



LO Electronics Installation

Linda Bagby

- System Electronics Overview
 - ◆ Low Voltage
 - ◆ High Voltage
 - ◆ RTD-Carbon Fiber Temperature Monitoring
 - ◆ Readout
- Prep Work Summary
- Person-power, Schedule



System Electronics

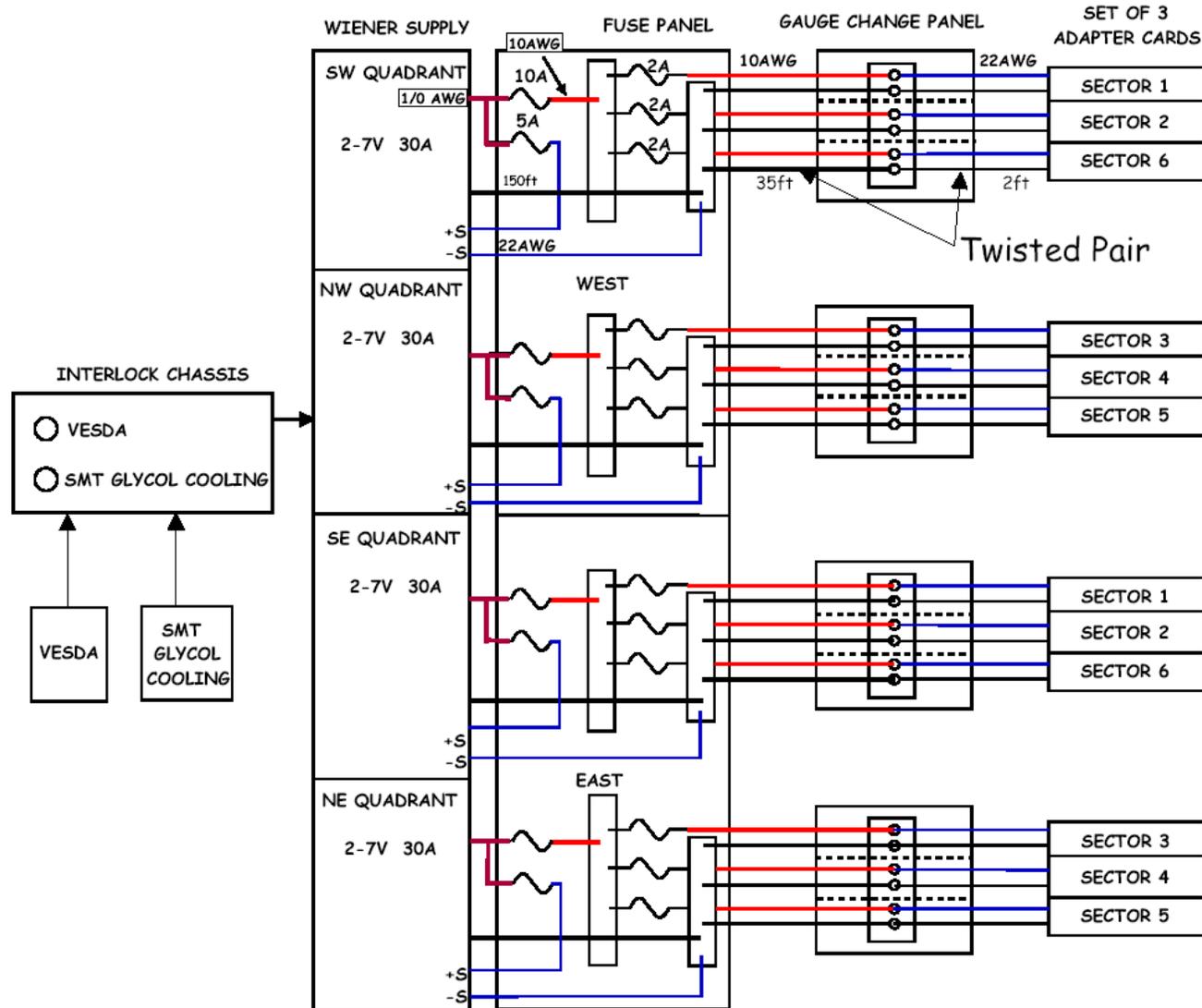
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- The LO Upgrade electronics consist of 4 systems.
 - ◆ Isolated Low Voltage Power Supply
 - Wiener PS-Filter-Fuse Panel-PS Interlock-CAN bus interface
 - ◆ High Voltage Power Supply
 - HV crate-Fanout Chassis (2 units)
 - ◆ RTD Temperature Monitoring
 - RTD-Flex-(32AWG-filter-26AWG)-Controller
 - ◆ Readout
 - Junction Card-Twisted pair cable-Adapter Card



Isolated Low Voltage System

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Components installed

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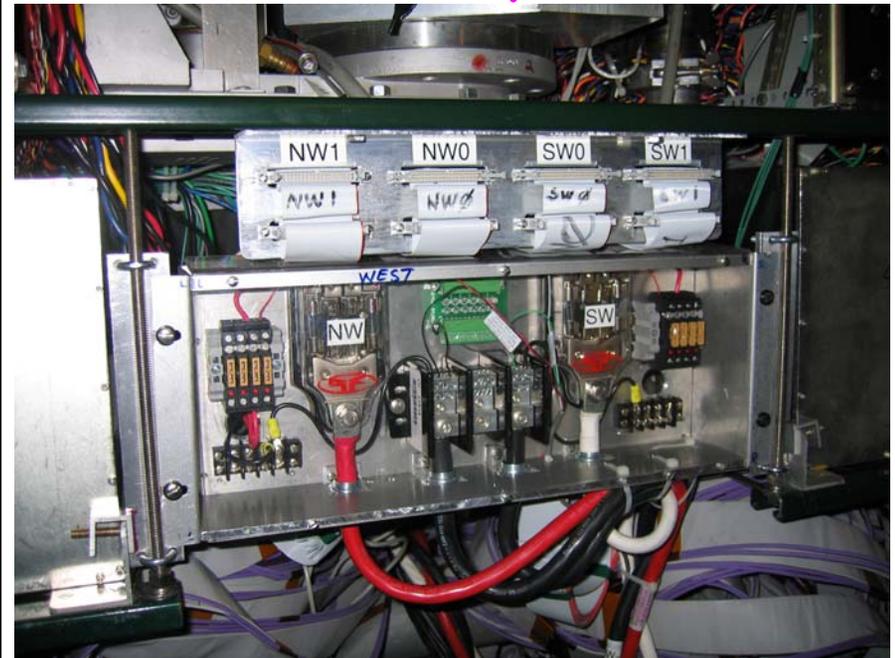
2nd Floor Movable Counting House

- Installed and Tested
 - ◆ Wiener Power Supply
 - ◆ Safety Interlock



Collision Hall-Cathedral Area

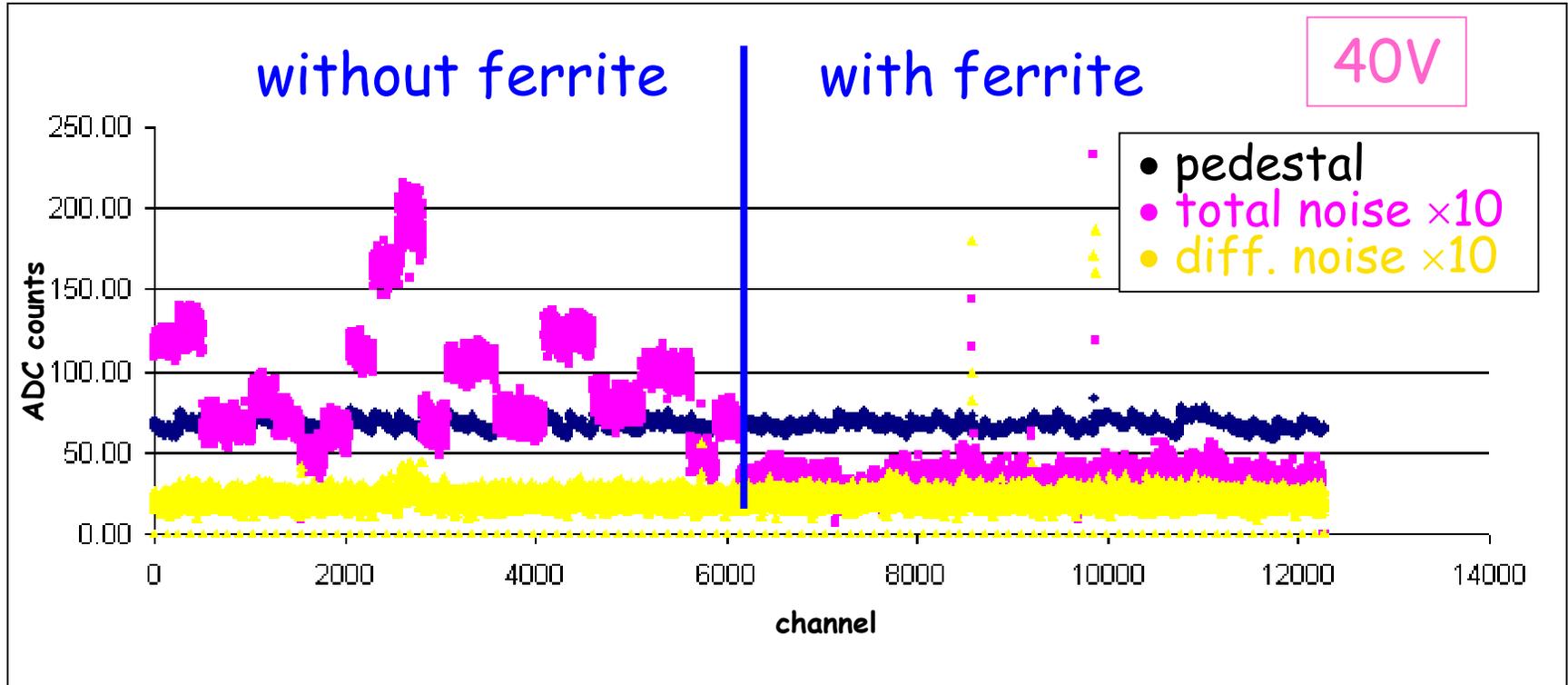
- Installed and Tested
 - ◆ 2 Fuse Panels
 - ◆ East and West Side
 - ◆ Quadrant Specific





LV Power Supply Filter Response

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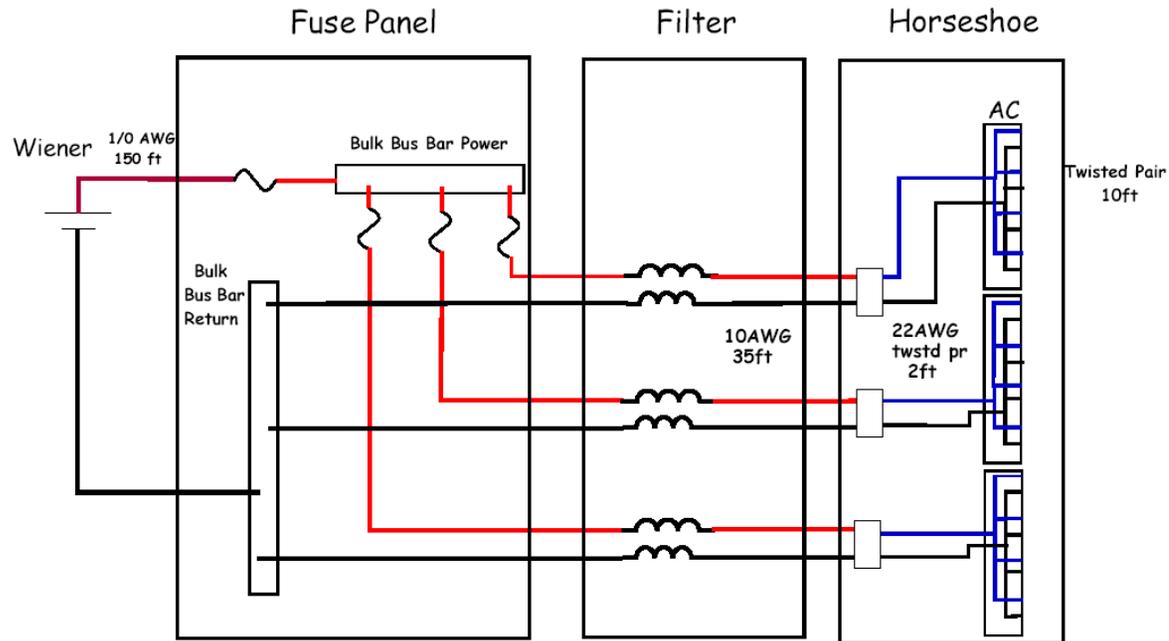


- 5 turns on ferrite core of power cable reduced noise to 3-3.5 cts.
- Prototype filter design ready to test.
- Preliminary 200 gauss magnetic field tests show minimal effect on filter action.



Filter location

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- Install below fuse panel in cathedral area.
- 2 quadrants per card.



LV PS work remaining

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- Prep work remaining
 - ◆ Test filter at 100% test stand.
 - ◆ Enter operating parameters in EPICS database.
 - ◆ Test CAN bus interface via GUI in Control Room.
- Work remaining in Collision Hall
 - ◆ Install filter in cathedral.
 - ◆ Cable Plant:
 - 12 twisted pair 10AWG cables
 - fuse panel → filter
 - filter → gauge change panels on horseshoe
 - 12 twisted pair 22AWG cables
 - gauge change panels → Adapter Card



High Voltage System

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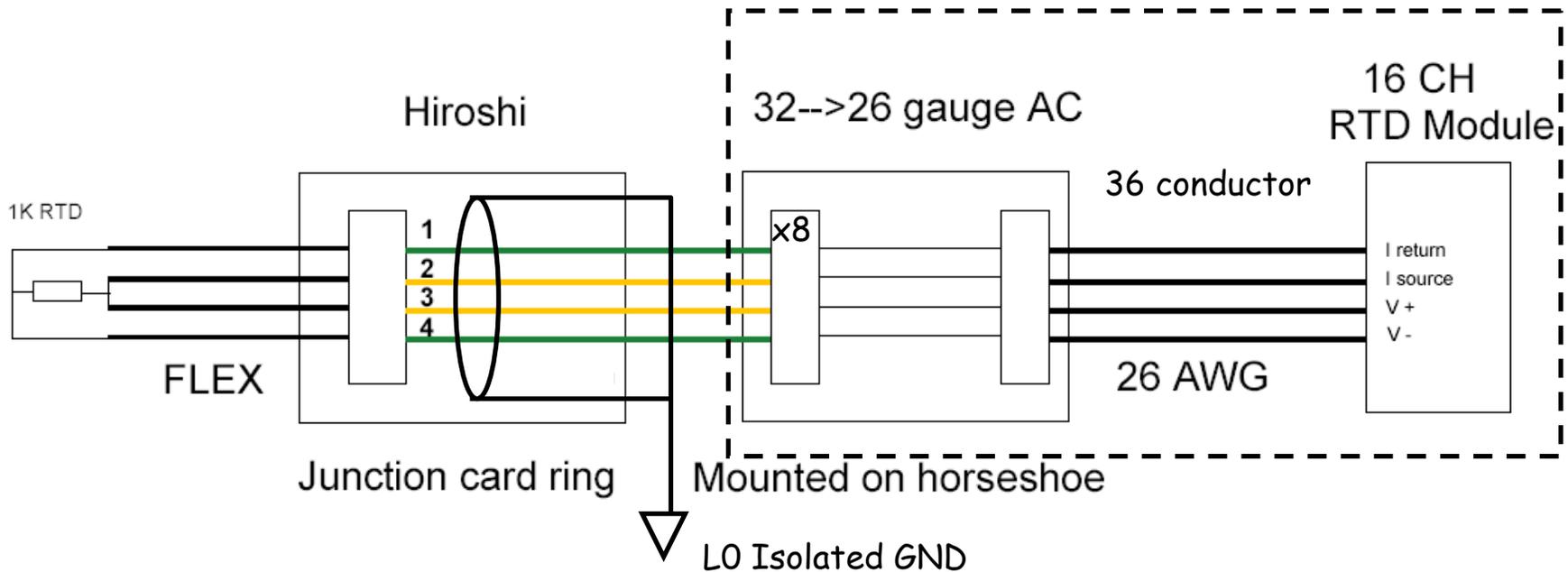
- 1st crate (L0) with 48 pods and power supply tested and installed in the 100% test stand at SiDet.
 - ◆ Pods modified to accommodate lower current.
- 2nd 48 pod crate (SMT expansion) load tested and ready for installation.
- Prep work:
 - ◆ Order HV cables within next couple of weeks.
- Work remaining in Movable Counting House.
 - ◆ Install 2 HV crates-1st from SiDet, 2nd in house.
 - ◆ Install 2 Fanout chassis for L0.
 - ◆ Install 96 SHV cables from HV pods to Fanout chassis.
 - ◆ Remapping of Inner H-disk channels.
 - ◆ Distribute additional 48 channels in Fanout chassis.
- Work remaining in Collision Hall:
 - ◆ None



RTD system

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- Monitors carbon fiber structure temperature.
- Testing at SiDet has uncovered noise coupling into the readout from RTD flex circuits.
- 32 AWG cable shielding tied to isolated ground at AC removed noise.





RTD System

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- Prep work

- ◆ Test filter card-shielding scheme.

- How much lead resistance can Controller tolerate?

- Latest studies show the Controller can handle 3K Ohm per lead. Filter design for 60dB attenuation at 1kHz has 1.3K Ohm per lead.

- Current design (RCRCR) has filter located on horseshoe.

- Filter: Capacitors need a connection to detector ground in the vicinity of Adapter Card. 1 location per quadrant required. Location has been defined.
- Shield: Requires a connection to LV isolated ground. By positioning filter card in close proximity to gauge change panel, connection is easy. Location has been defined.



DAQ Mapping

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- Positions for the temperature monitoring gauge change panels, LV gauge change panels, and Adapter Cards were determined based on the existing DAQ cable map.
- Every effort has been made to minimize the number of cable moves required to integrate LO into the current system.
- Since the Outer and Inner H-disk low mass cables are combined on one old AC, it is necessary to move half of the Inner H-disk low mass cables (48). The open channels will be used for LO.



SE_1 Mapping

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IB	1B			0B								H Inner	
	II	II/III	III	I	III	I/III	I	III	I	III	III	II/IV	
	15	16	17	12	13	14	15	16	17	18	19	20	21
	F-8	F-8	L0-1-56	B_3	B_9	B_9	B_6	B_6	B_9	F_6	F_8	2.2-1.1	
F-6	F-8	F-8	L0-1-78	B_3	B_9	B_9	B_6	B_6	B_9	F_6	F_8	1.2-2.24	
F-6	F-8	F-8	OPEN	B_3	B_9		B_6		B_9	F-6	F-8	2.1-1.24	
F-6			OPEN				B_6		B_9			2.3-1.3	

Sequencer				0B			SEQ6			H Inner		L0
	I	III	I/III	I	I	III	III	II	II/IV	IV		
	12	13	14	15	16	17	18	19	20	21		
	B_3	B_9	B_9	B_6	B_9	F_6	F_8	F-6	2.2-1.1	L0-1-56		
	B_3	B_9	B_9	B_6	B_9	F_6	F_8	F-6	1.2-2.24	L0-1-78		
	B_3	B_9	B_6	B_6	B_9	F-6	F-8	F-6	2.1-1.24	OPEN		
			B_6	B_6	B_9	F-8	F-8	F-8	2.3-1.3	OPEN		

VRB	M211-1									HO HI		L0
										B(1) A(2)		
	9	10	11	12	13	14	15	16	17	18	19	
	B_3	B_9	B_9	B_6	B_9	0	F_6	F_8	F-6	2.2-1.1	L0-1-56	
	B_3	B_9	B_9	B_6	B_9	1	F_6	F_8	F-6	1.2-2.24	L0-1-78	
	B_3	B_9	B_6	B_6	B_9	2	F-6	F-8	F-6	2.1-1.24	OPEN	
			B_6	B_6	B_9	3	F-8	F-8	F-8	2.3-1.3	OPEN	



Readout-Adapter Card

Digital jumper cable → Junction Card → Twisted Pair → Adapter Card

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Adapter Card Installed on Horseshoe



- Work in Collision Hall
 - ◆ Remove 24 old ACs and standoffs.
 - ◆ Install 12 new ACs and mounts - 3 per quadrant.
 - ◆ Route 48 twisted pair cables from Adapter Card mounting ring (horseshoe) to Junction Card ring.
 - ◆ Connect Isolated LV power supply cable.

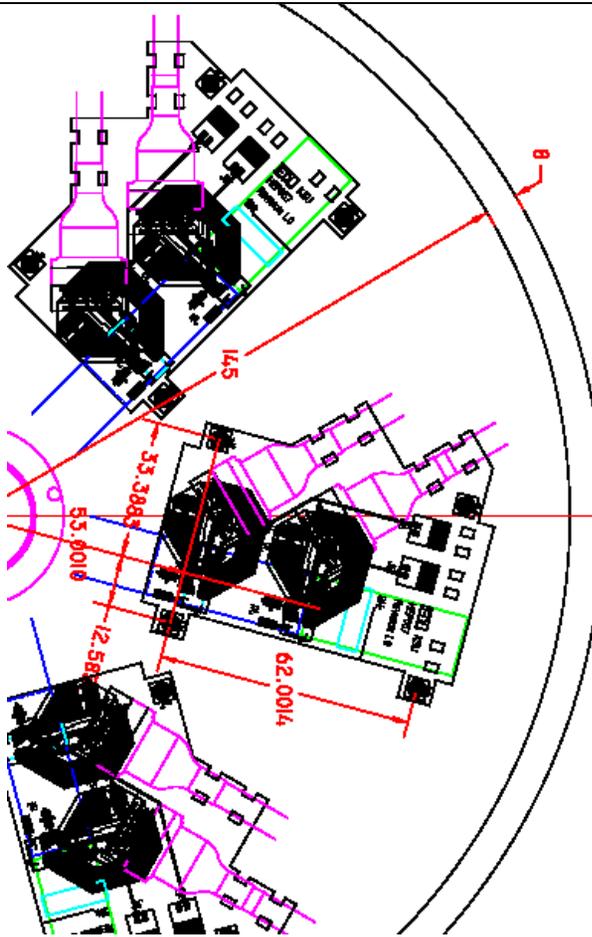


Readout-Junction Card

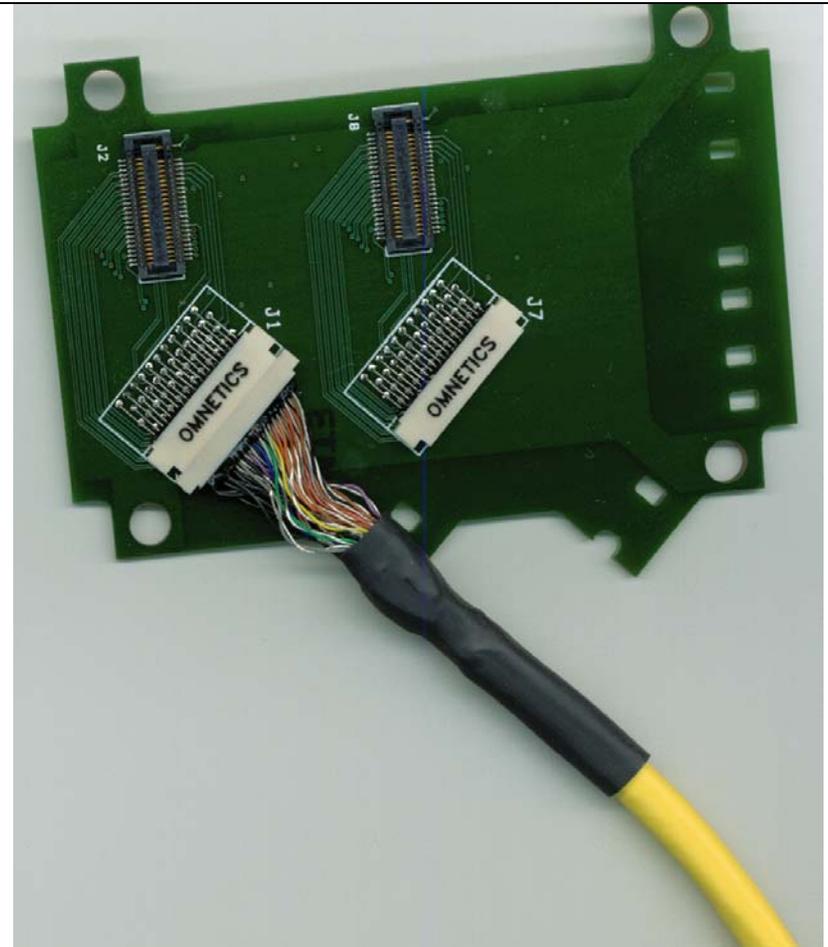
Digital jumper cable → Junction Card → Twisted Pair → Adapter Card

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Junction Card Mounting Ring
2 rings per end



Junction Card and Twisted pair cable
6 per ring — 12 per end





Readout-Junction Card

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- Work in Collision Hall
 - ◆ Connect digital jumper cable from detector to Junction card.
 - ◆ Mount Junction card.
 - ◆ Test channel with laptop and calibration pulse.
 - Confirms HV and LV are correct, the hybrid can be downloaded, and a calibration pulse is read out through entire chain.
 - ◆ Complete first tier ring of 6 cards on each end.
 - ◆ Install 6 more cards on second tier mounting ring.
 - ◆ Test in same fashion.



Silicon Track Trigger

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- Layer Zero utilizes VRB slots previously used by H-disks.
- H-disks were not used in the STT trigger.
- To integrate Layer Zero into the trigger, SEQ fibers need to be moved from the associated VRB crates to the splitters mounted on the wall in the 2nd floor movable counting house (MCH2).
- Work in MCH2
 - ◆ Reroute 2 fibers/VRB crate (24 total) to splitter.
 - ◆ Install 2 fibers/splitter (24 total) to VRB crates.



Prep Work Summary

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- **LV system**
 - ◆ Filter designed. Ready for testing.
- **HV system**
 - ◆ Install RunIIa SMT expansion crate.
 - ◆ Order SHV cables for LO and expansion crate.
- **RTD system**
 - ◆ Filter designed. Quotes requested.
- **Readout**
 - ◆ SEQ-splitter fiber plant.
 - ◆ Fibers/splitters in house. Need labels.



Time and Personnel

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TASK	TIME (days)	PERSONNEL	DETAIL
1.5.2.4.1 Uncable Outer H-disks	1	2	If time permits remove 96 Outer LM cables. 96 total cables 15min / cable
1.5.2.4.7 Uncable Inner H-disks	1	2	Begin remapping of Inner H-disk Disconnect 96, remap 48, 6 min/cable
1.5.2.5.6 Install AC, LV, Temp monitoring-S gap	3	2	Testing included. Remove old (12) AC, install (6) new. Route 6 LV cables. Install temp mon interface panel. Remapping of Inner H-disk (24) 48 min/cable
1.5.2.7.2 Install AC, LV, Temp monitoring-S gap	3	2	Testing included. Remove old (12) AC, install (6) new. Route 6 LV cables. Install temp mon interface panel. Remapping of Inner H-disk (24) 48 min/cable
1.5.2.10.3 Install Junction Cards, Temp mon, Connect L0	4	2	Connect digital jumper cable to JC (48). Install JC. Route twisted pair cables (48) to ACs. Connect Temp monitoring. 30 min / JC
1.5.2.11.1 Install and cable Inner H-disk	4	2	Assumes remapping complete. 15 min /cable