

# Readiness Review

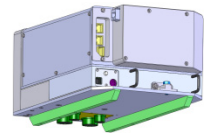
## Torrent Mechanical Design

J. DeVries

8/20/2010

# Overview

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## Dewar Interface

- Connectors
- Isolation

## Transition Module (TSM)

- Chassis
- Transition Module Assembly

## Controller

- Layout
- Power Supply Module (PSM)
- Chassis
- Local Control Board Assembly (LCB)
- Ethernet Board Assembly
- Blower Housing Assembly
- Removal / Installation from DHE

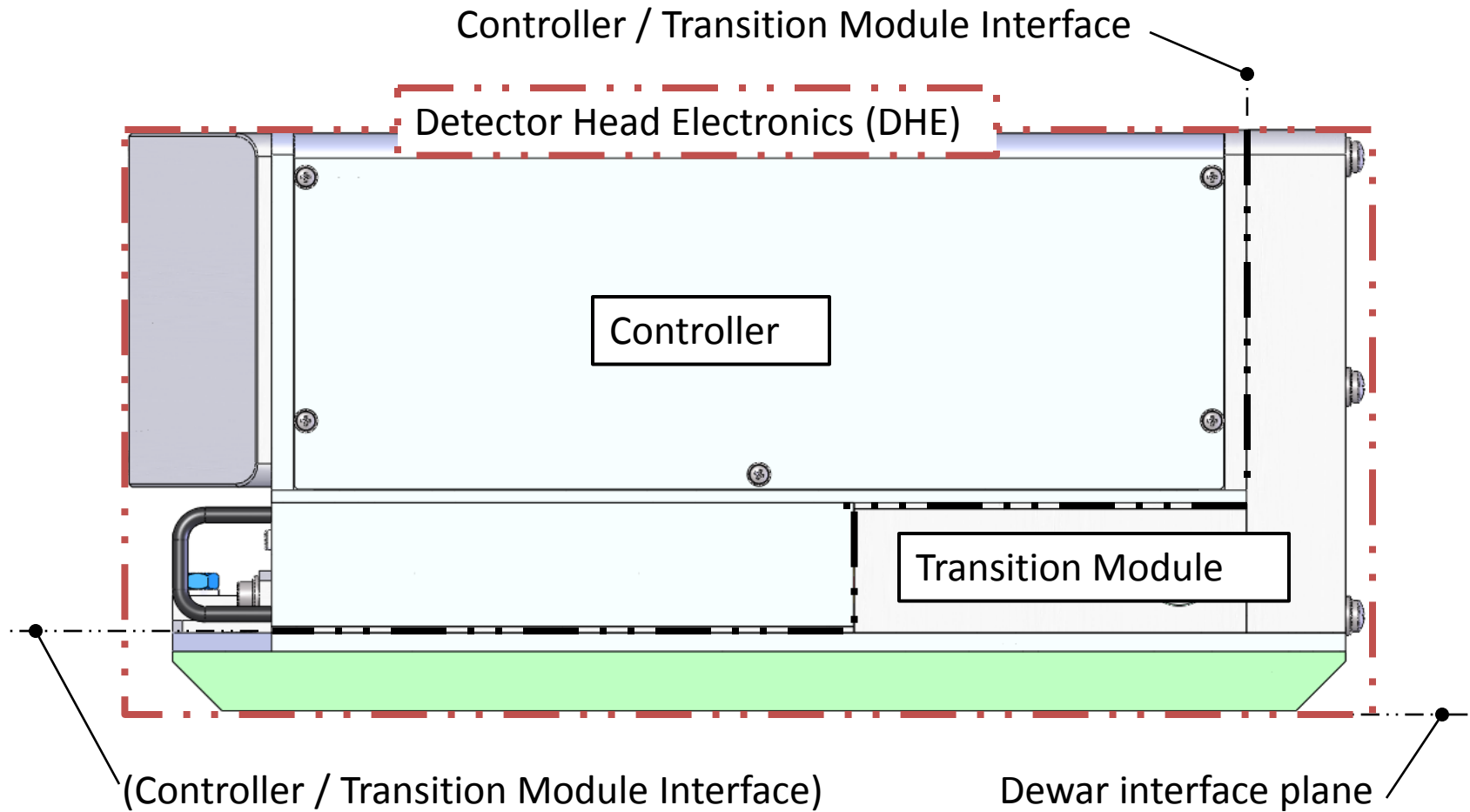
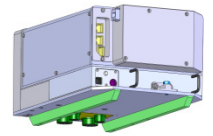
## Detector Head Electronics (DHE)

- Assembly
- Momentary switches

## Mechanical Hardware Manufacture

- Detail / Assembly drawings
- Materials / plating
- Machined part quotes
- Identification

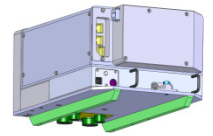
# DHE Layout



- Transition Module is the only customizable part of the DHE

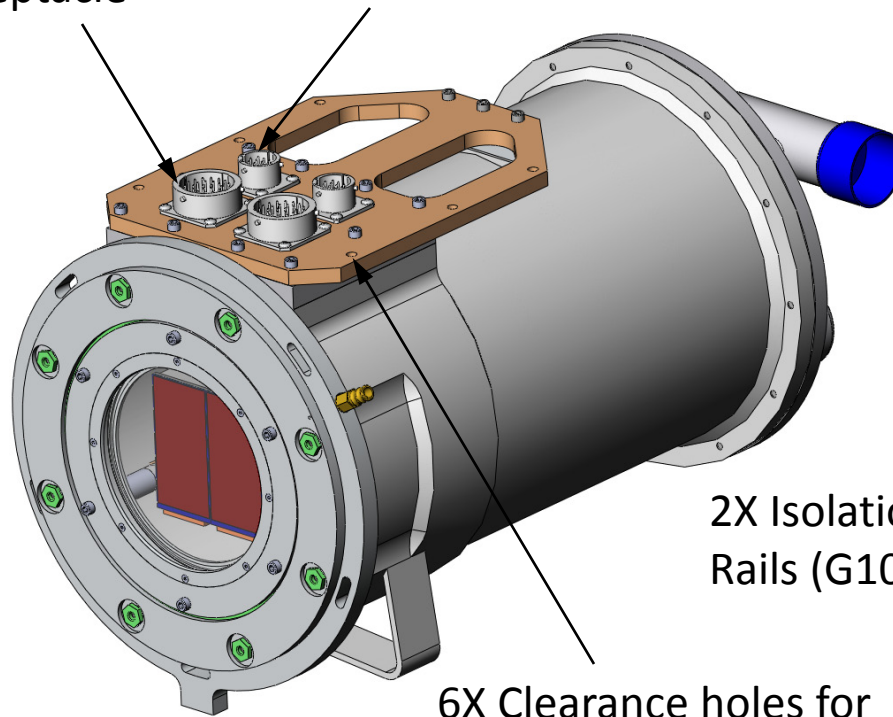
# Dewar / Detector Head Electronics (DHE) Interface

# Dewar / DHE Interface



2X 32 pin  
hermetically sealed  
receptacle

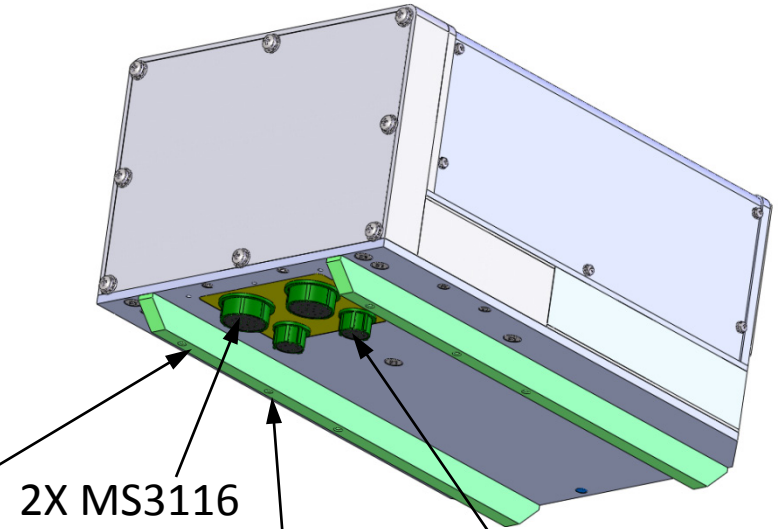
2X 10 pin  
hermetically sealed  
receptacle



2X Isolation  
Rails (G10)

6X Clearance holes for  
M4 mounting screws

Kitt Peak Universal Dewar Shown



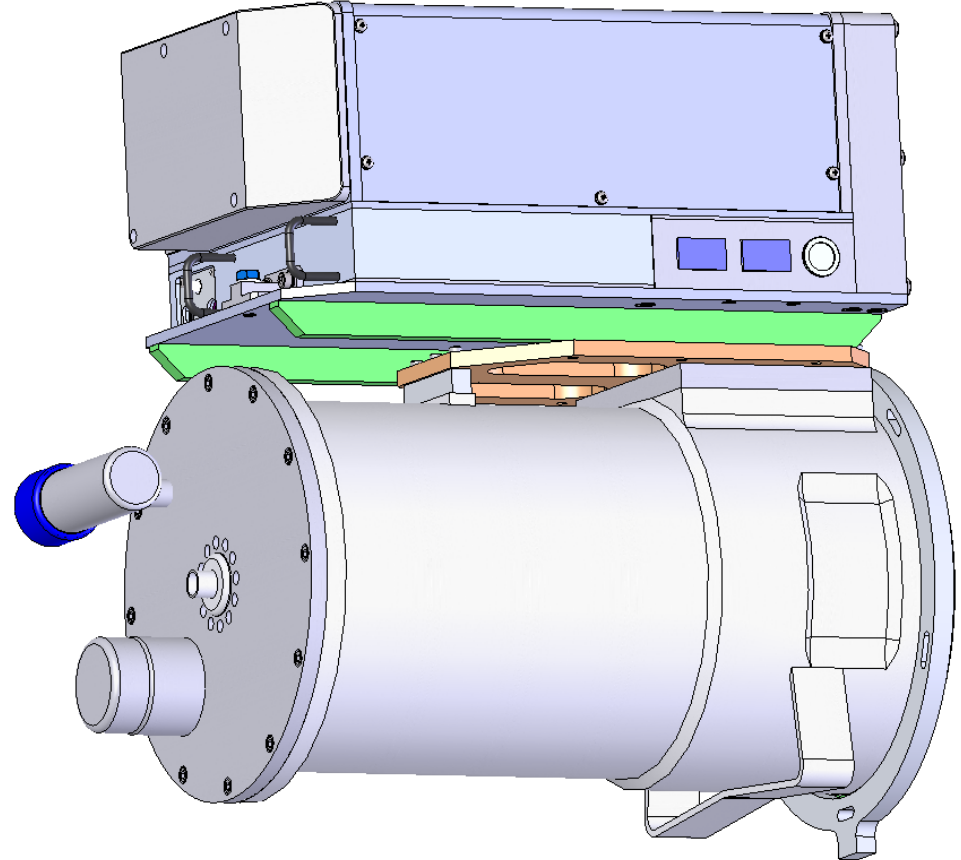
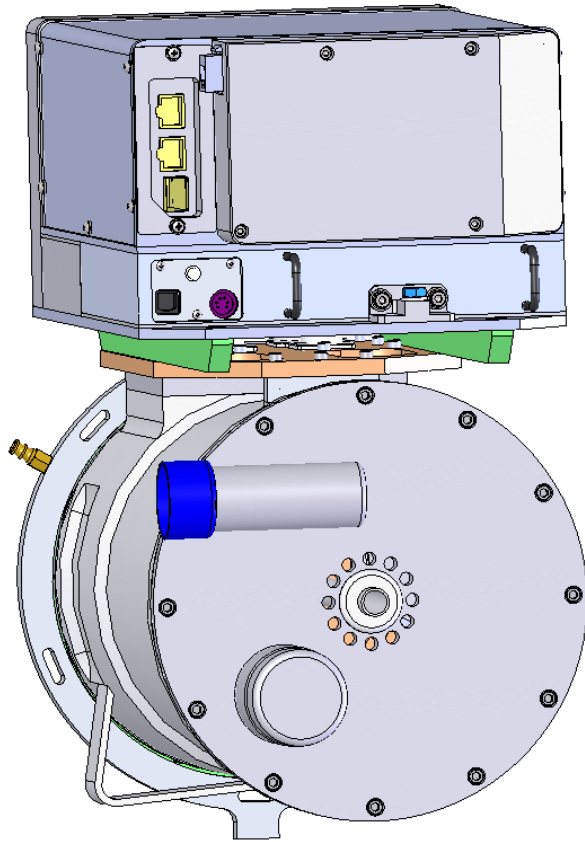
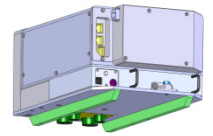
2X MS3116  
32 pin plug

6X M4 tapped holes  
in isolation rails

2X MS3116  
10 pin plug

➤ DHE Interface (Transition Module)  
can be customized to accept  
different dewars

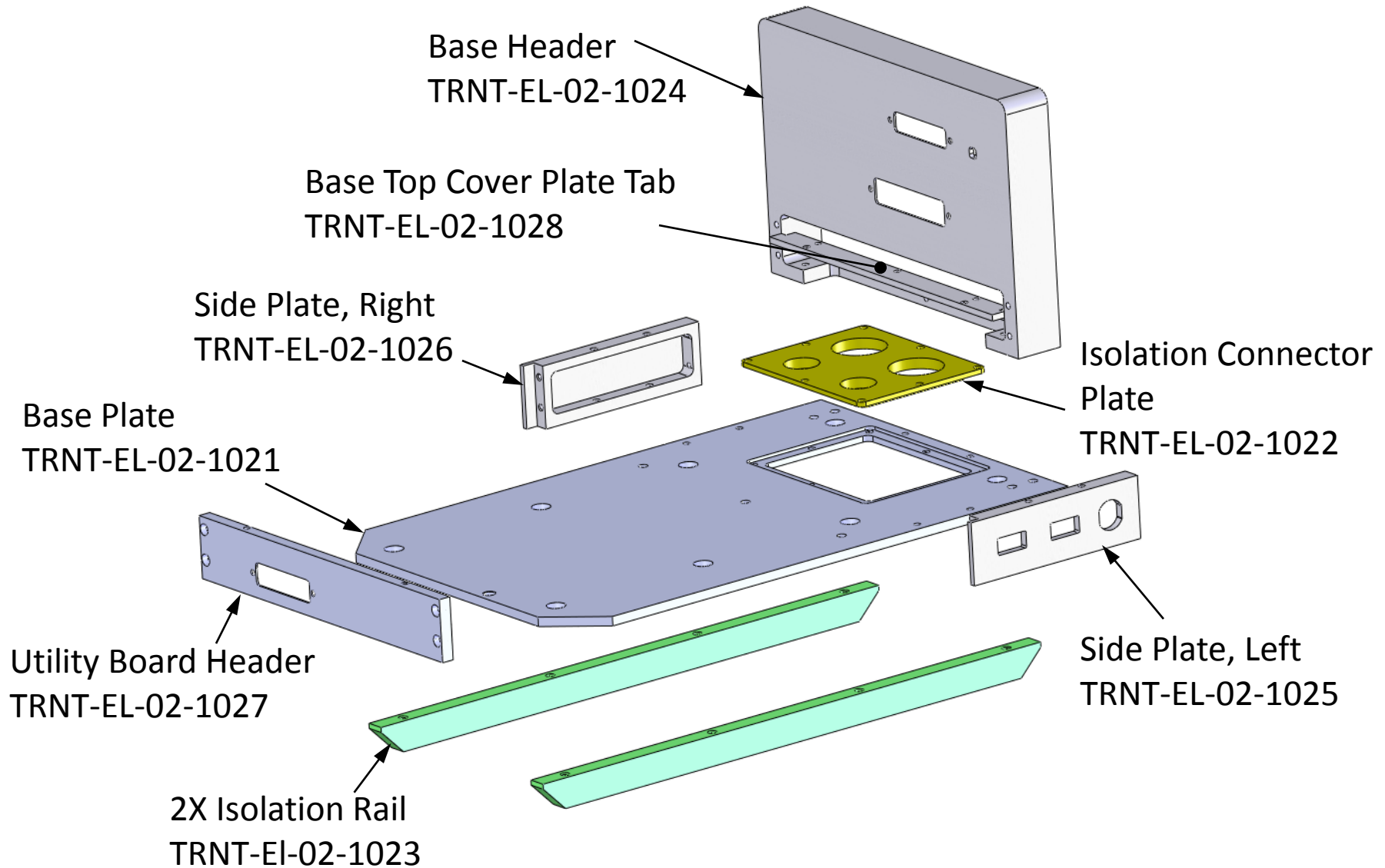
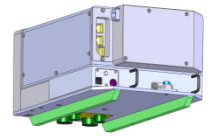
# Assembled DHE on Dewar



Kitt Peak Universal Dewar Shown

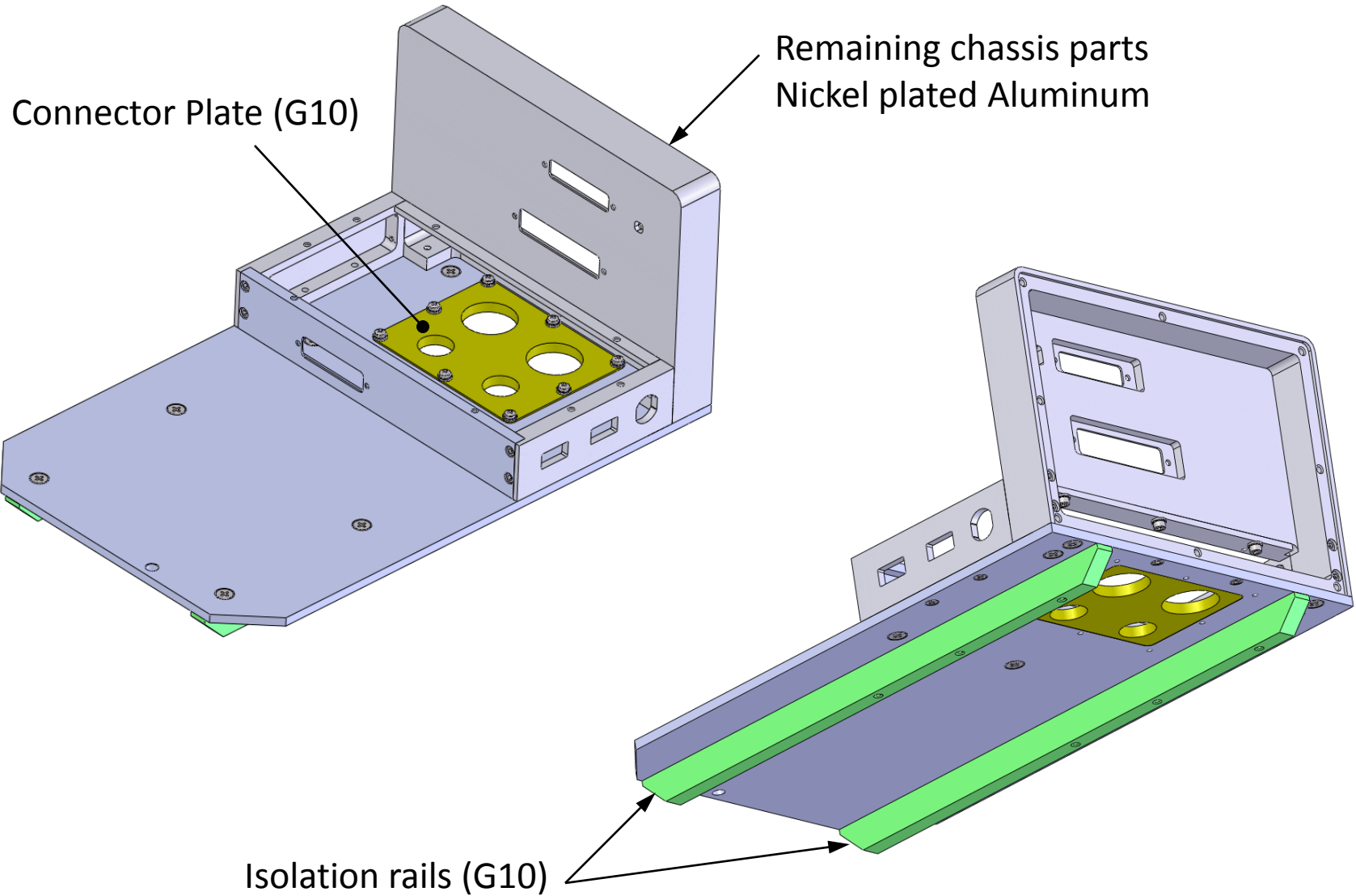
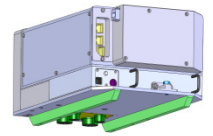
# Transition Module (TSM)

# TSM Chassis Exploded View





# TSM Chassis

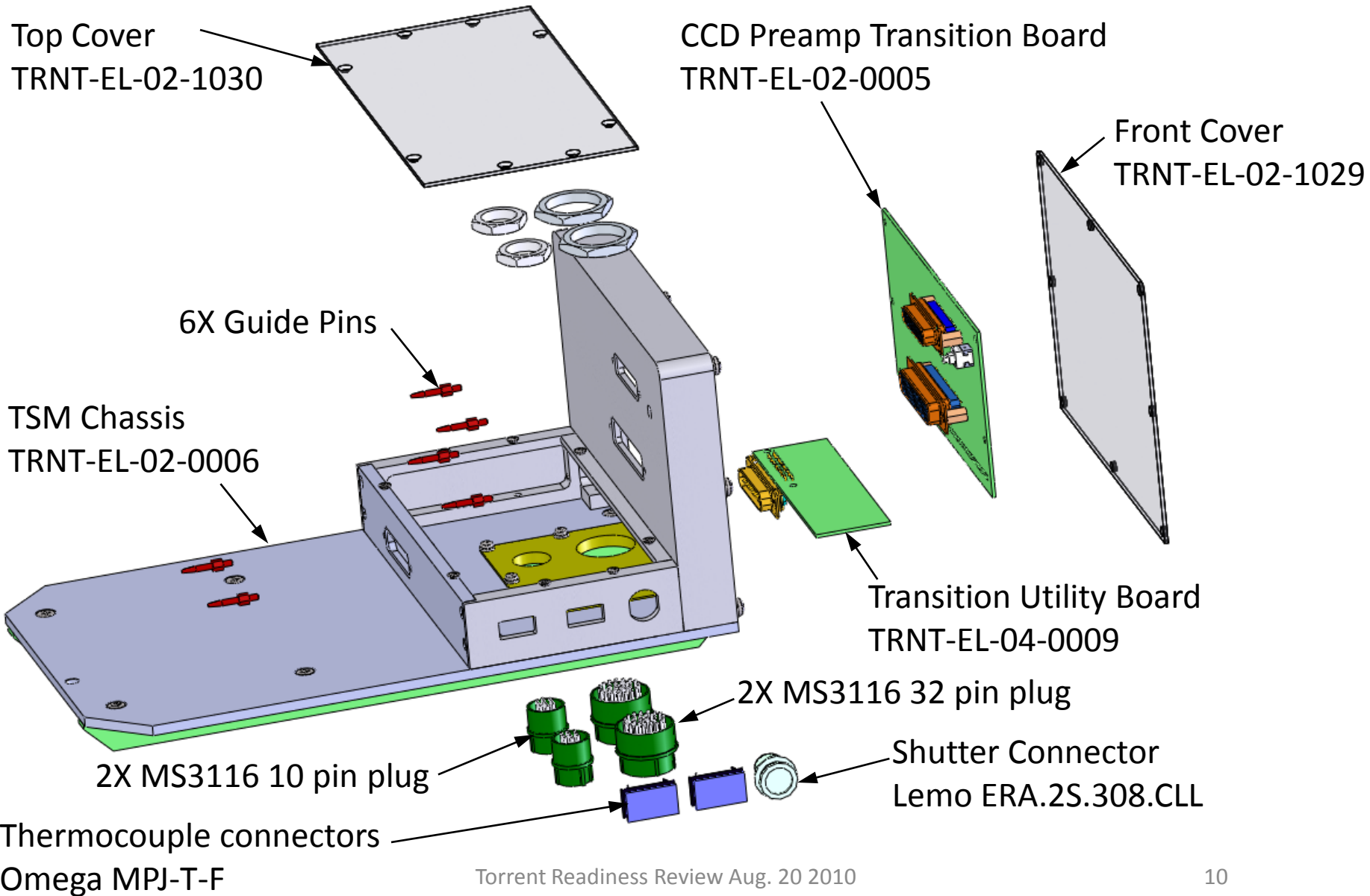
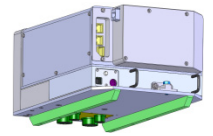


Connector Plate (G10)

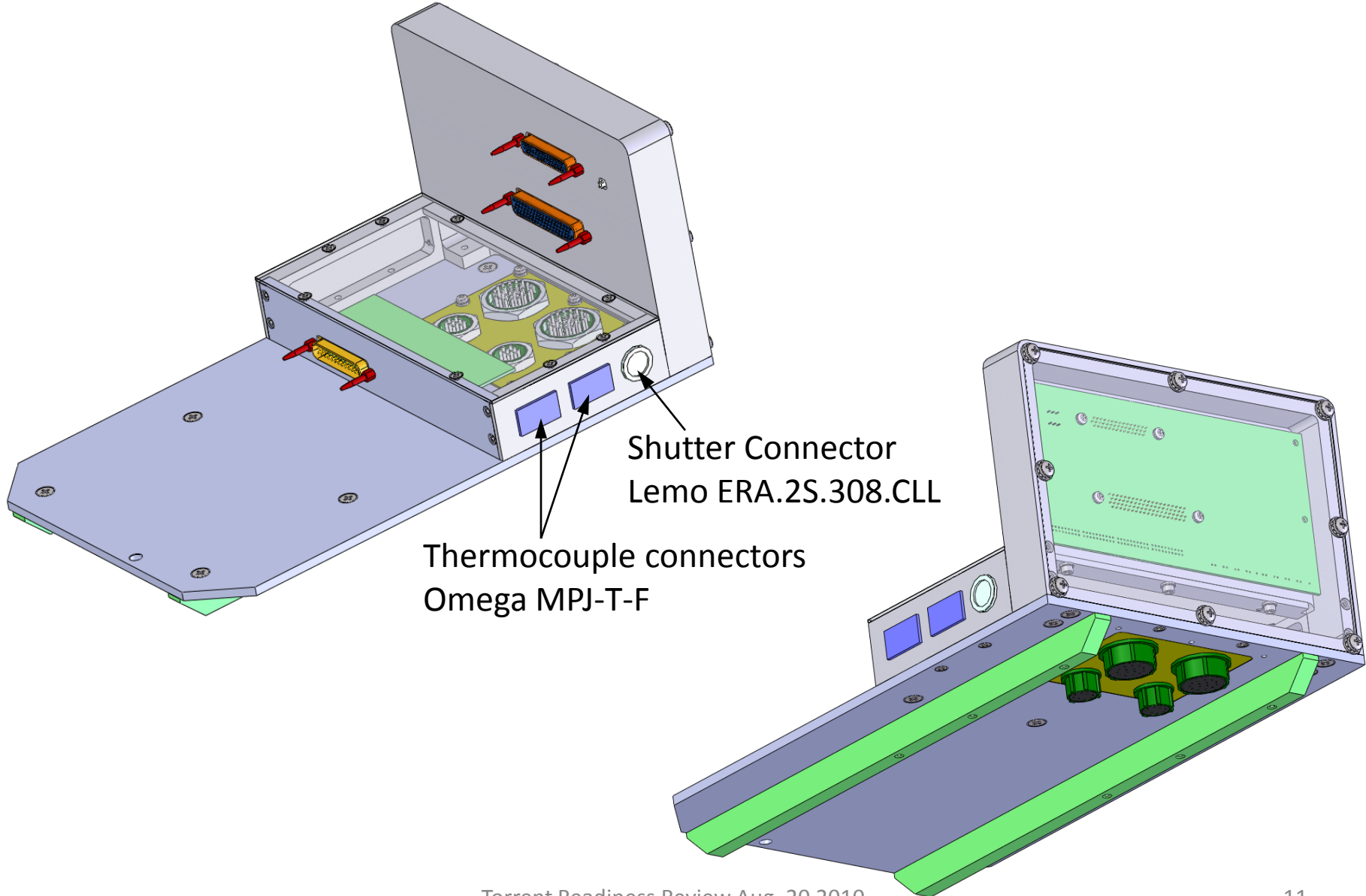
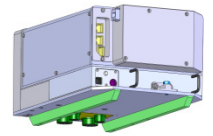
Remaining chassis parts  
Nickel plated Aluminum

Isolation rails (G10)

# Transition Module Exploded View



# TSM Assembly

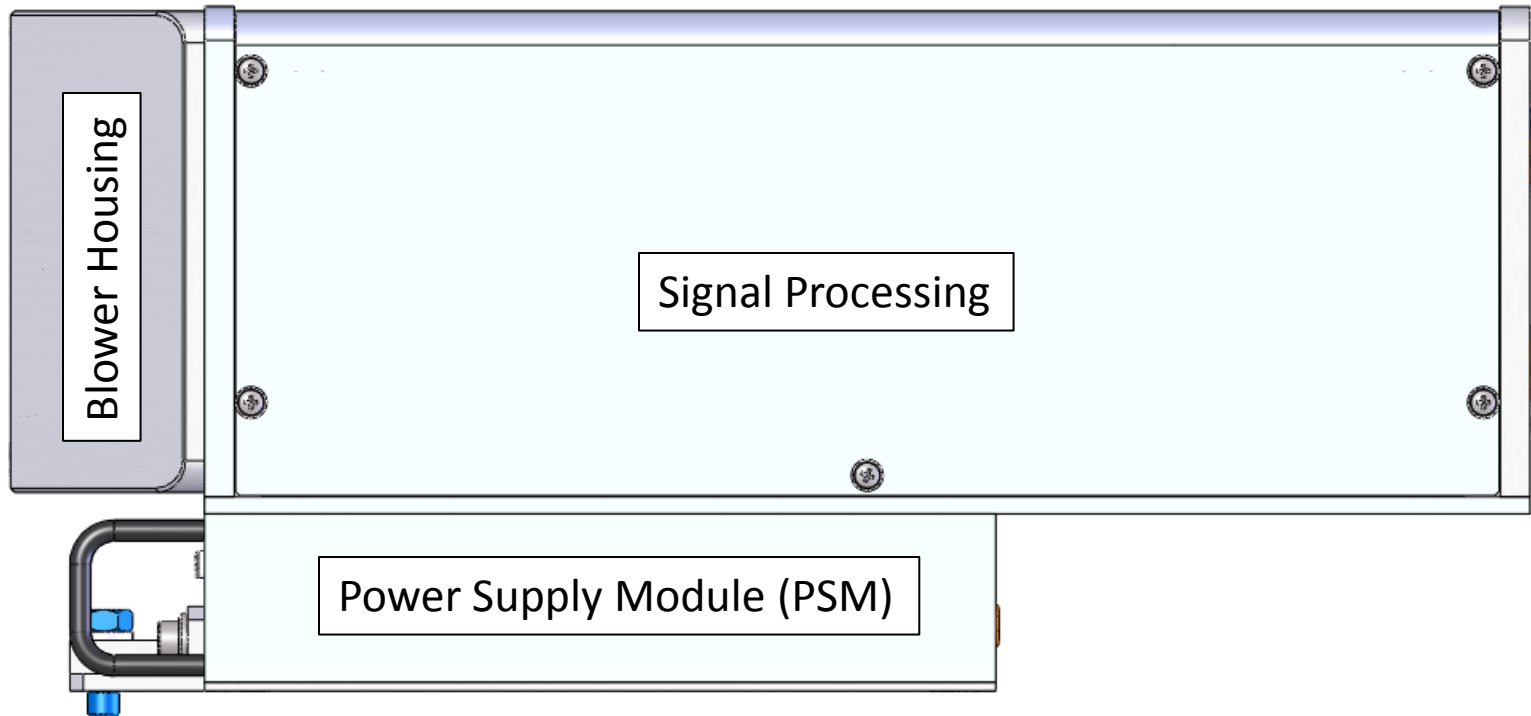
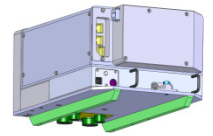


Thermocouple connectors  
Omega MPJ-T-F

Shutter Connector  
Lemo ERA.2S.308.CLL

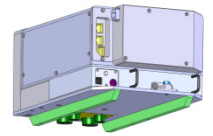
# Controller

# Controller Layout



- PSM and Blower located in separate sections to isolate noise from signal

# PSM Exploded View



Positronics  
SD25F10000-759.1

Controller Mounting Bolt  
TRNT-EL-12-0002

PSM Enclosure Base  
TRNT-EL-02-1010

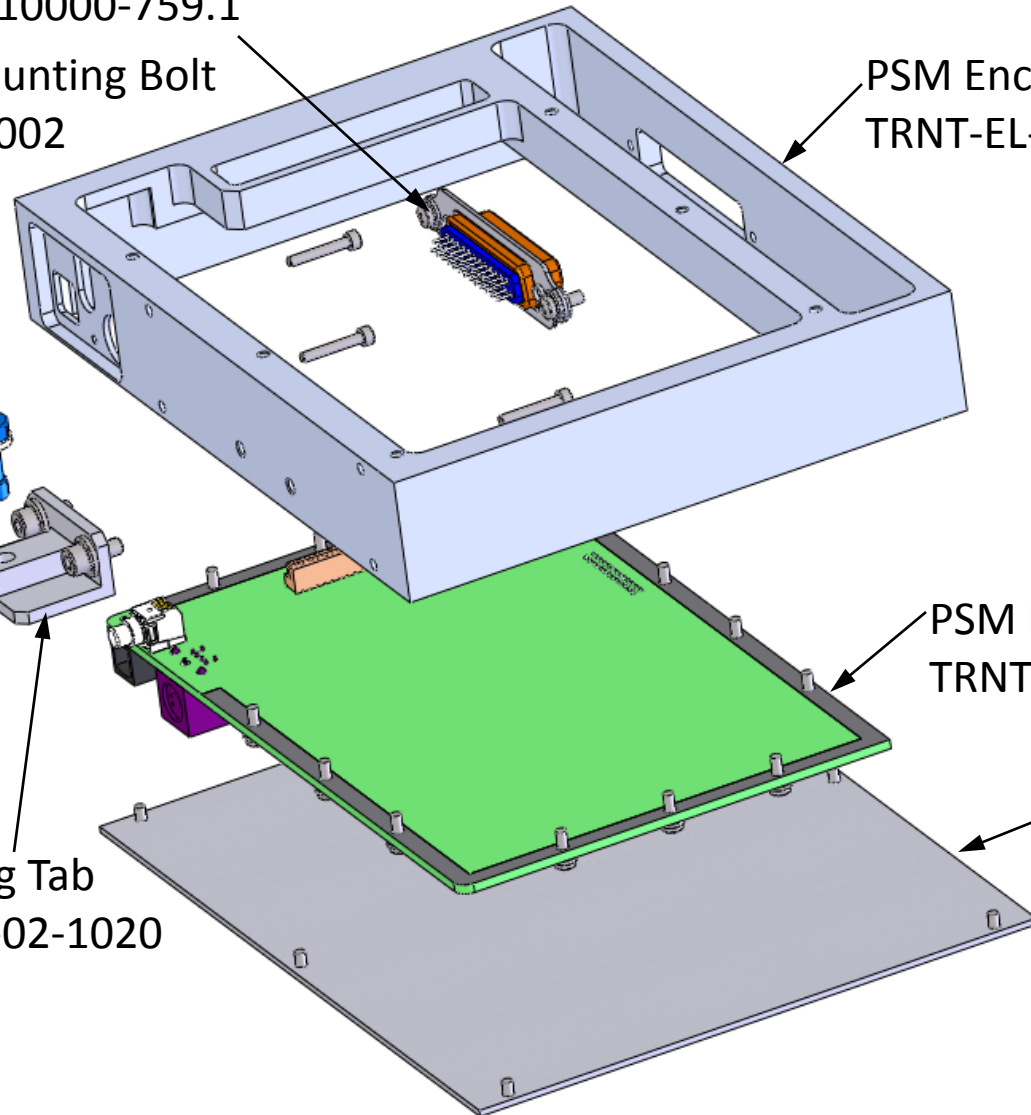
Fill Plate  
TRNT-EL-02-1012

2X Handle  
TRNT-EL-12-0003

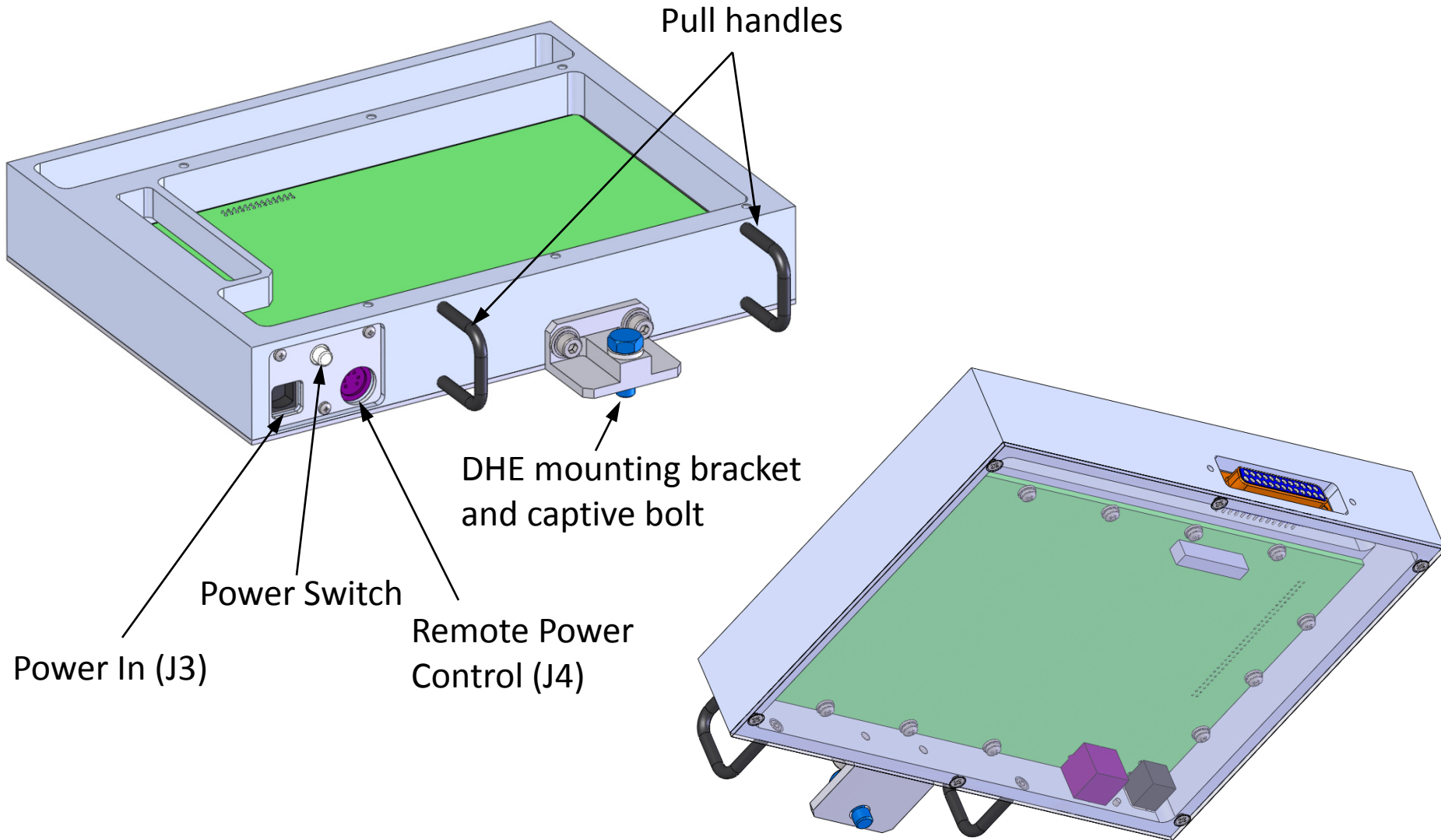
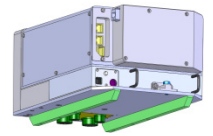
Mounting Tab  
TRNT-EL-02-1020

PSM Board  
TRNT-EL-04-0001

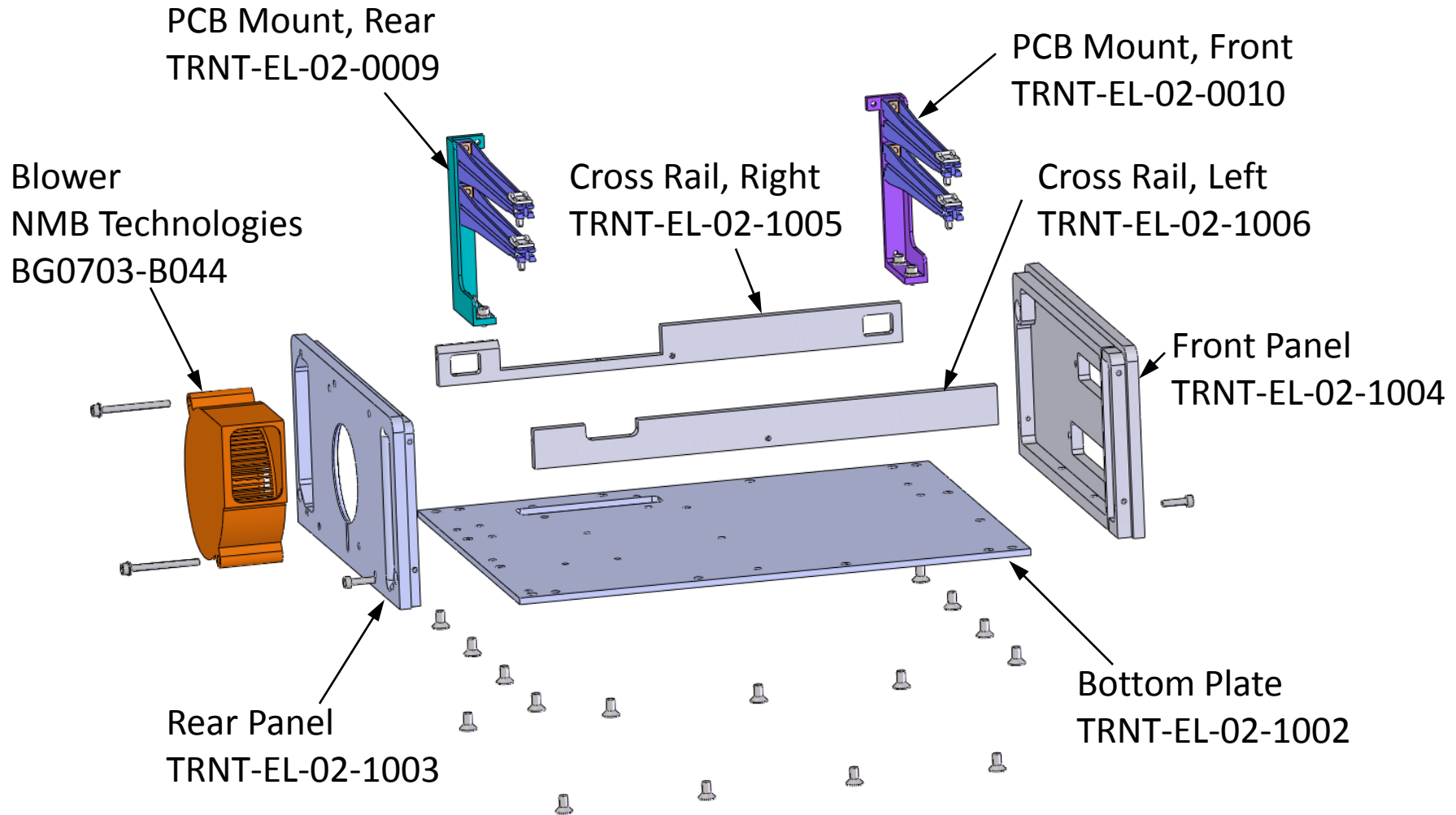
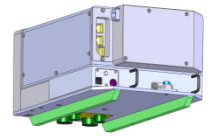
Bottom Cover  
TRN-EL-02-1011



# Power Supply Module (PSM)

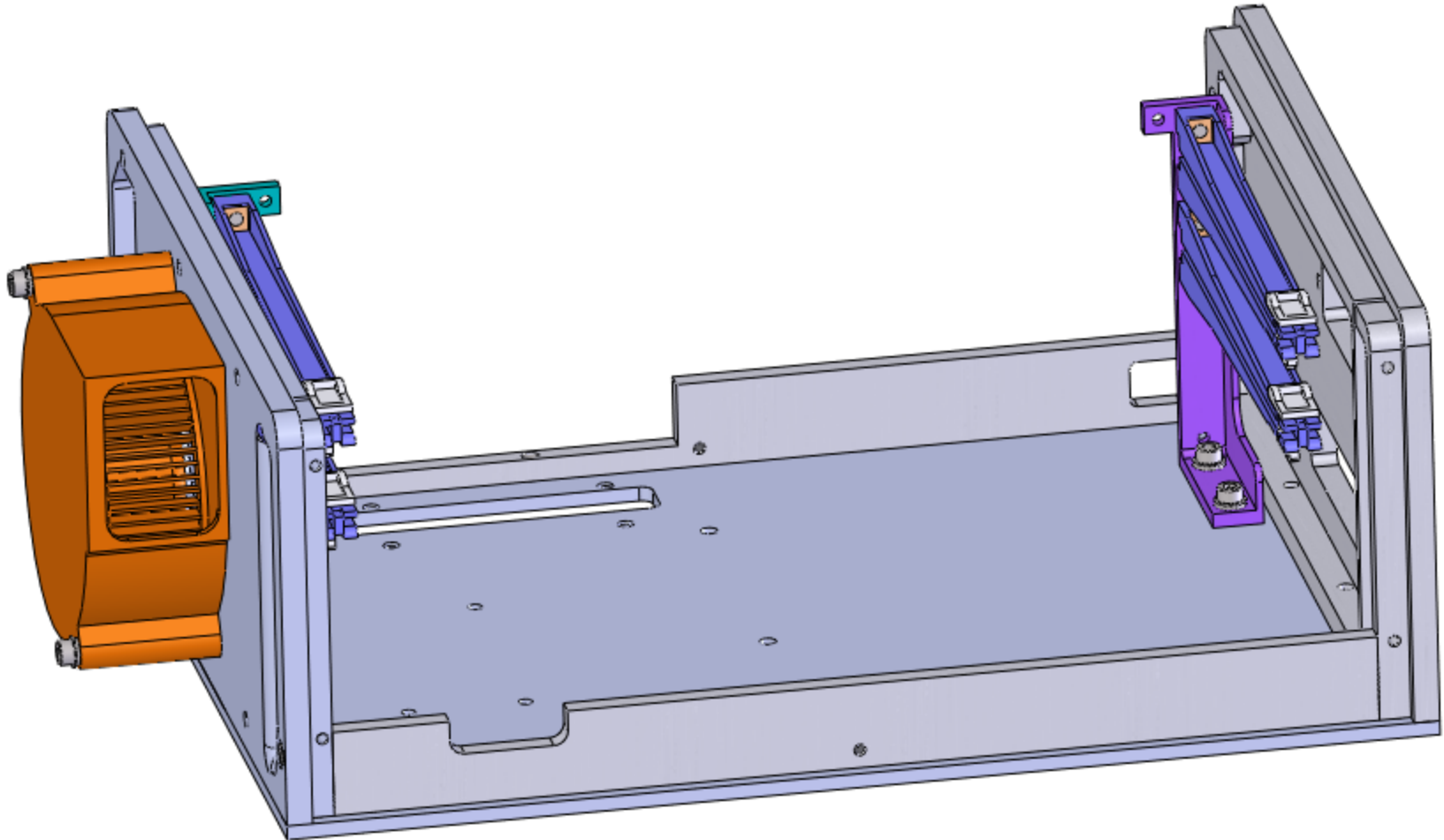
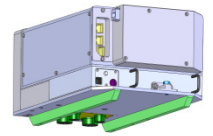


# Controller Chassis Exploded View

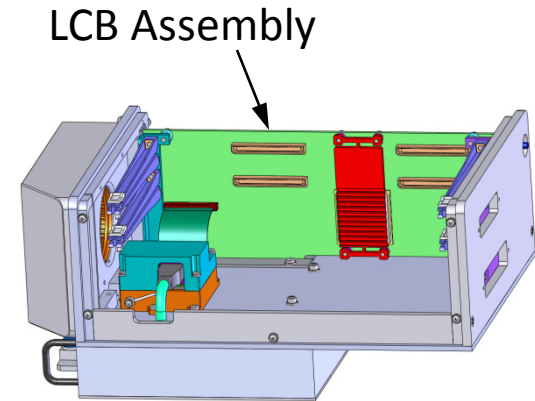
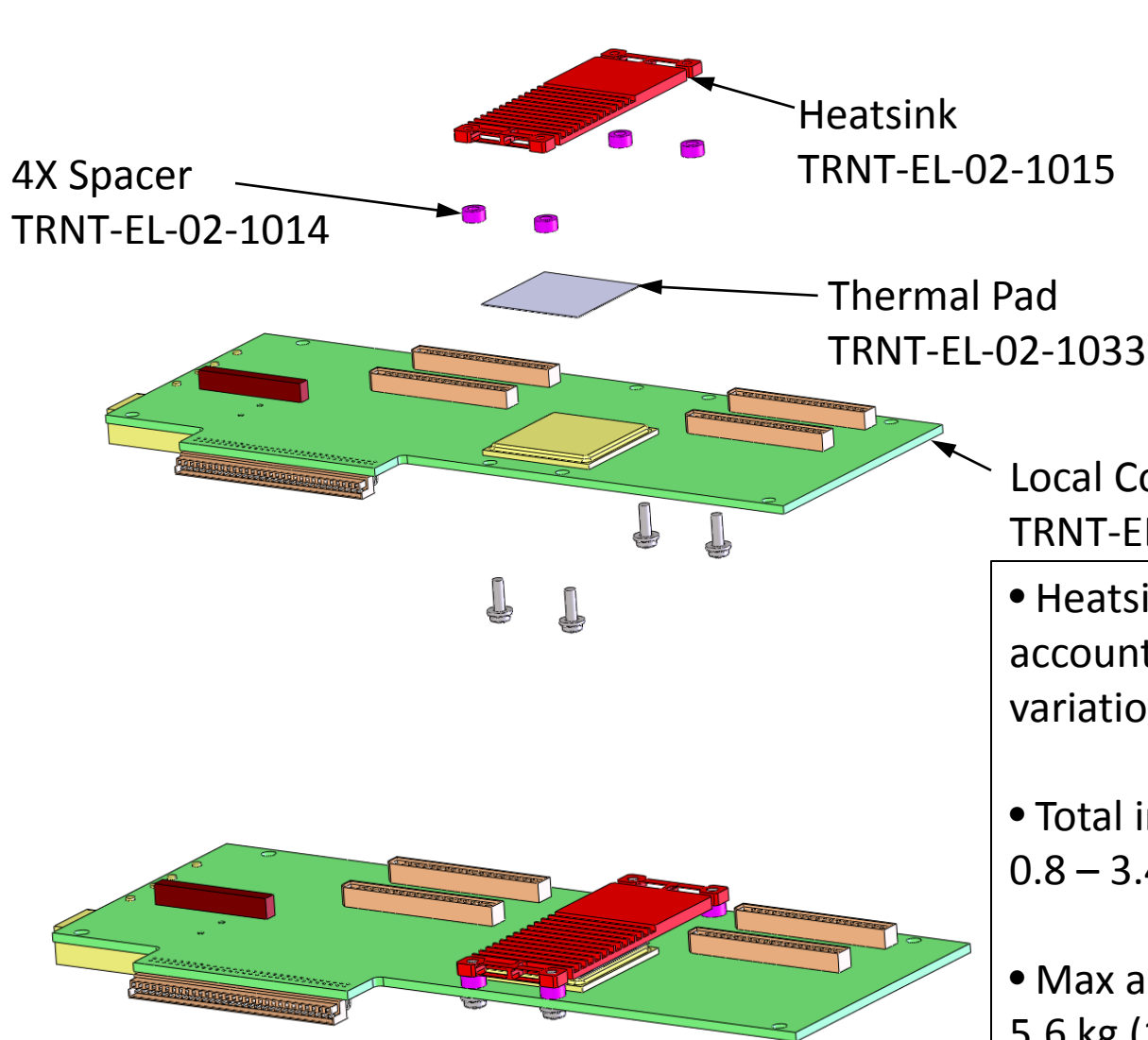
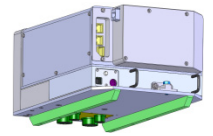




# Assembled Controller Chassis

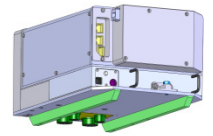


# Local Control Board (LCB) Assembly

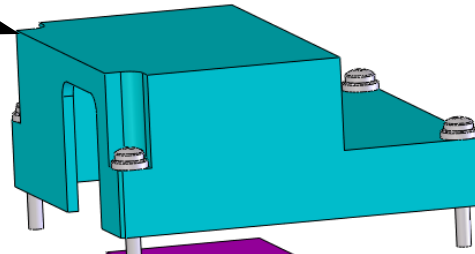


- Heatsink is flexure mounted to account for component height variation
- Total imparted force on FPGA is 0.8 – 3.4 lbs
- Max allowable force on FPGA is 5.6 kg (12.3 lbs)

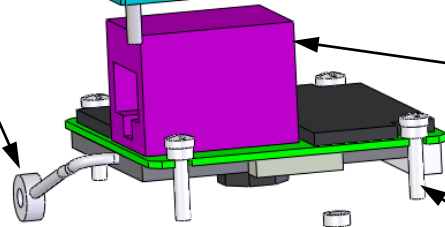
# Ethernet Board Assembly



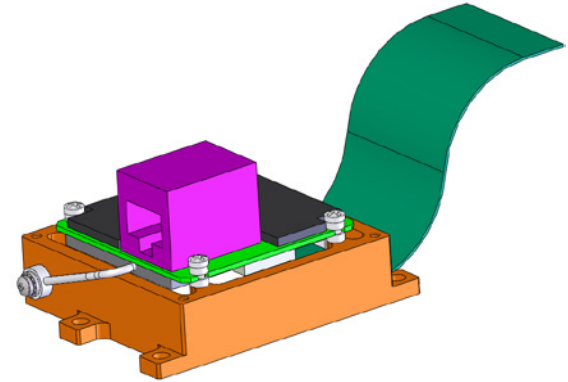
Cover  
TRNT-EL-02-1032



Chassis ground wire  
for RJ45 Jack shield  
(other end soldered  
to jack shield pin)



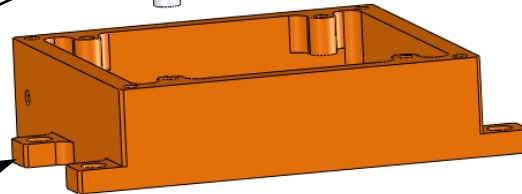
PT01-PB0MH1-32BG33  
Pleora iPORT NTx-Mini  
IP Engine



8X Richco R906-1  
Nylon Spacer

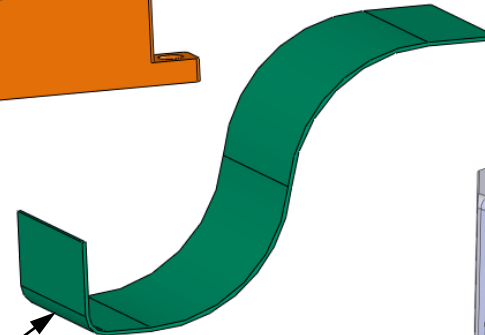


4X Nylon M2 screws

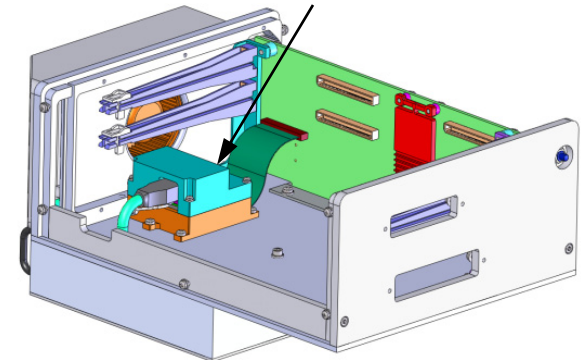


Standoff  
TRNT-EL-02-1031

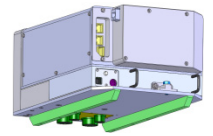
Parlex 050R60-0090BO A  
Ribbon Cable



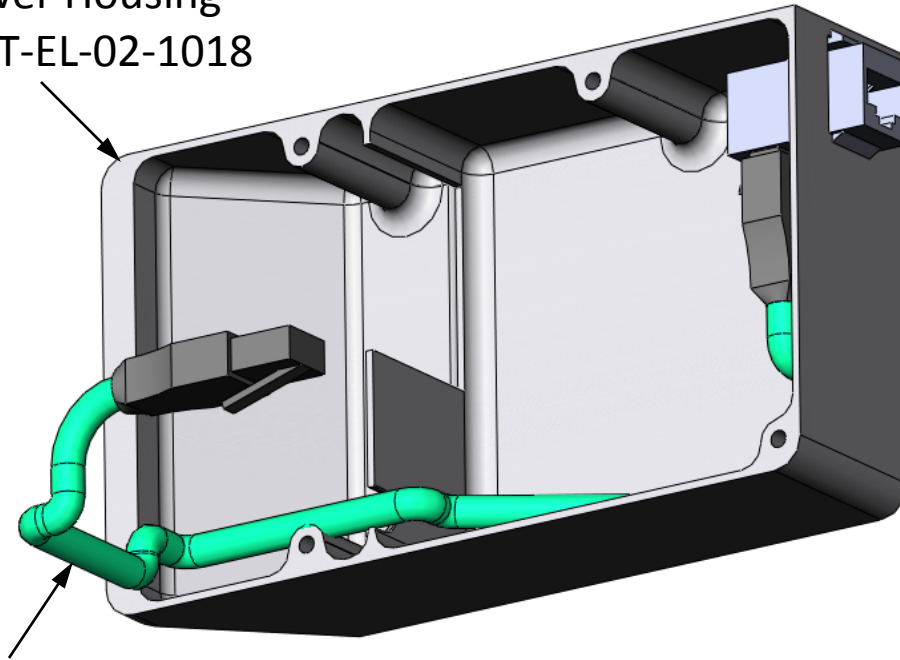
Ethernet Board Assembly



# Blower Housing Assembly



Blower Housing  
TRNT-EL-02-1018

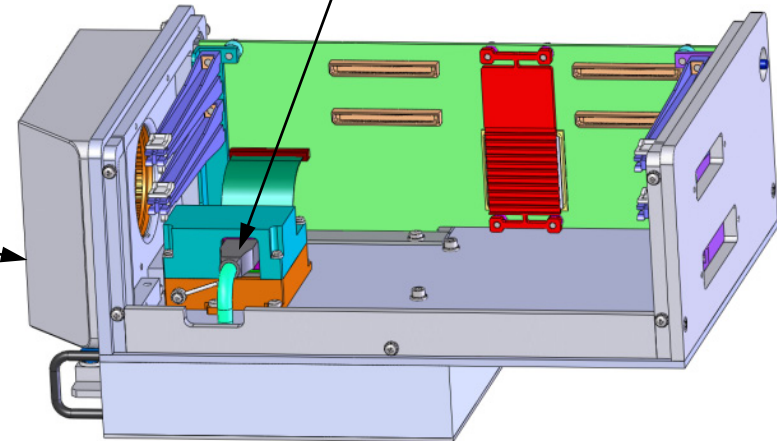


RJ45 right angle coupler  
(unshielded)  
Tyco C-555051-1

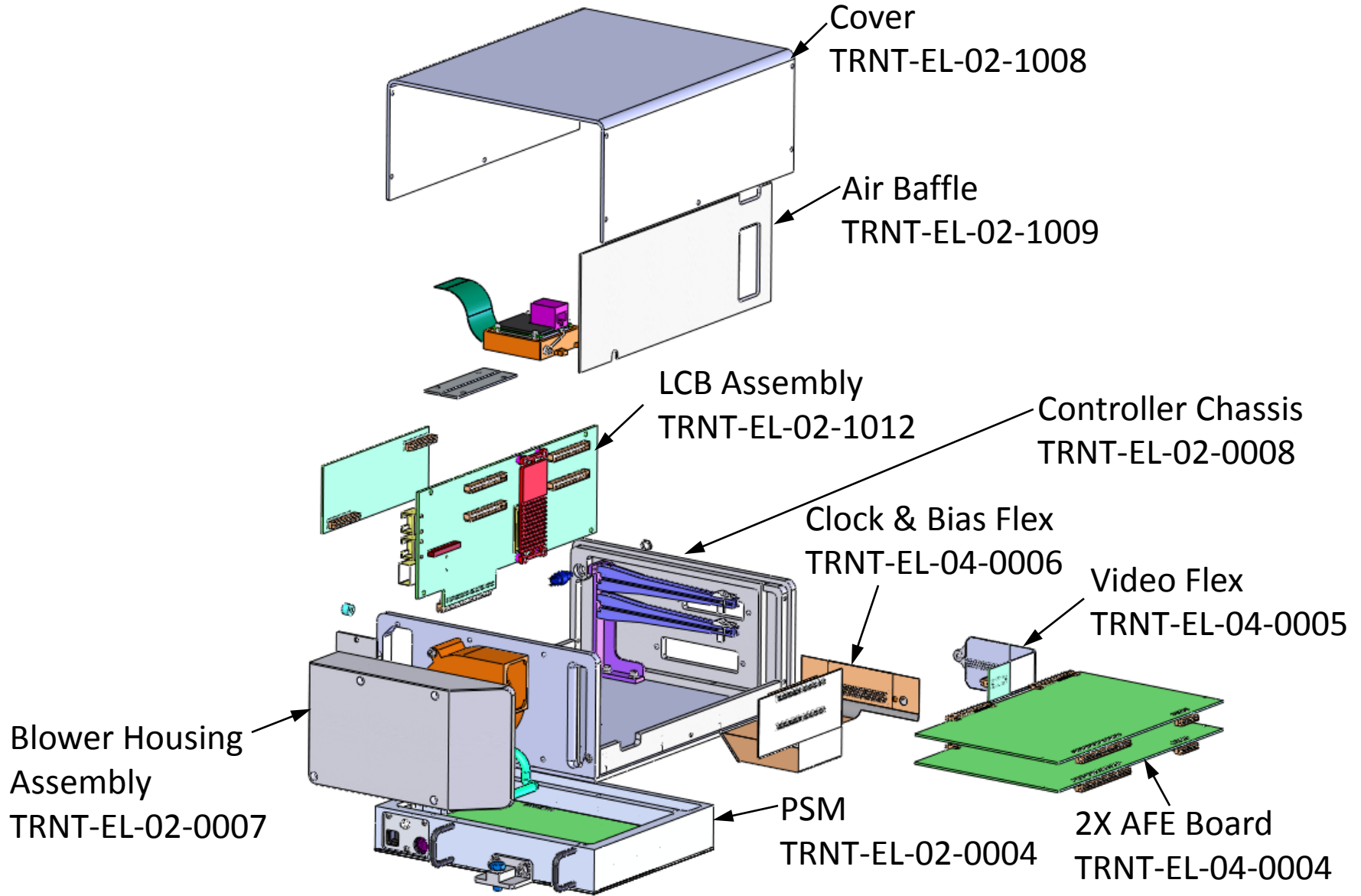
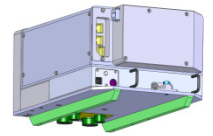
Ethernet Patch Cable (Shielded), Cat 6, 12" long  
L-Com TRD695SCR-1

Ethernet Patch Cord

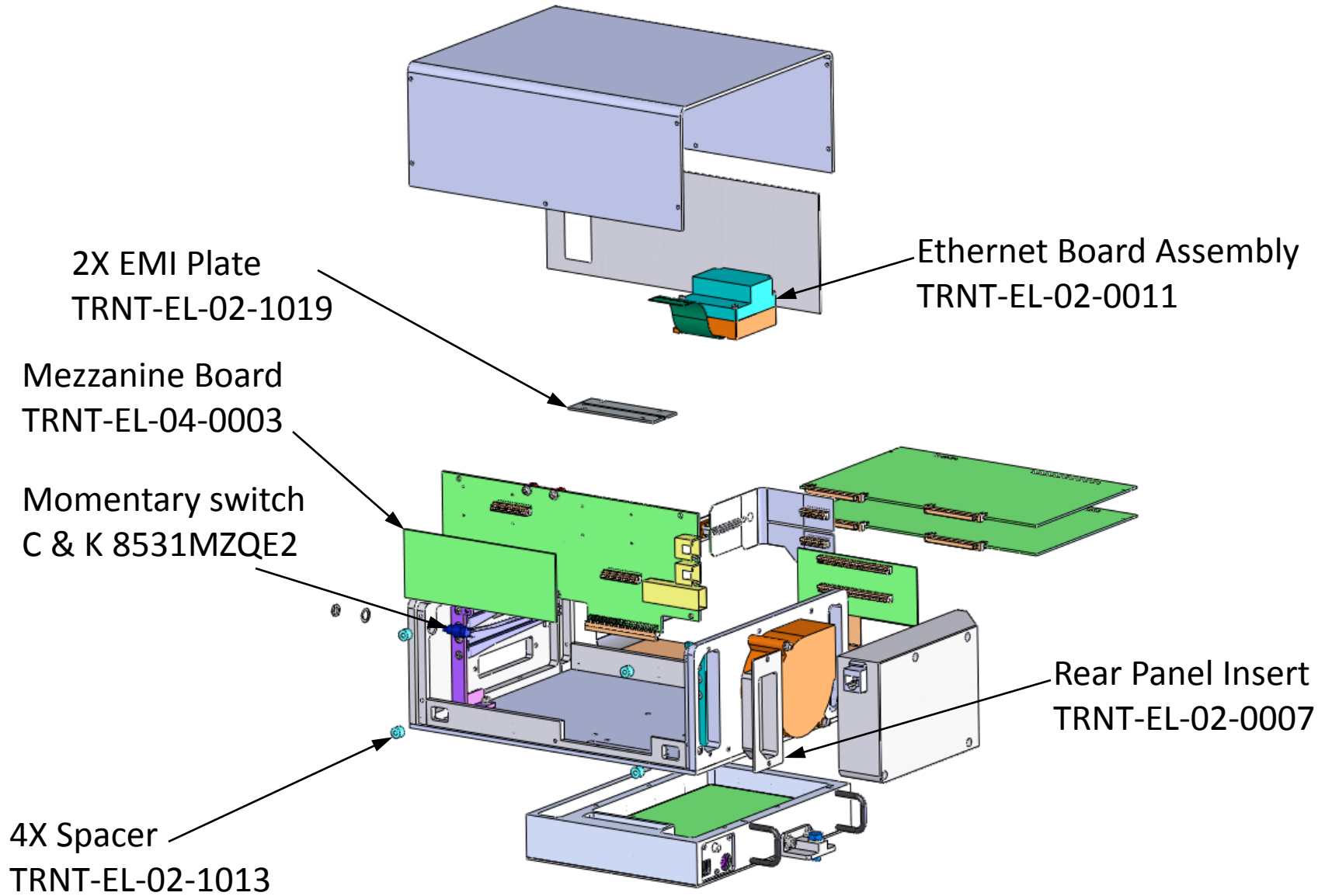
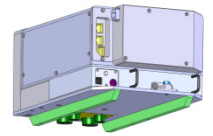
Blower  
Housing  
Assembly



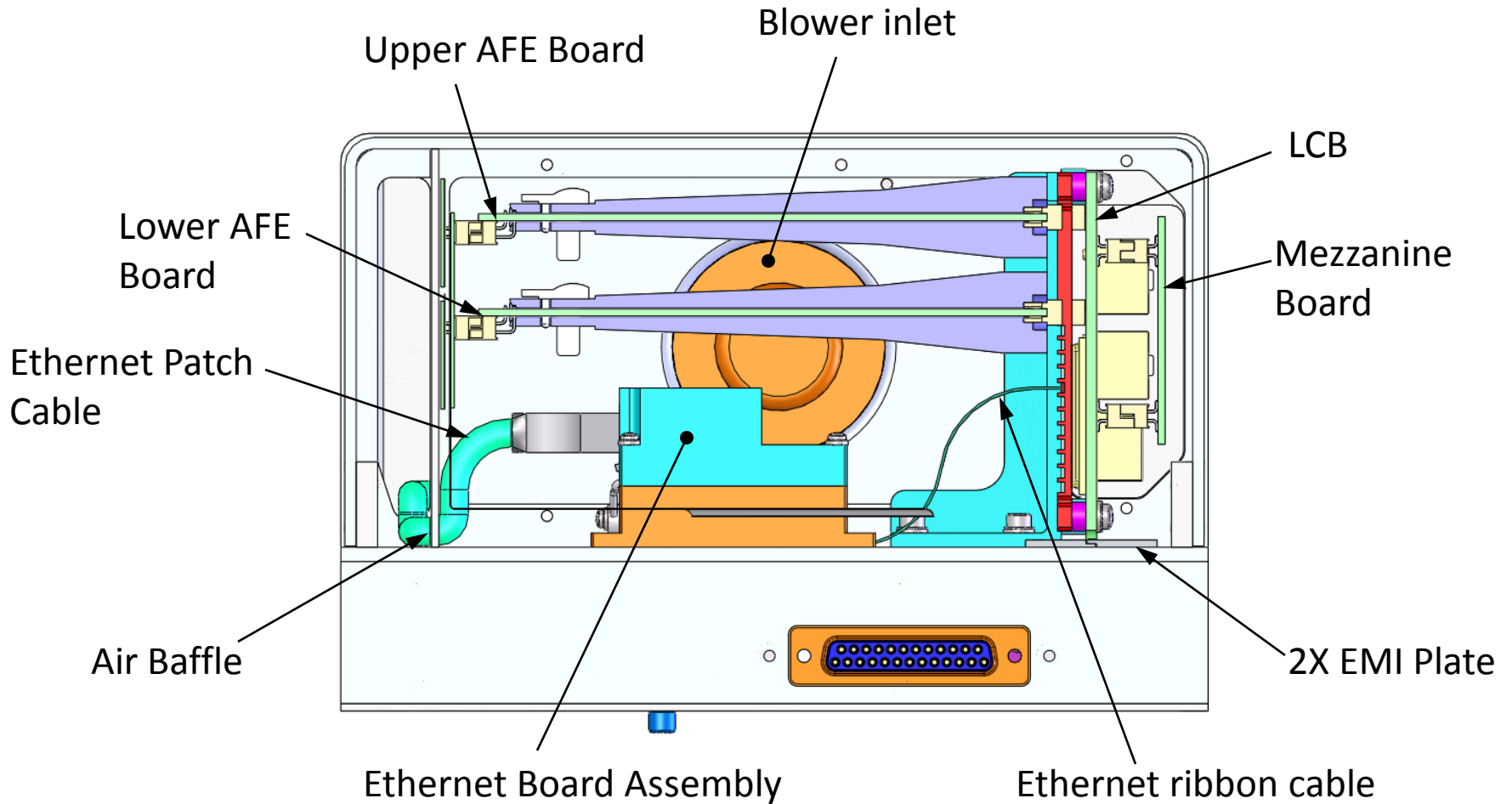
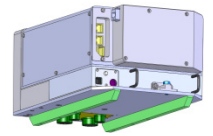
# Exploded Controller Assembly



# Exploded Controller Assembly

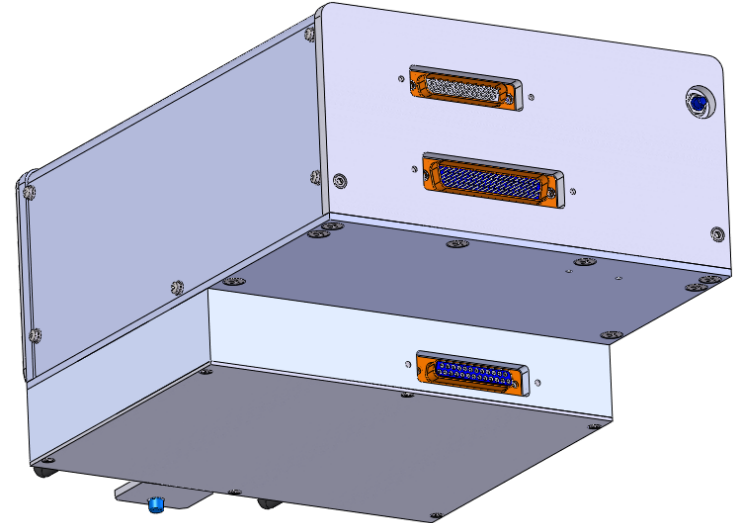
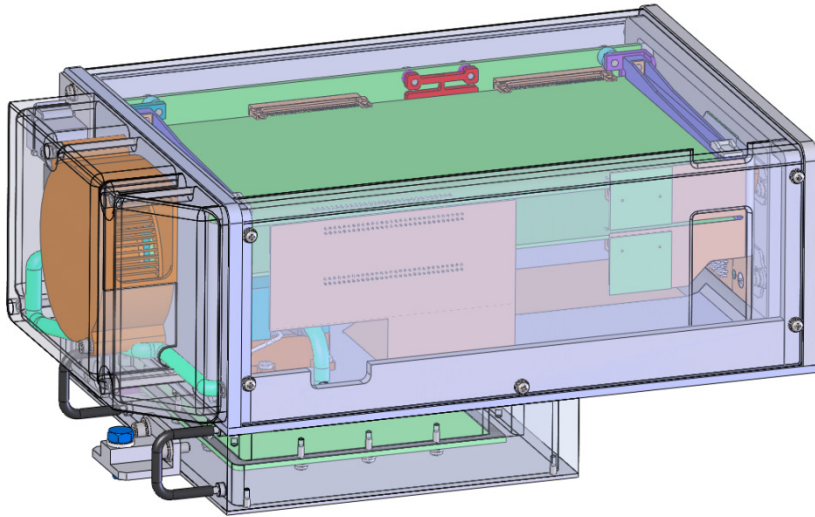
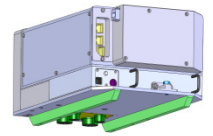


# Controller Section View





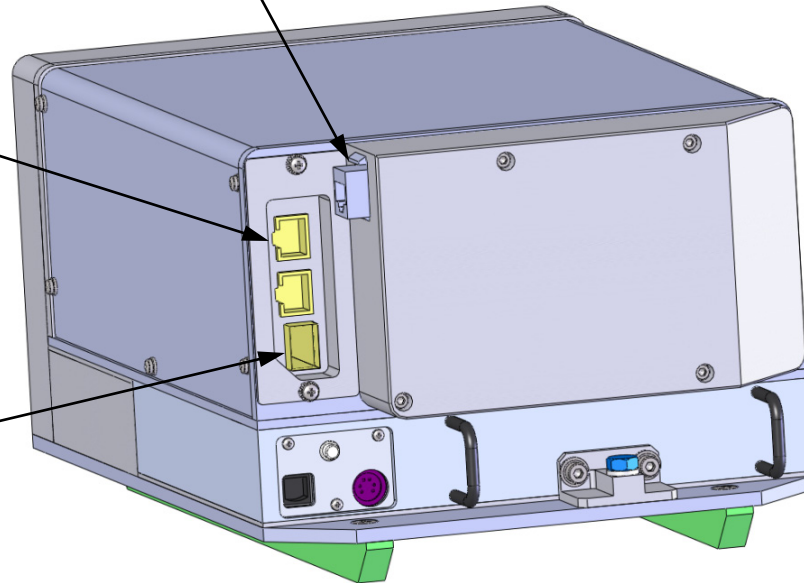
# Assembled Controller



RJ45 (routed from Ethernet Board)

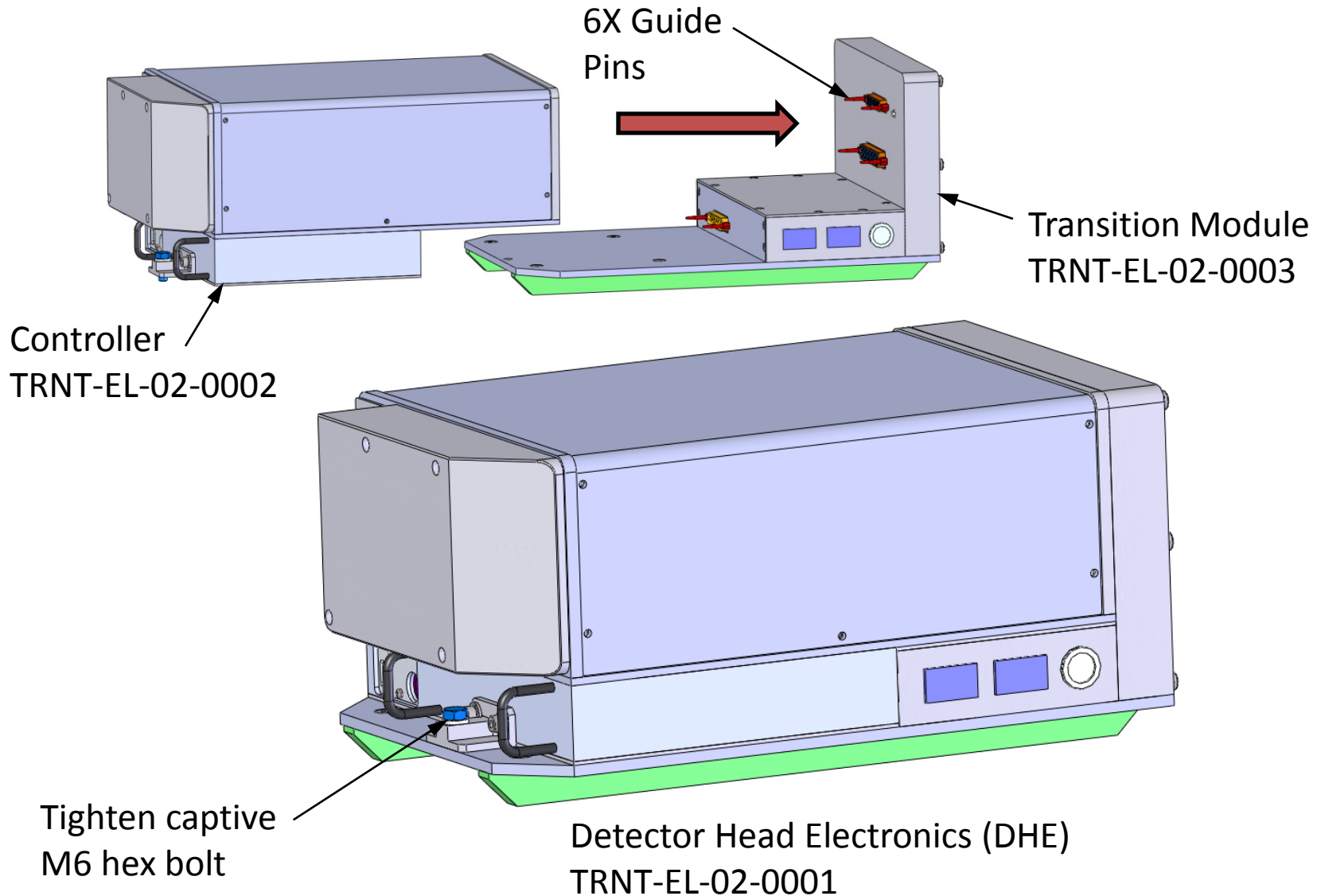
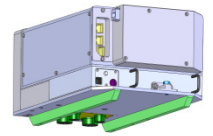
2X RJ45 (data sync)

Duplex LC  
Fiber-optic

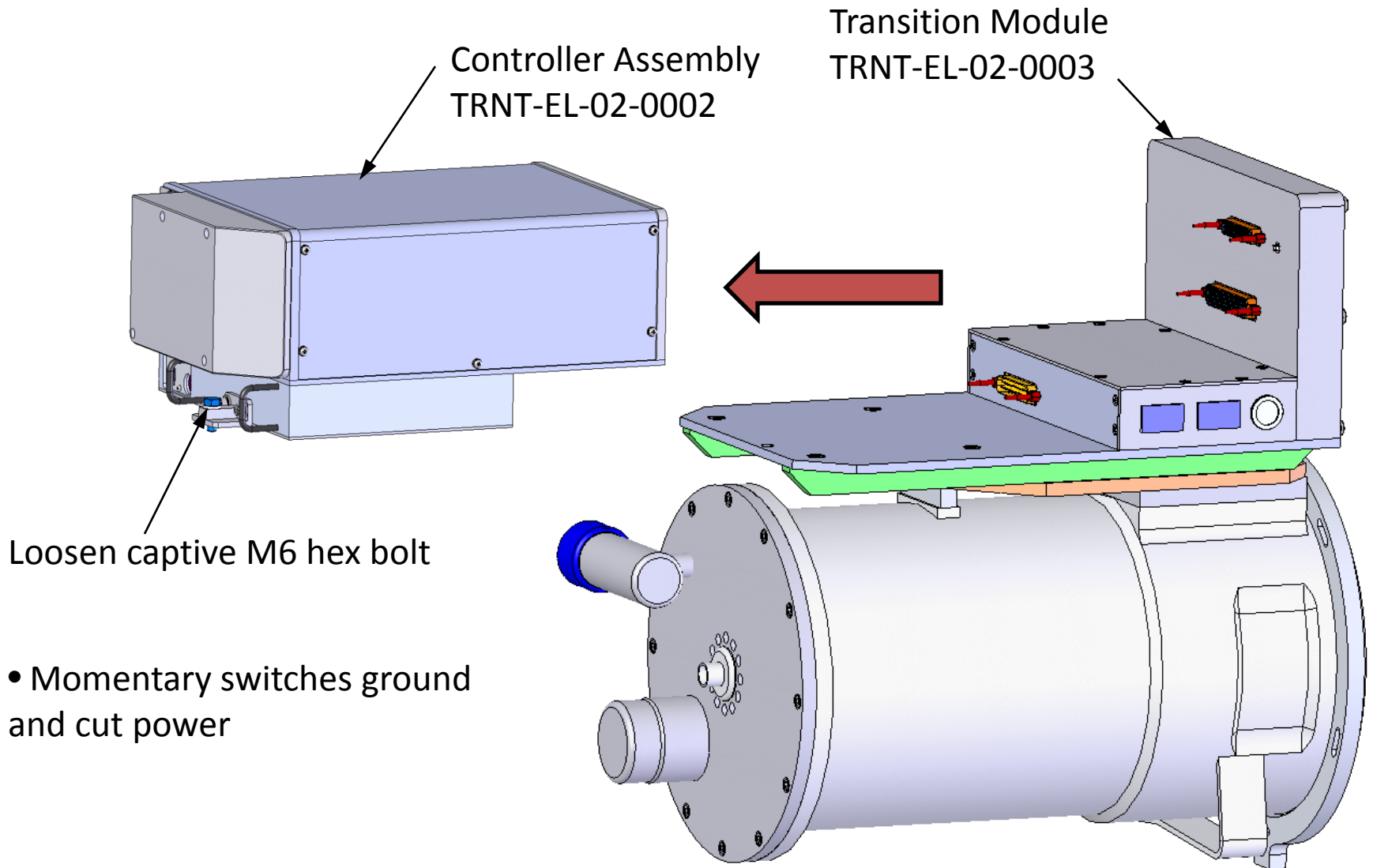
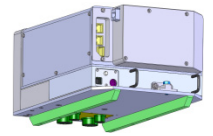




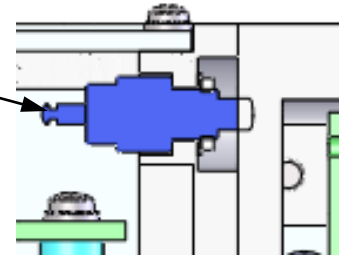
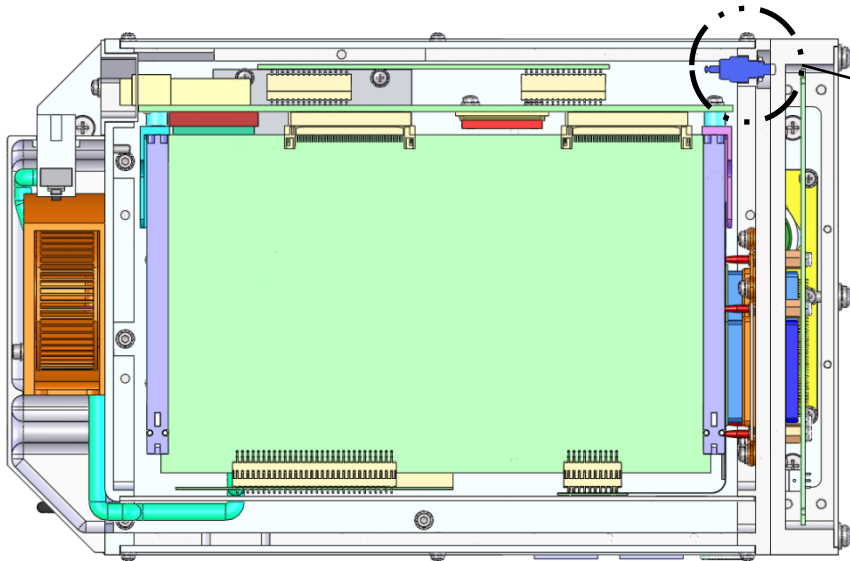
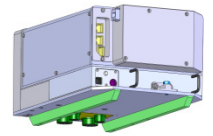
# Controller Installation



# Controller Removal



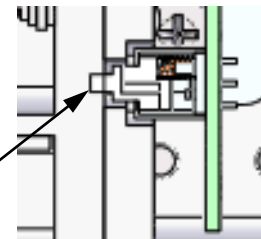
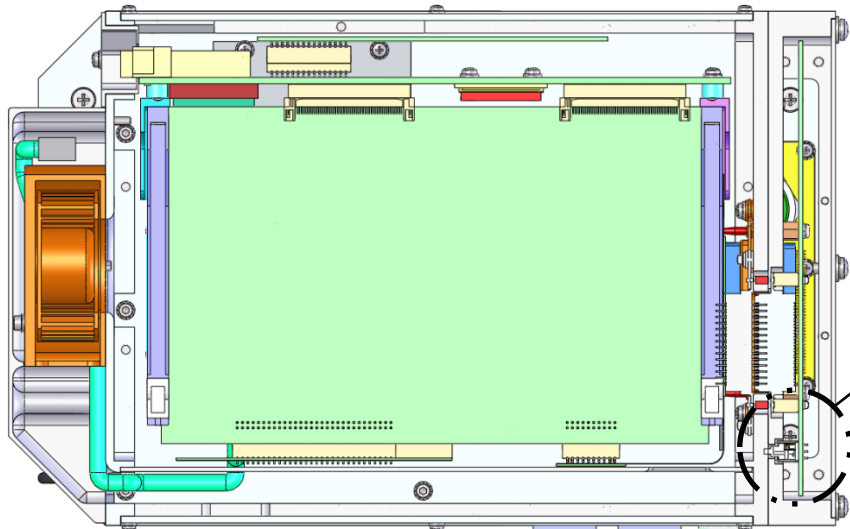
# Momentary Switches



TSM Present Switch  
(C&K Components  
8531MZQE2, SPST,  
.095" travel)

Controller ← ● → TSM

- Cuts power to the Detector when the Controller is removed from the TSM (provides safety interlock for the detector)



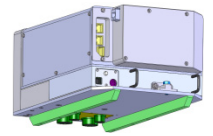
Grounding Switch  
(E-Switch TL 2285 OA,  
TSM preamp board  
mounted, DPDT, .098"  
travel)

Controller ← ● → TSM

- Connects analog ground to chassis (shorts TSM to short CCD substrate)

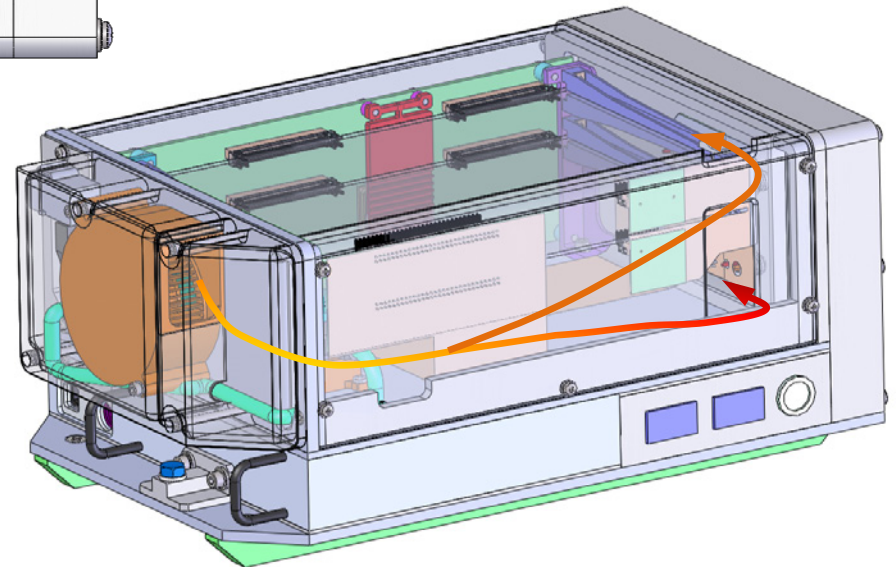
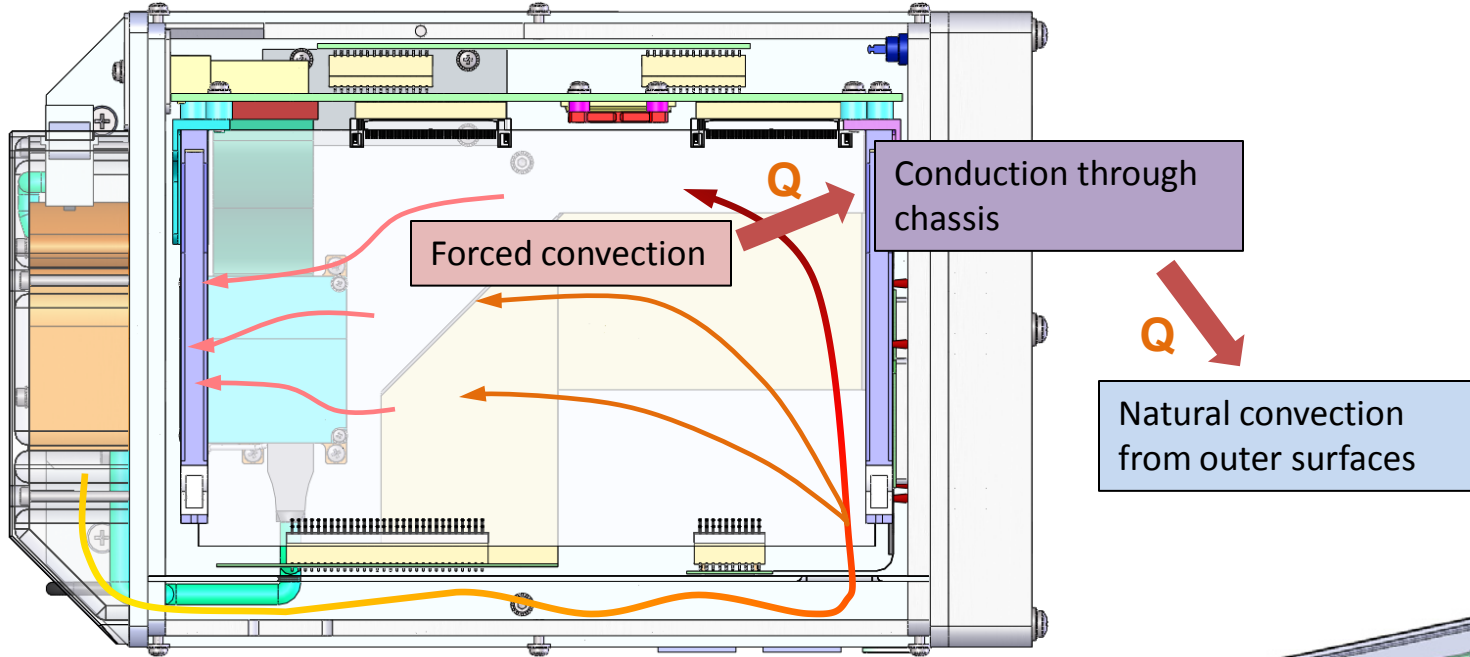
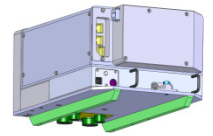
# Thermal Management

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- 44 W power input for fully populated DHE (two AFE boards)
- 30 W power input for fully populated DHE, minus one AFE Board
- Electronic parameters drift with temperature
- Servo control speed of blower to maintain constant component temperatures for a given night (varies the convection coefficient)
- Convection (forced) and conduction inside enclosure
- Natural convection to outside environment

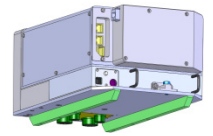
# Heat Transfer



# Mechanical Hardware Manufacture

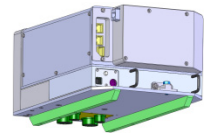
# Assembly / Detail Drawings

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- Complete set of assembly and detail drawings available on a local server in  
\TorrentEngr\DOC\_CTRL\EL-02 and \TorrentEngr\DOC\_CTRL\EL-04
- \EL-02 contains the bulk of the mechanical documentation
- \EL-04 is for the altered items
- The assembly and part files can be opened with e-Drawings (free download from SolidWorks website)

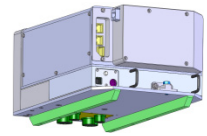
# Materials / Plating



- Cover - 5052-H32 Aluminum Alloy (good for forming)
  - Most remaining machined parts 6061-T6 Aluminum Alloy
  - Where isolation required, G10 fiberglass
  - Parts generally held to  $\pm.005$ " tolerance
  - Parts will be check fit before plating
- 
- Plating requires good heat conduction, durability and shielding properties
  - Aluminum parts will be electroless Nickel plated per ASTM B733-04 Type V, SC1, Class 4 (no masking)
  - This is a high Phosphorus (>10%) content Ni plating that has good EMI shielding characteristics (non-magnetic) and is duller in appearance than the more common lower Phosphorus content Ni coatings
  - The applied plating will be nominally 0.0002" thick.
  - The temperature rise due to the plating is insignificant



# Machined Part / Plating Quotes



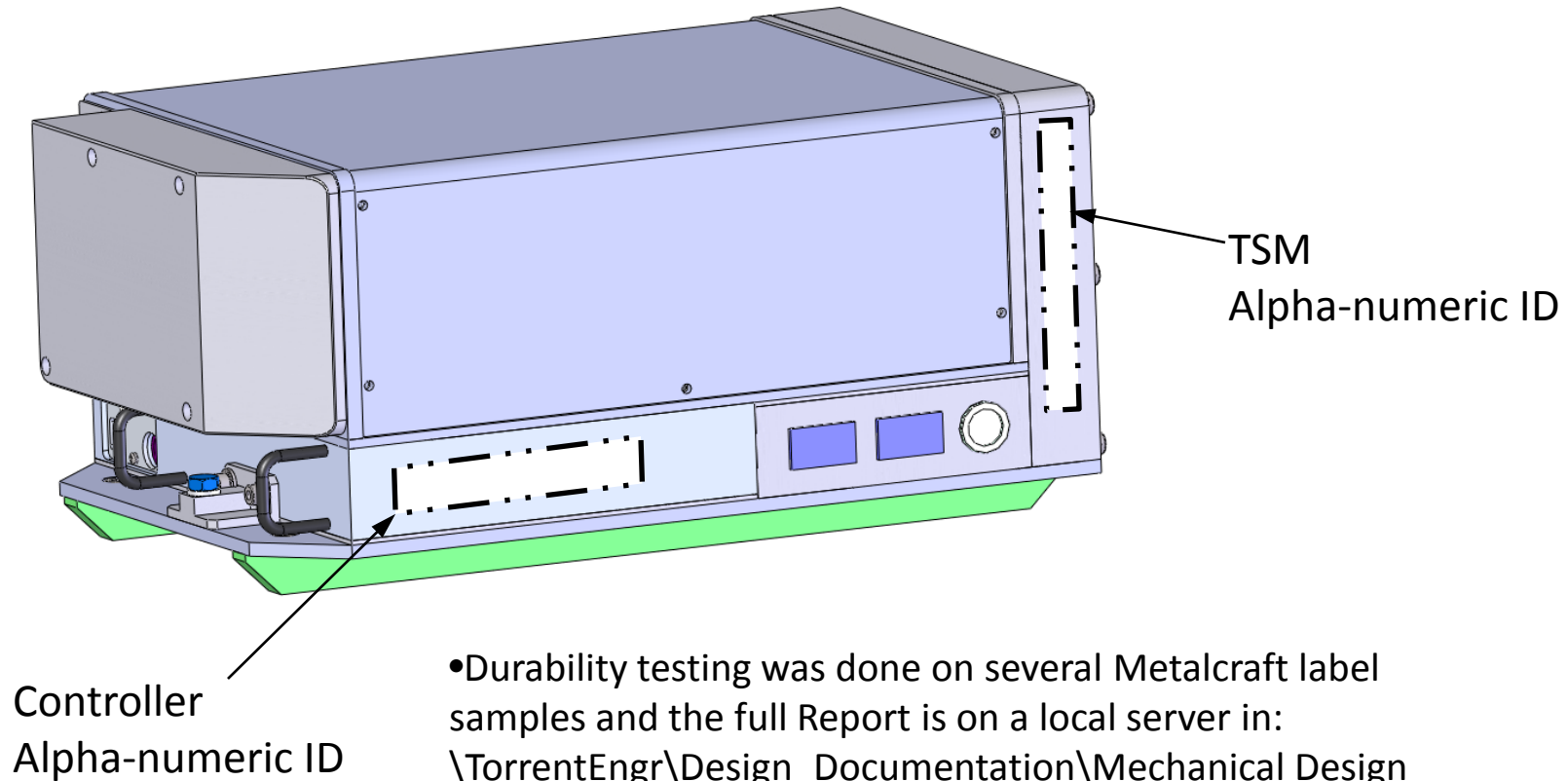
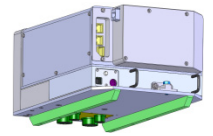
4 bids for machined parts:

	<b>Tahl Inc.</b>	<b>Lindel</b>	<b>Landmark</b>	<b>NOAO</b>
<b>10 units</b>	<b>\$21,670.60</b>	<b>\$22,005.80</b>	<b>\$30,732.40</b>	<b>-</b>
<b>20 units</b>	<b>\$33,564.40</b>	<b>\$35,270.20</b>	<b>\$62,145.00</b>	<b>\$53,823.60</b>
<b>cost ea (10 units)</b>	<b>\$2,167.06</b>	<b>\$2,200.58</b>	<b>\$3,073.24</b>	<b>-</b>
<b>cost ea (20 units)</b>	<b>\$1,678.22</b>	<b>\$1,763.51</b>	<b>\$3,107.25</b>	<b>\$2,691.18</b>

3 bids for Nickel plating:

	<b>Chem Research</b>	<b>Gold Tech Industries</b>	<b>Oasis</b>
<b>10 units</b>	<b>\$2,135.00</b>	<b>pending</b>	<b>-</b>
<b>20 units</b>	<b>\$4,270.00</b>	<b>pending</b>	<b>-</b>
<b>cost ea (10 units)</b>	<b>\$213.50</b>	<b>pending</b>	<b>-</b>
<b>cost ea (20 units)</b>	<b>\$213.50</b>	<b>pending</b>	<b>-</b>

# Torrent Unit Identification



- Durability testing was done on several Metalcraft label samples and the full Report is on a local server in:  
\TorrentEngr\Design\_Documentation\Mechanical Design
- Most durable label was adhesive backed photo anodized Aluminum foil available from Metalcraft (PHF series)

# Backup Slides

