

**NOTE:** The GND connected via the series 100 Ohm can be used as a remote ground signal reference where needed.

**JDx\_y\_NODE\_2V5\_SENSE\_z** is the location where the sense line pair is to be connected to the plane between the two DCB slots sharing this 2V5 rail.

**WHERE:**

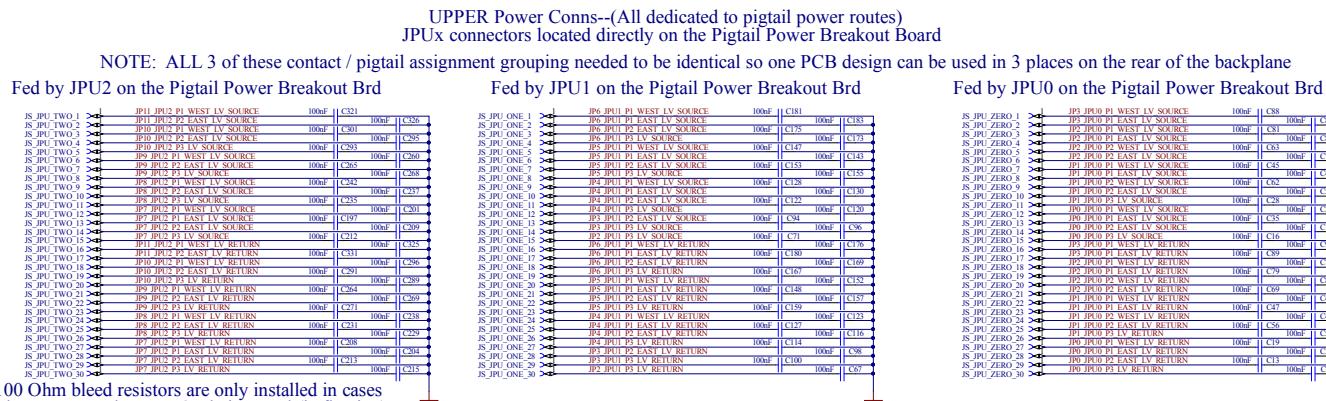
**Z='P'** goes to the 2V5 rail

**Z='N'** goes to the ground plane

# IMPORTANT NOTE: The "GND" pins **MUST NOT EVER** be connected to any remote ground nodes.



Project/Equipment		PEPI	
Document	TE/MPE	Designer	M. Franco Sevilla
<b>PEPI Backplane True Telemetry IO UpperConns</b>		Drawn by	M. Franco Sevilla
		Check by	B. Civiel
		Last Mod.	B. Civiel
		Date	5/6/2019
		File	Telemetry IO UpperConns SchDoc
		Print Date	6/20/2019 6:55:55 AM
		Sheet	Sheet 1 of 21
European Organization for Nuclear Research CH-1211 Genève 23 - Switzerland		EDA-03992-V1-0	



NOTE: These 100 Ohm bleed resistors are only installed in cases where the copper tracks are NOT being used (ie floating)



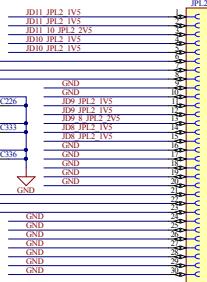
EACH Power Group receives SOURCE power from a single Maraton Channel.

The Maraton Channel is indirectly connected to system power ground via the ground sense resistor connections (ie one per 4-ASICs)

#### LOWER Power Conns--(All DCB slot power routes and a few pigtail power routes)

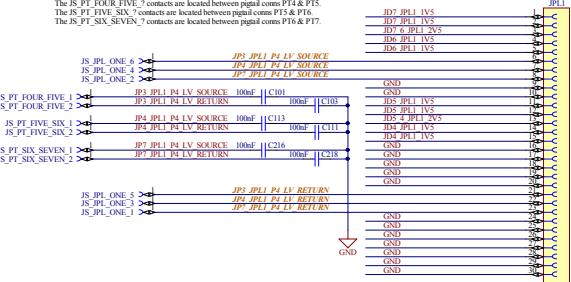
The JS JPU\_TWO\_? contacts are located by the JPL2 connector

The JS\_PT\_EIGHT\_NINE\_? contacts are located between signal conn PT8 & PT9  
The JS\_PT\_NINE\_TEN\_? contacts are located between signal conn PT9 & PT10.  
The JS\_PT\_TEN\_ELEVEN\_? contacts are located between signal conn PT10 & PT11.



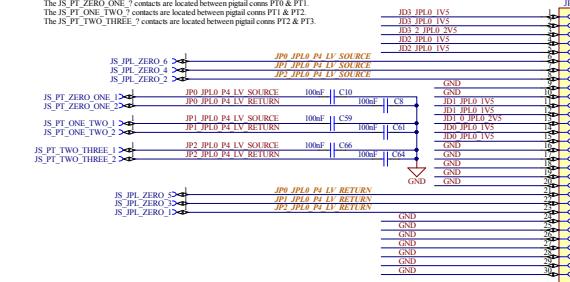
The JS JPU\_ONE\_? contacts are located by the JPL1 connector

The JS\_PT\_FOUR\_FIVE\_? contacts are located between signal conn PT4 & PT5.  
The JS\_PT\_FIVE\_SIX\_? contacts are located between signal conn PT5 & PT6.  
The JS\_PT\_SIX\_SEVEN\_? contacts are located between signal conn PT6 & PT7.



The JS JPU\_ZERO\_? contacts are located by the JPL0 connector

The JS\_PT\_ZERO\_ONE\_? contacts are located between signal conn PT0 & PT1.  
The JS\_PT\_ONE\_TWO\_? contacts are located between signal conn PT1 & PT3.  
The JS\_PT\_TWO\_THREE\_? contacts are located between signal conn PT2 & PT4.



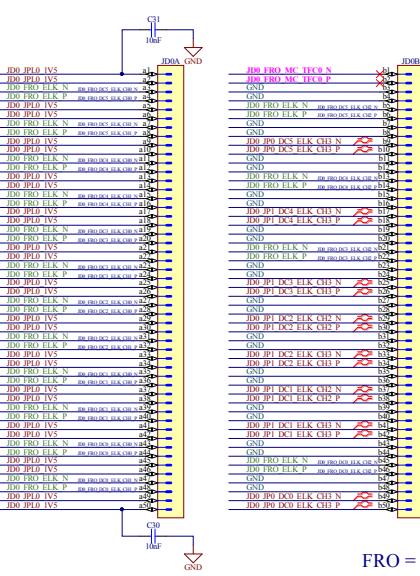
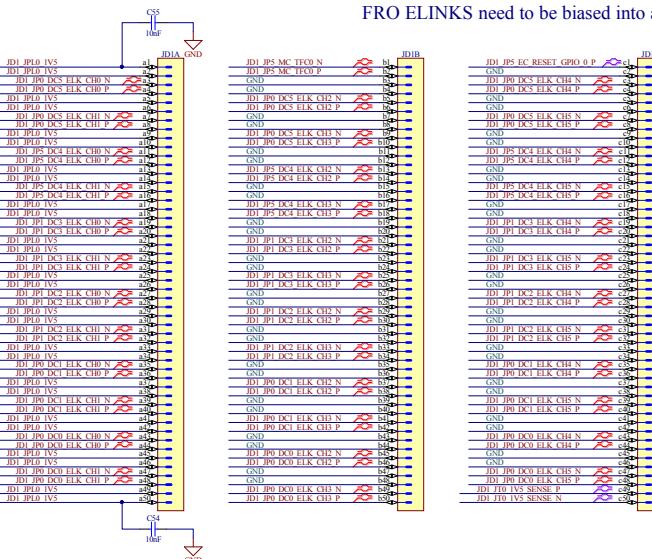
NOTE: (1) The pigtail power lines on JPL2, JPL1, and JPL0 get routed via the individual JS contacts to the PIGTAIL\_POWER\_Breakout\_PCB.

(2) Each DCB slot uses 1 master + 1 slave channel. Both connector pins are labeled '\_1V5'. Therefore, one is for the Master cable and the second is for the slave cable.

(3) The power group 'returns' being joined together also prevents any unused pigtail and Stave flex cable tracks from being left floating.

(4) The power group 'Source' lines in depopulated 'beta' and 'gamma' BP positions are connected via resistors with designators R\_B? and R\_G?, respectively, to the associated power group returns to avoid being left floating.

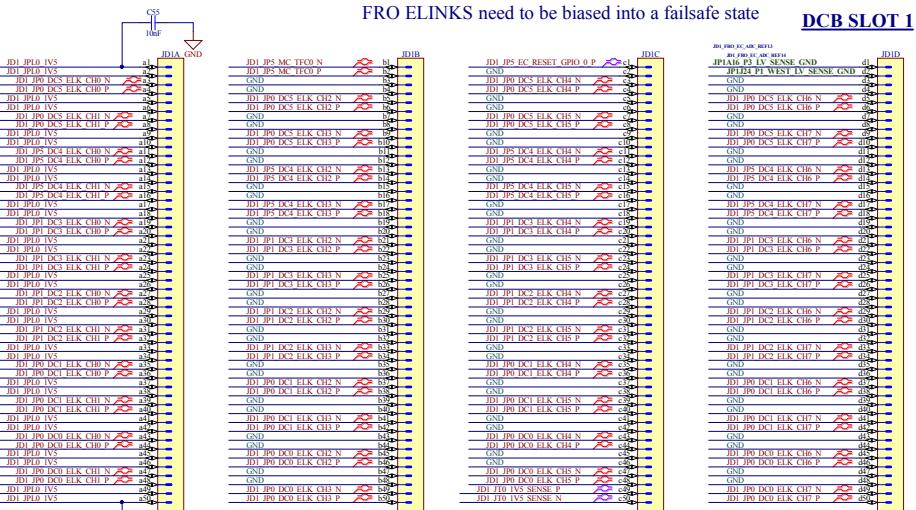
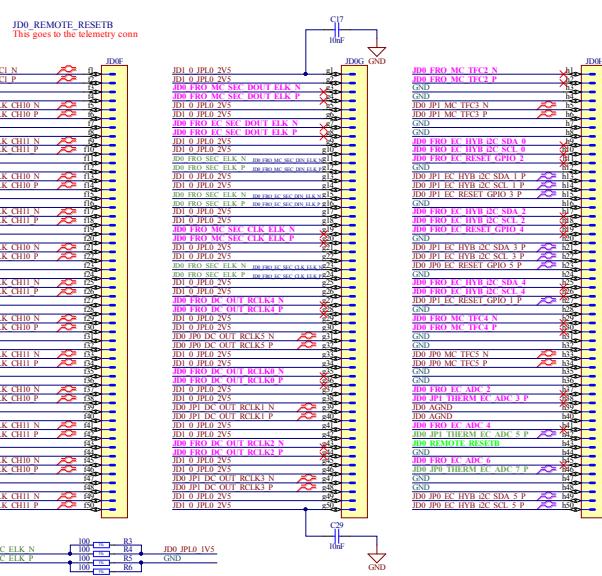
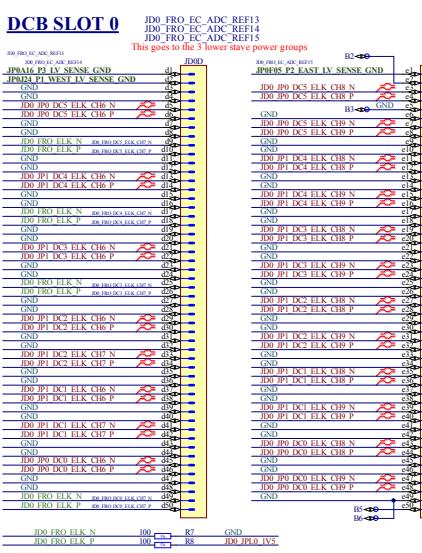
ProjectEquipment	PEPI
Document	
TE/MPE	
18	UNIVERSITY OF MARYLAND
18	PEPI Backplane True - Power Bank Comms -
18	European Organization for Nuclear Research CERN
18	CH-1212 Genvee 23 - Switzerland
18	Block diagram of the PEPI Backplane True - Power Bank Comms -
18	Sheet 1 of 21
18	EDA-03992-V1-0
18	A2 -

**FRO ELINKS need to be biased into a failsafe state****DCB SLOT 1**1  
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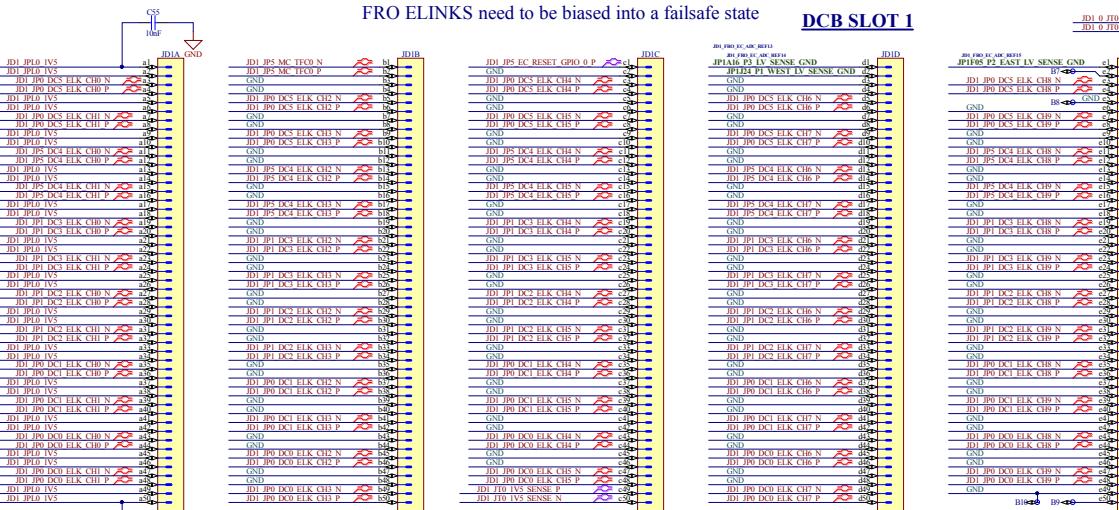
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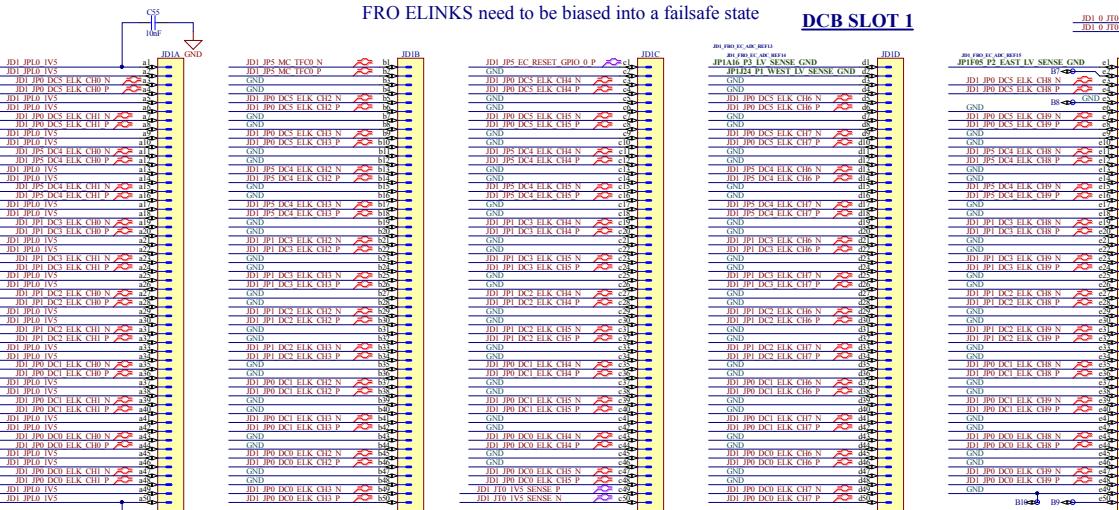
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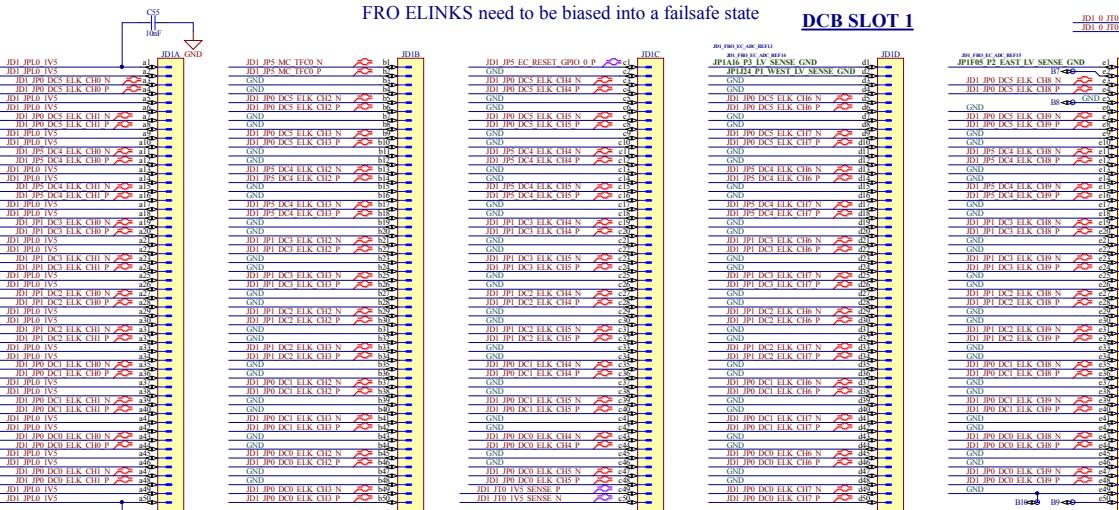
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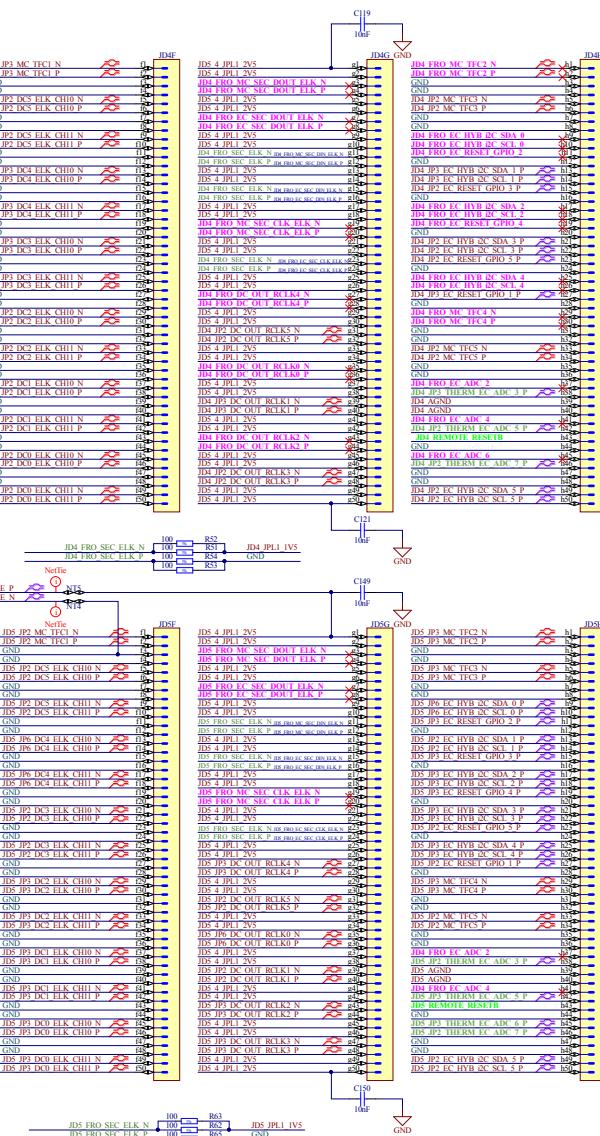
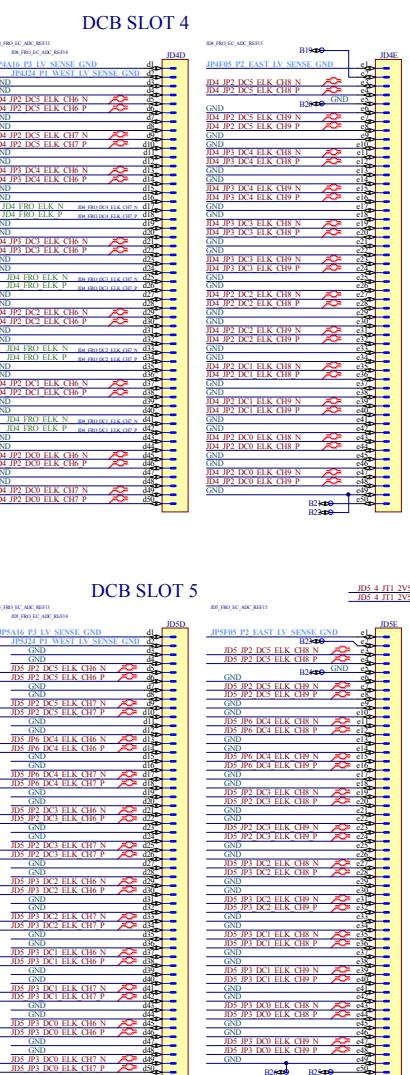
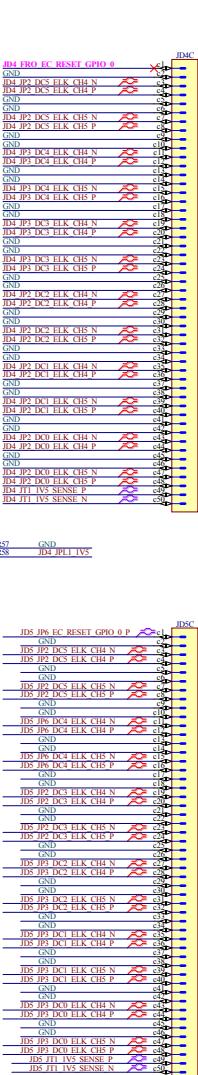
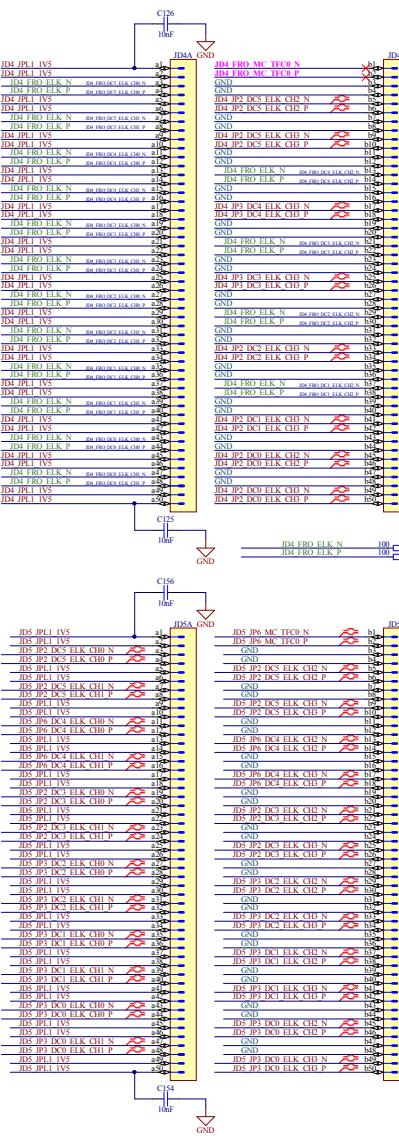
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ProjectEquipment PEPI  
 Document PEPI Backplane True  
 TE/MPE DCR Slot Connector 0 & 1  
 Last Mod. B.Cool 5/7/2013  
 File Mod. DCR Conn1.0.SchDrc  
 Last Rev. 1.0 Date 5/7/2013 Sheet 4 of 21  
 European Organization for Nuclear Research CERN-Genève 23 - Switzerland  
 EDA-03992-VI-0

Designer M. Franco Scoville  
 Drawn by M. Franco Scoville 18/3/2018  
 Last Mod. B.Cool 5/7/2013  
 File Mod. DCR Conn1.0.SchDrc  
 Last Rev. 1.0 Date 5/7/2013 Sheet 4 of 21  
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ectEquipment PEPI  
ument  
**PEPI**  
*PEPI Backplane Tru  
DCB Slot Connector 4*

Equipment	PEPI	Designer	M. Franco Sevilla	Sheet of 6 of 21
ment		Drawn by	M. Franco Sevilla	10/17/2018
<b>PEPI</b>		Check by	M. Franco Sevilla	10/17/2018
		Last Mod.	B. Cuel	5/7/2019
		DCB Connex 4 Sch/Bsc		
		Date Post	6/20/2019 - 6:00 AM	
European Organization for Nuclear Research	ED4-03992-V1-0	A2		
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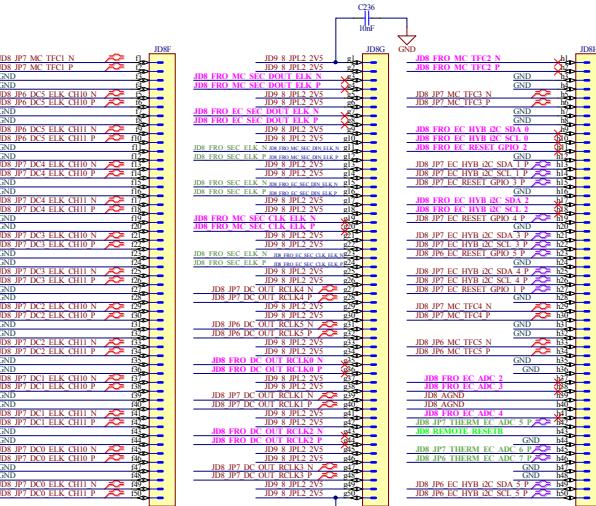
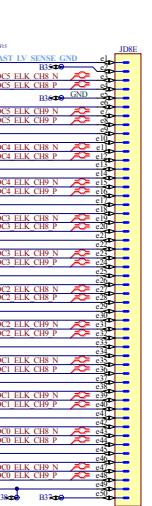
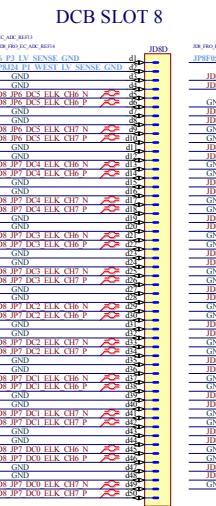
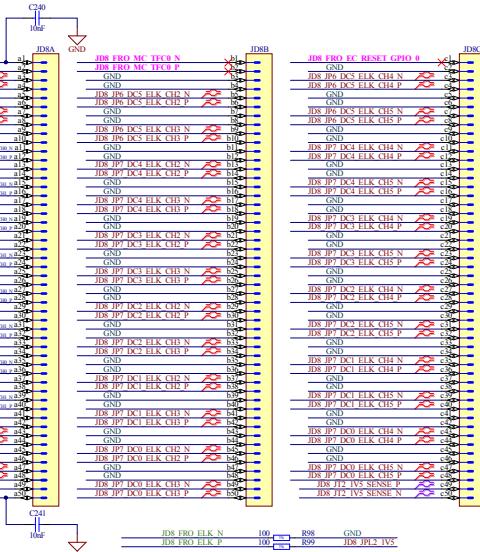


PEPI Backplane True  
DCB Slot Connector 6 & 7

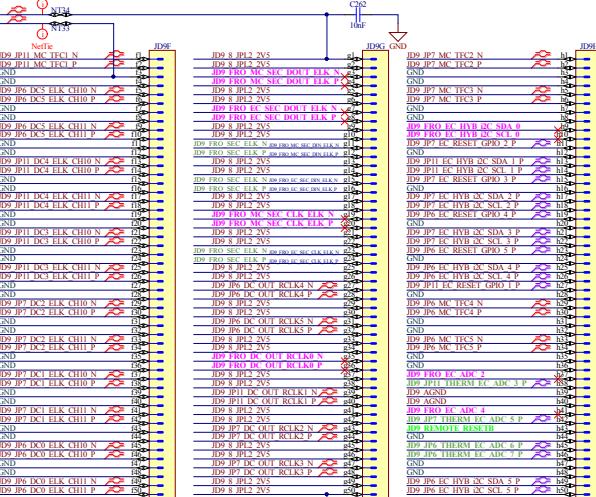
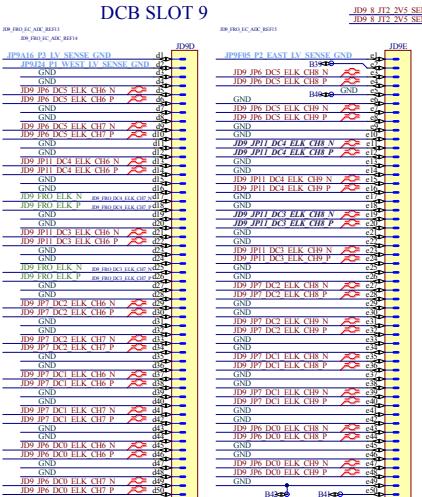
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CERN Geneva 23 - Switzerland

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ProjectEquipment	PEPI
Document	M. Franco Scovilla
Drawn by	M. Franco Scovilla
Date	18/3/2018
TE/MPE	
Last Mod.	B.Ced.
File	5/7/2018
Notes	DCB Conn. 6&7 SchDoc
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DCB SLOT 9

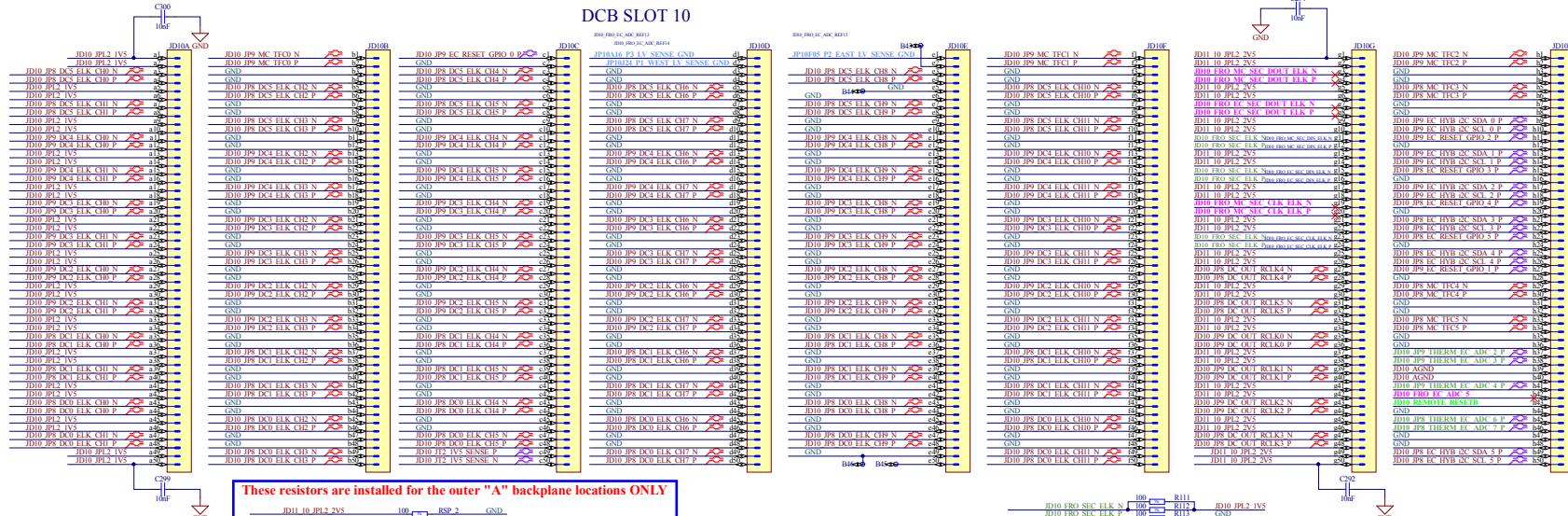


**PEPI Backplane True  
DCB Slot Connector 8 & 9**

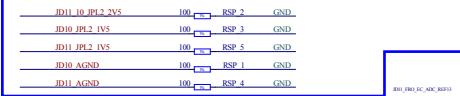
ProjectEquipment	PEPI
Document	M. Franco Scoville
Drawn by	M. Franco Scoville
Date	18/3/2018
TE/MPE	PEPI
File	DCB Conneg 8.SchDoc
Last Mod	D.C.B. Conneg 8.SchDoc
File type	SchDoc
Sheet	8 of 21
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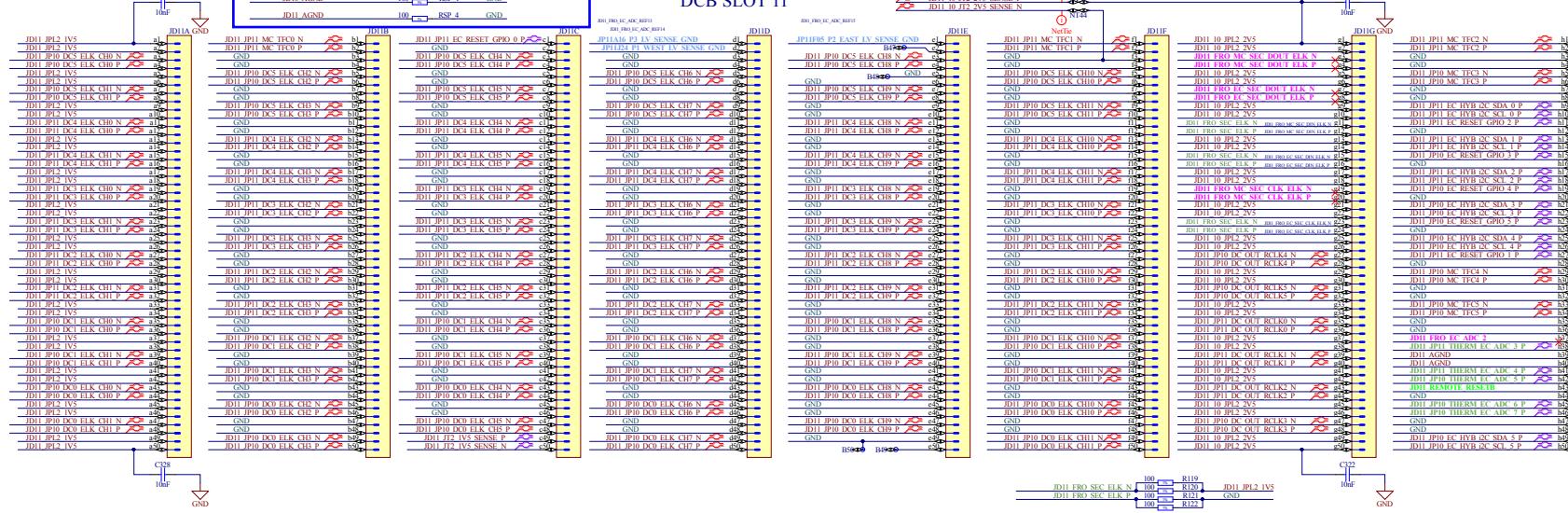
## DCB SLOT 10



These resistors are installed for the outer "A" backplane locations ONLY



## DCB SLOT 11



PEPI Backplane True  
DCB Slot Connector 10 & 11



Project/Equipment	PEPI
Document	M. Franco Scoville
Drawn by	M. Franco Scoville
Date	16/3/2018
TE/MPE	CERN
File Name	DCB Conn11
File Version	10 SchDoc
Author	PEPI Backplane True
Sheet	Sheet 9 of 21
Page	A2 -

**NOTES:**

FP = placeholders for floating copper. These could be pressed against a carbon impregnated foam to be glued to, if needed.

Bright Blue = AC signal reference ground return

Dark Green = Floating DC Hybrid reference ground return

Light Green = Thermistors

Fuscia = Telemetry Thermitors for connections External to PEPI

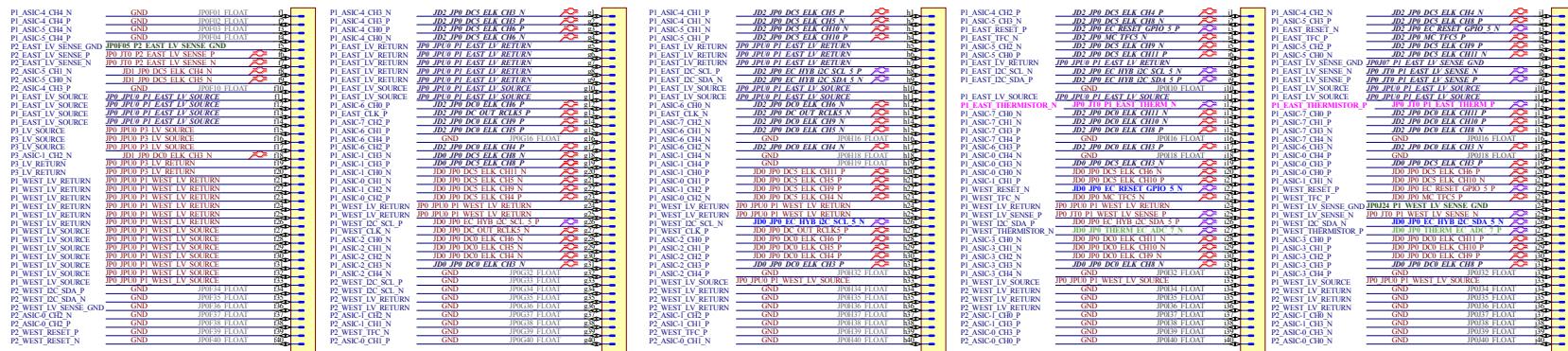
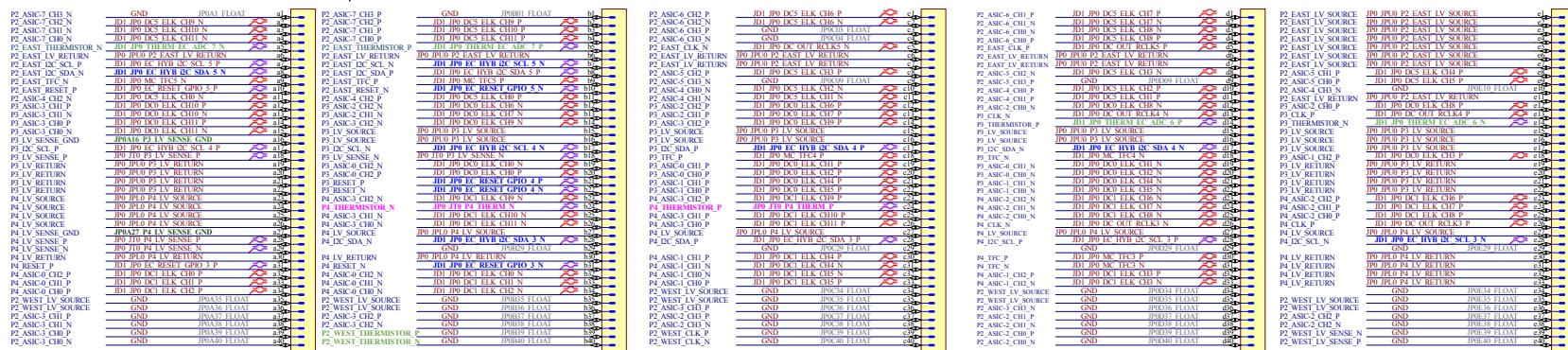
*These italics signals are not used in the middle and outer backplane locations*

**GENERAL GROUND RETURN RULES APPLIED**

- 1) Each floating hybrid ground is connected directly to the corresponding source regulator return path.
- 2) Every single-ended signal from each hybrid has a dedicated ground reference return that is connected to the main backplane ground via a small SMT cap to allow for a high frequency return path.
- 3) Analog ground for the PT1000 sensors is intentionally separate from the main backplane ground.

For REF: PigtaiV3\_Straight\_Long

Pigtail 0



**NOTE: P1 THERMISTOR and P1 EAST THERMISTOR are routed to the telemetry signal connector**

GND Depopulating SDA\_N, SCL\_N, and GPO\_N lines should have these swapped for 0402 100ohm resistors (see variants)

List of Hybrid Power circuits that are not used in middle and outer backplanes (Therefore, the pigtail power breakout boards need to handle these cases)

JPO1\_P1\_EAST\_LV\_SOURCE

JPO1\_P1\_EAST\_LV\_RETURN

JPO2\_P1\_EAST\_LV\_SOURCE

JPO2\_P1\_EAST\_LV\_RETURN

JPO3\_P1\_EAST\_LV\_SOURCE

JPO3\_P1\_EAST\_LV\_RETURN

JPO4\_P1\_EAST\_LV\_SOURCE

JPO4\_P1\_EAST\_LV\_RETURN

JPO5\_P1\_EAST\_LV\_SOURCE

JPO5\_P1\_EAST\_LV\_RETURN

JPO6\_P1\_EAST\_LV\_SOURCE

JPO6\_P1\_EAST\_LV\_RETURN

JPO7\_P1\_EAST\_LV\_SOURCE

JPO7\_P1\_EAST\_LV\_RETURN

JPO8\_P1\_EAST\_LV\_SOURCE

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JPO9\_P1\_EAST\_LV\_SOURCE

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JPO10\_P1\_EAST\_LV\_SOURCE

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JPO11\_P1\_EAST\_LV\_SOURCE

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JPO111\_P1\_EAST\_LV\_SOURCE

JPO111\_P1\_EAST\_LV\_RETURN

JPO112\_P1\_EAST\_LV\_SOURCE

**NOTES:**

**FP** = placeholders for floating copper. These could be pressed against a carbon-injected foam to bleed charge, if needed.

**Bright Blue** = AC signal reference ground return

**Dark Green** = Floating DC Hybrid reference ground return

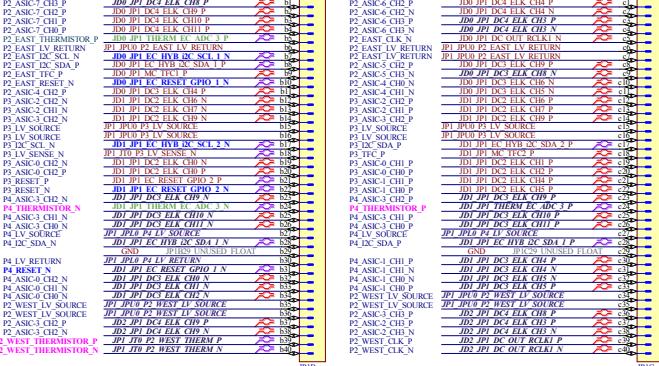
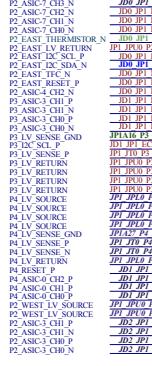
**Light Green** = Thermistors

**These italics signals are not used in the middle and outer backplane locations**

**GENERAL GROUND RETURN RULES APPLIED**

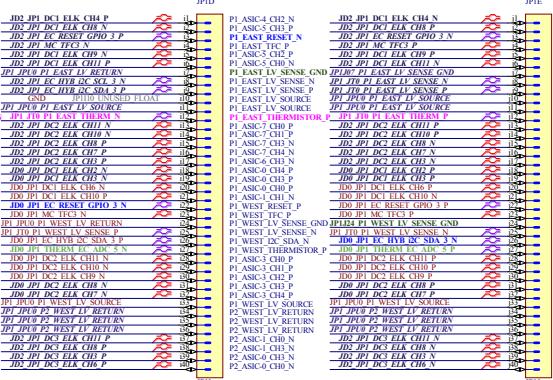
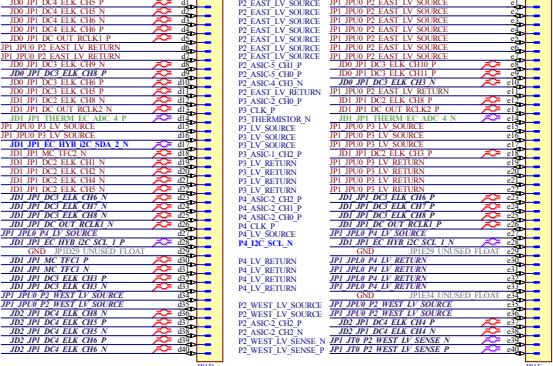
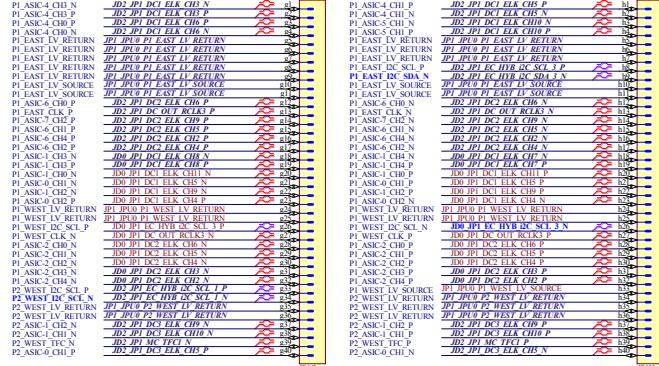
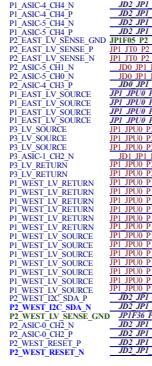
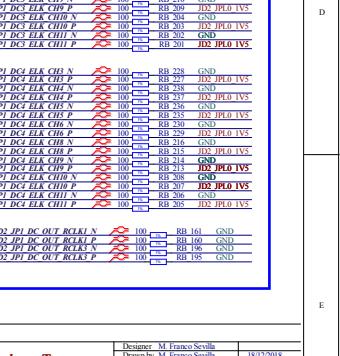
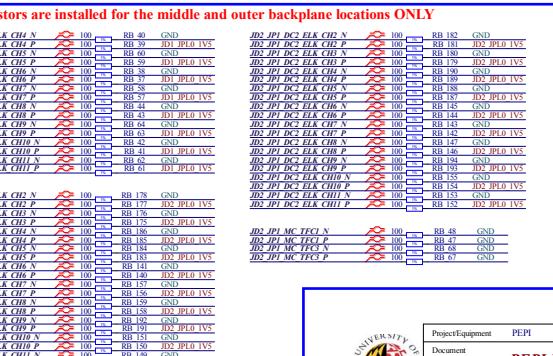
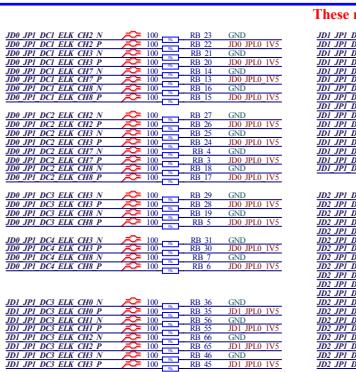
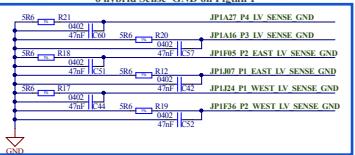
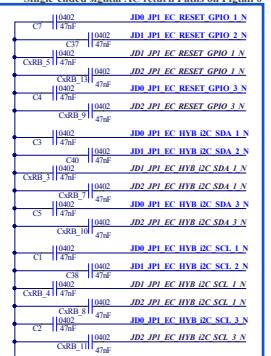
- Each floating hybrid ground is connected directly to the corresponding source regulator return path.
- But a DC bus levels relative to the main backplane ground are maintained via ground sense resistor to the main backplane ground. This also has a small parallel EMI cap to shunt high frequency noise.
- Every single-ended signal from each hybrid has a dedicated ground reference return that is connected to the main backplane ground via a small EMI cap to allow for a high frequency return path only.
- Analog ground for the PT1000 sensors is intentionally separate from the main backplane ground.
- Analogue ground for the PT1000 sensors is intentionally separate from the main backplane ground.
- The P2\_EAST\_THERMISTOR and P2\_EAST\_THERMISTOR are routed to the telemetry signal connector

For REF: PigtailV3\_Straight\_Long

**Pigtail 1****GENERAL COMMENTS:**

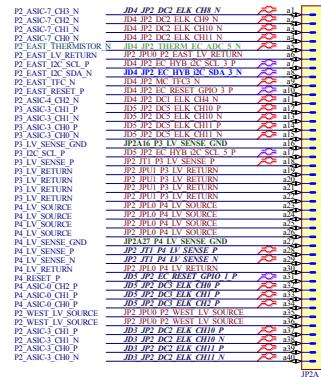
**EC\_ADC\_REF=15..13>** ADC channels can be used to sample the hybrid ground sense.

DCB slots 2, 3, 10, and 11 can be depopulated for middle and outer backplanes. Therefore, the corresponding ED\_? channels should be avoided for ground sense and backplane thermistor measurement to ensure the intended measurement connections are available in each of the backplane locations once populated per elink map requirements.

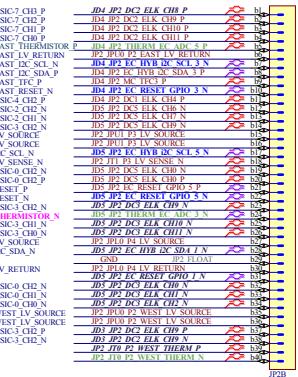
**These resistors are installed for the middle and outer backplane locations ONLY**

Depopulating SDA\_N, SCL\_N, and GPIO\_N lines should have these swapped for 0402 10mil resistors (see variants)

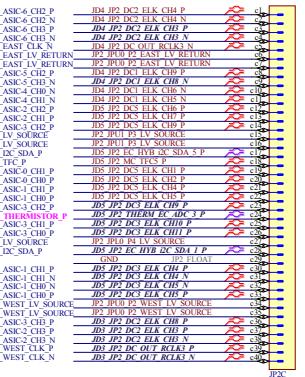
## Pigtail 2



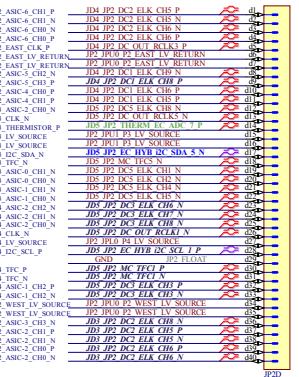
JP2A



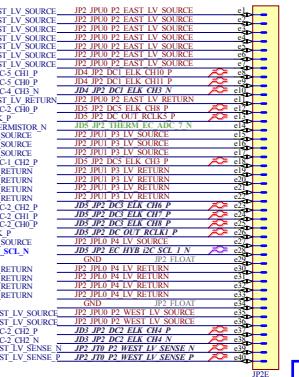
JP2B



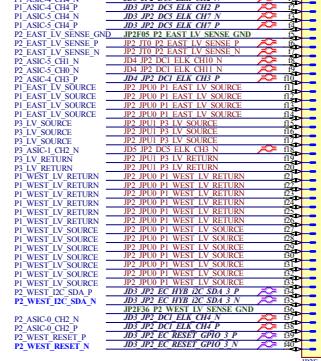
JP2C



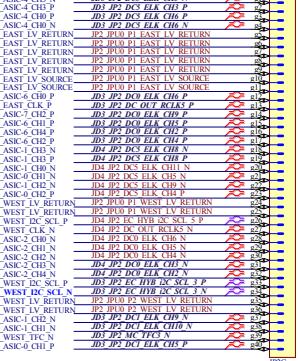
JP2D



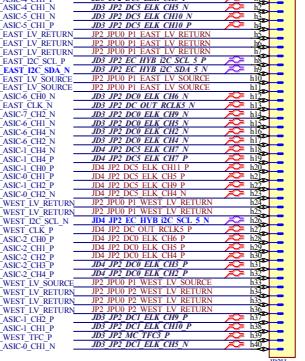
JP2E



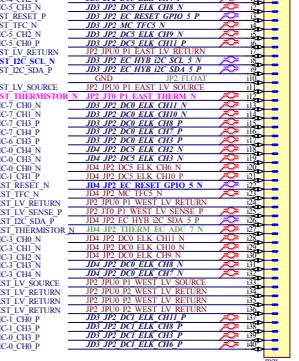
JP2F



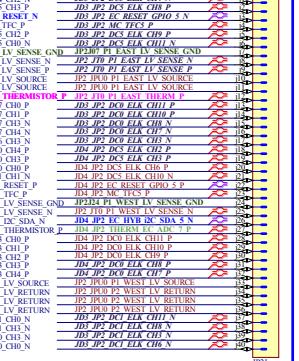
JP2G



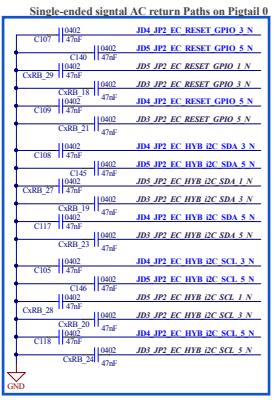
JP2H



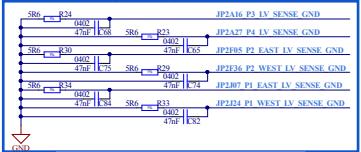
JP2I



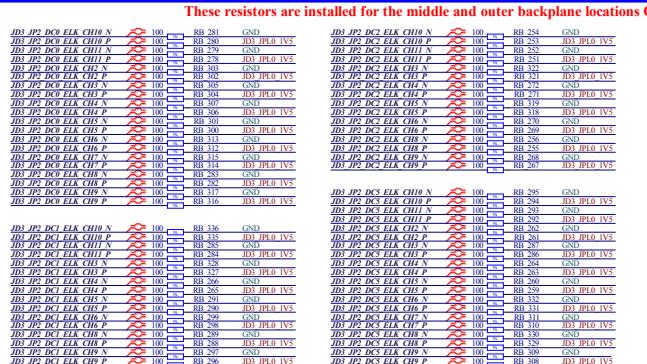
JP2J



6 hybrid Sense GND on Pigtail 2



These resistors are installed for the middle and outer backplane locations ONLY



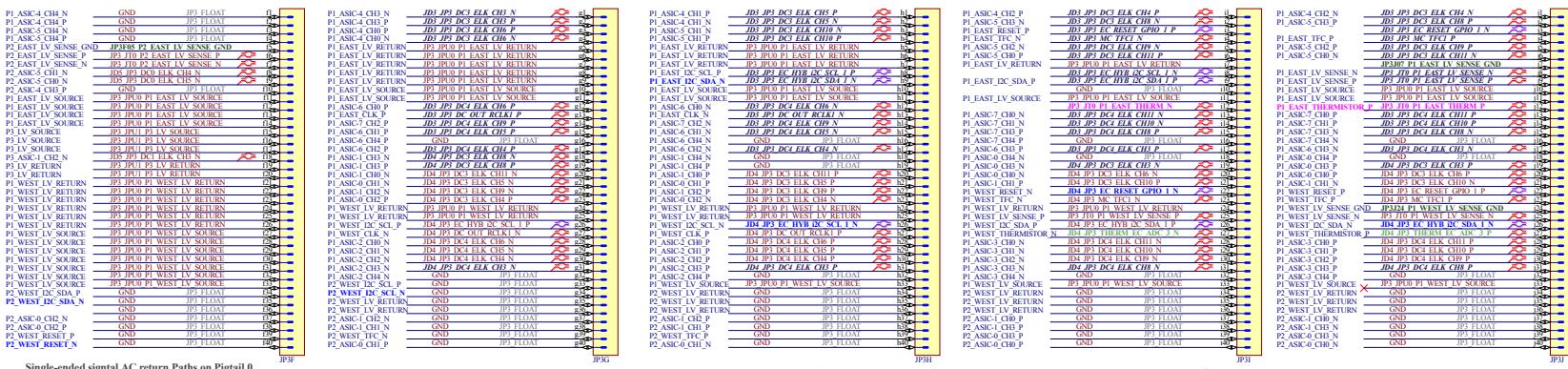
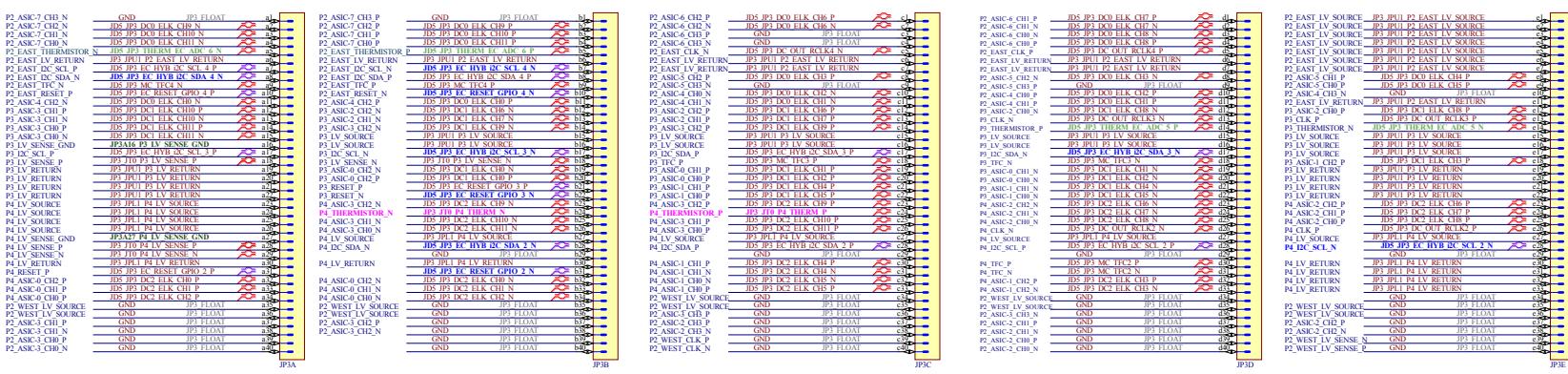
Depopulating SDA\_N, SCL\_N, and GPIO\_N lines should have these swapped for 0402 100nH resistors (see variants)



ProjectEquipment PEPI  
Document PEPI Backplane True - Pigtail Conn 2 -  
TE/MPE CERN

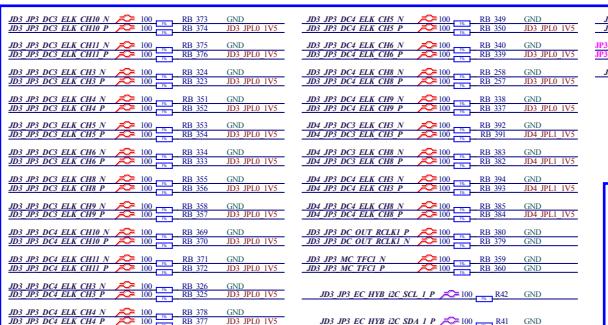
Designer M. Franco Scovilla  
Drawn by M. Franco Scovilla  
18/32/2018  
Last Mod. B Cred  
File Name CERN\_CERN\_Sch3dmc  
Sheet 12 of 21  
ED4-03992-V1-0

## Pigtail 3



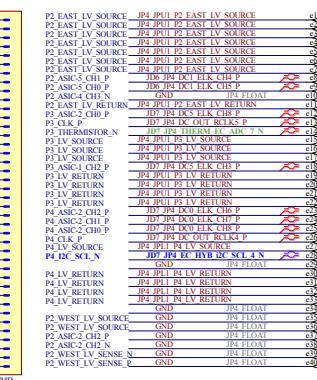
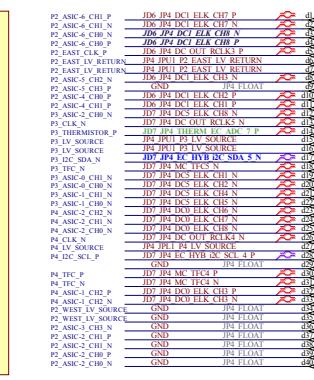
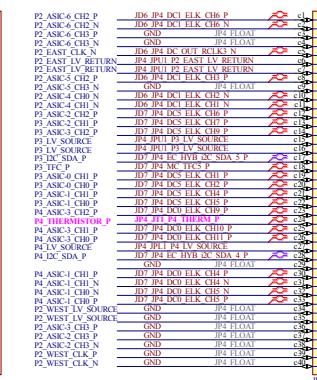
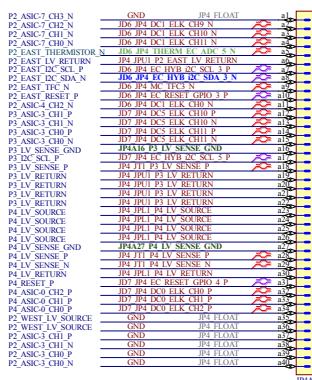
Note: P4 THERMISTOR and P1 EAST THERMISTOR are rooted to the telemetry signal connector GND

These resistors are installed for the middle and outer backplane locations ONLY

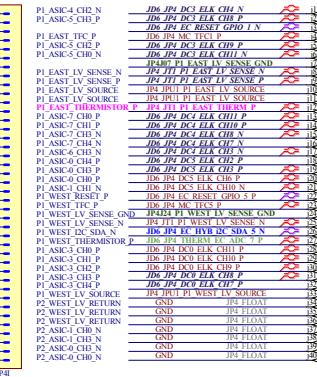
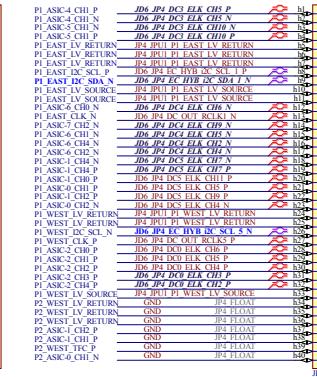
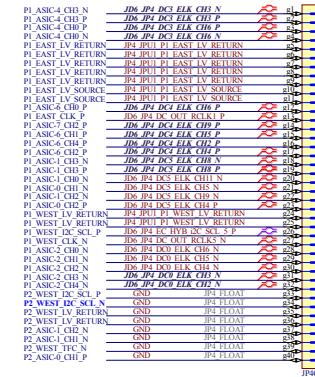
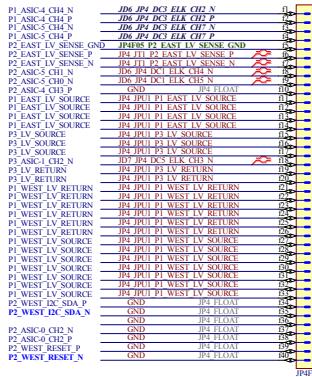


Depopulating SD<sub>N</sub>, SCL<sub>N</sub>, and GPIO<sub>N</sub> lines should have these swapped for 0402 100ohm resistors (see variants)

## Pigtail 4

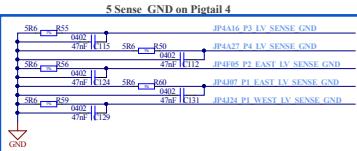
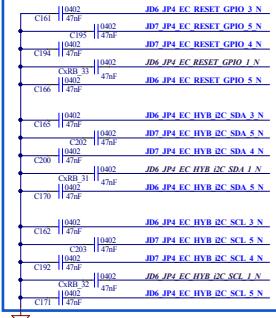


JP4



JP4

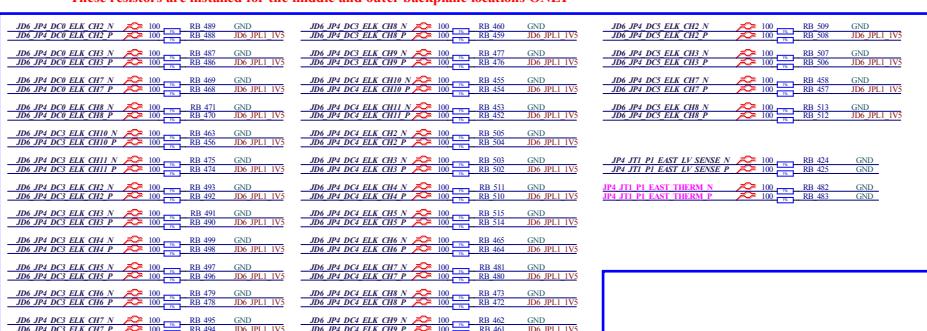
## Single-ended signal AC return Paths on Pigtail 0



NOTE: P4 THERMISTOR and P1 EAST THERMISTOR are routed to the telemetry signal connector  
J46 AGND N722  $\leftrightarrow$  J46 J44 THERM EC ADC 5.N  
J47 AGND N722  $\leftrightarrow$  J47 J44 THERM EC ADC 7.N  
J48 AGND N732  $\leftrightarrow$  J48 J44 THERM EC ADC 7.N

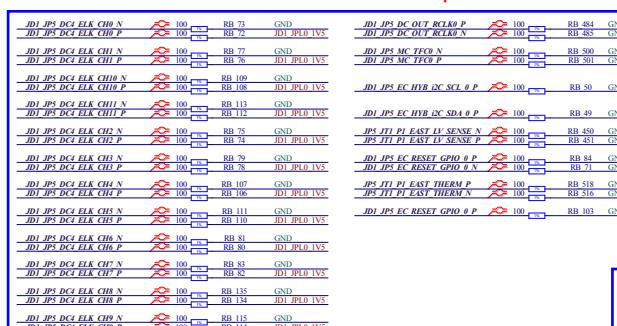
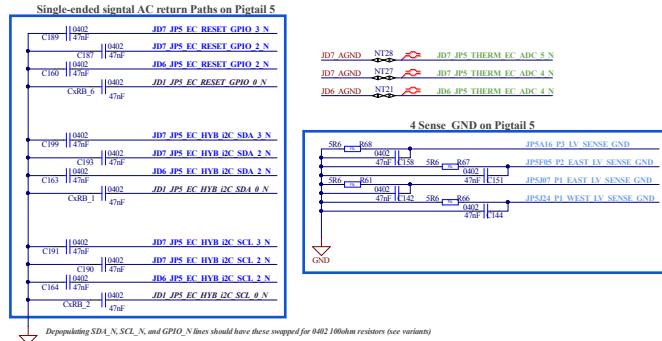
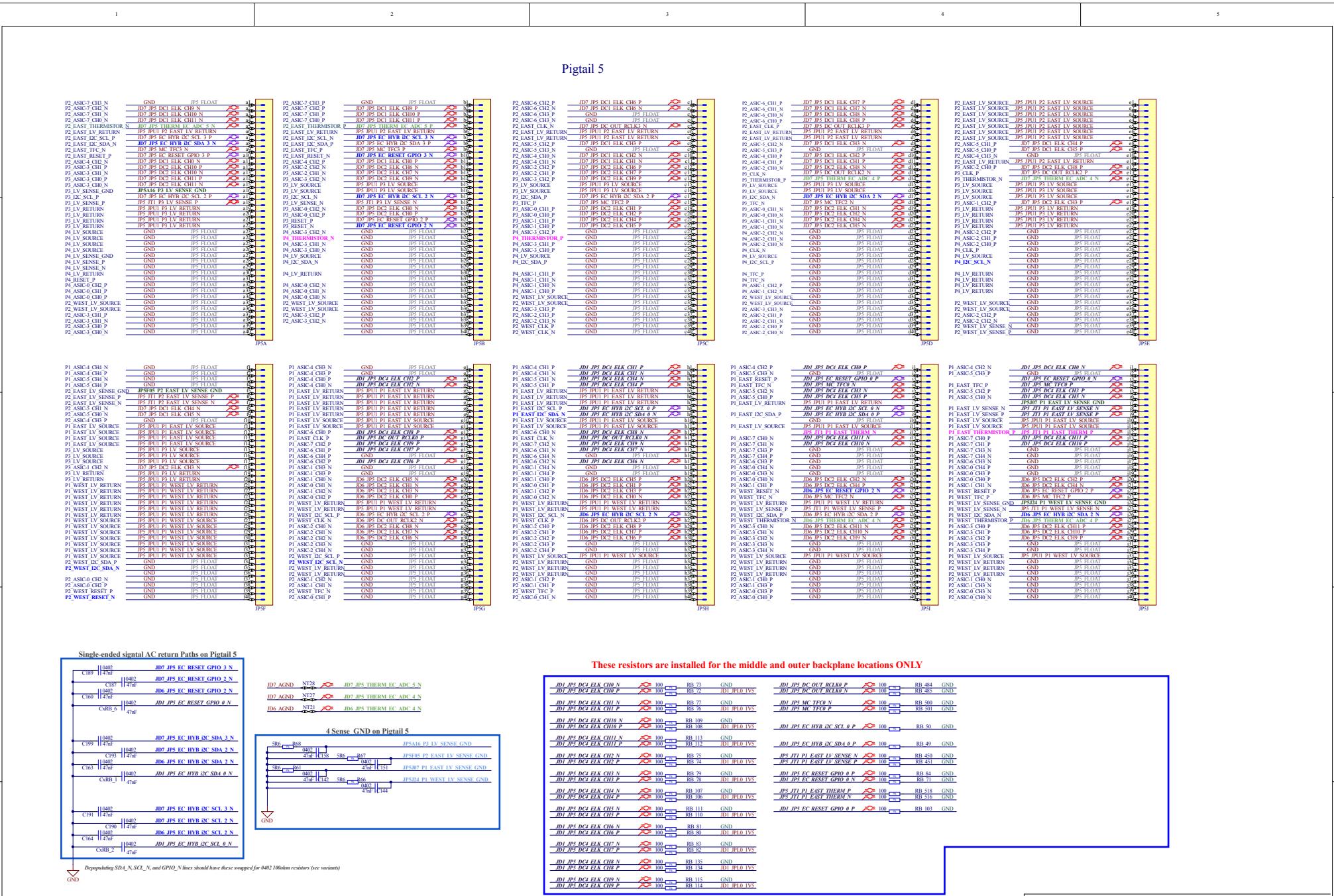
Depopulating SD4\_N, SCL\_N, and GPIO\_N lines should have these swapped for 0402 100ohm resistors (see variants)

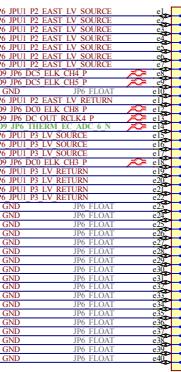
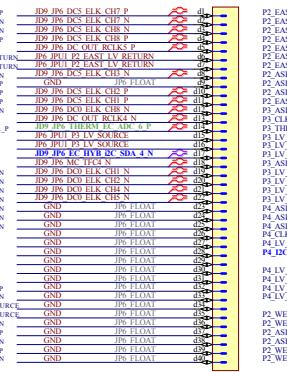
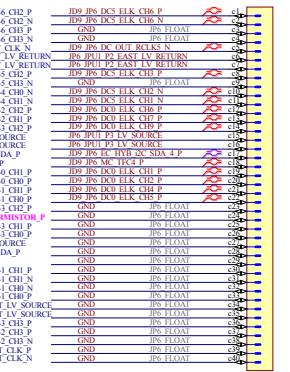
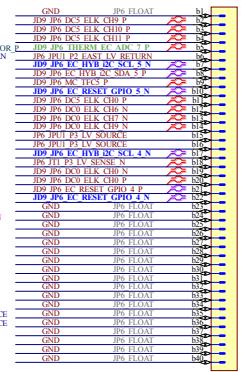
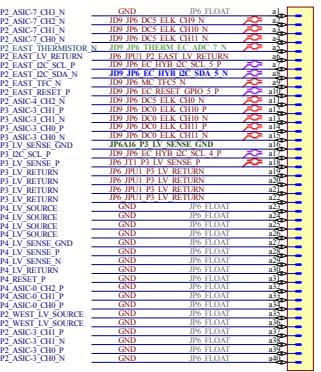
## These resistors are installed for the middle and outer backplane locations ONLY



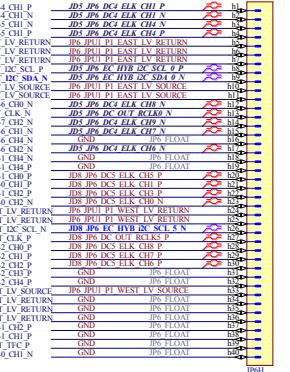
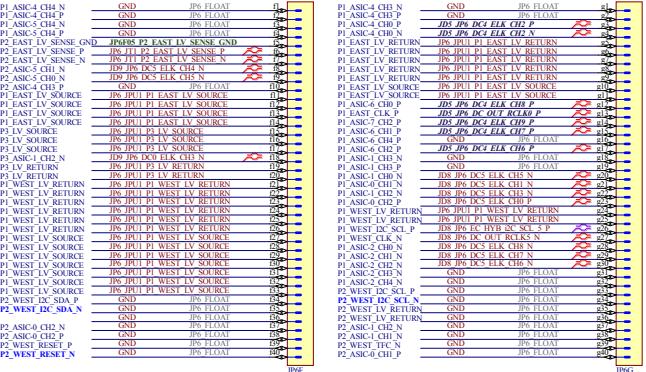
ProjectEquipment PEPI  
Document PEPI Backplane True - Pigtail Conn 4 -  
TE/MPE CERN  
18 European Organization for Nuclear Research  
CERN-EE-Gen-23-Switzerland

Designer M. Franco Scoville	Drawn by M. Franco Scoville	18/3/2018
		5/5/2018
Last Mod. B.Ced		5/5/2018
File Path	Pigtail Conn 4/SchDoc	
Rev	0.00	0.00
Sheet	18 of 21	A2 -

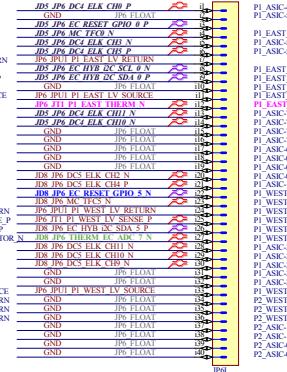




82



PI



4 CHE

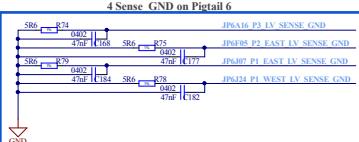


1

Single-ended signal AC return Paths on Pigtail 6

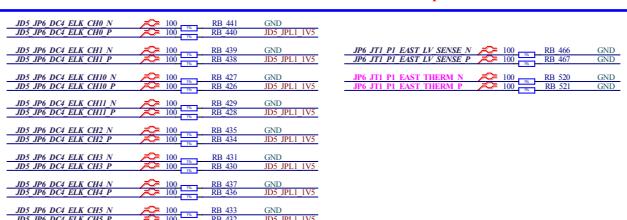


IDS AGENDA NT32



#### 4 Sense GND on Pigtail

**These resistors are installed for the middle and outer backplane locations ONLY**



[View Details](#)

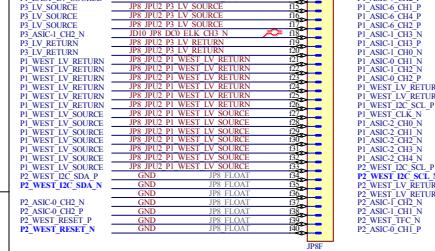
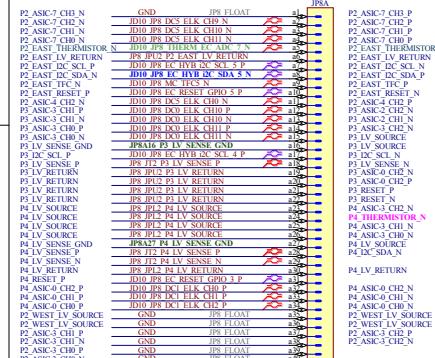


Equipment	PEPI		
ment	<b>PEPI Backplane True</b>		
	<b>- Pigtail Conn 6 -</b>		
		Designer: M. Franco Sevilla	
		Drawn by: M. Franco Sevilla	18/12/2018
		Check by: B. Cive	22/02/2019
		Lab. Mfg.:	5/6/2019
		Patent Conn. & S.hdc&Sch	
		Print Date: 6/2/2019 8:56:23 AM	Sheet 16 of 21
<i>European Organization for Nuclear Research CERN-2H14-Circuit-24-Schematic</i>		EDA-03992-V1-0	A2

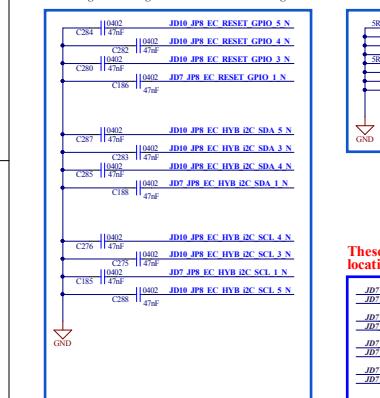


## Pigtail 8

A



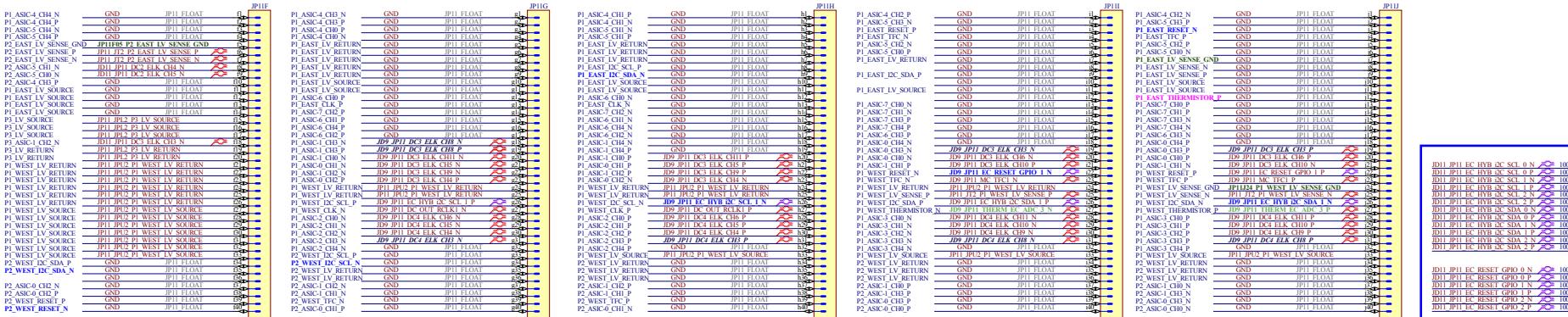
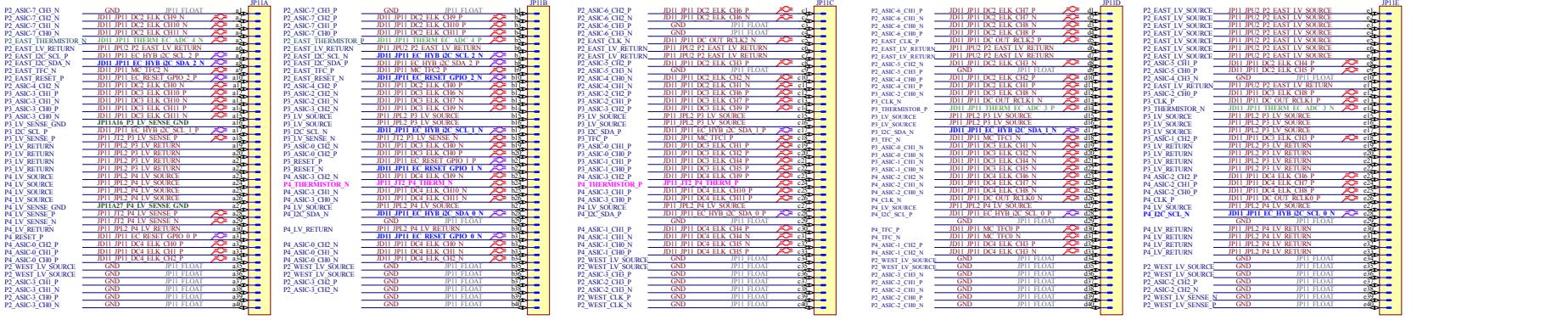
Single-ended signal AC return Paths on Pigtail 8





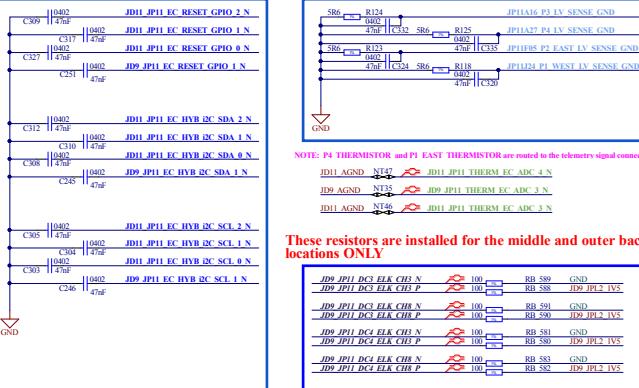


### Pigtail 11



These resistors are installed for the outer "A" Plane backplane locations ONLY  
(Since Pigtails JP<8...11> are absent)

### Single-ended signal AC return Paths on Pigtail 11



These resistors are installed for the middle and outer backplane locations ONLY



ProjectEquipment PEPI  
Document PEPI Backplane True  
TE/MPE - Pigtail Conn II -  
18 SEP 2012

Designer	M. Franco Scoville
Drawn by	M. Franco Scoville
Date	10/27/2018
Review	
Approved	
Last Mod	B. Codd
Mod Date	5/26/2019
File Name	PEPI Backplane True - Pigtail Conn II -
Page	2 of 21
Sheet	A2 -