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DI/OT CRATE

Document Name Table	
Document ID	PR-CTI-INS-1
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Date	2021-10-05
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Document Change Log				
Version	Date	Modified by	Section / Paragraph affected	Description
Ver1Rev1	2021-10-05		All	Initial version

1. Tools and accessories you will need

1.1. Tools

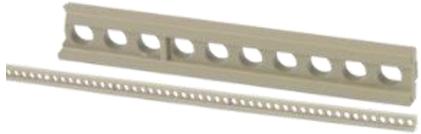
- Cordless drill with following bits:
 - PZ2 type for M4 flat-head screws
 - PZ1 type for M2.5 and M3 pan-head screws
 - TORX T20 for M4 pan-head screws
- Hex key 3
- Crimp tool
- IDC Crimp tool
- Hot air or heating gun
- Heat shrink tubing (sleeve), 5 and 8mm of diameter
- Soldering iron
- Socket wrench with tips: 5.5, 7, 11 and 13

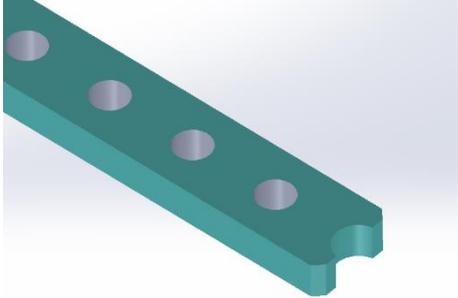
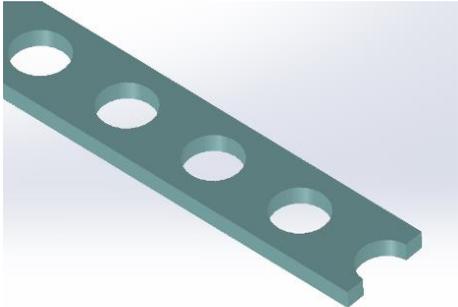
1.2. Screw connectors used:

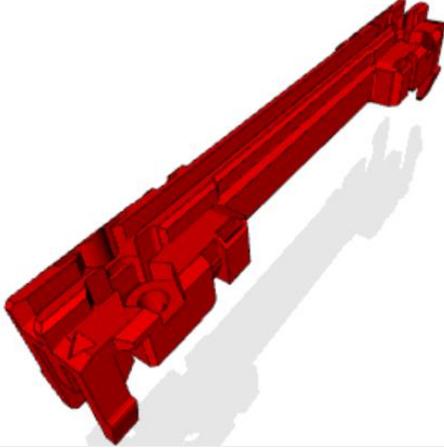
SYMBOL	NAME	PICTURE	QUANTITY
C.1	PANEL SLEEVE (Shroff's P/N: 21100-464)		12
C.2	M4x12 FLAT-HEAD SCREW (DIN965)		1
C.2.1	M4x10 FLAT-HEAD SCREW (DIN965)		4
C.3	M2.5 PAN-HEAD SCREW (Shroff's P/N: 21101-101)		42
C.4	M4x8 PAN-HEAD SCREW (Shroff's P/N: 24566-104)		20

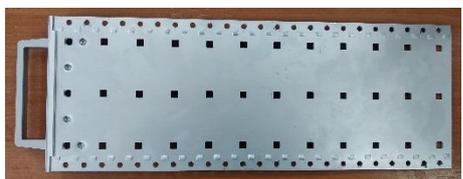
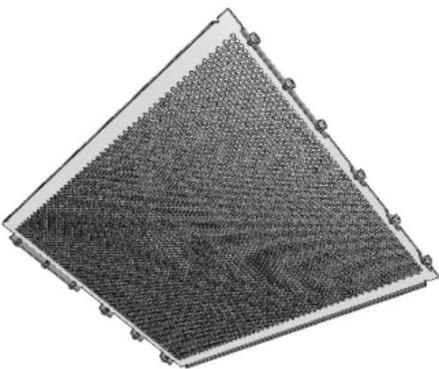
C.5	M4x14 PAN-HEAD SCREW (Shroff's P/N: 24566-102)		36
C.6	M3x6 PAN-HEAD SCREW (ISO7045)		13
C.7	M3x10 FLAT-HEAD SCREW (DIN965)		4
C.8	M4x16 HEX-SOCKET SCREW (DIN912)		1
C.9	TOOTH WASHER FOR M3 (DIN6798A)		17
C.10	TOOTH WASHER FOR M4 (DIN6798A)		2
C.11	WASHER FOR M4 (DIN125A)		4
C.12	M4 NUT (DIN934)		2

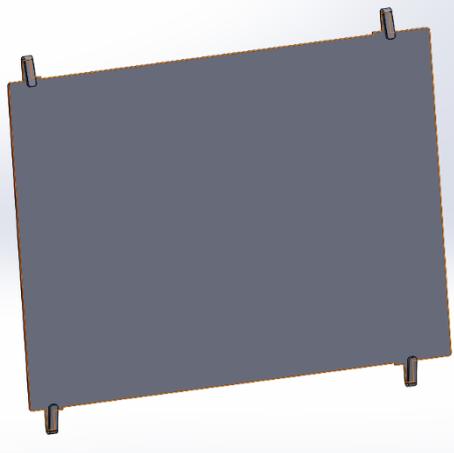
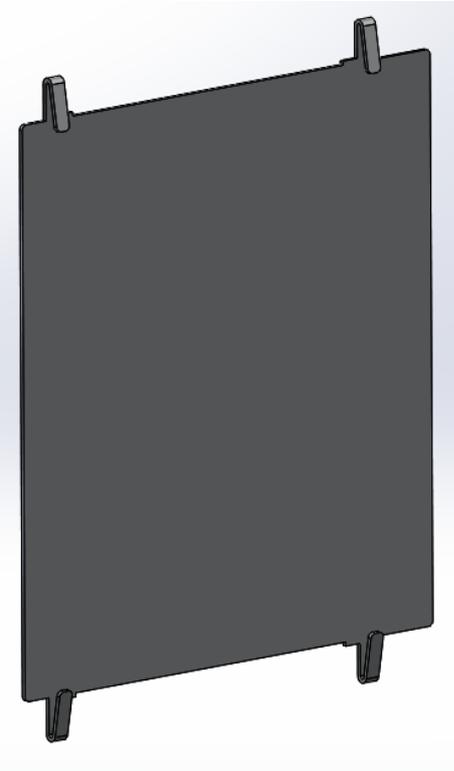
1.3. Parts used:

Name (symbol)	Picture	Manufacturer's partnumber	Quantity
Long lip rail (RA)		34560-384	4
Medium rail (RB)		34560-584	4
Double sided rail (RC)		34561-584	2
Plastic insulation strip (IS)		24560-884	4

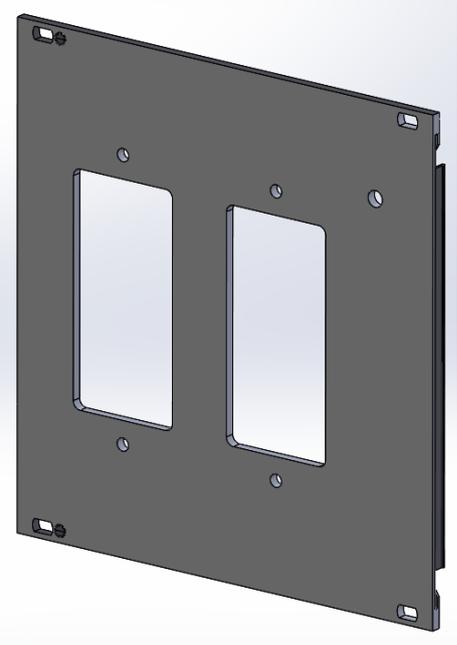
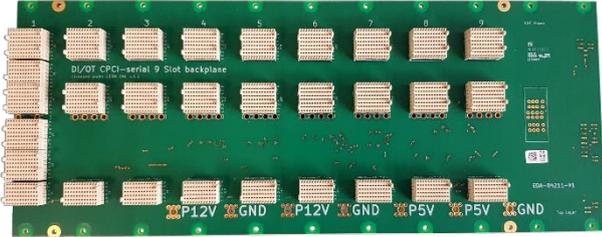
<p>Threaded insert (TI)</p>		<p>34561-384</p>	<p>8</p>
<p>Perforated strip (PS)</p>		<p>30845-253</p>	<p>4</p>
<p>Aluminum bezel</p>		<p>24561-198</p>	<p>2</p>
<p>Red guide rail, 220mm</p>		<p>64560-091</p>	<p>2</p>

<p>Red guide rail, 160mm</p>		<p>64560-089</p>	<p>2</p>
<p>Red guide rail, 100mm</p>		<p>64560-082</p>	<p>18</p>
<p>Grey guide rail, 220mm</p>		<p>64560-092</p>	<p>16</p>

<p>Green guide rail,160mm, offset 0,1inch</p>		<p>24560-359</p>	<p>4</p>
<p>Side panel</p>		<p>24566-151</p>	<p>2</p>
<p>Handle</p>		<p>24566-010</p>	<p>2</p>
<p>Perforated top/bottom cover</p>		<p>24560-081</p>	<p>2</p>

<p>Divider plate, 160mm</p>		<p>34562-761</p>	<p>2</p>
<p>Divider plate, 100mm</p>		<p>Based on 34562-761</p>	<p>1</p>

<p>Pressboard isolator</p>			<p>1</p>
<p>Front panel, 14HP</p>		<p>Based on 20848-013</p>	<p>1</p>

<p>Front panel, 24HP</p>		<p>Based on 20848-020</p>	<p>1</p>
<p>Main backplane</p>			<p>1</p>
<p>Power backplane</p>			<p>2</p>

<p>Front panel PCB</p>			<p>1</p>
<p>EMC CLIP TYPE1</p>		<p>24560-255</p>	<p>72</p>
<p>EMC CLIP TYPE2</p>		<p>24560-256</p>	<p>36</p>
<p>CABLE CONDUIT (inner diameter 8-10mm)</p>		<p>-</p>	<p>15 cm</p>



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Instruction

ZIP-TIE	 A single white plastic zip-tie is shown in a loop, with the locking head and tail visible.	-	4
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2. Chassis part 1

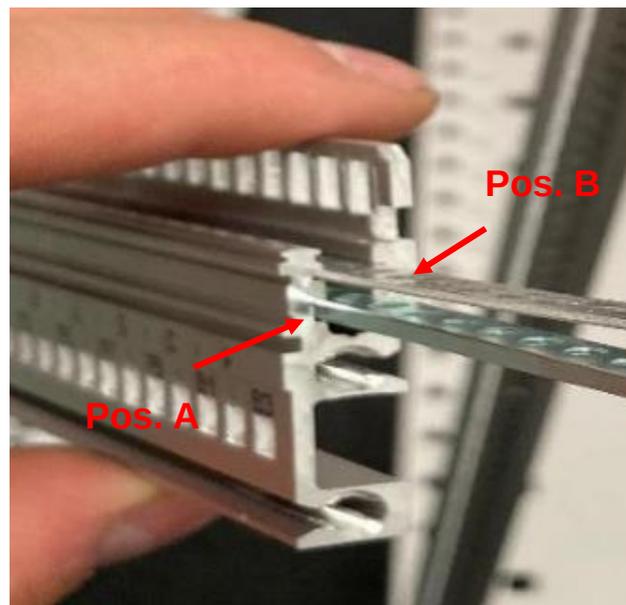
2.1. Preparation of horizontal rails

RA rails need to be prepared before assembling the crate.



2.1.1. Slide in the threaded insert (TI) into the wider of the two slots in the center of the rail (Pos. A in the picture below).

2.1.2. Slide in the perforated strip (PS) right next to the threaded insert into the narrower slot (Pos. B).



2.1.3. Repeat point 2.1.1 for the medium RB rail. It has only one slot (see picture below) (x4).

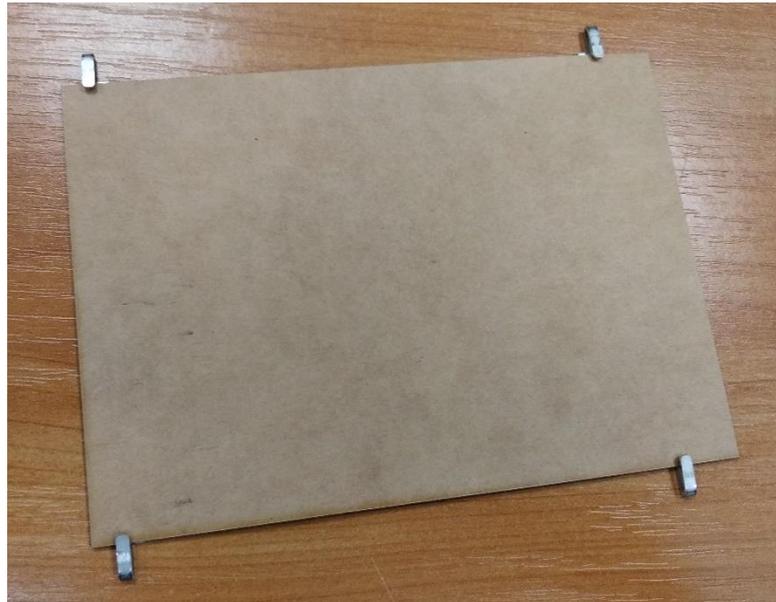


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3. Internal circuitry

3.1. Preparation of isolating divider plate

Put pressboard isolator on one of the divider plates using, e.g. double sided adhesive tape (see picture below)



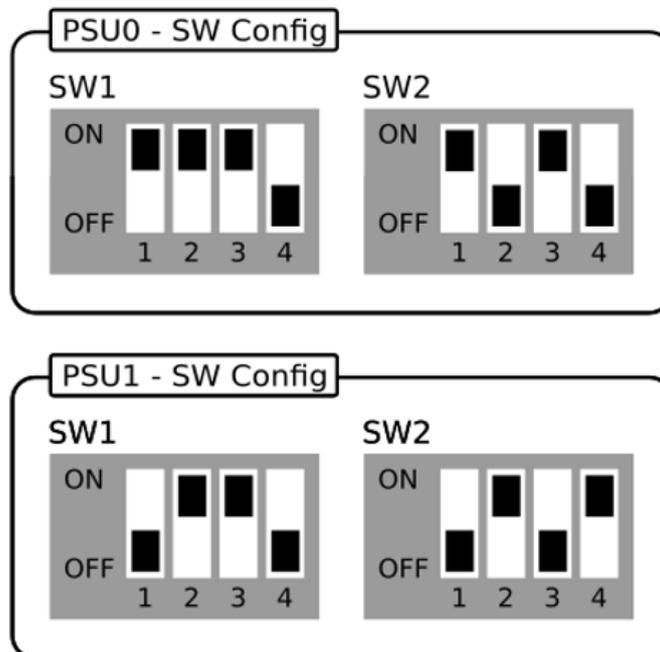
3.2. Assembly of power backplanes

3.2.1. Set the address micro-switches to the positions given in the pictures below.

Please note:

PSU0 is the one closer to the inside of the crate

PSU1 is the one near the side plate



3.2.2. Put a plastic insulation strip (IS) on a RB rail (x2).

Please note:

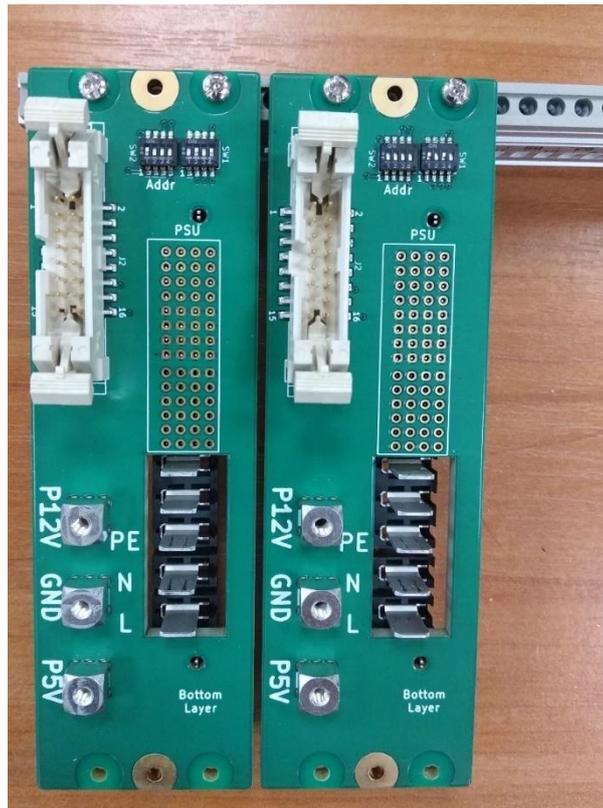
The IS strip has a little notch on both ends. The notch should be facing the groove in the rail(see picture below).



3.2.3. Using M2.5 pan-head screws(C.3), mount the PCBs facing “Bottom layer” up (see picture below).

Please note:

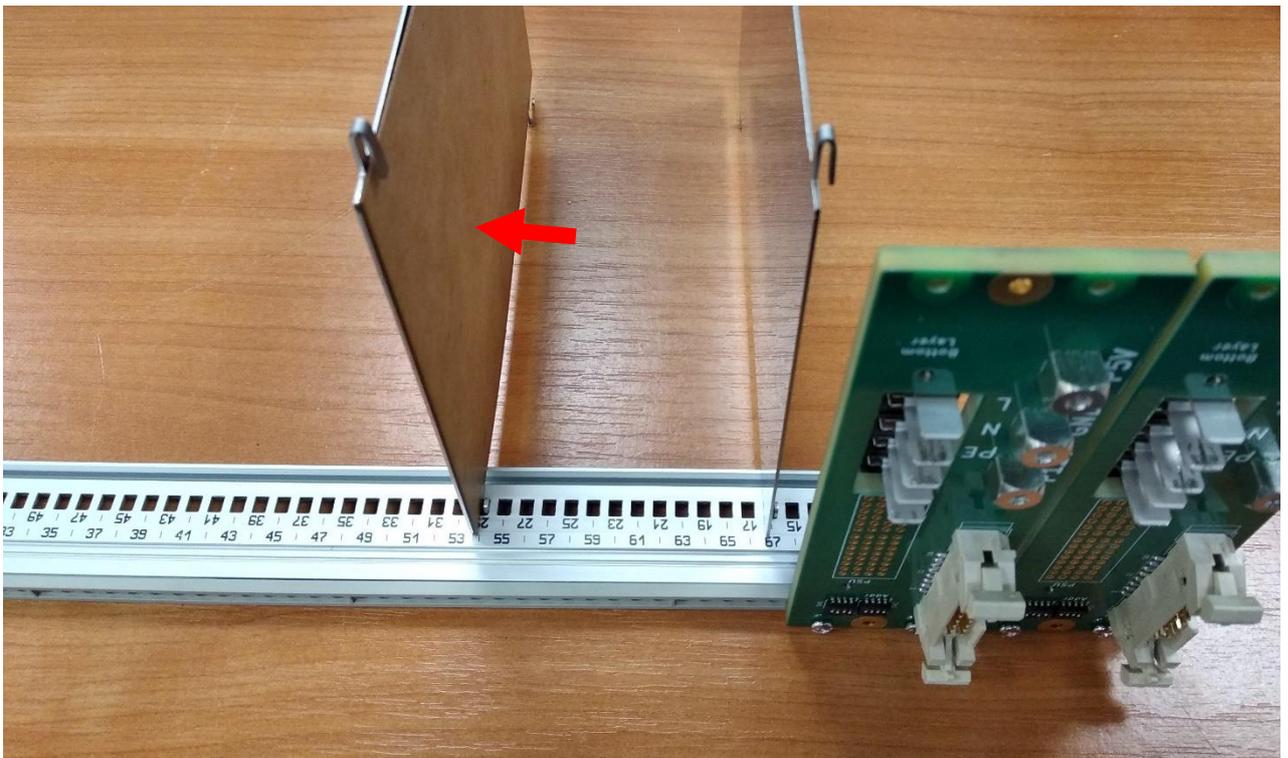
- Put screws ONLY in the holes covered by soldermask!



3.2.4. Put two separating stainless steel divider plates into perforated holes of the rails marked #16 and 29.

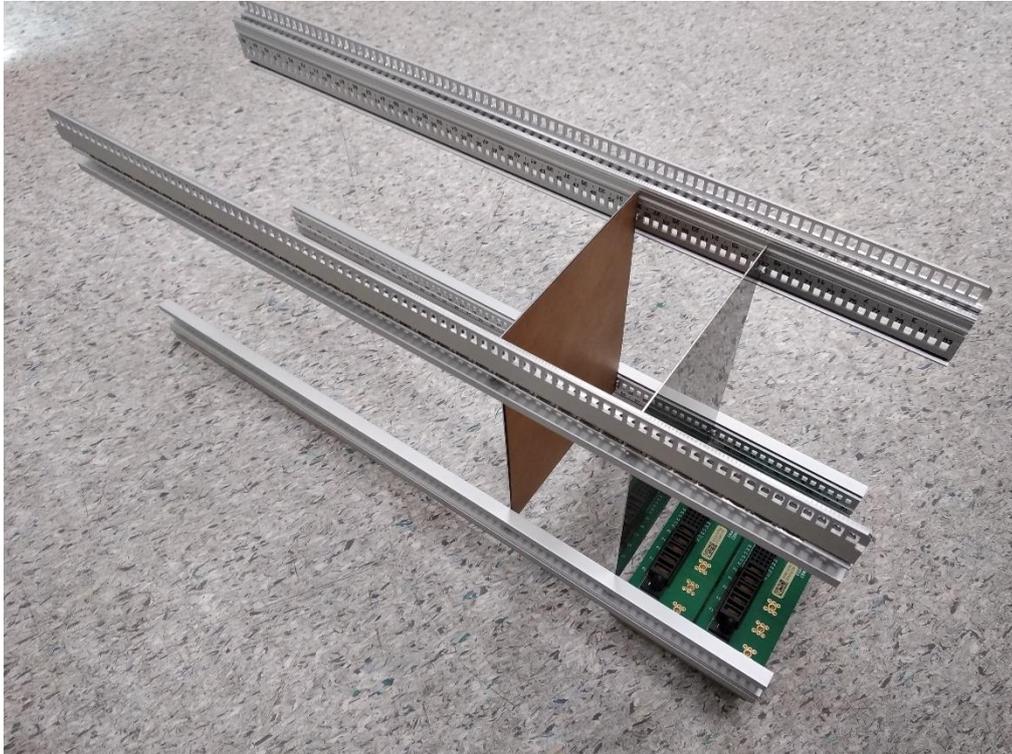
Please note:

The isolated divider plate must be in the position #29 (marked with red arrow)



3.2.5. Put the second RB rail on the other end of the PCBs and screw in the other M2.5 screws.

3.2.6. Put the RA rails on the opposite side of the divider plates. Finally you should have a subassembly like in the picture below.



3.3. Assembly of 9-slot backplane PCB

3.3.1. Put a plastic insulation strip (IS) on a RB rail (x2).

3.3.2. Using M2.5 pan-head screws(C.3), mount the PCB to the rail, facing “Top layer” down to the strips (see picture below).

Please note:

- Put screws ONLY in the holes covered by soldermask!



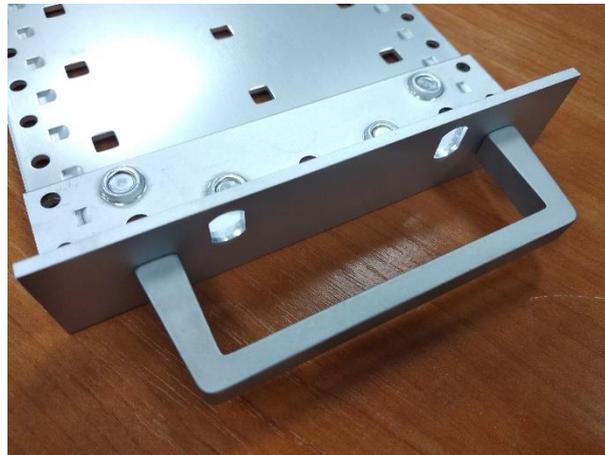
Finally you should have a subassembly like in the picture below.



4. Chassis part 2

4.1. Preparation of side plates

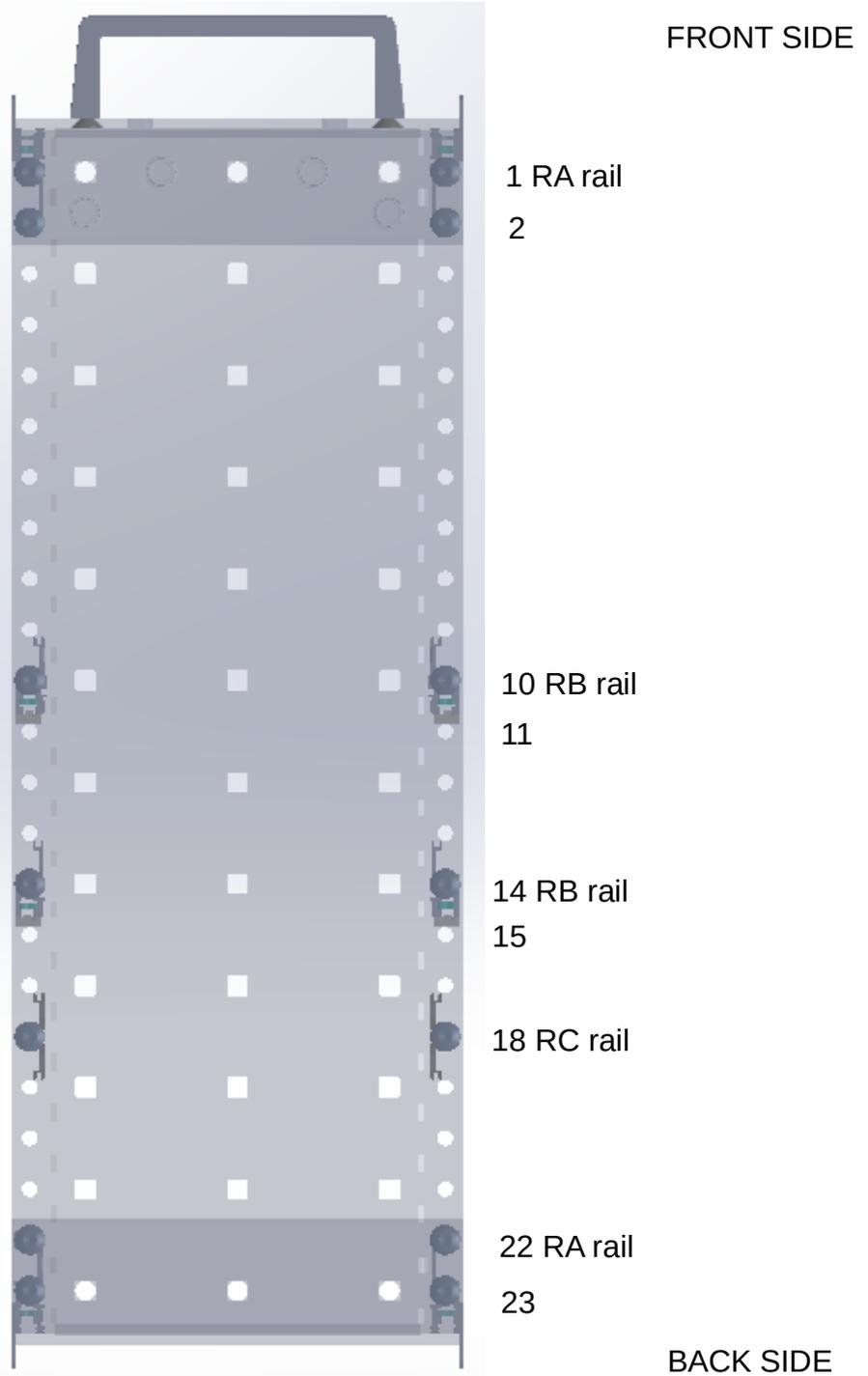
Using M4x10 flat-head screws (C.2.1) mount the handle to the side plate (x2).



4.2. Assembly of the crate

All the rails are mounted to the side plates using M4x14 pan-head screws (C.5).

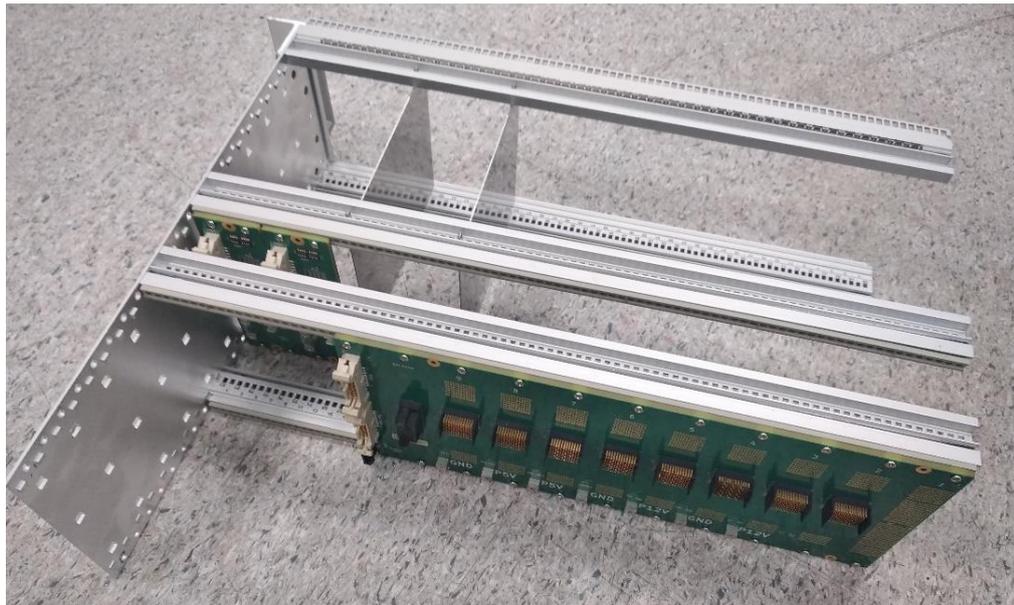
Below is a schematic showing exactly which holes in the side plates should be used for a given type of rail.



Please note:

Two next steps should be made according to the picture below.

Please pay attention to the position and direction of the PCBs.



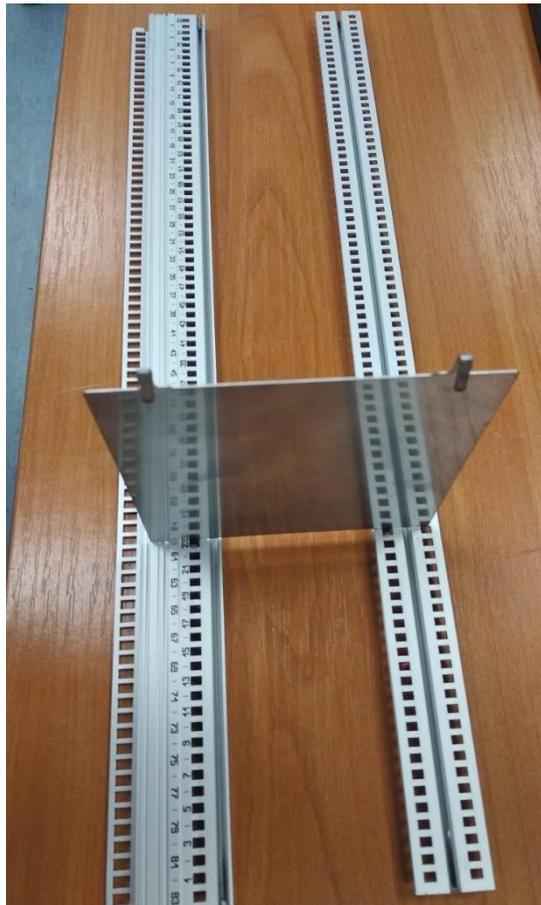
4.2.1. Mount the subassembly from point 3.1 to the holes #1, 2, 10, 11

4.2.2. Mount the subassembly from point 3.2 to the holes #14, 15.

4.2.3. Put small divider plate into the perforation #23 of the RA rail and analogical perforation in RC rail.

Please note:

The flat part of the RC rail should be facing towards the divider plate.



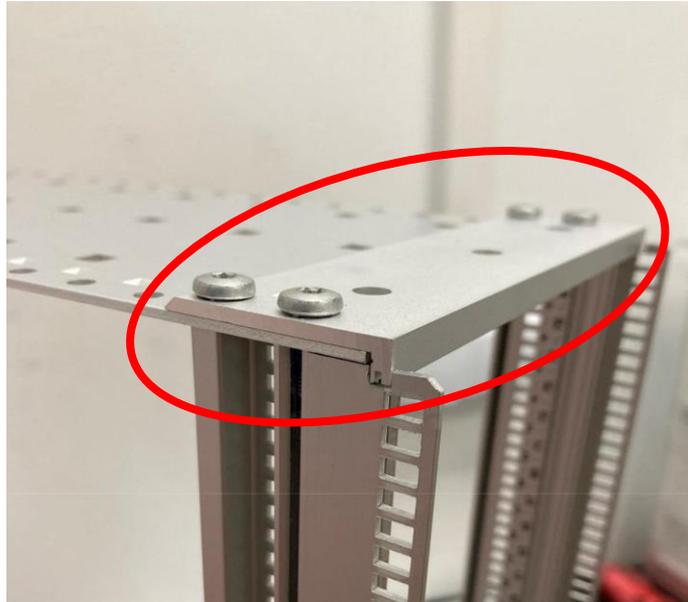
4.2.4. Repeat last step for the other side having final effect like in the picture below.



4.2.5. Mount this subassembly to the holes #18, 22, 23 in the side plate.

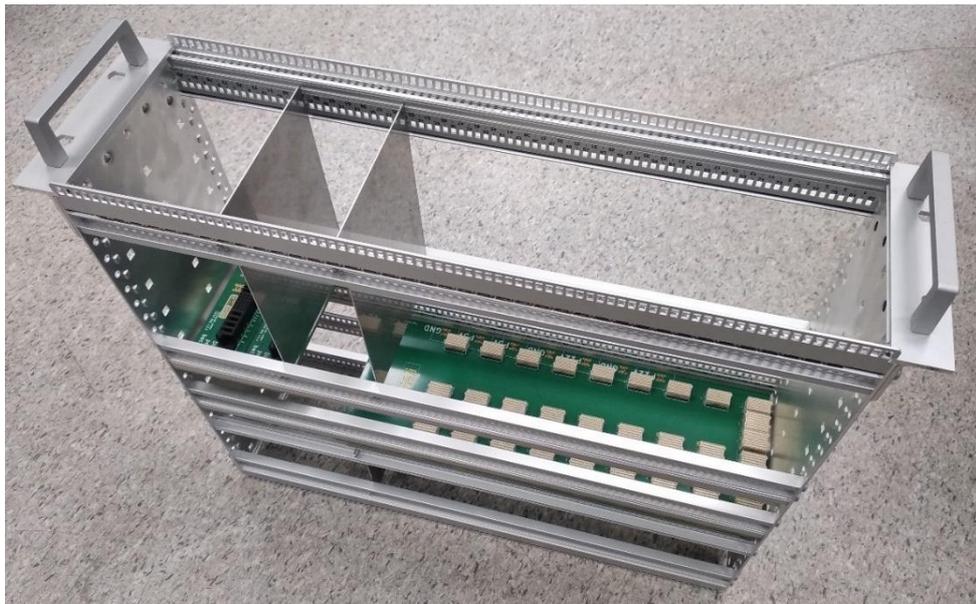
Please note:

On the back side put aluminum bezel before mounting the rails (see picture below).



4.3. Finishing the chassis

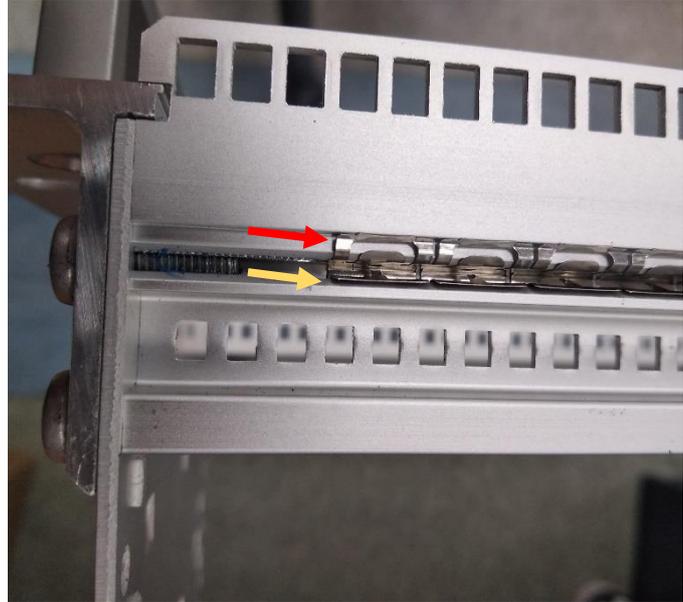
- 4.3.1. Mount the second side-plate using M4x14 pan-head screws (C.5). It is mirrored with regard to the first one.



4.3.2. Place stainless steel EMC gasket in the groove along all four RA rails (see pictures below).

Please note:

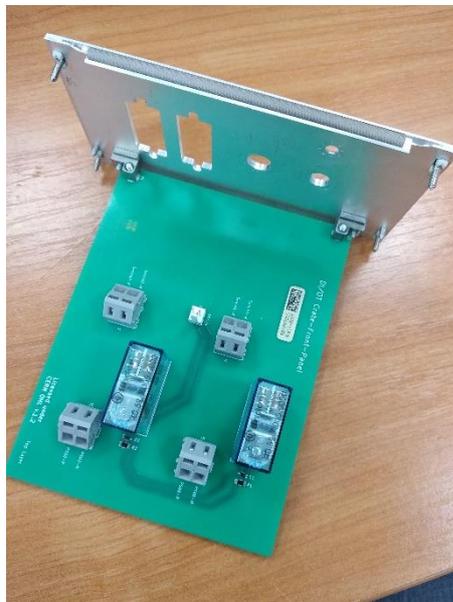
The gasket should be positioned according to the red and yellow arrows in the pictures below.



5. Module circuitry

5.1. Preparation of Front-Panel

5.1.1. Equip the panel with sleeves and screws, and mount the panel to the PCB according to Schroff's instruction.



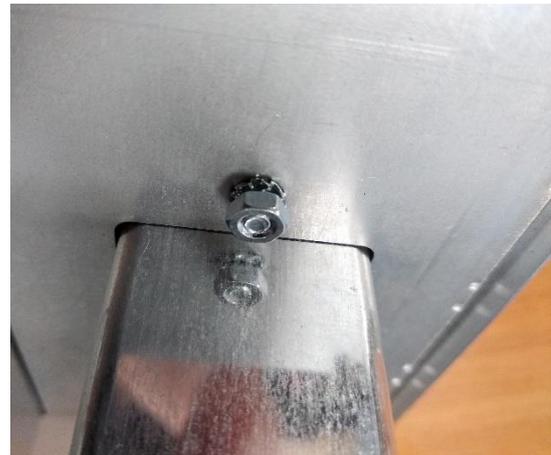
5.1.2. Mount the earthing spade terminal using M4x12 flat-head screw (C.2). Put a tooth washer (C.10) under the terminal and tighten both with M4 nut.



5.2. Preparation of power socket plate

5.2.1. Equip the panel with sleeves and screws, according to Schroff's instruction.

5.2.2. Mount IEC connectors using M3x10 flat-head screws, M3 tooth washers(C.10) and M3 nuts.



5.2.3. Put a 2A/250V fuses into IEC connector's socket (both)

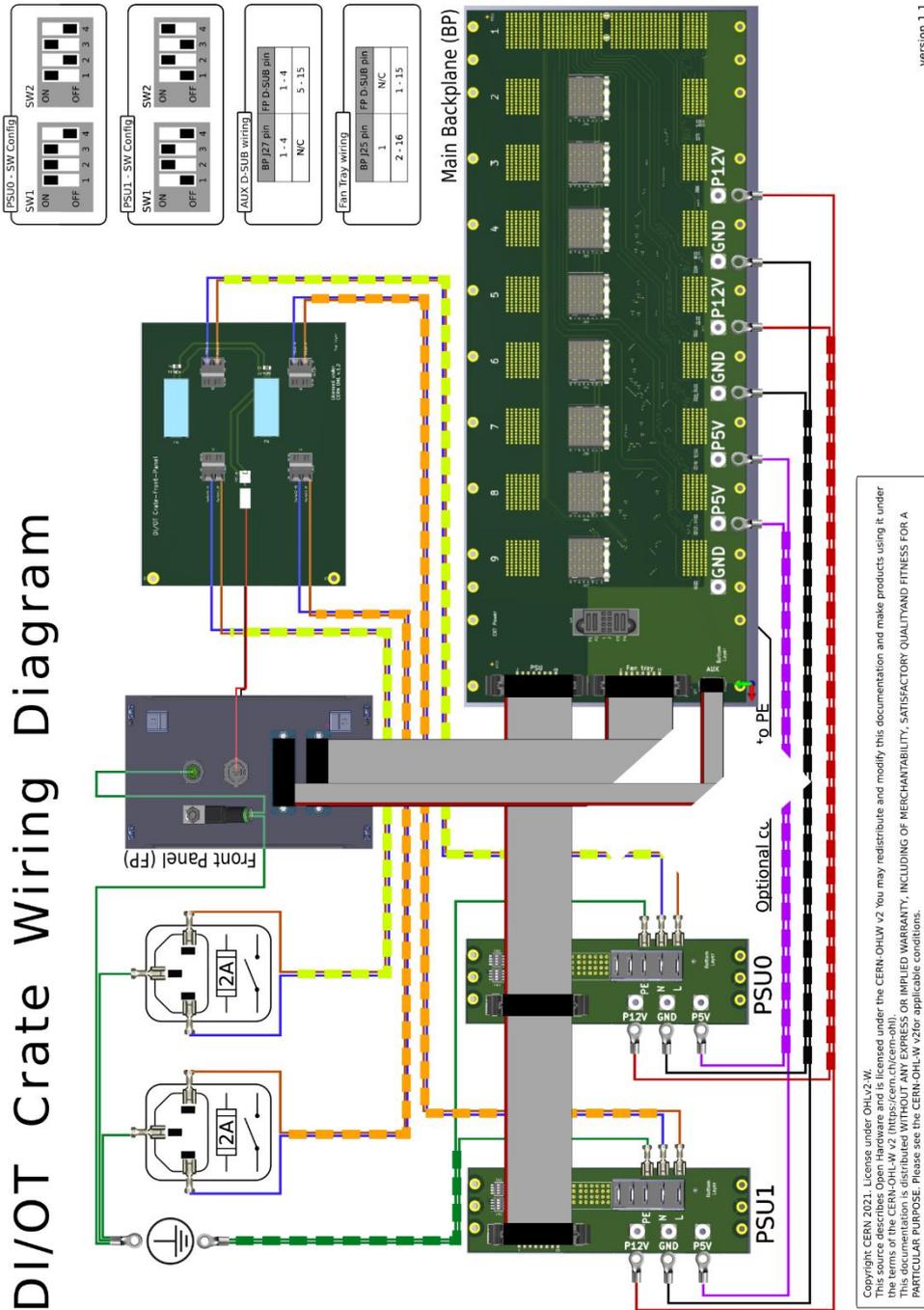


5.2.4. Mount the earthing screw (M4x16 hex-socket screw) and spade terminal in the following manner(see pictures below). Use M4 tooth washer on the terminal side and M4 flat washer on the other and tighten with M4 nut.



6. Wiring

All the wires in the crate are prepared based on the wiring diagram placed on the next page and the wiring list (additional file named DIOT_CRATE_WIRING_LIST) with all the necessary information listed in a table.



6.1. Cutting the wires

6.1.1. Cut the wires according to Wiring list.

6.2. Preparation of wire tips

Please note:

There are two types of crimp connectors: insulated and uninsulated. Following instruction will guide you through how to properly attach an uninsulated one. If you have isolated one, it doesn't require heat-shrink tubing, just crimping.

Insulated



Uninsulated



6.2.1. Cut off 5mm of insulation at both ends of each wire.



6.2.1.1. Twist the strands of the wire so they hold tight.



6.2.2. Preparation of wires with a ring- (or spade-) terminal connector

6.2.2.1. Put a ring terminal, so it covers only the twisted tip and crimp it, using the crimp tool.



6.2.2.2. Put a piece (~10mm) of heat shrink tubing on the wire.



6.2.2.3. Repeat two last steps for the other end of the wire, in reversed order.

6.2.2.4. Move the heat-shrink sleeve, so it covers crimped part of the terminal and heat it up to shrink.



6.2.2.5. Bend the tip of the terminal 90 degrees on one end of the wire and 45 degrees on the other (only for wires #1, 2, 15).



6.2.3. Preparation and mounting of cables for Front-Panel module

6.2.3.1. ESD cable

6.2.3.1.1. Solder one end of the wire to the connector

6.2.3.1.2. Put a heat-shrink sleeve so it covers the metal end of the connector, and heat it up to shrink.

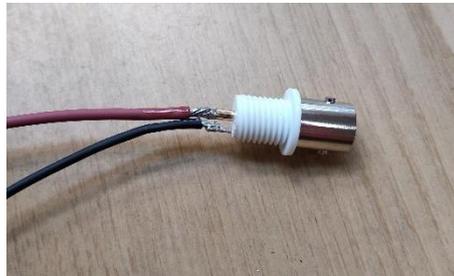
6.2.3.1.3. Put another heat-shrink sleeve and ring terminal.

6.2.3.1.4. Put a heat-shrink sleeve so it covers the metal end of the connector, and heat it up to shrink.

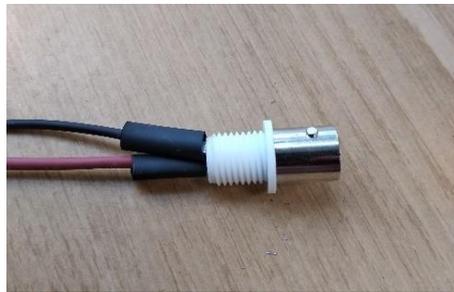


6.2.3.2. BNC cable

6.2.3.2.1. Solder red wire to the central pin of the connector and black wire to the off-center pin.



6.2.3.2.2. Put heat-shrink sleeve on each wire and move it until it covers the soldered tips. Heat them up to shrink.



6.2.3.2.3. Put 7mm heat-shrink sleeve on both wires until it covers the ones from the last point. Heat it up to shrink.



6.2.3.2.4. Mount the crimp connectors on the other end of both wires, using crimp tool.



6.2.3.2.5. Slide the crimped wires into white Molex connector.

Please note:

Polarization of the wires must be preserved (see picture below).



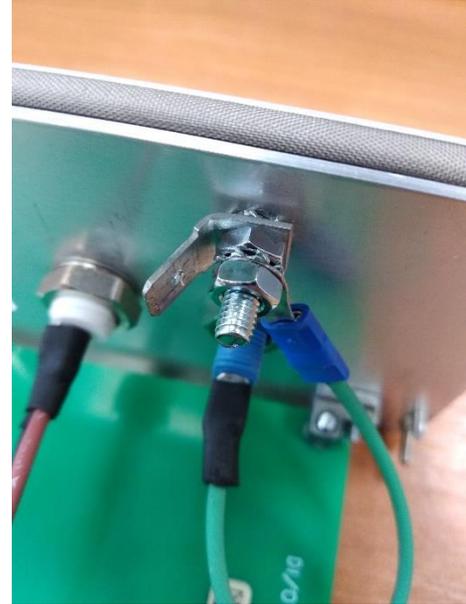
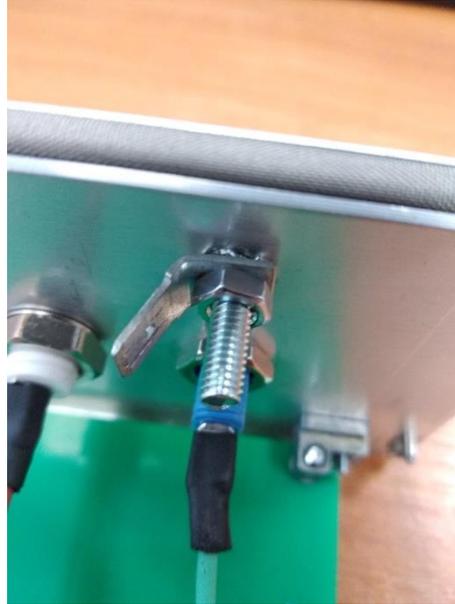
6.2.3.3. Put the BNC cable through the bigger round hole in the panel. Put a dedicated washer and nut and screw them in using flat wrench #11.



6.2.3.4. Put the EMC cable through the smaller round hole in the panel and screw in the dedicated nut using flat wrench #7.



6.2.3.5. Mount the ring terminal of the EMC cable to the earthing screw.



6.2.4. Preparation of ribbon cables.

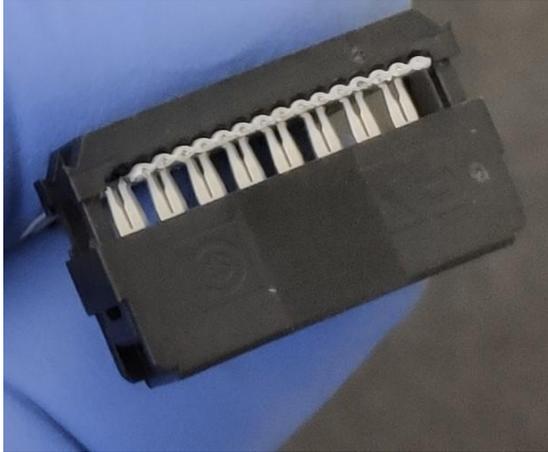
6.2.4.1. Tear off every ribbon wire to the following number of strands:

- Cable #17 – 16
- Cable #18 – 4
- Cable #19 – 15

Please note:

Do not tear off the marked strand (different color than other strands, usually blue or pink). It is needed to mark the order of the signals.

- 6.2.4.2. For cable #19 put one end of the ribbon cable into the 16 pin IDC connector. Marked wire must be placed nearest to the side of the connector (on the right in the picture below)



6.2.4.2.1. Tighten the connector using IDC crimp tool.

6.2.4.2.2. The second end of the wire goes into DSUB connector (see picture below).

Please note:

The marked wire should be on the right hand side in this view



6.2.4.2.3. To tighten the connector you may use some hand press or vice with some soft layer not to damage the connector.

6.2.4.3. Cable #18 – put crimp contacts on one end of the cable and put them into four pin IDC connector (see pictures below)



6.2.4.3.1. The other end of the cable has DSUB connector, mount the same way as for cable #19, except for the number of strands. The marked wire should be in the same position.

6.2.4.4. Cable #17 has three IDC connectors (the same as in cable #19).

6.2.4.4.1. Put first connector on one end of the ribbon cable (see picture below)



6.2.4.4.2. Put the second connector 10 cm away of the first one, and facing the same direction.

6.2.4.4.3. Put the last connector at the other end of the cable, also facing the same direction.

6.3. Wiring the crate.

6.3.1. Plug all the wires according to Wiring diagram.

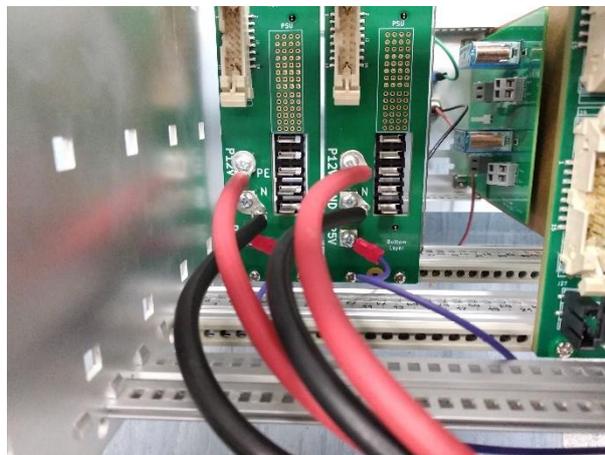
6.3.2. The ring terminated wires need to be mounted using M3x6 pan-head screw (C.6) and tooth washer(C.9).



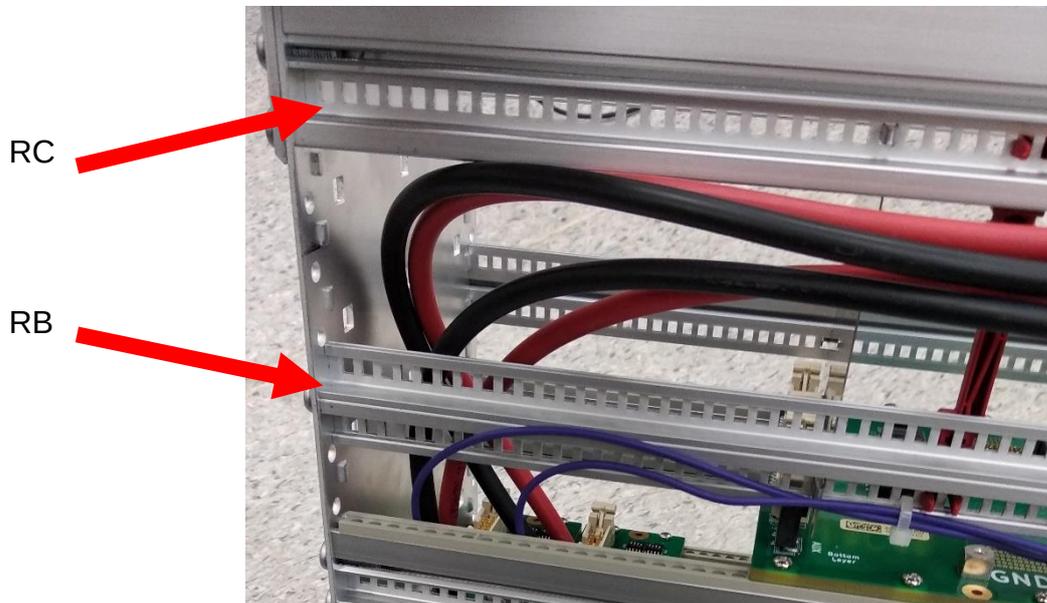
6.4. Routing of power supply wires

The wires connecting 9-slot backplane and PSU modules must be arranged in a way, so they don't collide with any RTM module when placed in the back space of the crate.

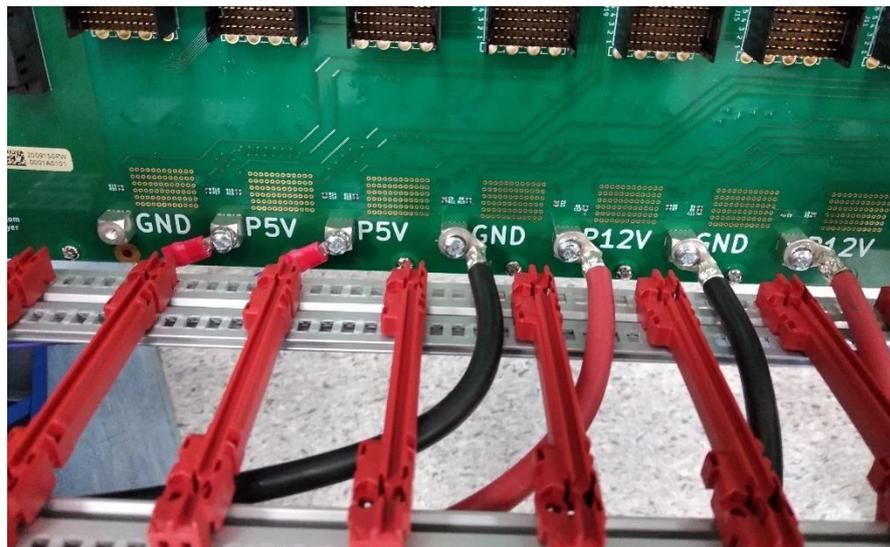
6.4.1. Mount the cables to the terminals on the PSU modules (see picture below).



6.4.2. Pull out red and black cables through the space between rails RB and RC and purple wires under the RB rail as in the picture below.



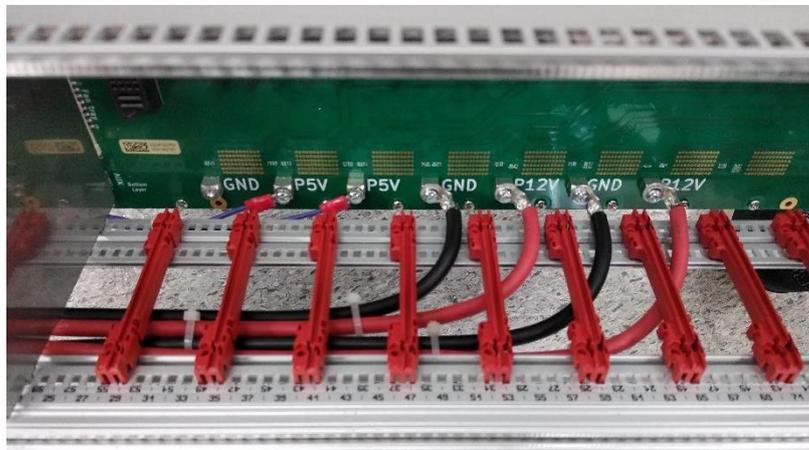
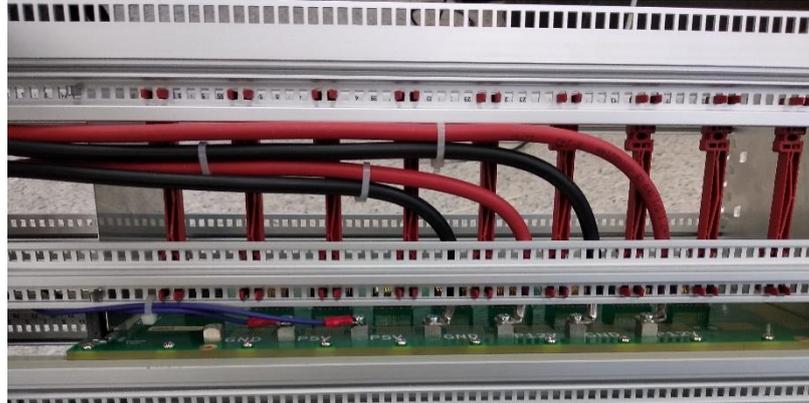
6.4.3. Mount the other end of every cable to corresponding terminals on the 9-slot backplane.



Please note:

Red and black cables must be placed as close as possible to the aluminum rails and under the 100mm red rails, so they do not interrupt space for the modules.

6.4.4. Arrange all the cables and tighten them using zip-ties (see picture below)



7. Guiding rails

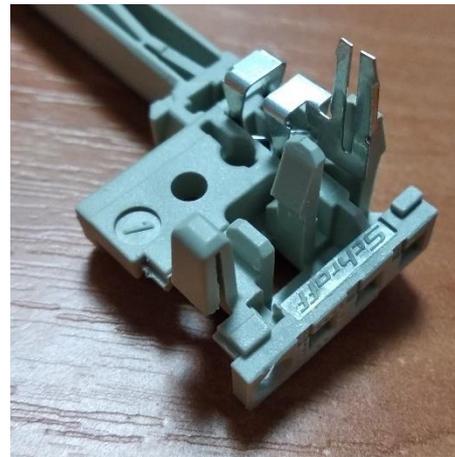
7.1. Preparation of EMC hardware

Please note:

This point applies to 220mm and 100mm rails only.

There are two types of ESD clips that must be mounted in the PCB guiding rails.

7.1.1. Put the first type ESD clip into the rail according to the following pictures. Push it until it clicks. Repeat this on the other end of the rail as well.



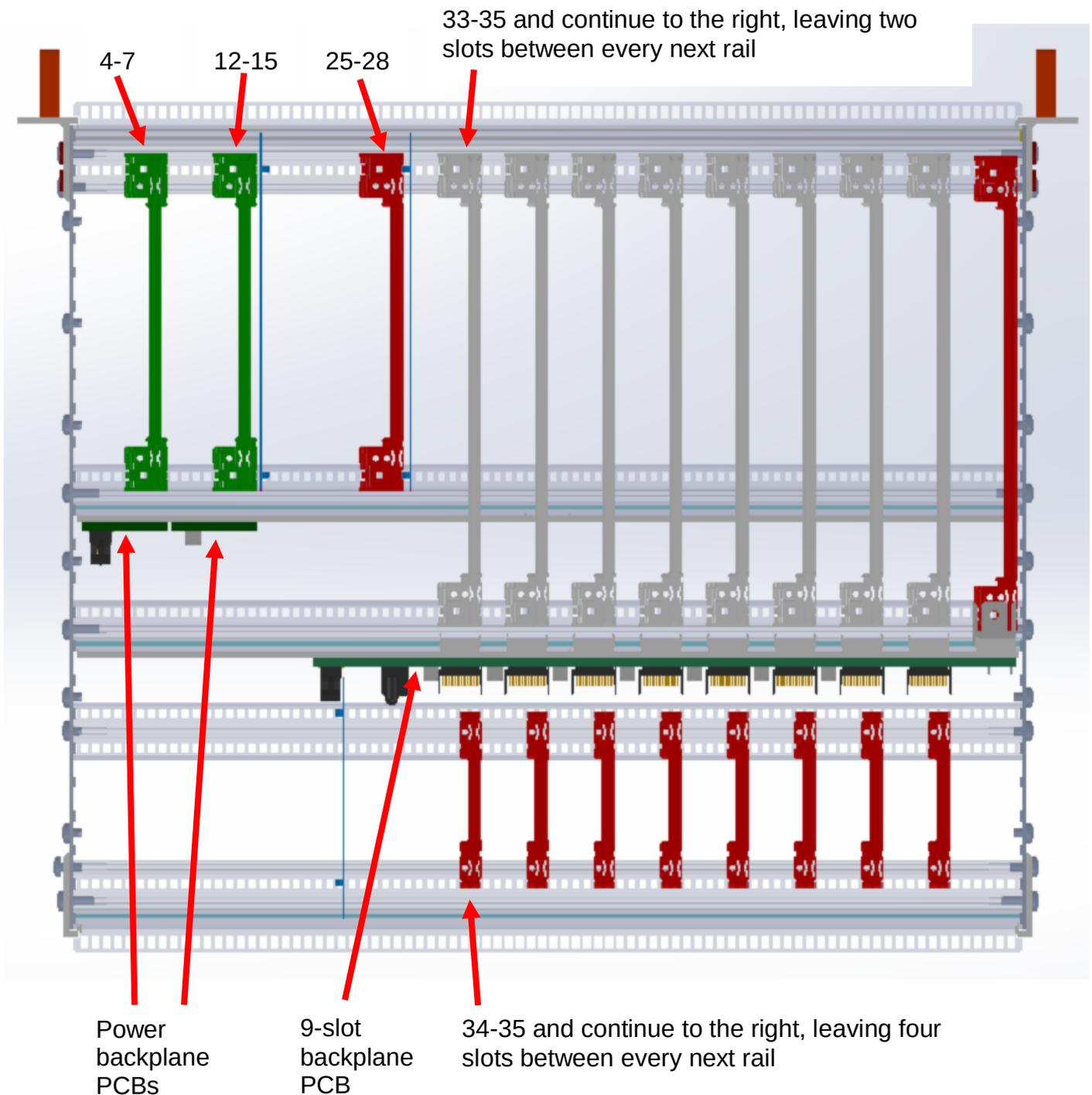
7.1.2. Put the second type ESD clip into the rail according to the following pictures. Push it until it clicks.

Please note:

This clip is on the front side of the rail only and it connects with the pcb module panels.



7.1.3. Mount the rails according to the following diagram. The numbers given below correspond with the perforations in the horizontal rails.



7.1.4. Repeat the last point on the other side of the crate (all the rails are mirrored).

8. Closing the crate

8.1. Mount the perforated aluminum cover on top and bottom of the crate, using M4x8 pan-head screws (C.4).

Please note:

Longer bends of the cover should be put in the EMC gaskets from point 4.2.2 (see picture below).



8.2. Mount all the screws according to the schematic below

Please note:

The mounting holes of the cover are not threaded. They form while screwing in the screws, so in the first moment carefully put a little more pressure on the screw than usually, so it catches the metal properly. Also remember to keep the screw perpendicular to the plate.

