Technical Specification

for

NML – CM2 Interfaces

Fermilab CM No. RFCA002

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1. SCOPE

The second cryomodule (CM2) to be installed in the NML test area is a type "3-plus". The Fermilab designation for this cryomodule is RFCA002. Locally it is being referred to as CM2. This document specifies the external interfaces between the CM2 and the NML test area.

2. GENERAL CONFIGURATION

An elevation view of the type "3-plus" cryomodule is shown in Figure 2.1.
The figure shows the major dimensional locations of the key external features of the cryomodule.

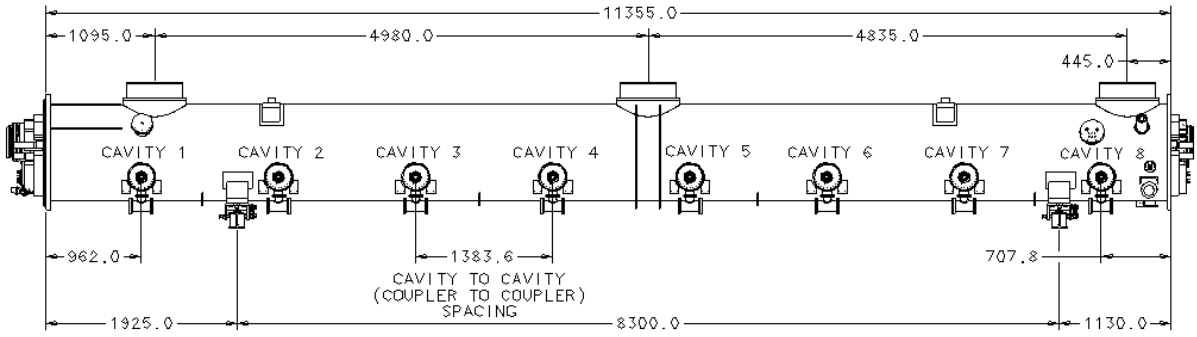

Figure 2.1 Type 3+ Cryomodule, CM2. Major dimensions.

Figure 2.2 shows more clearly the feed through port "K" and the first two of the eight coupler ports. The coupler ports are detailed in section 4. Flange "K" provides the feed throughs for four CERNOX cryogenic temperature sensors and a vessel spot heater, detailed in section 13. One of the two support feet is shown in Figure 2.3. The support feet are detailed in section 11.

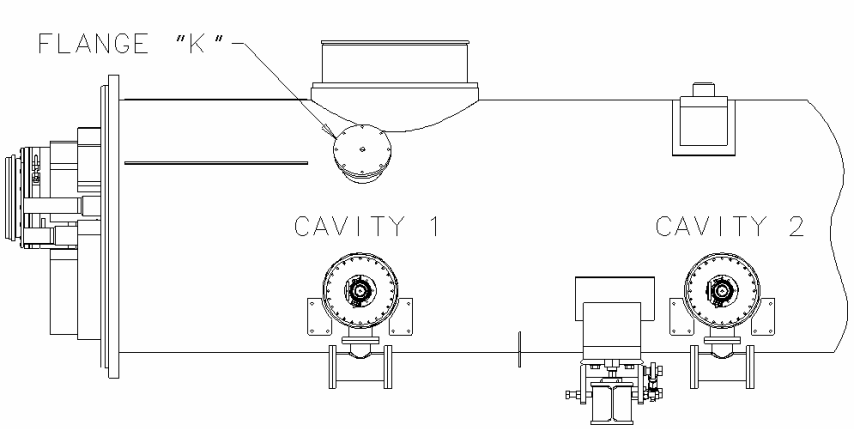

Figure 2.2. "Upstream" end of Cryomodule, CM2.

Figure 2.3 shows the feed through port "D", the second of the two support feet, and the last two of the eight coupler ports. Flange "D" provides feed through for eight cavity tuning stepper motors (section 6.2) and four BPM signals, detailed in section 13. The support feet are detailed in section 11.

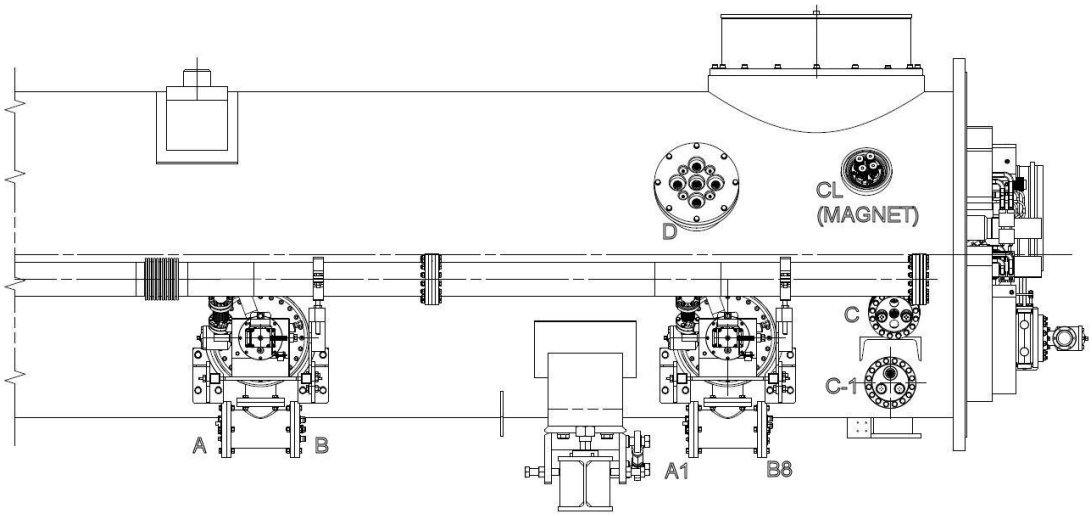

Figure 2.3. "Downstream" end of Cryomodule, CM2.

There are feed through flanges "A" and "B" attached to each of the eight coupler ports as shown in Figure 2.4. Flange "A" contains the feed through for the piezo tuners in each

cavity, detailed in section 13. Six of the "A" flanges contain the feed through for the wire position monitors, WPM. Flange "B" contains signals from temperature sensors on the coupler and helium vessel, e- pick-up from the coupler, and cavity HOM.

Flanges "A" and "B" are detailed in section 13.

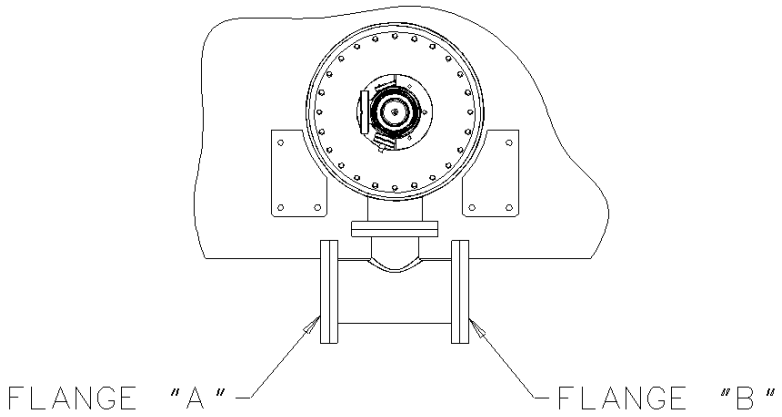

Figure 2.4. A typical coupler port showing Flange "A" and Flange "B".

3. BEAM LINE

The beam line is terminated at each end of the cryomodule with a gate valve. Each gate valve has a flange face on it. Figure 3.1 shows the axial location (as measured) of the flange face on each gate valve. Figure 3.2 shows the bolt pattern on the gate valve flange. The beam line is back-filled with LN2 boiled off gas at 1050 mbar absolute and 67 F while in the class 10 clean room during cavity string assembly.

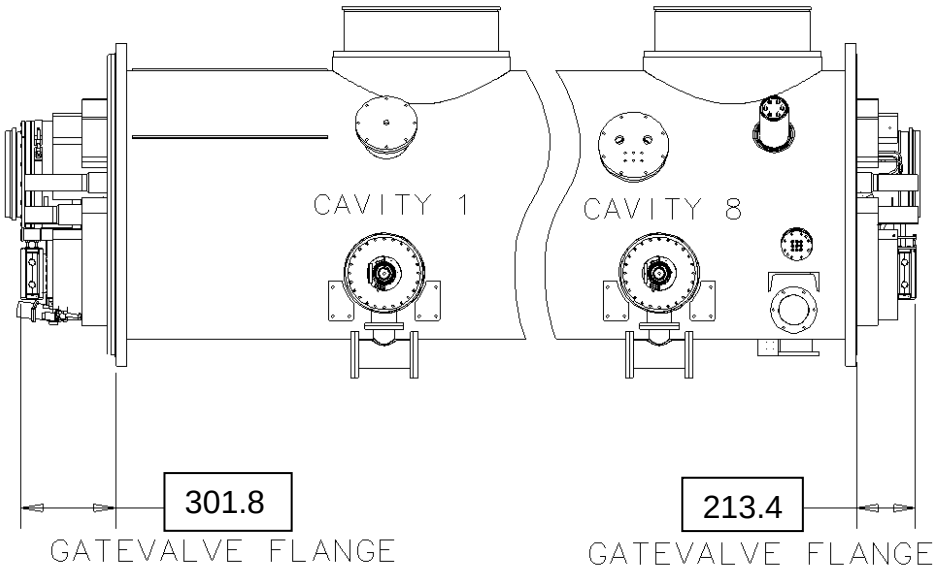

Figure 3.1 Beam line gate valve flange locations, as measured.

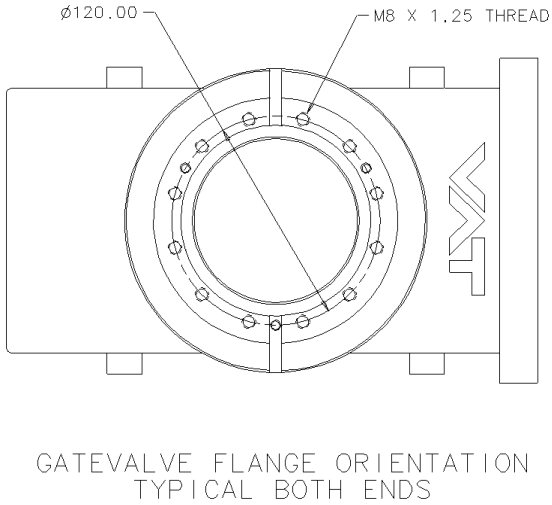

Figure 3.2 Beam line gate valve flange

4. INPUT COUPLERS

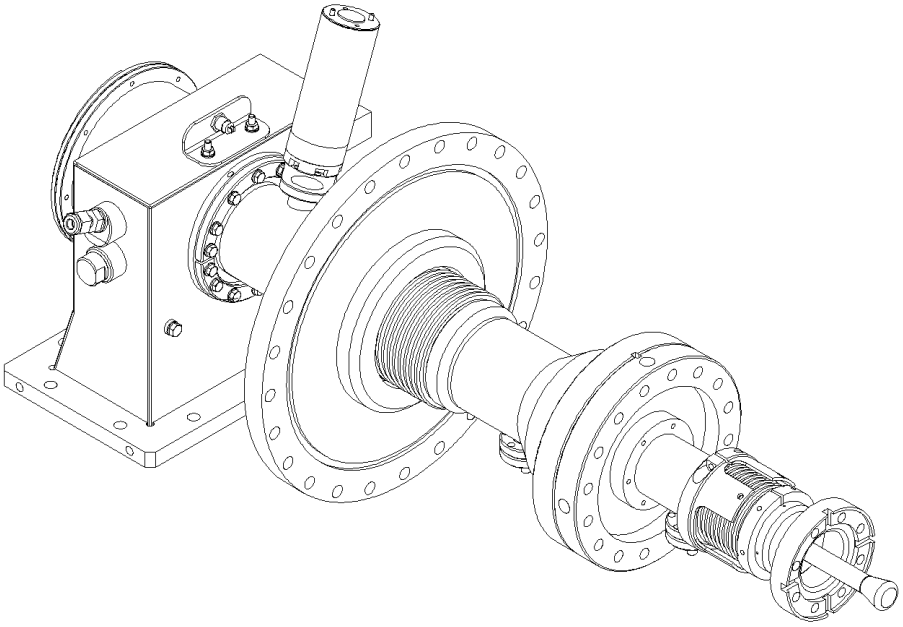

Figure 4.1 Input Coupler

4.1. Coupler Tuner

The main input coupler is tunable; meaning the position of the antenna tip inside the cavity can be adjusted, as installed, from the back side of the coupler's waveguide. Couplers include an automatic tuning mechanism. The tuner will be installed on couplers prior to delivery of the cryomodule to NML. Tuners will be prewired and equipped with plug in connectors. Accelerator Division will procure, install, and connect all electrical devices that plug into the tuner. A cartoon of the tuner as mounted on the backside of the coupler's waveguide is shown in Figure 4.2

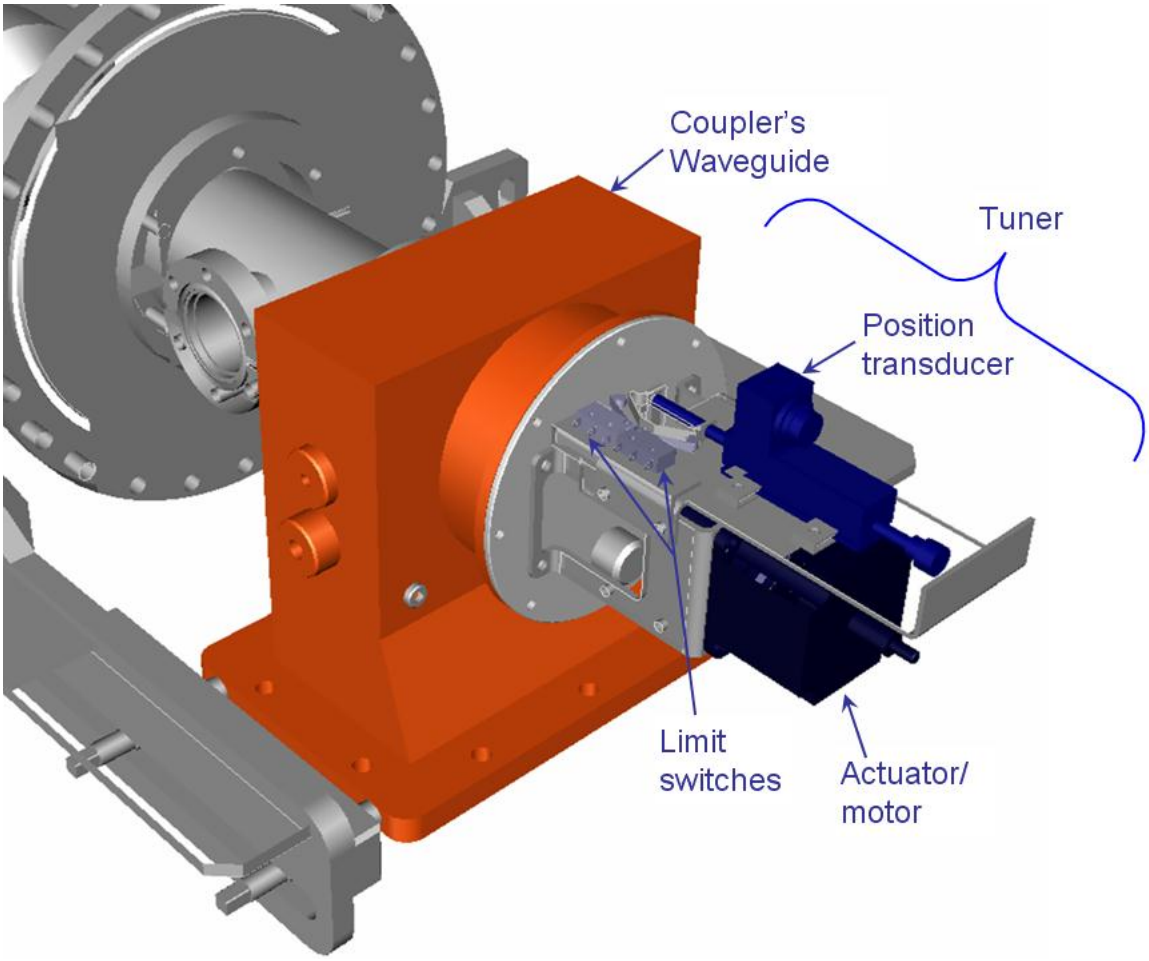

Figure 4.2 Coupler tuner

The tuner includes a linear motor, a linear potentiometer, and two limit switches. They are identified in the figure. A Trim Trio 8-pin Burndy connector will also be mounted on the tuner assembly (not shown in the figure). This connector is provided to wire to the limit switches and motor. A mating connector is supplied with the position transducer and a separate cable is to be run to it for noise isolation. Table 4.1 summarizes these devices.

Table 4. 1 Coupler tuner interfaces

Device	Function	Manuf./model	Parameters	Connection	Notes
Motor, linear	Actuator	Haydon Switch, p/n 57H47-12-810	12V, 25.4mm stroke	(4)leads	Wire to 12-88 Burndy connector.
Limit switches (2)	Over-travel sensing	Marquardt, p/n 1050.0151		(3) solder terminals	Wire to 12-88 Burndy connector.
Potentiometer, linear	Position transducer	Novotechnik, p/n TRS-25		Plug connector	Mating connector will also be provided.

4.2. Field Probes

Figure 4.3 shows a section of the input coupler as installed on a cavity. Each input coupler includes three field probes. Two are located inside the cryomodule, labeled #1 and #2 in the figure, while the third is accessible on the warm end portion of the coupler outside the vessel. Cables for the interior field probes are routed through the Flange B. The details are in Section 13.

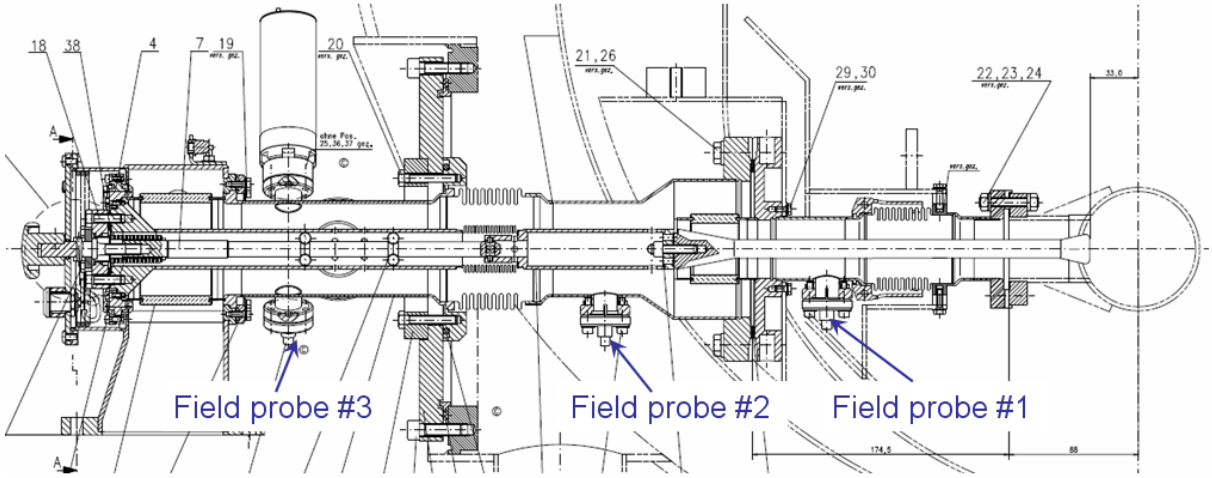

Figure 4.3. Field probes in the coupler.

4.3. Temperature Sensors

Each coupler includes two temperature sensors. Two platinum RTD's are installed on the back side of the 80K flange of the coupler's cold end to monitor cold window temperature. The sensors are mounted in the 12 o'clock and 10 o'clock positions. The cable for these sensors is routed through the center feed through on Flange B or Flange B8. The details of this connection are in Section 13. There is a provision for an additional temperature sensor to be inserted into a 3.1 to 3.2mm diameter blind hole on the flange connection between the waveguide and the warm end assembly to monitor heating of the warm window. See Figure 4.4. Use thermal grease on the RTD to ensure thermal contact. A strain relief for the connector for this RTD is provided on the top of the waveguide. This is also shown in Figure 4.4. A 14mm x 1mm pitch threaded port is available on the waveguide for insertion of an infrared sensor to monitor warm window temperature.

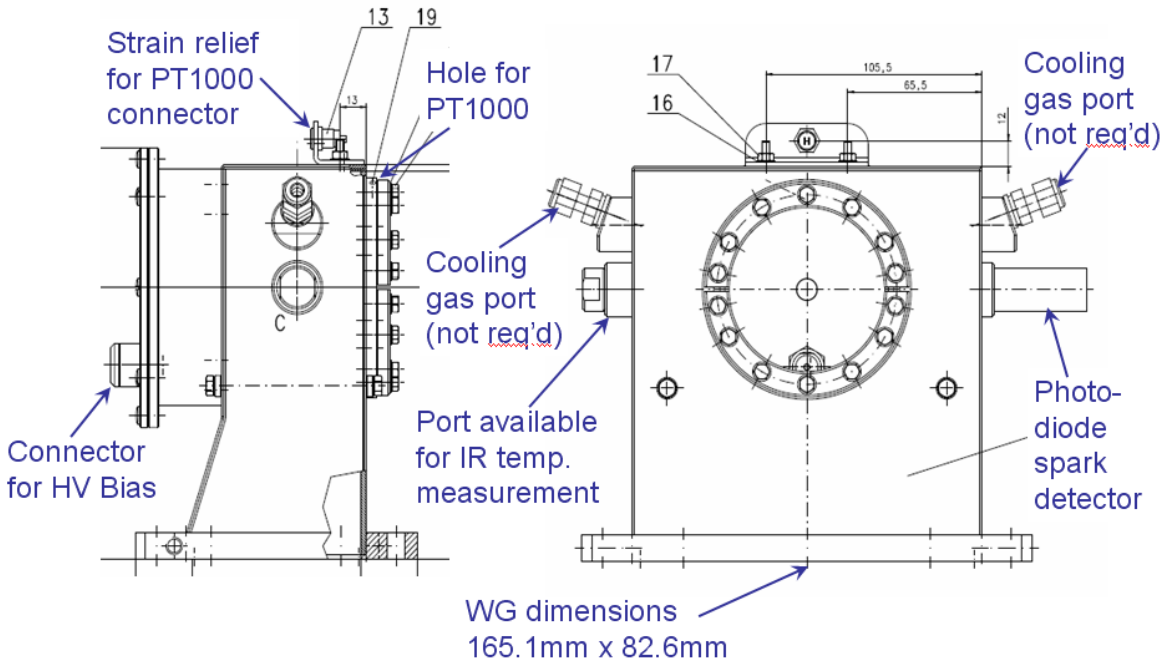

Figure 4.4 Instrumentation on Coupler Waveguide

4.4. Spark Detectors

A mini-Conflat window flange on the coupler's warm end assembly is provided for connection of a PM tube. This allows spark detection in the vacuum volume between the coupler's two ceramic RF windows. The mechanical drawing of the window flange is shown in Figure 4.5.

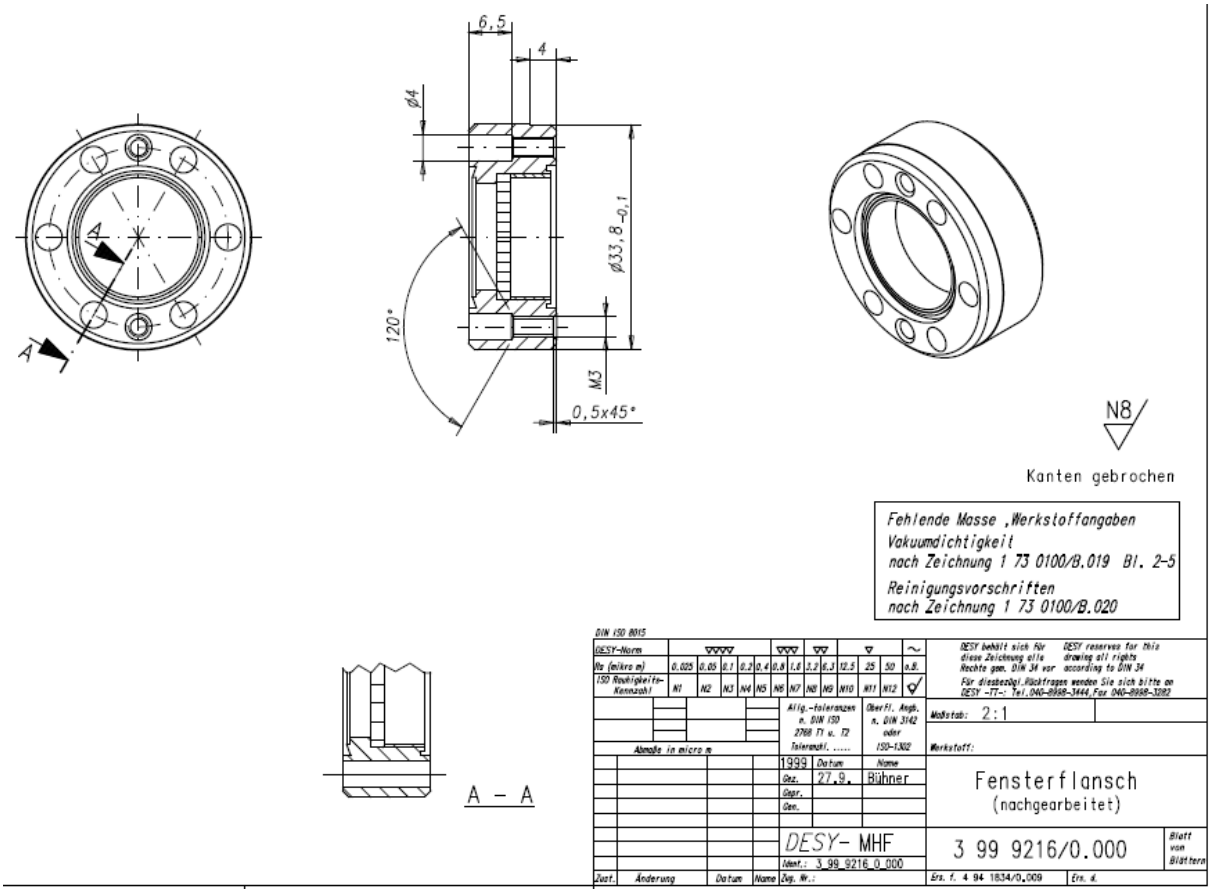

Figure 4.5 Detail of mini-Conflat window flange for warm end spark detector.

A ¼"-36 threaded port on the waveguide is available for connection of a photodiode to monitor for sparks inside the waveguide. This is shown in Figure 4.4.

4.5. Wave Guide

Wave guide interior dimensions are shown in Figure 4.4.

4.6. Gas Ports

Gas ports for cooling wave guide will not be connected. They are shown in Figure 4.4

4.7. Bias Voltage

Bias voltage is applied through a connector on the back side of the coupler's waveguide. The connector has LEMO p/n HGP.1S.405.CLASV and is identified in Figure 4.4.

4.8. Coupler Vacuum

The cryomodule is supplied with a vacuum header and connections to each of the eight couplers. Each end of the header will be flanged with a blank flange at the upstream end and a pump-out valve at the downstream end. The vacuum header is serviced with a sublimation pump and an ion getter pump. Both pumps were procured by AD and will be installed at NML. The vacuum header will have blank flanges installed at the pump locations before transport to NML.

5. HOM COUPLERS

There are two HOM couplers per cavity. The signals are fed through Flange B, nos. 2 and 3 at each location. Details are in section 13.

6. TUNERS

6.1. Piezo Tuners

Each cavity has a piezo tuner. The leads from the piezo for each cavity are routed to the respective flanges A and A1 (see Figure 13.1, 13.2). The detailed pin assignments are presented in table 6.1.

Table 6.1 Piezo Connection Details.

Piezo Connection Details				
Cavity-Flange-Connector	Device/Sensor Name	Serial Number	Device Location	Feed Through Connector Pin
Cav_1-Flange_A1-05	BladeTuner-1-1	PZ-8	Cavity 1 Blade Tuner Coupler side	A,B (V+,V-)
Cav_1-Flange_A1-05	BladeTuner-1-2	PZ-1x	Cavity 1 Blade Tuner Non Coupler side	D,E (V+,V-)
Cav_2-Flange_A-05	BladeTuner-2-1	PZ-15	Cavity 2 Blade Tuner Coupler side	A,B (V+,V-)
Cav_2-Flange_A-05	BladeTuner-2-2	PZ-06	Cavity 2Blade Tuner Non Coupler side	D,E (V+,V-)
Cav_3-Flange_A-05	BladeTuner-3-1	PZ-19	Cavity 3 Blade Tuner Coupler side	A,B (V+,V-)
Cav_3-Flange_A-05	BladeTuner-3-2	PZ-13	Cavity 3 Blade Tuner Non Coupler side	D,E (V+,V-)
Cav_4-Flange_A-05	BladeTuner-4-1	PZ-14	Cavity 4 Blade Tuner Coupler side	A,B (V+,V-)
Cav_4-Flange_A-05	BladeTuner-4-2	PZ-5	Cavity 4 Blade Tuner Non Coupler side	D,E (V+,V-)
Cav_5-Flange_A1-05	BladeTuner-5-1	PZ-16	Cavity 5 Blade Tuner Coupler side	A,B (V+,V-)
Cav_5-Flange_A1-05	BladeTuner-5-2	PZ-07	Cavity 5 Blade Tuner Non Coupler side	D,E (V+,V-)
Cav_6-Flange_A-05	BladeTuner-6-1	PZ-2x	Cavity 6 Blade Tuner Coupler side	A,B (V+,V-)
Cav_6-Flange_A-05	BladeTuner-6-2	PZ-3x	Cavity 6 Blade Tuner Non Coupler side	D,E (V+,V-)
Cav_7-Flange_A-05	BladeTuner-7-1	PZ-17	Cavity 7 Blade Tuner Coupler side	A,B (V+,V-)
Cav_7-Flange_A-05	BladeTuner-7-2	PZ-02	Cavity 7 Blade Tuner Non Coupler side	D,E (V+,V-)
Cav_8-Flange_A1-05	BladeTuner-8-1	PZ-11	Cavity 8 Blade Tuner Coupler side	A,B (V+,V-)
Cav_8-Flange_A1-05	BladeTuner-8-2	PZ-12	Cavity 8 Blade Tuner Non Coupler side	D,E (V+,V-)
All Devices				
Device/Sensor Type		Piezo Fast Tuner, NOLIAC SCMAP09 H52mm, Prod. Batch SML-10-233		
Device Connection		D01PB406MSUTH (4p)		
Feed Through Mating Connection(Vacuum)		16027-02-A		
Feed Through Type		16001-02-W		
Feed Through Mating Connection(AIR)		MS3126F10-6S		

6.2. Cavity Tuners

Each cavity has a slow tuner driven by a stepper motor. The leads from the stepper motor for each cavity are routed to Flange D. The detailed pin assignments are presented in Section 13.

7. INSTRUMENTATION

7.1. Wire Position Monitor

The wire position monitor (WPM) runs along the cold mass inside the cryomodule has seven pick-up stations, positioned approximately, at each cavity location. Each pick-up

station has four pick-ups. The pick-up signals are routed out of the cryomodule through Flanges A, A1, and B8, as indicated in the table below. The feed through and pin assignments at each cavity location are detailed in Section 13.

Table 7.1 WPM Feed Through Location Summary.

WPM Pick-up Location	Cavity Feed Thru Flange #	Feed Through Flange	Connector # Note: Position orientation is based upon as observed when looking downstream in the direction of the beam.			
			Top	Right	Bottom	Left
1	1	A1	A1-01	A1-02	A1-03	A1-04
2	2	A	A-01	A-02	A-03	A-04
3	3	A	A-01	A-02	A-03	A-04
4	5	A1	A1-01	A1-02	A1-03	A1-04
5	7	A	A-01	A-02	A-03	A-04
6	8	B8	B8-05	B8-06	B8-07	B8-08
7	8	A1	A1-01	A1-02	A1-03	A1-04

The wire passes through the cryomodule and is anchored in the feedcap and endcap. The wire termination is longitudinally fixed in the feedcap and held through a pully and deadweight in the endcap. This produces a constant tension on the wire throughout the cooldown.

7.2. Vibration

Geophones are installed inside the cryomodule at the "downstream" end of the Dipole corrector (Table 7.2). Each geophone would require a twisted pair wire to be connected to the feed through locations (see Section 13). Model GS-11D geophone is used for the vertical axis, and Ion sensor SM-6/H-B are used on the horizontal axis.

Table 7.2 Geophone Locations, Dipole corrector

Device No.	Orientation	Axis	Feed through	Pins
Geo-001	Horizontal	X	Flange C1-03	A,B (V+,V-)
Geo-002	Vertical	Y	Flange C1-03	D,E (V+,V-)
Geo-003	Horizontal	X	Flange C1-03	G,H(V+,V-)

7.3. Cryogenic Temperatures

Cryogenic temperatures are measured on the helium vessel, main coupler and heat shields. The wires for the heat shield temperatures are routed through Flange K. The helium vessel and main coupler temperatures are routed through Flanges B and B8. The details are in Section 13.

The inside of each end of the 300mm HGRP is instrumented with three temperature sensors to measure the vertical temperature gradient within the pipe on each end. Cernox temperature sensors are mechanically mounted at three different heights within the pipe. Wires for the sensors are encased in a stainless steel tube and are routed out of the vessel through the bottom flange on the downstream end of the cryomodule. Flange and wiring details will be handled by AD. The sensors are individually serialized and calibrated.

8. BEAM POSITION MONITOR

The beam position monitor (BPM) signals are routed through Flange D, nos. 1 – 4. The details are in Section 13.

9. QUADRUPOLE MAGNET

CM2 has been fitted with a dipole corrector magnet. Connection details can be found in section 13.

10. CRYOGENIC PIPING

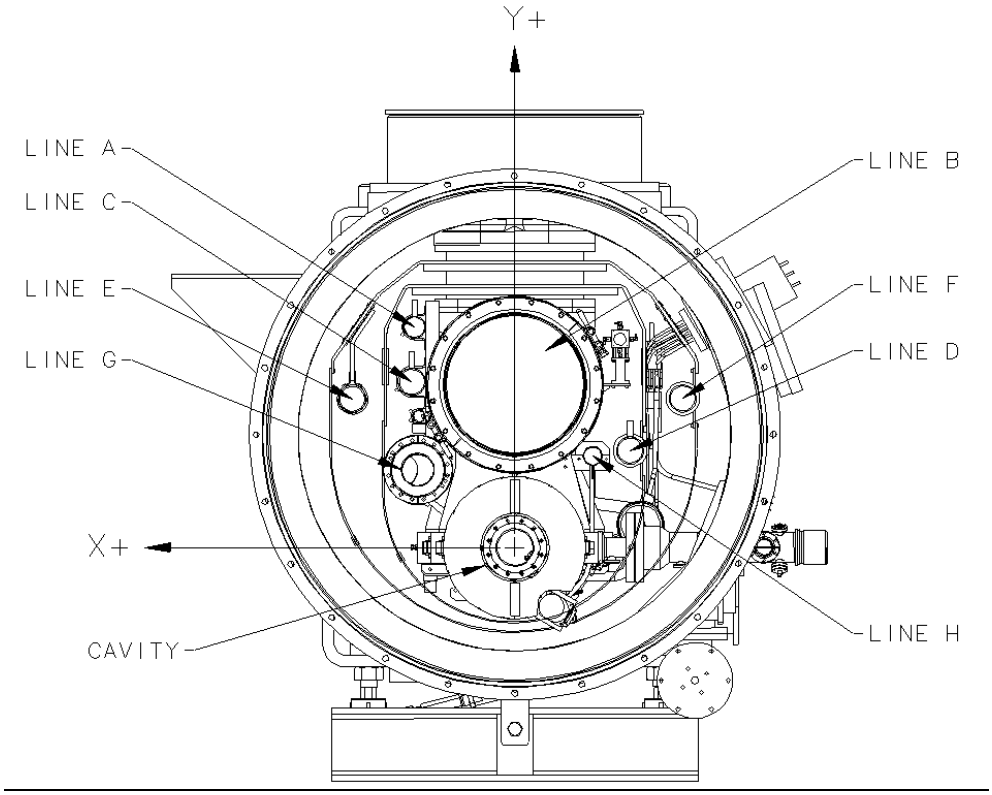

Figure 10.1. Upstream (bellows) end of cryomodule showing coordinate system.

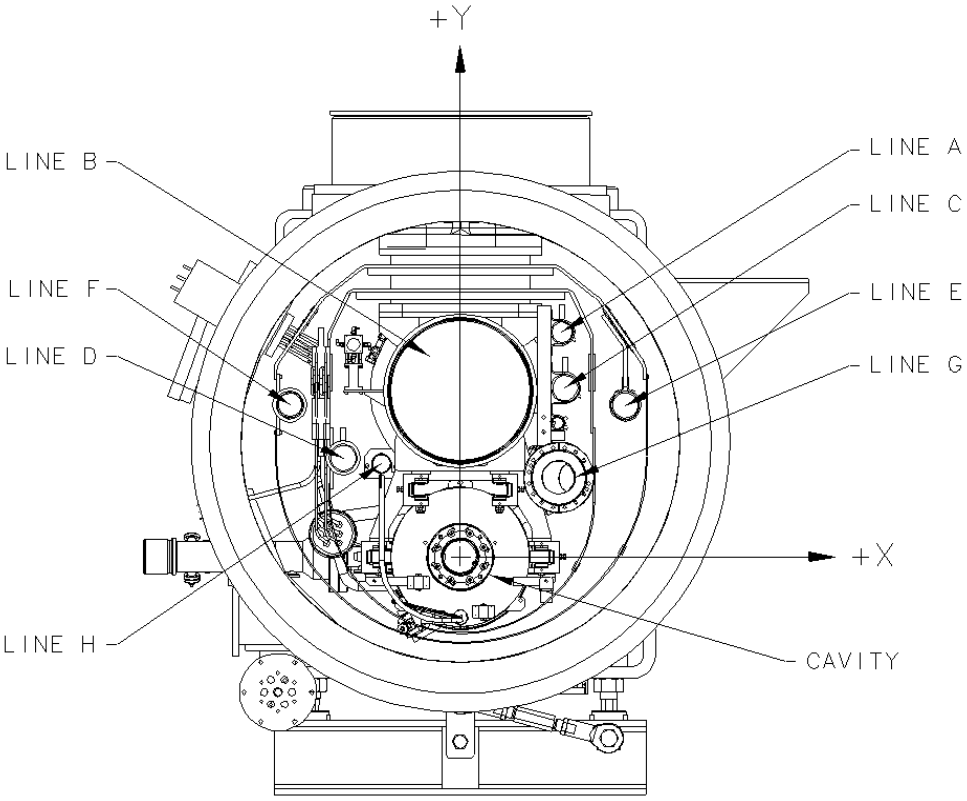

Figure 10.2. Downstream (non-bellows) end of cryomodule.

Table 10.1 Cryogenic Pipe coordinates (nominal, may vary)

Cryogenic Line	Circuit description	T3PCM Pipes Coordiantes	
		X	Y
[-]	[-]	[mm]	[mm]
A	2K helium supply	219.0	481.5
B	Sub atmospheric helium return	0.0	356.0
C	5K Thermal shield supply	225.5	362.5
D	5K Thermal shield return	-252.0	212.0
E	80K Thermal shield supply	355.0	325.0
F	80K Thermal shield return	-367.0	326.0
G	Sub atmospheric helium supply	212.0	170.0
H	Cooldown/warmup	-170.0	200.0

Table 10.2 Nominal cryogenic pipe characteristics and thermal contractions.

Note : Actual length of each pipe will be measured by the alignment group and this data will be provided to AD for use in installation. Bellows end is the upstream end.

Cryogenic Line	Type III plus cryomodule	L* [mm]	Δ [mm]	OD [mm]	Wall [mm]	Material
A	2K helium supply bellows end	5860.0	18	48.30	1.65	ASTM A240 SS 316L
	2K helium supply non-bellows end	6040.0	18	48.30	1.65	
B	Sub atmosphiric helium return bellows end	6471.0	0	312.00	6.00	ASTM A240 SS 316L
	Sub atmosphiric helium return non bellows end	5505.0	17	312.00	6.00	
C	5K supply bellows end	5810.0	17	60.30	2.76	ASTM A240 SS 316L
	5K supply non - bellows end	6090.0	18	60.30	2.76	
D	5K return bellows end	6400.0	26	60.00	5.00	Aluminum AL 6065 T5
	5K return non bellows end	5500.0	22	60.00	5.00	
E	80K supply bellows end	6000.0	18	60.30	2.77	ASTM A240 SS 316L
	80K supply non bellows end	5900.0	18	60.30	2.77	
F	80K return bellows end	6400.0	26	60.00	5.00	Aluminum AL 6065 T5
	80K return non bellows end	5500.0	22	60.00	5.00	
G	Sub atmosphiric helium bellows end	6321.5	3	CF100		Titanium Grade 2
	Sub atmosphiric helium non bellows end	5455.5	3			
H	Cooldown/warm-up line bellows end	6400.0	19	42.20	1.65	ASTM A240 SS 316L
	Cooldown/warm-up line non bellows end	5500.0	17	42.20	1.65	

* all distances are referenced to lines respective anchor centers

11. CRYOMODULE SUPPORT

The cryomodule support structure is pictured in Figure 11.1 below. There are two supports per cryomodule, located 4150 mm (163.4 in) on each side of the center cold mass support port, 8300 mm (326.8 in) apart.

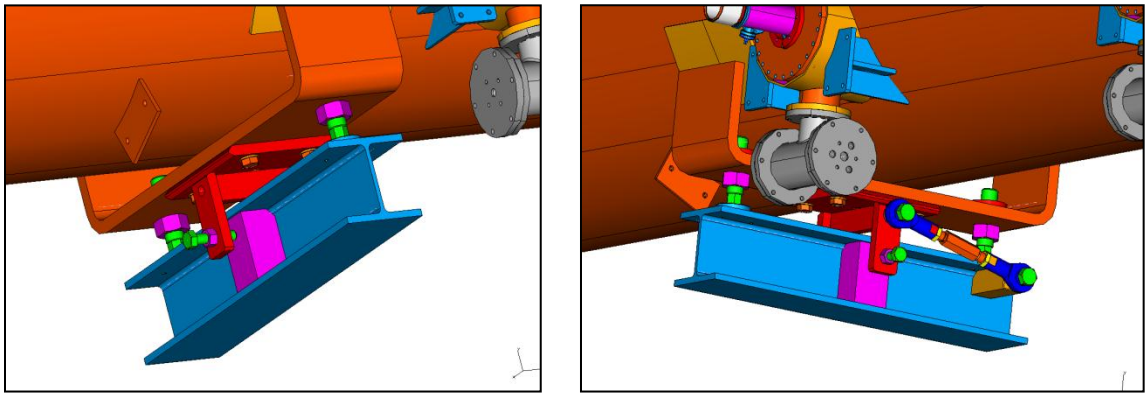

Figure 11.1 Cryomodule Supports

Figure 11.2 shows the key dimensions of the cryomodule supports. The base of the support mechanism is an I-beam with a flange width of 160.0 mm (6.3 in) and length of 800.0 mm (31.5 in). The thickness of the base plate, not dimensioned in the figure, is 13 mm (0.5 in).

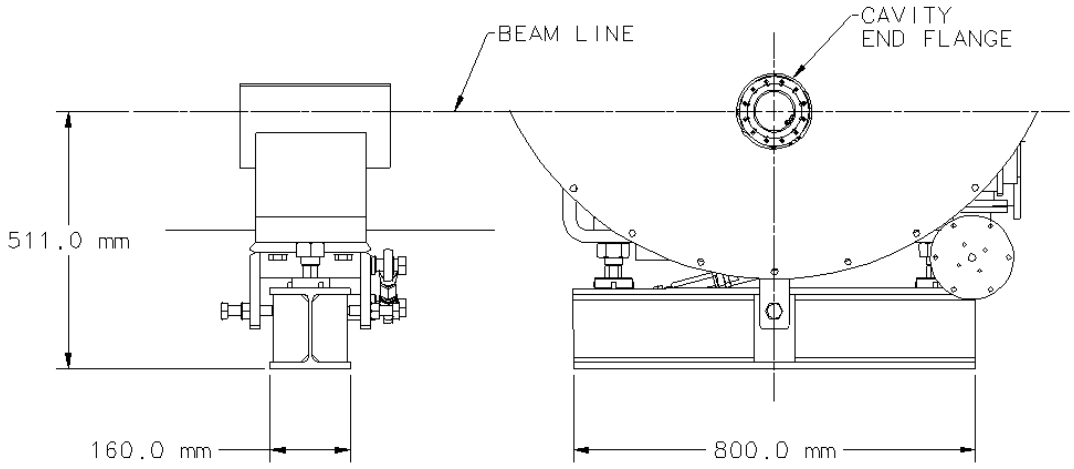

Figure 11.2 Cyomodule Support Details

The base of the support is 511.0 mm (20.118 in) below the beam line. The beam line will be positioned 47 inches above the highest point in the floor in the NML building. The floor varies in elevation by 1.3 inches, leaving the average height approximately 48 inches. This leaves approximately 28 inches between the bottom of the cryomodule support and the average elevation of the floor. A support structure in NML will make up the difference.

12. ALIGNMENT POINTS

There are three alignment platforms, each one located on the coupler side of the cryomodule at each cold mass support port location as shown in Figure 12.1. A Taylor-Hobson nest and two alignment ball targets are positioned on each platform as shown in Figure 12.2.

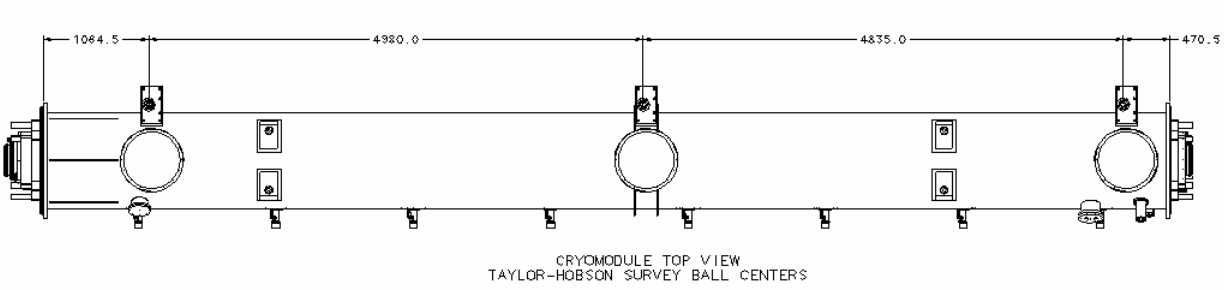

Figure 12.1 Locations of alignment platforms.

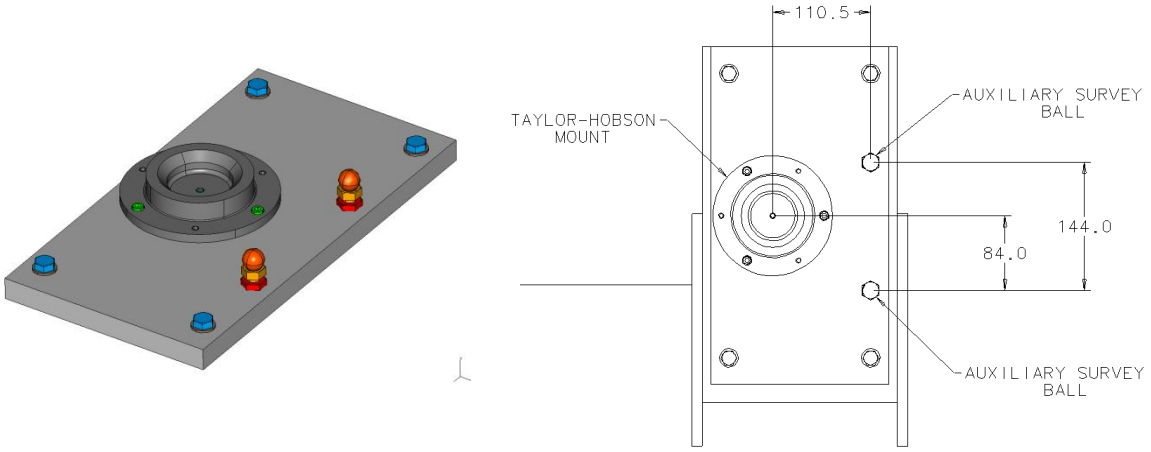

Figure 12.2 Locations of the Taylor Hobson nest and the two survey balls on each alignment platform.

13. FEED THROUGH DETAILS – FLANGES A, A1, B, B8, C, CL, C1, D, K

13.1. Flange A

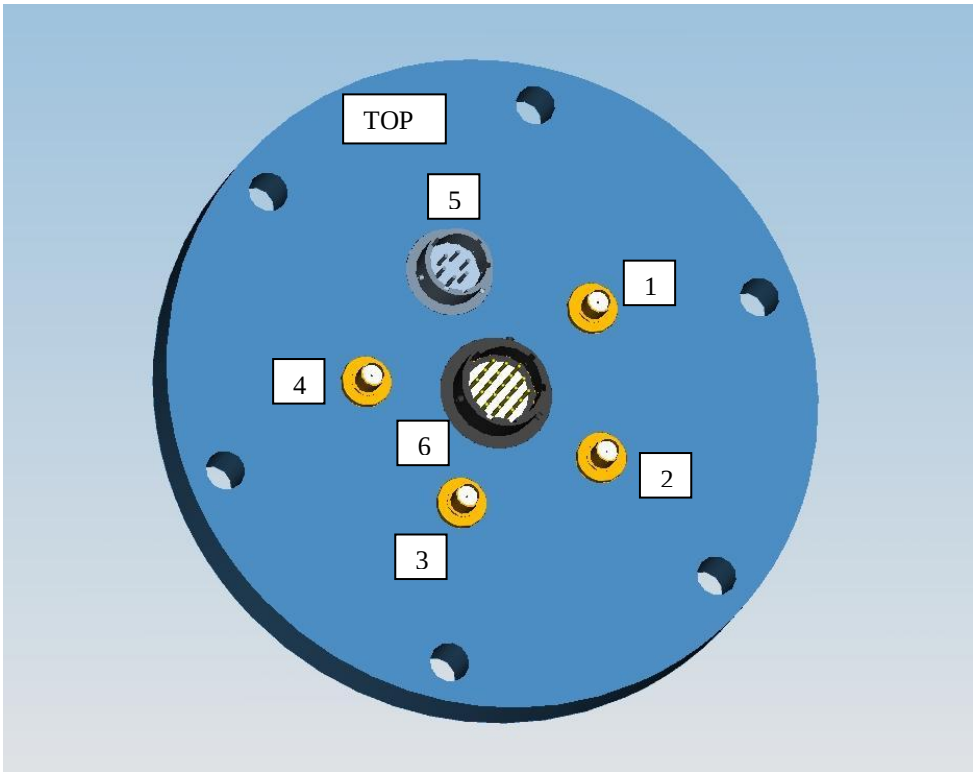

Figure 13.1. Feed Through Arrangement for Flange A.

Table 13.1 Feed Through Assignments for Flange A

Feed Through No.	Application	Cavities	Feed Through Type	Outside Connector
1	WPM	2,3,7	34_SMA-50-0-3/11NE	SMA 0^0
2	WPM	2,3,7	34_SMA-50-0-3/11NE	SMA 0^0
3	WPM	2,3,7	34_SMA-50-0-3/11NE	SMA 0^0
4	WPM	2,3,7	34_SMA-50-0-3/11NE	SMA 0^0
5	Blade tuner, (piezo)	2,3,4,6,7	Cermatec, 16001-02-W	MS3126F10-6S
6	RTD HOM	2,3,4,6,7	Cermatec, 16003-02-W	MS3126F14-19S

Six of the seven pick-up locations are passed through Flanges A and one is routed through Flange B at cavity 8 as indicated in Table 8.1. There are four pick-up signals at each cavity location.

13.2 Flange A1

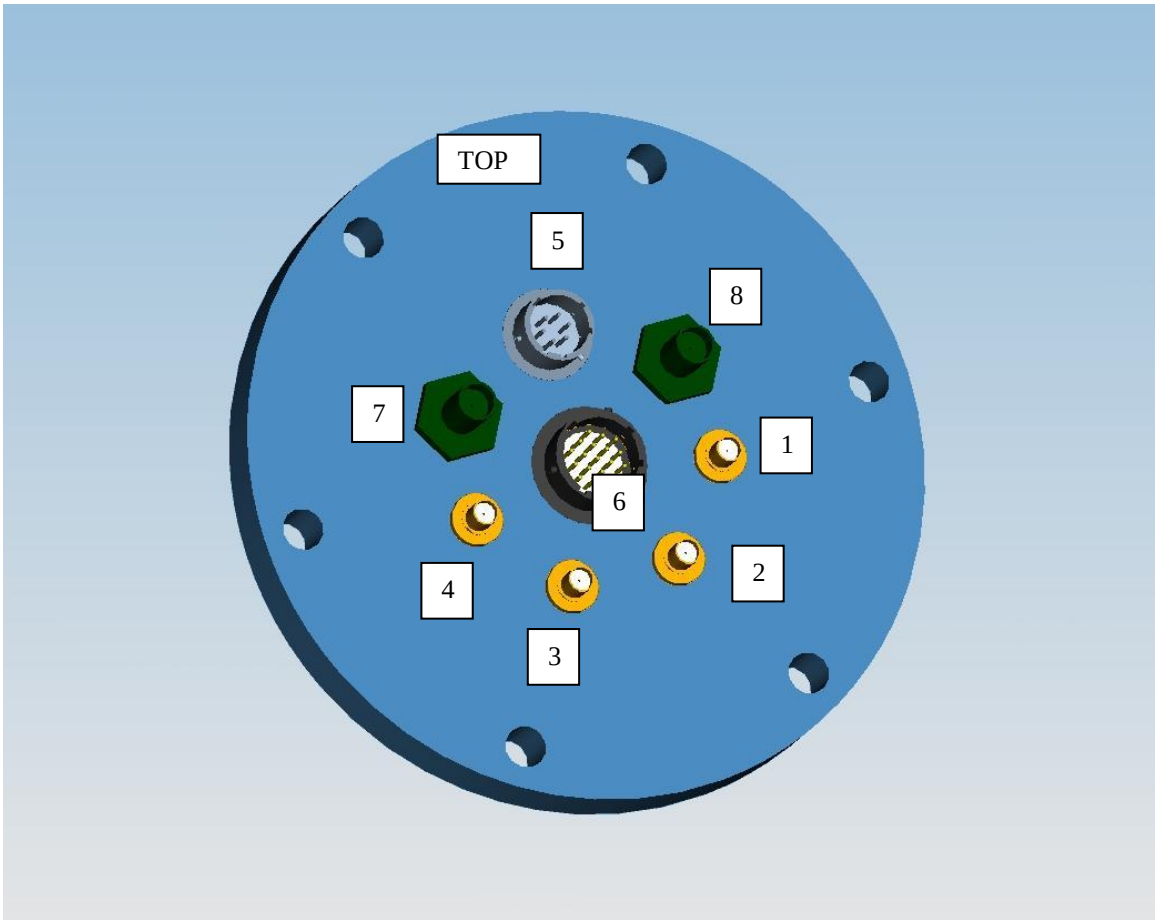

Figure 13.2. Feed Through Arrangement for Flange A1.

Table 13.2 Feed Through Assignments for Flange A1

Feed Through No.	Application	Cavities	Feed Through Type	Outside Connector
1	WPM	1, 5, 8	34_SMA-50-0-3/11NE	SMA 0^0
2	WPM	1, 5, 8	34_SMA-50-0-3/11NE	SMA 0^0
3	WPM	1, 5, 8	34_SMA-50-0-3/11NE	SMA 0^0
4	WPM	1, 5, 8	34_SMA-50-0-3/11NE	SMA 0^0
5	Blade tuner, (piezo)	1, 5, 8	Cermatec, 16001-02-W	MS3126F10-6S
6	RTD HOM, RTD Ionization chamber, Spare	1, 5, 8	Cermatec, 16003-02-W	MS3126F14-19S
7	Ionization chamber, +90V	1, 5, 8	34_BNC_50_0_6/100NE	BNC
8	Ionization chamber, signal	1, 5, 8	34_BNC_50_0_6/100NE	BNC

Table 13.3 WPM Feed Through Assignments for Flange A, A1, B8

Wire Position Monitor (WPM) Details					
Cavity-Flange-Connector	**Device/Sensor Name**	**Device Location**	**Position (looking down beam)**	**Device Connection**	**Feed Through Mating Connection (both sides)**
Cav_1-Flange_A1-01	WPM-1_Top	Location #1: On the upstream end of the GRHP.	Top	SMA 90^0	SMA 0^0
Cav_1-Flange_A1-02	WPM-1_Right	Location #1: On the upstream end of the GRHP.	Right	SMA 90^0	SMA 0^0
Cav_1-Flange_A1-03	WPM-1_Bot	Location #1: On the upstream end of the GRHP.	Bottom	SMA 90^0	SMA 0^0
Cav_1-Flange_A1-04	WPM-1_Left	Location #1: On the upstream end of the GRHP.	Left	SMA 90^0	SMA 0^0
Cav_2-Flange_A-01	WPM-2_Top	Location #2: Under the first cold support post.	Top	SMA 90^0	SMA 0^0
Cav_2-Flange_A-02	WPM-2_Right	Location #2: Under the first cold support post.	Right	SMA 90^0	SMA 0^0
Cav_2-Flange_A-03	WPM-2_Bot	Location #2: Under the first cold support post.	Bottom	SMA 90^0	SMA 0^0
Cav_2-Flange_A-04	WPM-2_Left	Location #2: Under the first cold support post.	Left	SMA 90^0	SMA 0^0
Cav_3-Flange_A-01	WPM-3_Top	Location #3: In the middle distance between first and second (middle) cold support post.	Top	SMA 90^0	SMA 0^0
Cav_3-Flange_A-02	WPM-3_Right	Location #3: In the middle distance between first and second (middle) cold support post.	Right	SMA 90^0	SMA 0^0
Cav_3-Flange_A-03	WPM-3_Bot	Location #3: In the middle distance between first and second (middle) cold support post.	Bottom	SMA 90^0	SMA 0^0
Cav_3-Flange_A-04	WPM-3_Left	Location #3: In the middle distance between first and second (middle) cold support post.	Left	SMA 90^0	SMA 0^0
Cav_5-Flange_A-01	WPM-4_Top	Location #4: under the second (middle) cold support post.	Top	SMA 90^0	SMA 0^0
Cav_5-Flange_A-02	WPM-4_Right	Location #4: under the second (middle) cold support post.	Right	SMA 90^0	SMA 0^0
Cav_5-Flange_A-03	WPM-4_Bot	Location #4: under the second (middle) cold support post.	Bottom	SMA 90^0	SMA 0^0
Cav_5-Flange_A-04	WPM-4_Left	Location #4: under the second (middle) cold support post.	Left	SMA 90^0	SMA 0^0
Cav_7-Flange_A-01	WPM-5_Top	Location #5: in the middle distance between second (middle) and the third cold support post.	Top	SMA 0^0	SMA 0^0
Cav_7-Flange_A-02	WPM-5_Right	Location #5: in the middle distance between second (middle) and the third cold support post.	Right	SMA 0^0	SMA 0^0
Cav_7-Flange_A-03	WPM-5_Bot	Location #5: in the middle distance between second (middle)and the third cold support post.	Bottom	SMA 0^0	SMA 0^0
Cav_7-Flange_A-04	WPM-5_Left	Location #5: in the middle distance between second (middle) and the third cold support post.	Left	SMA 0^0	SMA 0^0
Cav_8-Flange_A1-01	WPM-7_Top	Location #7: At the downstream end of the GRHP.	Top	SMA 90^0	SMA 0^0
Cav_8-Flange_A1-02	WPM-7_Right	Location #7: At the downstream end of the GRHP.	Right	SMA 90^0	SMA 0^0
Cav_8-Flange_A1-03	WPM-7_Bot	Location #7: At the downstream end of the GRHP.	Bottom	SMA 90^0	SMA 0^0
Cav_8-Flange_A1-04	WPM-7_Left	Location #7: At the downstream end of the GRHP.	Left	SMA 90^0	SMA 0^0
Cav_8-Flange_B-8-05	WPM-6_Top	Location #6: Under the third cold support post.	Top	SMA 90^0	SMA 0^0
Cav_8-Flange_B-8-06	WPM-6_Right	Location #6: Under the third cold support post.	Right	SMA 90^0	SMA 0^0
Cav_8-Flange_B-8-07	WPM-6_Bot	Location #6: Under the third cold support post.	Bottom	SMA 90^0	SMA 0^0
Cav_8-Flange_B-8-8	WPM-6_Left	Location #6: Under the third cold support post.	Left	SMA 90^0	SMA 0^0

All devices	
Device Cable Type	P 02182-02
Feed Through Type	34_SMA-50-0-3/111NE
Feed Through Connector	Single Pin,Shield

Table 13.4 Pin Assignments for Flanges A, A1, Cavities 1-8, Feed Through #6.

Cavity Thermometry, Flanges A, A1

Cavity-Flange-Connector	Device/Sensor Name	Sensor Type	Serial Number	Device Location	Feed Through Connector Pin
Cav_1-Flange_A1-06	RTD_HOM_Coupler_Side-1-1	Cernox 1030	X58339	HOM-1a Cavity #1 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_1-Flange_A1-06	RTD_HOM_Non_Coupler_Side-1-2	Cernox 1030	X58338	HOM-1b Cavity #1 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_1-Flange_A1-06	RTD-IonizationChamber_01	Cernox 1030	X58340	Near Ionization Chamber #1	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_1-Flange_A1-06	Spare	N/A	N/A	N/A	N/A
Cav_2-Flange_A-06	RTD_HOM_Coupler_Side-2-1	Cernox 1030	X58342	HOM-1a Cavity #2 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_2-Flange_A-06	RTD_HOM_Non_Coupler_Side-2-2	Cernox 1030	X58341	HOM-1b Cavity #2 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_2-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_2-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_3-Flange_A-06	RTD_HOM_Coupler_Side-3-1	Cernox 1030	X58347	HOM-1a Cavity #3 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_3-Flange_A-06	RTD_HOM_Non_Coupler_Side-3-2	Cernox 1030	X58346	HOM-1b Cavity #3 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_3-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_3-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_4-Flange_A-06	RTD_HOM_Coupler_Side-4-1	Cernox 1030	X58382	HOM-1a Cavity #4 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_4-Flange_A-06	RTD_HOM_Non_Coupler_Side-4-2	Cernox 1030	X58381	HOM-1b Cavity #4 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_4-Flange_A-06	RTD-IonizationChamber_02	Cernox 1030	X58089	Near Ionization Chamber #2	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_4-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_5-Flange_A1-06	RTD_HOM_Coupler_Side-5-1	Cernox 1030	X58384	HOM-1a Cavity #5 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_5-Flange_A1-06	RTD_HOM_Non_Coupler_Side-5-2	Cernox 1030	X58383	HOM-1b Cavity #5 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_5-Flange_A1-06	Spare	N/A	N/A	N/A	N/A
Cav_5-Flange_A1-06	Spare	N/A	N/A	N/A	N/A
Cav_6-Flange_A-06	RTD_HOM_Coupler_Side-6-1	Cernox 1030	X58386	HOM-1a Cavity #6 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_6-Flange_A-06	RTD_HOM_Non_Coupler_Side-6-2	Cernox 1030	X58385	HOM-1b Cavity #6 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_6-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_6-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_7-Flange_A-06	RTD_HOM_Coupler_Side-7-1	Cernox 1030	X58389	HOM-1a Cavity #7 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_7-Flange_A-06	RTD_HOM_Non_Coupler_Side-7-2	Cernox 1030	X58388	HOM-1b Cavity #7 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_7-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_7-Flange_A-06	Spare	N/A	N/A	N/A	N/A
Cav_8-Flange_A1-06	RTD_HOM_ThermShldSupSide-8-1	Cernox 1030	X584011	HOM-1a Cavity #8 On HOM can.	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_8-Flange_A1-06	RTD_HOM_ThermShldRtnSide-8-2	Cernox 1030	X58407	HOM-1b Cavity #8 On HOM can.	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_1-Flange_A1-06	RTD-IonizationChamber_03	Cernox 1030	X58457	Near Ionization Chamber #3	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_8-Flange_A1-06	Spare	N/A	N/A	N/A	N/A

All Sensors

Feed Through Mating Connection(Vacuum)	16029-02-A
Feed Through Type	16003-02-W
Feed Through Mating Connection(AIR)	MS3126F14-19S
Device Cable Type	Lakeshore Quad Twist
Intermediate Connection	PC Interface Card

Table 13.5 Pin Assignments for Ionization Chambers, Flange A1

Ionization Chambers				
Cavity-Flange-Connector	Device/Sensor Name	Device/Sensor Type	Device/Cable Serial Number	Device Location
Cav_1-Flange_A1-07	IonizationChamber1-Pos	Ionization Chamber +90V	Device# 003 Cable# CM2-RF041	Near Cavity #1
Cav_1-Flange_A1-08	IonizationChamber1-Neg	Ionization Chamber Signal	Cable# CM2-RF042	Near Cavity #1
Cav_5-Flange_A1-07	IonizationChamber2-Pos	Ionization Chamber +90V	Device# 005 Cable# CM2-RF043	Near Cavity #4
Cav_5-Flange_A1-08	IonizationChamber2-Neg	Ionization Chamber Signal	Cable# CM2-RF044	Near Cavity #4
Cav_8-Flange_A1-07	IonizationChamber3-Pos	Ionization Chamber +90V	Device# 006 Cable# CM2-RF045	Near Cavity #8
Cav_8-Flange_A1-08	IonizationChamber2-Neg	Ionization Chamber Signal	Cable# CM2-RF046	Near Cavity #8
All devices				
Feed Through Mating Connection(Vacuum)		BNC		
Feed Through Type		34_BNC-50-0-6/100NE		
Feed Through Mating Connection(AIR)		BNC		
Feed Through Connector Pin		Single Pin		

13.3 Flange B

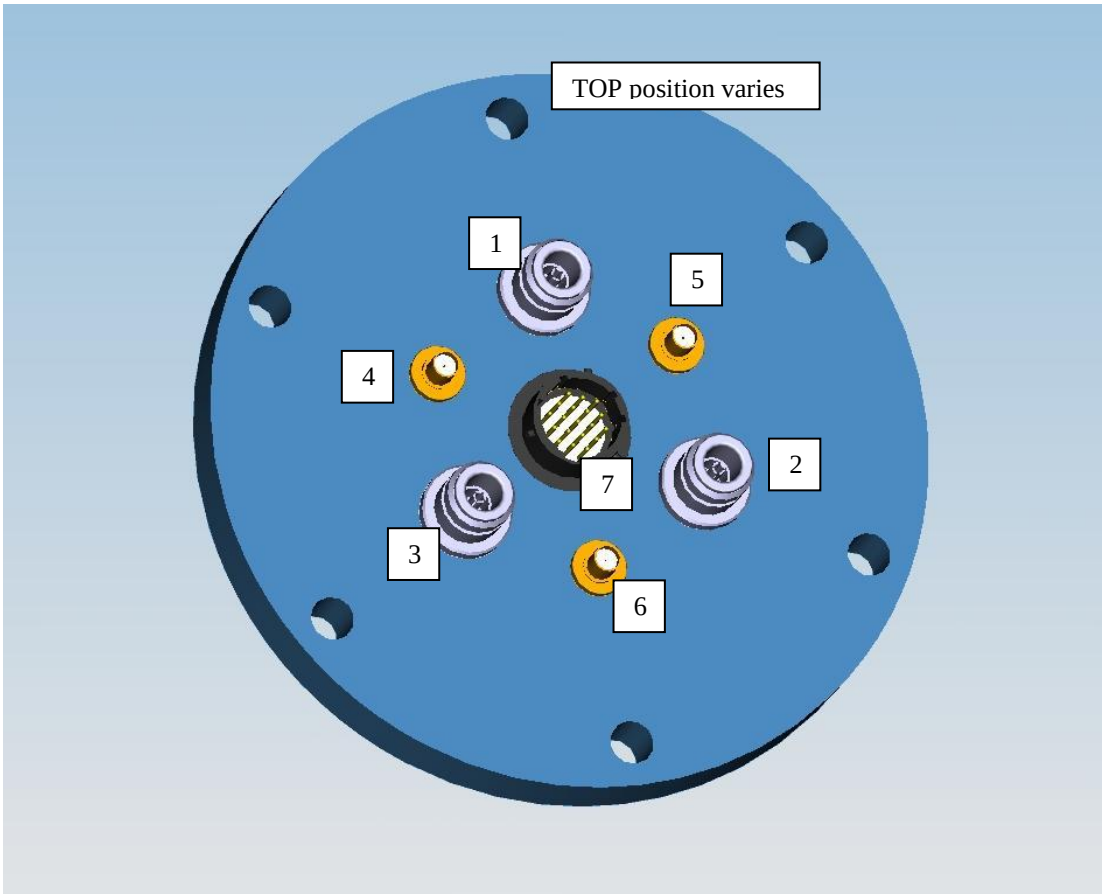

Figure 13.3 Feed Through Arrangement for Flange B, Cavities 1 – 7.

Table 13.6 Feed Through Assignments for Flange B, Cavities 1 – 7

Feed Through No.	Application	Feed Through Type	Outside Connector
1	Pick-up	34_N-50-0-12/133NE	N 0°
2	HOM1	34_N-50-0-12/133NE	N 0°
3	HOM2	34_N-50-0-12/133NE	N 0°
4	e- Cy	34_SMA-50-0-3/111NE	SMA 0^0
5	e- WG	34_SMA-50-0-3/111NE	SMA 0^0
6	spare	34_SMA-50-0-3/111NE	SMA 0^0
7	2 x Platinum 100 (RTD coupler) 1x CERNOX (He vessel) 1 x CERNOX (RTD steppermotor)	Cermatec, 16003-02-W	MS3126F14-19S

13.4 Flange B8

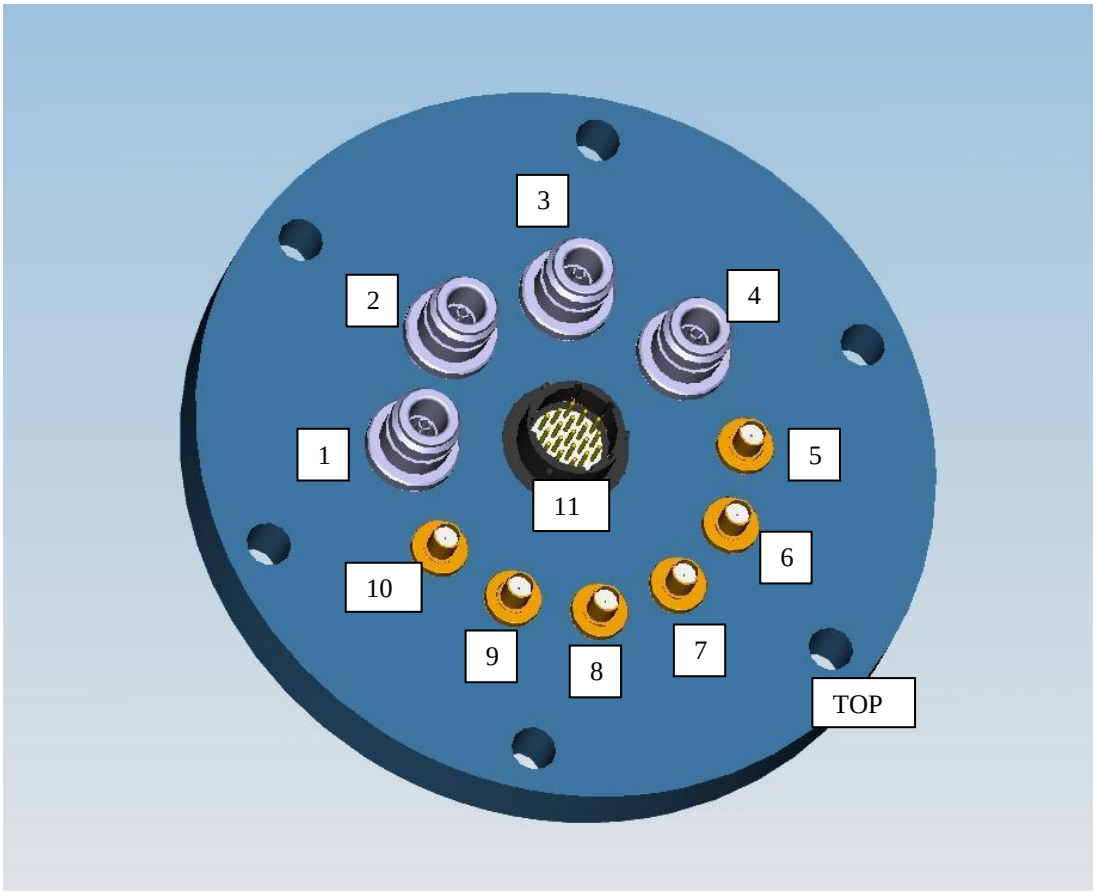

Figure 13.4. Feed Through Arrangement for Flange B, cavity 8.

Table 13.7. Feed Through Assignments for Flange B, Cavity 8.

Feed Through No.	Application	Feed Through Type	Outside Connector
1	Pick-up	34_N-50-0-12/133NE	N 0°
2	HOM1	34_N-50-0-12/133NE	N 0°
3	HOM2	34_N-50-0-12/133NE	N 0°
4	Diamond beam loss monitor	34_N-50-0-12/133NE	N 0°
5	WPM	34_SMA-50-0-3/111NE	SMA 0^0
6	WPM	34_SMA-50-0-3/111NE	SMA 0^0
7	WPM	34_SMA-50-0-3/111NE	SMA 0^0
8	WPM	34_SMA-50-0-3/111NE	SMA 0^0
9	e- Cy	34_SMA-50-0-3/111NE	SMA 0^0
10	e- WG	34_SMA-50-0-3/111NE	SMA 0^0
11	2 x Platinum 100 (RTD coupler) 1x CERNOX (He vessel) 1 x CERNOX (RTD steppermotor)	Cermatec, 16003-02-W	MS3126F14-19S

Table 13.8. Pin Assignments for Flanges B, B8, Cavities 1-8, Feed Throughs #7, #11

Cavity Thermometry, Flanges B, B8

Cavity-Flange-Connector	Device/Sensor Name	Sensor Type	Serial Number	Device Location	Feed Through Connector Pin
Cav_1-Flange_B-07	RTD_HeVessel-1	Cernox 1030	X59929	He Vesssel, Cavity #1	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_1-Flange_B-07	RTD_MainCoupler1a-12o'clock	Platinum 100	P22578	Main Coupler, Cavity #1, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_1-Flange_B-07	RTD_MainCoupler1b-10o'clock	Platinum 100	P22579	Main Coupler, Cavity #1, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_1-Flange_B-07	RTD_StepperMotor_01	Cernox 1030	X58090	Stepper Motor #1 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)
Cav_2-Flange_B-07	RTD_HeVessel-2	Cernox 1030	X58088	He Vesssel, Cavity #2	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_2-Flange_B-07	RTD_MainCoupler2a-12o'clock	Platinum 100	P22580	Main Coupler, Cavity #2, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_2-Flange_B-07	RTD_MainCoupler2b-10o'clock	Platinum 100	P22581	Main Coupler, Cavity #2, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_2-Flange_B-07	RTD_StepperMotor_02	Cernox 1030	X58073	Stepper Motor #2 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)
Cav_3-Flange_B-07	RTD_HeVessel-3	Cernox 1030	X58380	He Vesssel, Cavity #3	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_3-Flange_B-07	RTD_MainCoupler3a-12o'clock	Platinum 100	P22582	Main Coupler, Cavity #3, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_3-Flange_B-07	RTD_MainCoupler3b-10o'clock	Platinum 100	P22583	Main Coupler, Cavity #3, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_3-Flange_B-07	RTD_StepperMotor_03	Cernox 1030	X58418	Stepper Motor #3 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)
Cav_4-Flange_B-07	RTD_HeVessel-4	Cernox 1030	X59925	He Vesssel, Cavity #4	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_4-Flange_B-07	RTD_MainCoupler4a-12o'clock	Platinum 100	P22584	Main Coupler, Cavity #4, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_4-Flange_B-07	RTD_MainCoupler4b-10o'clock	Platinum 100	P22585	Main Coupler, Cavity #4, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_4-Flange_B-07	RTD_StepperMotor_04	Cernox 1030	X58414	Stepper Motor #4 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)
Cav_5-Flange_B-07	RTD_HeVessel-5	Cernox 1030	X58417	He Vesssel, Cavity #5	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_5-Flange_B-07	RTD_MainCoupler5a-12o'clock	Platinum 100	P22586	Main Coupler, Cavity #5, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_5-Flange_B-07	RTD_MainCoupler5b-10o'clock	Platinum 100	P22587	Main Coupler, Cavity #5, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_5-Flange_B-07	RTD_StepperMotor_05	Cernox 1030	X59926	Stepper Motor #5 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)
Cav_6-Flange_B-07	RTD_HeVessel-6	Cernox 1030	X58410	He Vesssel, Cavity #6	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_6-Flange_B-07	RTD_MainCoupler6a-12o'clock	Platinum 100	P22588	Main Coupler, Cavity #6, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_6-Flange_B-07	RTD_MainCoupler6b-10o'clock	Platinum 100	P22589	Main Coupler, Cavity #6, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_6-Flange_B-07	RTD_StepperMotor_06	Cernox 1030	X58405	Stepper Motor #6 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)
Cav_7-Flange_B-07	RTD_HeVessel-7	Cernox 1030	X58416	He Vesssel, Cavity #7	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_7-Flange_B-07	RTD_MainCoupler7a-12o'clock	Platinum 100	P22590	Main Coupler, Cavity #7, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_7-Flange_B-07	RTD_MainCoupler7b-10o'clock	Platinum 100	P22591	Main Coupler, Cavity #7, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_7-Flange_B-07	RTD_StepperMotor_07	Cernox 1030	X58436	Stepper Motor #7 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)
Cav_8-Flange_B-8-11	RTD_HeVessel-8	Cernox 1030	X59927	He Vesssel, Cavity #8	A,B,C,D (I+R,I-B,V+G,V-Y)
Cav_8-Flange_B-8-11	RTD_MainCoupler8a-12o'clock	Platinum 100	P22592	Main Coupler, Cavity #8, at 12 o'clock	E,F,G,H (I+R,I-B,V+G,V-Y)
Cav_8-Flange_B-8-11	RTD_MainCoupler8b-10o'clock	Platinum 100	P22168	Main Coupler, Cavity #8, at 10 o'clock	J,K,L,M (I+R,I-B,V+G,V-Y)
Cav_8-Flange_B-8-11	RTD_StepperMotor_08	Cernox 1030	X59921	Stepper Motor #8 Casing	N,P,R,S (I+R,I-B,V+G,V-Y)

All Sensors

Feed Through Mating Connection(Vacuum)	16029-02-A
Feed Through Type	16003-02-W
Feed Through Mating Connection(AIR)	MS3126F14-19S
Device Cable Type	Lakeshore Quad Twist
Intermediate Connection	PC Interface Card

Table 13.9. Pin Assignments for Flanges B, B8

Pickups and Probes, Flanges B, B8

Cavity-Flange-Connector	Device/Sensor Name	Sensor Type	Serial Number	Device Location	Feed Through Type	Connector (single pin)
Cav_1-Flange_B-01	C1_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF001	Cavity 1	34_N-50-0-3/133NE	N 0°
Cav_1-Flange_B-02	C1_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF002	Cavity 1 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_1-Flange_B-03	C1_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF003	Cavity 1 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_1-Flange_B-04	Cav_1_e-Cy (EPickup_Cavity)	70KCy e- 1.1 (Electron Pickup)	CM2-RF004	Cavity side of Coupler 1	34_SMA-50-0-3/111NE	SMA 0^0
Cav_1-Flange_B-05	Cav_1_e-WG (EPickup_Waveguide)	70KWg e- 2.1 (Electron Pickup)	CM2-RF005	Wave Guide side of Coupler 1	34_SMA-50-0-3/111NE	SMA 0^0
Cav_1-Flange_B-06	Spare	N/A	N/A	N/A	34_SMA-50-0-3/111NE	SMA 0^0
Cav_2-Flange_B-01	C2_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF006	Cavity 2	34_N-50-0-3/133NE	N 0°
Cav_2-Flange_B-02	C2_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF007	Cavity 2 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_2-Flange_B-03	C2_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF008	Cavity 2 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_2-Flange_B-04	Cav_2_e-Cy (EPickup_Cavity)	70KCy e- 1.2 (Electron Pickup)	CM2-RF009	Cavity side of Coupler 2	34_SMA-50-0-3/111NE	SMA 0^0
Cav_2-Flange_B-05	Cav_2_e-WG (EPickup_Waveguide)	70KWg e- 2.2 (Electron Pickup)	CM2-RF010	Wave Guide side of Coupler 2	34_SMA-50-0-3/111NE	SMA 0^0
Cav_2-Flange_B-06	Spare	N/A	N/A	N/A	34_SMA-50-0-3/111NE	SMA 0^0
Cav_3-Flange_B-01	C3_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF011	Cavity 3	34_N-50-0-3/133NE	N 0°
Cav_3-Flange_B-02	C3_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF012	Cavity 3 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_3-Flange_B-03	C3_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF013	Cavity 3 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_3-Flange_B-04	Cav_3_e-Cy (EPickup_Cavity)	70KCy e- 1.3 (Electron Pickup)	CM2-RF014	Cavity side of Coupler 3	34_SMA-50-0-3/111NE	SMA 0^0
Cav_3-Flange_B-05	Cav_3_e-WG (EPickup_Waveguide)	70KWg e- 2.3 (Electron Pickup)	CM2-RF015	Wave Guide side of Coupler 3	34_SMA-50-0-3/111NE	SMA 0^0
Cav_3-Flange_B-06	Spare	N/A	N/A	N/A	34_SMA-50-0-3/111NE	SMA 0^0
Cav_4-Flange_B-01	C4_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF016	Cavity 4	34_N-50-0-3/133NE	N 0°
Cav_4-Flange_B-02	C4_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF017	Cavity 4 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_4-Flange_B-03	C4_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF018	Cavity 4 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_4-Flange_B-04	Cav_4_e-Cy (EPickup_Cavity)	70KCy e- 1.4 (Electron Pickup)	CM2-RF019	Cavity side of Coupler 4	34_SMA-50-0-3/111NE	SMA 0^0
Cav_4-Flange_B-05	Cav_4_e-WG (EPickup_Waveguide)	70KWg e- 2.4 (Electron Pickup)	CM2-RF020	Wave Guide side of Coupler 4	34_SMA-50-0-3/111NE	SMA 0^0
Cav_4-Flange_B-06	Spare	N/A	N/A	N/A	34_SMA-50-0-3/111NE	SMA 0^0
Cav_5-Flange_B-01	C5_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF021	Cavity 5	34_N-50-0-3/133NE	N 0°
Cav_5-Flange_B-02	C5_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF022	Cavity 5 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_5-Flange_B-03	C5_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF023	Cavity 5 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_5-Flange_B-04	Cav_5_e-Cy (EPickup_Cavity)	70KCy e- 1.5 (Electron Pickup)	CM2-RF024	Cavity side of Coupler 5	34_SMA-50-0-3/111NE	SMA 0^0
Cav_5-Flange_B-05	Cav_5_e-WG (EPickup_Waveguide)	70KWg e- 2.5 (Electron Pickup)	CM2-RF025	Wave Guide side of Coupler 5	34_SMA-50-0-3/111NE	SMA 0^0
Cav_5-Flange_B-06	Spare	N/A	N/A	N/A	34_SMA-50-0-3/111NE	SMA 0^0
Cav_6-Flange_B-01	C6_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF026	Cavity 6	34_N-50-0-3/133NE	N 0°
Cav_6-Flange_B-02	C6_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF027	Cavity 6 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_6-Flange_B-03	C6_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF028	Cavity 6 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_6-Flange_B-04	Cav_6_e-Cy (EPickup_Cavity)	70KCy e- 1.6 (Electron Pickup)	CM2-RF029	Cavity side of Coupler 6	34_SMA-50-0-3/111NE	SMA 0^0
Cav_6-Flange_B-05	Cav_6_e-WG (EPickup_Waveguide)	70KWg e- 2.6 (Electron Pickup)	CM2-RF030	Wave Guide side of Coupler 6	34_SMA-50-0-3/111NE	SMA 0^0
Cav_6-Flange_B-06	Spare	N/A	N/A	N/A	34_SMA-50-0-3/111NE	SMA 0^0
Cav_7-Flange_B-01	C7_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF031	Cavity 7	34_N-50-0-3/133NE	N 0°
Cav_7-Flange_B-02	C7_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF032	Cavity 7 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_7-Flange_B-03	C7_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF033	Cavity 7 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_7-Flange_B-04	Cav_7_e-Cy (EPickup_Cavity)	70KCy e- 1.7 (Electron Pickup)	CM2-RF034	Cavity side of Coupler 7	34_SMA-50-0-3/111NE	SMA 0^0
Cav_7-Flange_B-05	Cav_7_e-WG (EPickup_Waveguide)	70KWg e- 2.7 (Electron Pickup)	CM2-RF035	Wave Guide side of Coupler 7	34_SMA-50-0-3/111NE	SMA 0^0
Cav_7-Flange_B-06	Spare	N/A	N/A	N/A	34_SMA-50-0-3/111NE	SMA 0^0
Cav_8-Flange_B-8-01	C8_Pt (PTrans)	Cavity Pickup -- Transmitted Power (Field Probe)	CM2-RF036	Cavity 8	34_N-50-0-3/133NE	N 0°
Cav_8-Flange_B-8-02	C8_H1 (PTrans_HOM-1)	HOM 1 -- Transmitted Power	CM2-RF037	Cavity 8 HOM 1	34_N-50-0-3/133NE	N 0°
Cav_8-Flange_B-8-03	C8_H2 (PTrans_HOM-2)	HOM 2 -- Transmitted Power	CM2-RF038	Cavity 8 HOM 2	34_N-50-0-3/133NE	N 0°
Cav_8-Flange_B-8-04	Diamond beam loss monitor	Diamond monitor	Device #001	Near Cavity #8	34_N-50-0-3/133NE	N 0°
Cav_8-Flange_B-8-9	Cav_8_e-Cy (EPickup_Cavity)	70KCy e- 1.8 (Electron Pickup)	CM2-RF039	Cavity side of Coupler 8	34_SMA-50-0-3/111NE	SMA 0^0
Cav_8-Flange_B-8-10	Cav_8_e-WG (EPickup_Waveguide)	70KWg e- 2.8 (Electron Pickup)	CM2-RF040	Wave Guide side of Coupler 8	34_SMA-50-0-3/111NE	SMA 0^0

13.5 Flange C

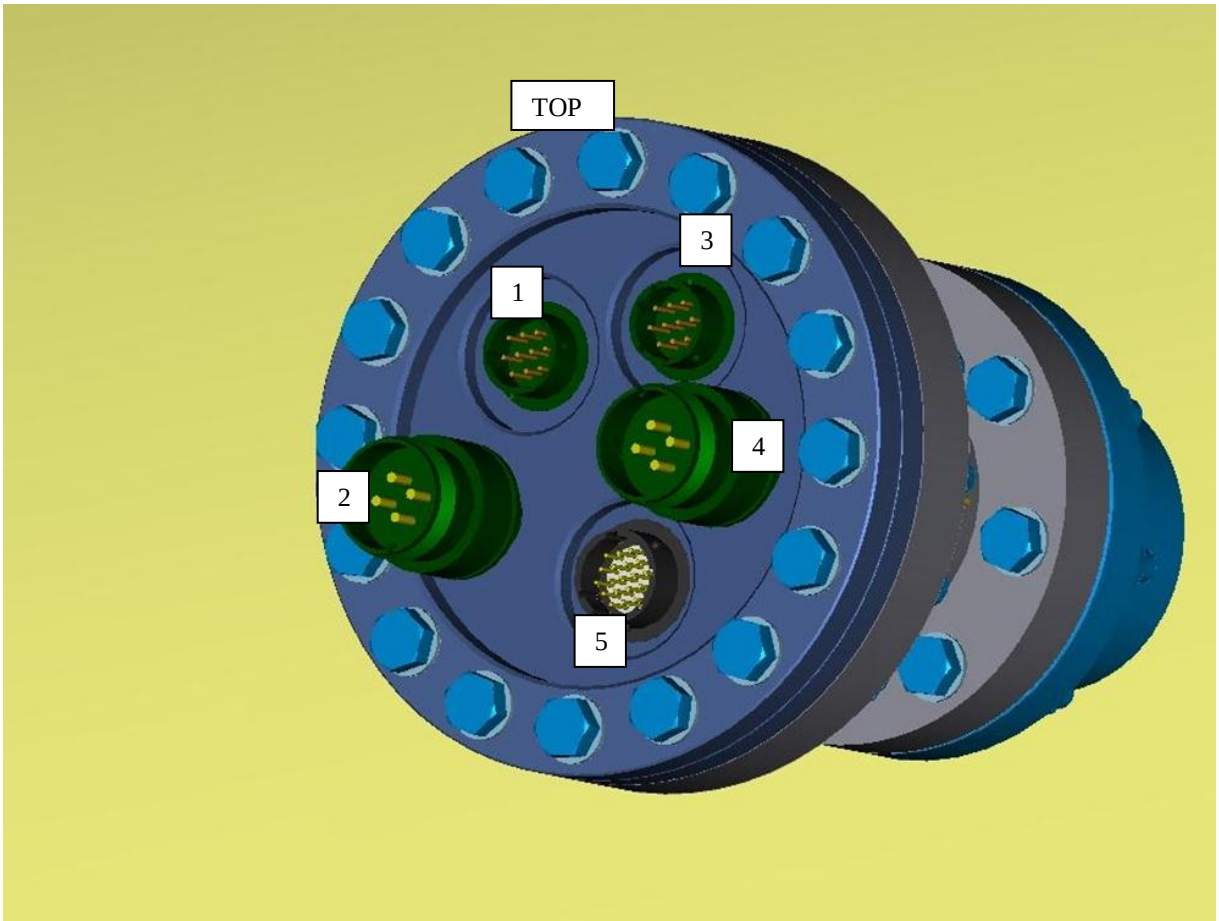

Figure 13.5. Flange C is for corrector magnet temperature sensors

Table 13.10. Feed Through Assignments for Flange C

Feed Through No.	Application	Feed Through Type	Outside Connector
1	Dipole voltage taps	16012-02-W	MS3126F12-10S
2	Dipole strip heater	18093-06-W	18600-02-A
3	Reserved for dipole voltage taps	16012-02-W	MS3126F12-10S
4	Reserved for Quad Doublet Strip Heater	18093-06-W	18600-02-A
5	RTD Dipolelead G10 Block (primary) RTD Dipolelead G10 Block (secondary) 2x Reserved for Quad doublet RTD	16003-02-W	MS3126F14-19S

Table 13.11. Pin Assignments for Flange C

Flange C, Corrector Magnets:

Flange-Connector	Device/Sensor Name	Device/Sensor Type	Serial Number	Device Location	Feed Through Type	Feed Through Mating	Feed Through Connector Pin
Flange_C-01	VT_HorzDipoleSCLeadTop-Pos	Voltage Tap for Coil and SC Lead Quench Detection	VT-D1	Interface of Positive Bronze Quad Lead and Superconducting Lead for Horizontal Dipole	16012-02-W (10p)	MS3126F12-10S	Pin-A
Flange_C-01	VT_HorzDipoleCoilCenterTap	Voltage Tap for Coil and SC Lead Quench Detection	VT-D2	Horizontal Dipole Corrector Coil Center Tap	16012-02-W (10p)	MS3126F12-10S	Pin-B
Flange_C-01	VT_HorzDipoleSCLeadTop-Neg	Voltage Tap for Coil and SC Lead Quench Detection	VT-D3	Interface of Negative Bronze Quad Lead and Superconducting Lead for Horizontal Dipole	16012-02-W (10p)	MS3126F12-10S	Pin-C
Flange_C-01	VT_VertDipoleSCLeadTop-Pos	Voltage Tap for Coil and SC Lead Quench Detection	VT-D4	Interface of Positive Bronze Quad Lead and Superconducting Lead for Verticle Dipole	16012-02-W (10p)	MS3126F12-10S	Pin-D
Flange_C-01	VT_VertDipoleCoilCenterTap	Voltage Tap for Coil and SC Lead Quench Detection	VT-D5	Vertical Dipole Corrector Coil Center Tap	16012-02-W (10p)	MS3126F12-10S	Pin-E
Flange_C-01	VT_VertDipoleSCLeadTop-Neg	Voltage Tap for Coil and SC Lead Quench Detection	VT-D6	Interface of Negative Bronze Quad Lead and Superconducting Lead for Verticle Dipole	16012-02-W (10p)	MS3126F12-10S	Pin-F
Flange_C-02	HTR-DipoleCoil-Pos	Strip Heater for Dipole (Shared) Quench Protection	SH-D1	Corrector D-Horz D-Vert Strip Htr (pos)	18093-06-W (4p)	18600-02-A	A,B (I+,I-)
Flange_C-02	Spare	N/A	N/A	N/A	18093-06-W (4p)	18600-02-A	C,D (I+,I-)
Flange_C-03	Reserved for Quad Doublet VT	Reserved for Voltage Tap for Coil and SC Lead Quench Detection	N/A	Reserved	16012-02-W (10p)	MS3126F12-10S	Pin-A
Flange_C-03	Reserved for Quad Doublet VT	Reserved for Voltage Tap for Coil and SC Lead Quench Detection	N/A	Reserved	16012-02-W (10p)	MS3126F12-10S	Pin-B
Flange_C-03	Reserved for Quad Doublet VT	Reserved for Voltage Tap for Coil and SC Lead Quench Detection	N/A	Reserved	16012-02-W (10p)	MS3126F12-10S	Pin-C
Flange_C-03	Reserved for Quad Doublet VT	Reserved for Voltage Tap for Coil and SC Lead Quench Detection	N/A	Reserved	16012-02-W (10p)	MS3126F12-10S	Pin-D
Flange_C-03	Reserved for Quad Doublet VT	Reserved for Voltage Tap for Coil and SC Lead Quench Detection	N/A	Reserved	16012-02-W (10p)	MS3126F12-10S	Pin-E
Flange_C-03	Reserved for Quad Doublet VT	Reserved for Voltage Tap for Coil and SC Lead Quench Detection	N/A	Reserved	16012-02-W (10p)	MS3126F12-10S	Pin-F
Flange_C-04	Reserved for Quad Doublet Strip Heater	Strip Heater for Dipole (Shared) Quench Protection	N/A	Reserved	18093-06-W (4p)	18600-02-A	A,B (I+,I-)
Flange_C-04	Reserved for Quad Doublet Strip Heater	N/A	N/A	Reserved	18093-06-W (4p)	18600-02-A	C,D (I+,I-)
Flange_C-05	RTD_DipoleleadG10Block-Primary	Cernox 1030	X53845	Mounted on G-10 Block at Cold Flange where SC leads are soldered to the Bronze Lead	16003-02-W	MS3126F14-19S	A,B,C,D (I+R,I-B,V+G,V-Y)
Flange_C-05	RTD_DipoleleadG10Block-Redundant	Cernox 1030	X58345	Mounted on G-10 Block at Cold Flange where SC leads are soldered to the Bronze Lead	16003-02-W	MS3126F14-19S	E,F,G,H (I+R,I-B,V+G,V-Y)
Flange_C-05	Reserved for Quad Doublet RTD	N/A	N/A	Reserved	16003-02-W	MS3126F14-19S	J,K,L,M (I+R,I-B,V+G,V-Y)
Flange_C-05	Reserved for Quad Doublet RTD	N/A	N/A	Reserved	16003-02-W	MS3126F14-19S	N,P,R,S (I+R,I-B,V+G,V-Y)

13.6 Flange CL

Figure 13.6. Flange CL is for corrector magnet current leads.

13.7 Flange C1

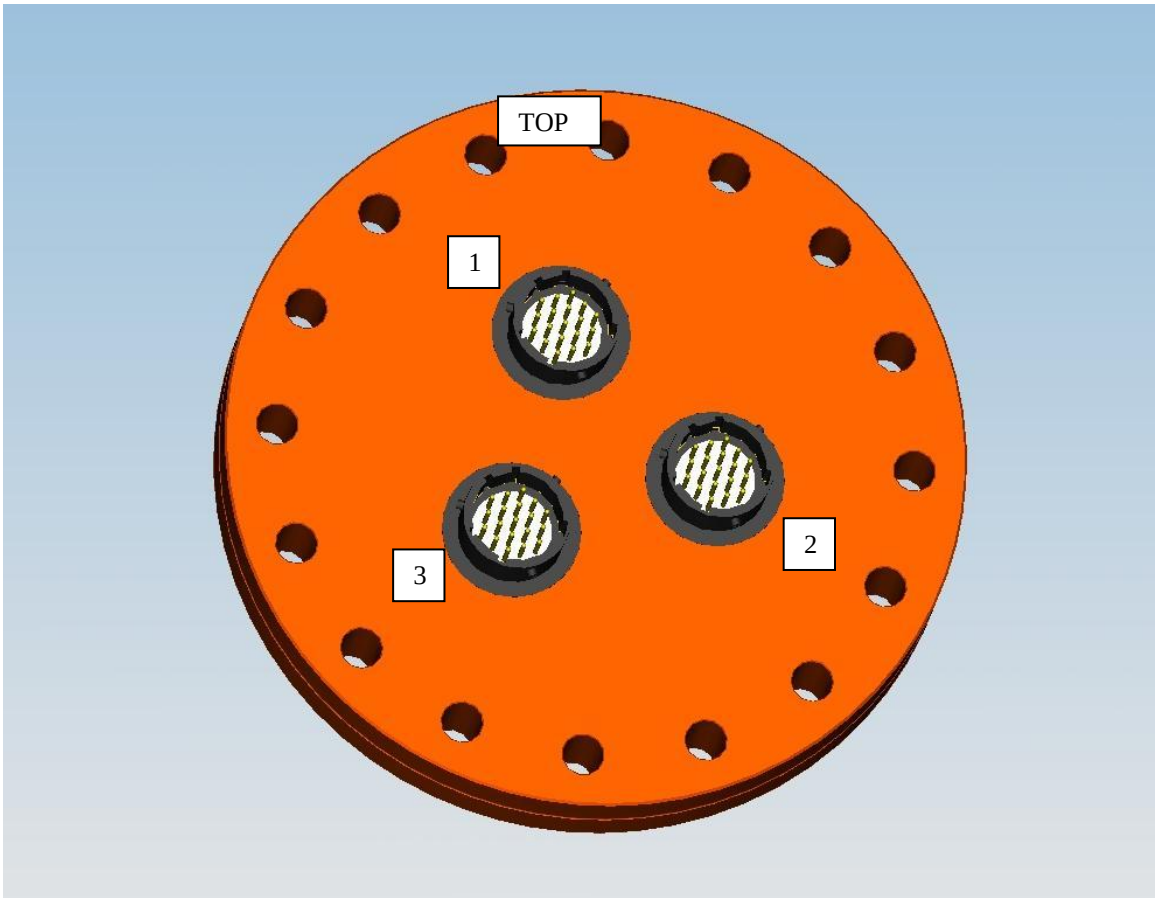

Figure 13.7. Flange C is for BPM temperature sensors

Table 13.12. Feed Through Assignment for Flange C1

Feed Through No.	Application	Feed Through Type	Outside Connector
1	RTD Cernox 1030 (QuadLead 4K-1, 4K-2, 4KIntercept,4K-80K)	16003-02-W	MS3126F14-19S
2	RTD Cernox 1030 (QuadLead 80K Intercept, 80K) 2x Spare	16003-02-W	MS3126F14-19S
3	Geophone (Quadrupole face, Horz1, Vert, Horz2) Spare	16003-02-W	MS3126F14-19S

Table 13.13. Feed Through Assignment for Flange C1, Diagnostics

Flange C1, Diagnositc Instrumentation:					
Flange-Connector	**Device/Sensor Name**	**Device/Sensor Type**	**Serial Number**	**Device Location**	**Feed Through Connector Pin**
Flange_C1-01	RTD_QuadLead_4K-1	Cernox 1030	X58408	RTD on Quad Lead close to Cold CL Flange	A,B,C,D (I+R,I-B,V+G,V-Y)
Flange_C1-01	RTD_QuadLead_4K-2	Cernox 1030	X58409	RTD on Quad Lead close to 4K Copper Intercept Block	E,F,G,H (I+R,I-B,V+G,V-Y)
Flange_C1-01	RTD_QuadLead_4K_Intercept	Cernox 1030	X58455	RTD on Quad Lead 4K Copper Intercept Block	J,K,L,M (I+R,I-B,V+G,V-Y)
Flange_C1-01	RTD_QuadLead_4K-80K1	Cernox 1030	X58468	RTD on Quad Lead between 4K and 80K Copper intercept Blocks	N,P,R,S (I+R,I-B,V+G,V-Y)
Flange_C1-02	RTD_QuadLead_4k-80K-2	Cernox 1030	X59928	RTD on Quad Lead 80K Copper Intercept Block	A,B,C,D (I+R,I-B,V+G,V-Y)
Flange_C1-02	RTD_QuadLead_80K	Cernox 1030	X59936	RTD on Quad Lead between 80K Copper Intercept Block and Warm CL Flange	E,F,G,H (I+R,I-B,V+G,V-Y)
Flange_C1-02	Spare	N/A	N/A	N/A	J,K,L,M (I+R,I-B,V+G,V-Y)
Flange_C1-02	Spare	N/A	N/A	N/A	N,P,R,S (I+R,I-B,V+G,V-Y)
Flange_C1-03	GeophoneQuadrupoleFaceHorz-1	ION SENSOR SM-6/H-B 4.5 Hz (375 ohm)	geo-001	Geophone on the Quadrupole Horizontal Face	A,B (V+,V-)
Flange_C1-03	GeophoneQuadrupoleFaceVert	Geospace GS-11D 4.5 Hz (380 ohm)	geo-002	Geophone on the Quadrupole Vertical Face	D,E (V+,V-)
Flange_C1-03	GeophoneQuadrupoleFaceHorz-2	ION SENSOR SM-6/H-B 4.5 Hz (375 ohm)	geo-003	Geophone on the Quadrupole Horizontal Face	G,H (V+,V-)
Flange_C1-03	Spare	N/A	N/A	N/A	G thru V

All Connections	
Feed Through Mating Connection (Vacuum)	16029-02-A
Feed Through Type	16003-02-W
Feed Through Mating Connection (AIR)	MS3126F14-19S

13.8 Flange D

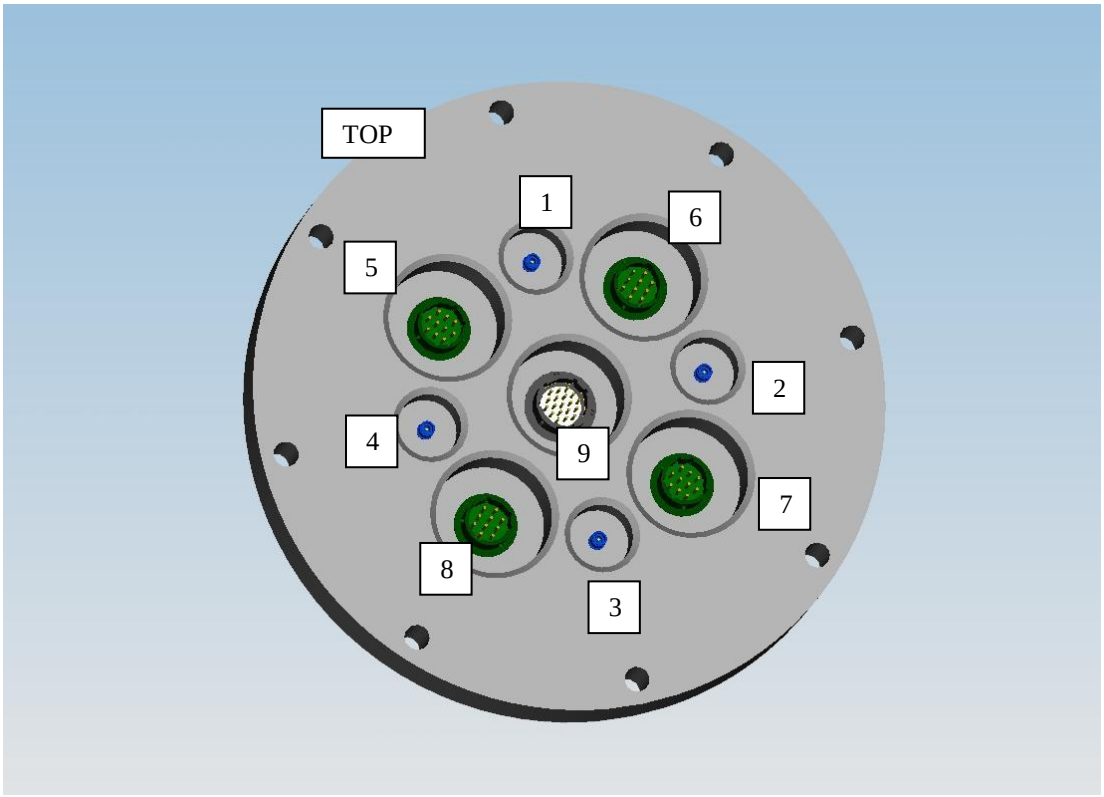

Figure 13.8. Feed Through Arrangement for Flange D.

Table 13.14. Feed Through Assignments for Flange D.

Feed Through No.	Application	Feed Through Type	Outside Connector
1	BPM Top	TMS SD-26021A	SMA 0^0
2	BPM Rt	TMS SD-26021A	SMA 0^0
3	BPM Bot	TMS SD-26021A	SMA 0^0
4	BPM Lft	TMS SD-26021A	SMA 0^0
5	Stepper Motor (Cavities 1-2)	16002-02-W	MS3126F12-10S
6	Stepper Motor (Cavities 3-4)	16002-02-W	MS3126F12-10S
7	Stepper Motor (Cavities 5-6)	16002-02-W	MS3126F12-10S
8	Stepper Motor (Cavities 7-8)	16002-02-W	MS3126F12-10S
9	RTD BPM3/4 (1 x primary , 1 x redundant) 2x spare	16003-02-W	MS3126F14-19S

Table 13.15. Pin Assignments for Flange D.

BPM/Stepper Motors:								
Flange-Connector	Device/Sensor Name	Device/Sensor Type	Serial Number	Device Location	Feed Through Mating Connection(Vacuum)	Feed Through Type	Feed Through Mating Connection(AIR)	Feed Through Connector Pin
Flange_D-01	BPM-Top	Beam Position Monitor	N/A	BPM/Q1	SMA 0^0	TMS SD-26021A	SMA 0^0	Single Pin,Shield
Flange_D-02	BPM-Right	Beam Position Monitor	N/A	BPM/Q2	SMA 0^0	TMS SD-26021A	SMA 0^0	Single Pin,Shield
Flange_D-03	BPM-Bot	Beam Position Monitor	N/A	BPM/Q3	SMA 0^0	TMS SD-26021A	SMA 0^0	Single Pin,Shield
Flange_D-04	BPM-Left	Beam Position Monitor	N/A	BPM/Q4	SMA 0^0	TMS SD-26021A	SMA 0^0	Single Pin,Shield
Flange_D-05	Stepper Motor 1	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836679	Cavity 1, Tuner #2	16028-02-A	16002-02-W	MS3126F12-10S	A,B,C,D
Flange_D-05	Stepper Motor 2	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836674	Cavity 2, Tuner #9	16028-02-A	16002-02-W	MS3126F12-10S	E,F,G,H
Flange_D-06	Stepper Motor 3	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836671	Cavity 3, Tuner #3	16028-02-A	16002-02-W	MS3126F12-10S	A,B,C,D
Flange_D-06	Stepper Motor 4	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836677	Cavity 4, Tuner #5	16028-02-A	16002-02-W	MS3126F12-10S	E,F,G,H
Flange_D-07	Stepper Motor 5	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836676	Cavity 5, Tuner #4	16028-02-A	16002-02-W	MS3126F12-10S	A,B,C,D
Flange_D-07	Stepper Motor 6	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836678	Cavity 6, Tuner #11	16028-02-A	16002-02-W	MS3126F12-10S	E,F,G,H
Flange_D-08	Stepper Motor 7	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836673	Cavity 7, Tuner #13	16028-02-A	16002-02-W	MS3126F12-10S	A,B,C,D
Flange_D-08	Stepper Motor 8	Phytron Stepper Motor, Model #: VSS 52.200.2.5-4LP-5M-UHVC	100836672	Cavity 8, Tuner #14	16028-02-A	16002-02-W	MS3126F12-10S	E,F,G,H
Flange_D-09	RTD_BPM3/BPM4Primary	Cernox 1030	X59931	Between BPM 3 & BPM 4	16029-02-A	16003-02-W	MS3126F14-19S	A,B,C,D (I+R,I-B,V+G,V-Y)
Flange_D-09	RTD_BPM3/BPM2Redundant	Cernox 1030	X59932	Between BPM 3 & BPM 2	16029-02-A	16003-02-W	MS3126F14-19S	E,F,G,H (I+R,I-B,V+G,V-Y)
Flange_D-09	Spare	N/A	N/A	N/A	N/A	16003-02-W	MS3126F14-19S	N/A
Flange_D-09	Spare	N/A	N/A	N/A	N/A	16003-02-W	MS3126F14-19S	N/A

13.9 Flange K

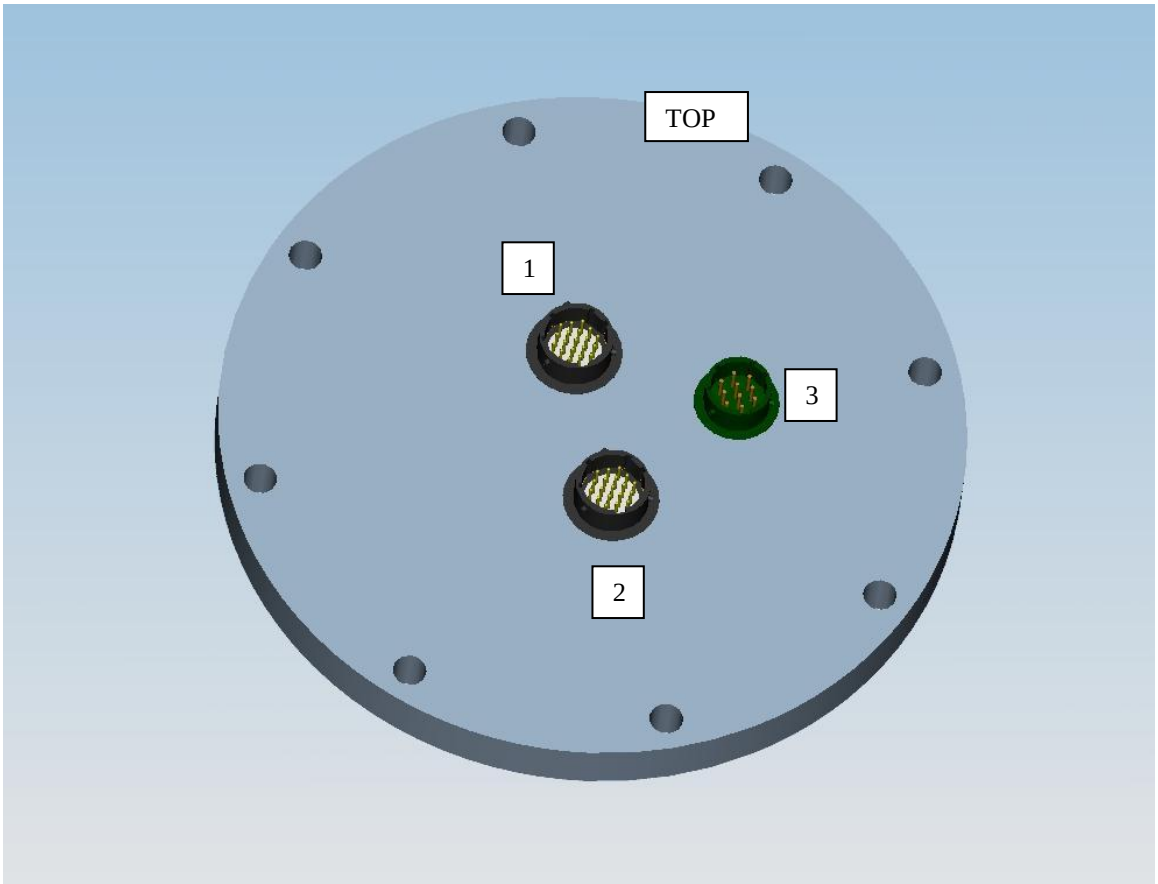

Figure 13.9. Feed Throughs in Flange K.

Table 13.16. Feed Through Assignments for Flange K.

Feed Through No.	Application	Feed Through Type	Outside Connector
1	5K and 80K shields	16003-02-W	MS3126F14-19S
2	Spare	16003-02-W	
3	Vessel 1 spot heater	16002-02-W	MS3126F12-10S

Table 13.17. Pin Assignments for Flange K, Cryogenics

Flange K, Cryogenic Pipe Temp:

Flange-Connector	Device/Sensor Name	Device/Sensor Type	Serial Numbe	Device Location	Feed Through Mating Connection(Vacuum)	Feed Through Type	Feed Through Mating Connection(AIR)	Feed Through Connector Pin
Flange_K-01	RTD_5K_Shield_Primary	Cernox 1030	X59933	Bottom of 5K Shield (Primary)	16029-02-A	16003-02-W	MS3126F14-19S	A,B,C,D (I+R,I-B,V+G,V-Y)
Flange_K-01	RTD_5K_Shield_Redundant	Cernox 1030	X59934	Bottom of 5K Shield (Redundant)	16029-02-A continued	16003-02-W	MS3126F14-19S	E,F,G,H (I+R,I-B,V+G,V-Y)
Flange_K-01	RTD_80K_Shield_Primary	Platinum 100	P22605	Bottom of 80K Shield (Primary)	16029-02-A continued	16003-02-W	MS3126F14-19S	J,K,L,M (I+R,I-B,V+G,V-Y)
Flange_K-01	RTD_80K_Shield_Redundant	Platinum 100	P22607	Bottom of 80K Shield (Redundant)	16029-02-A continued	16003-02-W	MS3126F14-19S	N,P,R,S (I+R,I-B,V+G,V-Y)
Flange_K-02	Spare	N/A	N/A	N/A	N/A	16003-02-W	MS3126F14-19S	N/A
Flange_K-02	Spare	N/A	N/A	N/A	N/A	16003-02-W	MS3126F14-19S	N/A
Flange_K-02	Spare	N/A	N/A	N/A	N/A	16003-02-W	MS3126F14-19S	N/A
Flange_K-02	Spare	N/A	N/A	N/A	N/A	16003-02-W	MS3126F14-19S	N/A
Flange_K-03	SpotHtr-HeVessel-01	Spot Cartridge Heater, 120VAC, 100W	HT-01	on Side Wall Furthest from the	16028-02-A	16002-02-W	MS3126F12-10S	A,E
Flange_K-03	Spare	N/A	N/A	N/A	16028-02-A	16002-02-W	MS3126F12-10S	B,C,D,F,G,H,J,K

14 REFERENCES

1. Fermilab CM1 Interface Document, CM RFCA001.
2. Fermilab Technical Division Spreadsheet “CM2_InstruSpec_V2.6, (or latest).