pin 5 - pin 6 **(float)** FLOAT V
Pin 1 - pin 6 **(float)** FLOAT V

9. Room Temperature Electrical Checkout

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

Date & time 6/26/03

Pos. Power Lead 7500 A DFLX 13 and Neg. Power Lead 7500 A DFLX 12

Voltage tap Connector 2 (Redundant) (Fisher DEE104A06)

Pin 1 - pin 2 **(160uv)** 165 V Pin 2 - pin 3 **(450uv)** 488 V
Pin 1 - pin 3 **(610uv)** 653 V Pin 3 - pin 4 **(480uv)** 511 V
Pin 1 - pin 4 **(1.1mv)** 1.14 V Pin 4 - pin 5 **(3.5mv)** 3.49 V
Pin 1 - pin 5 **(4.7mv)** 4.66 V Pin 5 - pin 6 **(float)** FLOAT V
Pin 1 - pin 6 **(float)** FLOAT V

Negative Lead

Voltage tap Connector 2 (Primary) (Fisher DEE104A06)

Pin 1 - pin 2 **(-160uv)** -164 V Pin 2 - pin 3 **(-450uv)** -477 V
Pin 1 - pin 3 **(-600uv)** -641 V Pin 3 - pin 4 **(-480uv)** -503 V
Pin 1 - pin 4 **(-1.1mv)** -1.14 V Pin 4 - pin 5 **(-3.5mv)** -3.53 V
Pin 1 - pin 5 **(-4.7mv)** -4.67 V Pin 5 - pin 6 **(float)** FLOAT V
Pin 1 - pin 6 **(float)** FLOAT V

Voltage tap Connector 2 (Redundant) (Fisher DEE104A06)

Pin 1 - pin 2 **(-160uv)** -164 V Pin 2 - pin 3 **(-450uv)** -481 V
Pin 1 - pin 3 **(-600uv)** -645 V Pin 3 - pin 4 **(-480uv)** -501 V
Pin 1 - pin 4 **(-1.1mv)** -1.14 V Pin 4 - pin 5 **(-3.5mv)** -3.52 V
Pin 1 - pin 5 **(-4.7mv)** -4.67 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 from the primary of each lead
Connection 2- one vtap cable from the redundant of each lead

Connection1 (Primary)

Positive Lead Pin 1 - Negative Lead pin 5 **(3.7mv)** 3.43 V
Positive Lead Pin 1 - Negative Lead pin 4 **(7.3mv)** 6.94 V
Positive Lead Pin 1 - Negative Lead pin 3 **(7.7mv)** 7.46 V
Positive Lead Pin 1 - Negative Lead pin 2 **(8.2mv)** 7.94 V
Positive Lead Pin 1 - Negative Lead pin 1 **(8.3mv)** 8.10 V

Connection 2 (Redundant)

Positive Lead Pin 1 - Negative Lead pin 5 **(3.7mv)** 3.43 V
Positive Lead Pin 1 - Negative Lead pin 4 **(7.3mv)** 6.96 V
Positive Lead Pin 1 - Negative Lead pin 3 **(7.7mv)** 7.46 V
Positive Lead Pin 1 - Negative Lead pin 2 **(8.2mv)** 7.94 V
Positive Lead Pin 1 - Negative Lead pin 1 **(8.3mv)** 8.10 V

When voltage measurements are complete, turn off kepco power supply and disconnect kepco power cable on positive and negative lead.

DFLX 13 DFLX 12

9. Room Temperature Electrical Checkout

Performed by Dan Eddy (Name typed) (Signature)

Date & time 6/26/03

Pos. Power Lead 7500 A DFLX 13 and Neg. Power Lead 7500 A DFLX 12

3.3 Temperature sensor resistance measurements. Using test cable, connect to connector 3 (lead rtd's) of leads. Lead rtd's are (511-3, 512-3, 509-3A, 509-3B, 510-3A, 510-3B).

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

Resistance between Pin 1 and pin 2 **(.800)** .849 Ω
Resistance between Pin 1 and pin 3 **(109)** 109.7 Ω
Resistance between Pin 1 and pin 4 **(109)** 109.7 Ω
Resistance between Pin 2 and pin 3 **(109)** 109.6 Ω
Resistance between Pin 2 and pin 4 **(109)** 109.6 Ω
Resistance between Pin 3 and pin 4 **(.800)** .810 Ω
Pins 1-4 resistance to lead ∞ Ω Pins 1-4 resistance to flange ∞ Ω

Resistance between Pin 5 and pin 6 **(.800)** .812 Ω
Resistance between Pin 5 and pin 7 **(109)** 109.6 Ω
Resistance between Pin 5 and pin 8 **(109)** 109.6 Ω
Resistance between Pin 6 and pin 7 **(109)** 109.6 Ω
Resistance between Pin 6 and pin 8 **(109)** 109.6 Ω
Resistance between Pin 7 and pin 8 **(.800)** .808 Ω
Pins 5-8 resistance to lead ∞ Ω Pins 5-8 resistance to flange ∞ Ω

Resistance between Pin 9 and pin 10 **(.800)** .736 Ω
Resistance between Pin 9 and pin 11 **(109)** 109.7 Ω
Resistance between Pin 9 and pin 12 **(109)** 109.6 Ω
Resistance between Pin 10 and pin 11 **(109)** 109.6 Ω
Resistance between Pin 10 and pin 12 **(109)** 109.6 Ω
Resistance between Pin 11 and pin 12 **(.800)** .717 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 108.85 Ω**(108.5)**(I+ at pin 1,U+ at pin 2,I- at pin 3,U- at pin 4)
Resistance of T2 108.83 Ω**(108.5)** (I+ at pin 5, U+ at pin 6, I- at pin 7, U- at pin 8)
Resistance of T3 108.97 Ω**(108.5)**(I+ at pin 9,U+ at pin 10,I- at pin 11,U- at pin 12)

DFLX 13 DFLX 12

9. Room Temperature Electrical Checkout

Performed by Dan Gow (Name/typed) (Signature)

Date & time 1/20/03

Pos. Power Lead 7500 A DFLX 13 and Neg. Power Lead 7500 A DFLX 12

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

Resistance between Pin 1 and pin 2 **(.800)** .827 Ω
Resistance between Pin 1 and pin 3 **(109)** 109.7 Ω
Resistance between Pin 1 and pin 4 **(109)** 109.7 Ω
Resistance between Pin 2 and pin 3 **(109)** 109.6 Ω
Resistance between Pin 2 and pin 4 **(109)** 109.6 Ω
Resistance between Pin 3 and pin 4 **(.800)** .793 Ω
Pins 1-4 resistance to lead ∞ Ω Pins 1-4 resistance to flange ∞ Ω

Resistance between Pin 5 and pin 6 **(.800)** .863 Ω
Resistance between Pin 5 and pin 7 **(109)** 109.6 Ω
Resistance between Pin 5 and pin 8 **(109)** 109.6 Ω
Resistance between Pin 6 and pin 7 **(109)** 109.6 Ω
Resistance between Pin 6 and pin 8 **(109)** 109.6 Ω
Resistance between Pin 7 and pin 8 **(.800)** .826 Ω
Pins 5-8 resistance to lead ∞ Ω Pins 5-8 resistance to flange ∞ Ω

Resistance between Pin 9 and pin 10 **(.800)** .723 Ω
Resistance between Pin 9 and pin 11 **(109)** 109.7 Ω
Resistance between Pin 9 and pin 12 **(109)** 109.7 Ω
Resistance between Pin 10 and pin 11 **(109)** 109.7 Ω
Resistance between Pin 10 and pin 12 **(109)** 109.7 Ω
Resistance between Pin 11 and pin 12 **(.800)** .761 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:

Resistance of T1 108.3 Ω**(108.5)**(I+ at pin 1,U+ at pin 2,I- at pin 3,U- at pin 4)
Resistance of T2 109.8 Ω **(108.5)**(I+ at pin 5, U+ at pin 6, I- at pin 7, U- at pin 8)
Resistance of T3 109.6 Ω**(108.5)**(I+ at pin 9,U+ at pin 10,I- at pin 11,U- at pin 12)

9. Room Temperature Electrical Checkout

Performed by Dan Ely (Name typed) (Signature)

Date & time 4/26/03

Pos. Power Lead 7500 A DFLX 13 and Neg. Power Lead 7500 A DFLX 12

3.4 Check remaining rtd's. This includes rtd's in the dewar (530-3,531-3,532-3,534-3, 535-3), in the leads (507-3A, 507-3B), for the N2 shield (594-3), and the outlet HE for each lead (513-3,514-3). Connect cables for three 19-pin top plate connectors labeled "dewar 0, dewar 1, and dewar inlet HE te/ll". Also connect 4-pin cables for N2 shield and outlet HE (one for each lead). All of these can be read out on the cryo computer. This cannot be done until Mike T has rebooted the system. Once into the system, you need to switch to a computer on the main network. The command for this is "ssh" (for example, ssh mdtf34). To open the GUI and choose readout values type "numdisp –n mtfvx27&". The selected rtd's should read room temperature that is approximately 295 K. The cables for rtd's in the leads can be connected (511-3,512-3,509-3A, 509-3B, 510-3A, 510-3B) and can be read out on the mtfops computer and should also read approximately 295K. Any problems list in space provided below:

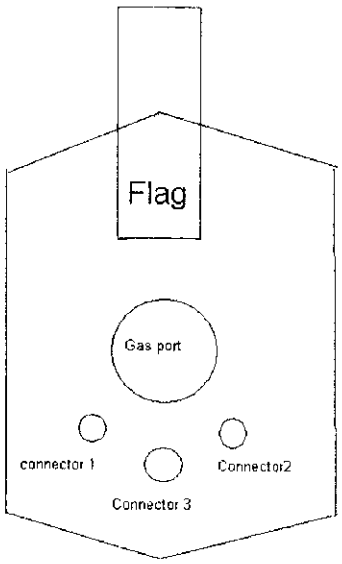
3.5 Check both liquid levels (12" and 30"). The 12" liquid level is connected to pins 9-12 of "dewar inlet HE te/ll" cable. Connect 4-pin cable to top plate for 30" probe. Disconnect J1 at the back of each liquid level meter and do a 4-wire resistance measurement on each probe. The resistance should read about 165 Ω (for 12") and 412 Ω (for 30"). Wires come out to pins 1(red), 7(black), 8(blue), and 6(yellow) on J1 connector. Do following measurements for each probe:

1.1(red) to 8(blue) should be approx. 5 Ω
2. 8(blue) to 6(yellow) should be approx. (13.75 X active length of probe) 165 Ω for 12" and 412.5 Ω for 30"
3. 6(yellow) to 7(black) should be something less than 5 Ω
4. 1(red) to 7(black) should approximately equal resistance from #2 + #1

√ OK ___ NOT OK

DFLX 13 DFLX 12

9. Room Temperature Electrical Checkout



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

DFLX _____ DFLX _____

12" DEWAR

1. 6.7
2. 166.37
3. 2.84
4. 170.88

30" DEWAR

1. 6.76
2. 404.83
3. 1.56
4. 409.91

30" PHASE SED

1. 7.39
2. 406.43
3. 2.41
4. 411.30

DEWAR RTD'S 4-WIRE RESISTANCE

DEWAR TE0

1. 65.97
2. 53.73
3. 56.43
4. 65.37

DEWAR TE1

1. 55.46
2. 69.17

INLET HE 507-3B

59.43

FERMILAB
Technical Division

7500 A HTS Power Leads for the LHC DFBX: 10. Installation of the Top Plate

Lead Pair

Negative Lead: DFLX-12

Positive Lead: DFLX-13

Signed C.F. Hess Jr. **Date** 06.27.03

___✓___ **1.** Install all bolts to fasten the top plate to the dewar extension.

___✓___ **2.** Loosen the tensioning rod nuts on the undersides of the lead plates at least 0.5 mm below the lead plate.

___✓___ **3.** Install the transfer lines for maintaining the test dewar liquid level.

___✓___ **4.** Install the transfer lines supplying the 4-20 K circuit.

___✓___ **5.** Install the test dewar flexible vent line.

___✓___ **6.** Install a power lead vent stack on each power lead, keeping in mind the orientation of the vent line.

___✓___ **7.** Connect the vent lines (thermally insulated, non-conductive hoses) to the power lead vent stacks.

___✓___ **8.** Connect the lines labeled "+ LD PDT –" and "- LD PDT –" to the positive and negative lead vent stacks, respectively. These lines connect to the low side of the differential pressure transducers.

___✓___ **9.** Connect the lines labeled "+ LD PDT +" and "- LD PDT +" at the 4-20 K female bayonet vacuum jacket. These lines connect to the high side of the differential pressure transducers.

___✓___ **10.** Connect the power leads' warm gas supply line to the 4-20 K transfer line.

___✓___ **11.** Connect one end of the bypass line at the phase separator and the other end at the vent piping.

FERMILAB Technical Division	7500A HTS Power leads for the LHC DFBX	Doc. No. Rev. No. Date: March 5,2003 Page 1 of 1 Author: Dan Eddy
	13. Cold Temp Hi-pot In HE 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)

Date & time 6/29/01 11:00

Pos. Power Lead 7500 A DFLX 13 and Neg. Power Lead 7500 A DFLX 12

This hi-pot should be performed after dewar has been filled with liquid helium. Notify the Cryo Operator before you disconnect cables. When checkout is complete, make sure you place the original and a copy of this document in the Traveler Binders.

3.1 Short all of the temperature sensors together using the special RTD high pot cable. High pot each set of temperature sensor to 300v with respect to the Lead (ground).

Record breakdown voltage (if any) _____ V.
Record current .01 μA A

3.2 Hi-pot the leads in a cold (4.5K) He environment to 1500V (1.3 Bar) using a Droege HV power supply. Connect the positive clip to one lead and the negative clip to ground. Also, short all of the temperature sensors together using the special RTD high pot cable. Connect the ring terminal from each connector to the flag of each lead. **Be sure to disconnect the redundant voltage taps on both leads and the power connections from Kepco power supply.**

Record breakdown voltage (if any) _____ V.
Record current 1.2 μA A.
Record approximate temp. 4.2 K.
Record approximate dewar pressure 14.6 PSIG.

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7500 A HTS Power Leads for the LHC DFBX: 12. Cooldown Checklist

Lead Pair

Negative Lead: DFLX-12

Positive Lead: DFLX-13

Signed C.E. Hess Jr. Date 06.27.03

✓ 1. ±5 A applied to the current leads during cooldown.

✓ 2. DAQ system is operational (temperature sensor readouts in the test dewar helium space are updating).

_____ 3. Test dewar and power leads cooled down as per the cooldown procedure "7500 A HTS Power Leads for the LHC DFBX: 12b. Cryogenic Operating Procedure".

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7500 A HTS Power Leads for the LHC DFBX: 14. Connect the Leads to the Power Supply & Configure

Lead Pair

Negative Lead: DFLX12

Positive Lead: DFLX13

Signed Roger Rabehl Date 6/27/03

1. Power Supply Changes

HMTF POWER INTERLOCK SELECTOR SWITCH

- ✓ **1.1** CPS-3 power supply ~~MUX~~ must be in the "Stand 3" position.
- ✓ **1.2** All three warning lights must be switched into the "Stand 3" position.
- ✓ **1.3** Adjust the power supply time constant by setting the resistance to 500 μΩ.
- ✓ **1.4** Adjust the power supply time constant by setting the inductance to 0.5 mH.
- ✓ **1.5** Adjust the dump resistance to 30 mΩ.
- ~~**1.6** Adjust the dump delay to 1 s.~~

2. Bus Connection Changes – Stand 3 Side

- ✓ **2.1** Perform MTF-ELEC-07 (VMTF/ST4/ST3) LOTO procedure for all handling of flexible bus work.
- ✓ **2.2** Mate the Stand 3 hard bus with the Stand 4 flexible bus on the Stand 4 platform. Verify the polarity is correct.
- ✓ **2.3** Disconnect trim current supply leads.
- ✓ **2.4** Connect the flex leads and chill blocks to the power lead flags.
- ✓ **2.5** Attach voltage taps VFF-A and VFF-B at the negative and positive flex lead flags, respectively, and voltage VLF-A and VLF-B at the negative and positive power lead flags, respectively. These taps will allow the voltage drop across the flex lead/chill block joint and chill block/power lead joint to be measured.
- ✓ **2.6** Using glass tape, attach the Kapton-wrapped platinum temperature sensors TE515-3 and TE516-3 to the positive and negative lead flags, respectively.
- ✓ **2.7** Wrap the power lead flags with rubber insulation for personnel safety.
- ✓ **2.8** Install the plexiglass enclosure around the power leads for personnel safety.

3. Bus Connection Changes – VMTF End

- ✓ **3.1** Remove the short VMTF flex leads from the 30 kA bus work.

✓ **3.2** Install flex leads from the Stand 4 bus to the 30 kA bus work.

✓ **3.3** Wrap all exposed bus with rubber insulation for personnel safety.

✓ **3.4** Place the VMTF ground switch in the "off" position.

✓ **3.5** Place the Stand 4 ground switch in the "on" position.

✓ **3.6** Place the Stand 4/VMTF ground switch on the ETS panel in the Stand 3 (up) position. AND PRESS MASTER RESET

✓ **3.7** Remove the power control cable, which contains QLM, PLC, etc. signals, from the VMTF "j" plug and insert into the Stand 4 "j" plug.

Negative lead DFLX 12 Positive lead DFLX 13

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	9.1 Warm Temp Hi-pot In Gasous He 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.

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Performed by DAN EDDY (Name typed) Dan Eddy (Signature)

Date & time 7/10/03 14:30

Pos. Power Lead 7500 A DFLX 13 and Neg. Power Lead 7500 A DFLX 12

This hi-pot should be performed after dewar has been filled with gaseous helium. Notify the Cryo Operator before you disconnect cables. When checkout is complete, make sure you place the original and a copy of this document in the Traveler Binders.

3.1 Short all of the temperature sensors together using the special RTD high pot cable. High pot each set of temperature sensor to 300v with respect to the Lead (ground).

Record breakdown voltage (if any) ——— V.
Record current >.01 uA

3.2 Hi-pot the leads in a gaseous He environment to 1500V (1.3 Bar) using a Droege HV power supply. Connect the positive clip to one lead and the negative clip to ground. Also, short all of the temperature sensors together using the special RTD high pot cable. Connect the ring terminal from each connector to the flag of each lead. **Be sure to disconnect the redundant voltage taps on both leads and the power connections from Kepco power supply.**

Record breakdown voltage (if any) ——— V.
Record current .01 A A.
Record approximate temp. 298 K.
Record approximate dewar pressure _____ PSIG.

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Stand 3 LHC-HTS Lead Testing: 23. Pack and Ship the Leads

Lead Pair

Negative Lead: DFLX12

Positive Lead: DFLX13

Signed Roger J. Rabehl Jeff Weiss Date 7/15/03 7-15-03

1. Pack the Leads

1.1 With the lead on the steel table, swing the insertion/lifting tool 180° so that the lead can be picked up and remain horizontal as shown in Figure 1.1.

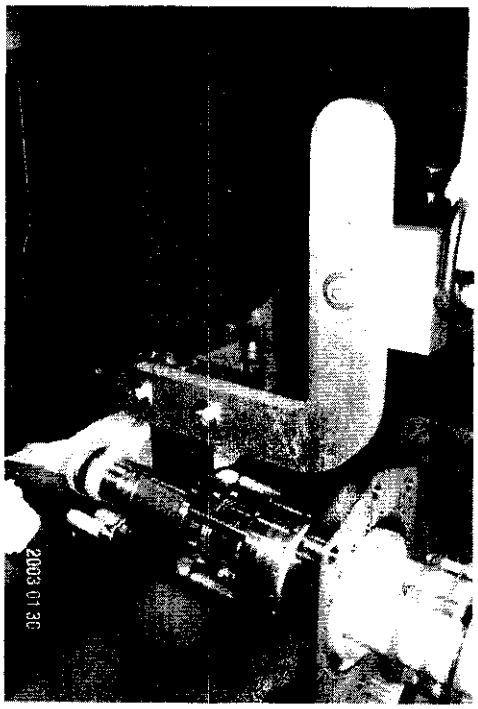

Figure 1.1 Orientation of the insertion/lifting tool to allow the power lead to be held horizontally.

1.2 Lift the power lead out of the V-blocks.

1.3 While supporting the lead from the crane, remove the end support clamped around the lower flange of the power lead.

1.4 Complete the lead preparation checklist:

✓ ✓ **a)** Install the protective covers for the lead top plate knife edge sealing surface and for the lower flange sealing surface on each lead. Secure them with tape.

✓ ✓ **b)** Insert a protective plastic cap into the 4-20 K gas port for each lead.

✓ ✓ **c)** Reattach the g-force indicators that were attached to the leads when they arrived.

✓ ✓ **d)** Wrap the ceramic insulator at the top of each lead in bubble wrap.

✓ ✓ **e)** Place a cap on the Conflat flange at the top of each lead.

Negative Lead DFLX 12 Positive Lead DFLX 13

✓ ✓ **f)** Wrap the power lead vacuum pumpout in aluminum foil.

✓ ✓ **g)** Secure the power lead bus and voltage tap wires to the power lead lower G-10 section with tape.

✓ ✓ **h)** Set each lead in the shipping crate and remove the insertion/lifting tool.

1.5 Complete the packing checklist:

✓ **a)** Reinstall the wooden supports in the crate to hold the lead in place during shipping.

✓ **b)** Make two photocopies of all documents in the lead travelers, and place the power lead travelers in the shipping crate. One copy of the documents is for Sandor, the second copy is for Marsha Schmidt.

✓ **c)** Verify the following items are in the shipping crate:

✓ **i)** Two flag heaters

✓ **ii)** Two flag heater connectors

✓ **iii)** Vacuum pumpout actuator

✓ **iv)** NW16 clamp

✓ **v)** NW16 o-ring

1.6 Close the shipping crate

2. Ship the Leads

2.1 Complete the shipping checklist:

✓ **a)** Call Marsha Schmidt (X-4377) to request that the power leads be shipped to storage.