

# ACQ2206 Installation Guide



*High Performance Simultaneous Data Acquisition*

## **ACQ2206** 6-Site D-TACQ ELF/FMC Carrier with High-Speed Comms

© D-TACQ Solutions Ltd.

The material contained in this document is provided "as is", and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, D-TACQ disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

D-TACQ shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein.

Should D-TACQ and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

## Table Of Contents

<b>1 Overview</b>	<b>3</b>
1.1 Product Description . . . . .	3
1.2 Variations and Options . . . . .	3
1.3 Glossary . . . . .	3
<b>2 Front Panel</b>	<b>4</b>
2.1 Standard 1U Front Panel . . . . .	4
2.2 2U Front Panel . . . . .	4
2.3 D-TACQ ELF/FMC Sites . . . . .	6
2.4 LEDs . . . . .	6
<b>3 Front Panel Features</b>	<b>7</b>
3.1 Clock [CLK] . . . . .	7
3.2 Trigger [TRG] . . . . .	7
3.3 Auxilliary Connectors[AUX1 AUX2] . . . . .	7
3.4 TTL or Opto-Coupled Signals . . . . .	7
3.5 Air Inlets . . . . .	8
<b>4 Rear Panel</b>	<b>9</b>
<b>5 Rear Panel Features</b>	<b>10</b>
5.1 Power and Chassis Stud . . . . .	10
5.2 Console [CONSOLE] . . . . .	10
5.3 Ethernet [ETH] . . . . .	10
5.4 Reset [RESET] . . . . .	10
5.5 Sync Bus [SYNC OUT] [SYNC IN] . . . . .	10
5.6 High-speed Comms [SFP+] . . . . .	11
5.7 Fans . . . . .	12
<b>6 ELF/FMC and MGT Module Replacement</b>	<b>13</b>
6.1 Case Opening . . . . .	13
6.2 ELF/FMC Mezzanine Module Removal . . . . .	14
6.2.1 Card replacement Detail VHDCI Connector . . . . .	14
6.3 MGT Card replacement . . . . .	15
<b>7 Specifications</b>	<b>16</b>
7.1 Declaration of Conformity . . . . .	16
7.2 Warranty . . . . .	16
<b>8 Mounting Options</b>	<b>16</b>
<b>9 Dimensions</b>	<b>18</b>
<b>10 Changelog</b>	<b>19</b>

# 1 Overview

## 1.1 Product Description

The ACQ2206 is a 1U (2U option), 19" rack-mountable carrier designed to accommodate up to six D-TACQ ELF or FMC modules, allowing up to 192 simultaneous analog data acquisition channels in one enclosure. ACQ2206 provides multiple high-speed comms links for high data throughput as well as gigabit Ethernet or USB 2.0 options. The system uses a Xilinx Zynq-7000 All Programmable SoC Z-7030 running Linux. External front panel Clock and Trigger inputs are also provided.

## 1.2 Variations and Options

ACQ2206 can be configured for multiple high-speed comms options. For other options including USB and local storage please contact [support@d-tacq.com](mailto:support@d-tacq.com). The ACQ2206 provides on-board Analog Power for D-TACQ ELF modules which can be configured for various voltage levels contact D-TACQ for details.

## 1.3 Glossary

- FMC : VITA57.1 FPGA Mezzanine Card
- ELF : Electrically Extended FMC, implies ULPC or DULPC (only compatible with D-TACQ carriers)
- LPC : FMC Low Pin Count standard as per VITA57.1
- ULPC : Subset by D-TACQ, Ultra Low Pin Count
- DULPC : Subset by D-TACQ, Differential Ultra Low Pin Count (ULPC with extra differential signalling)
- Xilinx ZYNQ System on Chip (SoC)
- FPGA : Field Programmable Gate Array

## 2 Front Panel

### 2.1 Standard 1U Front Panel

This is the standard ACQ2206 Front Panel for 6 VHDCI cut outs.

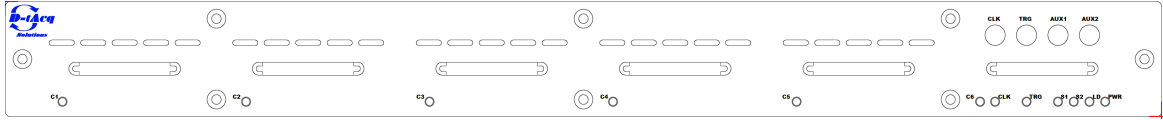


Figure 1: Standard Front Panel

All ACQ2106 Front Panel options are supported. Contact D-TACQ for details including custom panels.

### 2.2 2U Front Panel

This is an optional ACQ2206 Front Panel for dual pin LEMO Connectors.

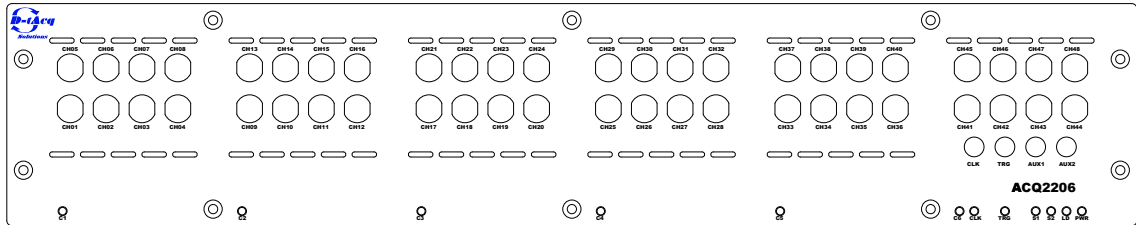


Figure 2: 2U Front Panel For Dual Pin LEMOs

Typical connections to the Front Panel are shown in the picture below.



Figure 3: Front Panel Connections

This picture shows (from left to right):

- A VHDCI Cable plugged into SITE 1, this connects to Customer Equipment for Analog Input etc. This could also be connected to a breakout panel like the D-TACQ [BNCPANEL](#)
- Single Pin LEMO Cables plugged into the CLK and TRG LEMO Connectors

## 2.3 D-TACQ ELF/FMC Sites

ACQ2206 has space for six D-TACQ ELF/FMC modules. Please note the sites are not recommended for third-party FMC modules. Please contact [support@d-tacq.com](mailto:support@d-tacq.com) for details on our range of data acquisition modules, see Section 6.2.1 for details on field replacement. Cable connections to the Front Panel depend on the Mezzanines fitted. In a typical system like that shown in Section 2.1 the shown connector is attached to Customer Equipment for Analog Input etc. This could also be connected to a breakout panel like the D-TACQ [BNCPANEL](#).

## 2.4 LEDs

Upon power-up, the PWR LED should light, followed 20s later by LD to indicate loading of the FPGA. When Linux boots, an LED test sequence will be shown, showing red and green on each LED.

LED	Description	
C1-C6	Green	Card present, valid configuration. Analog power enabled if all cards are valid.
	Red	Card present, invalid configuration. Analog Power disabled if any card is invalid.
CLK	Green	Lit when a valid clock signal is in use.
	Red	Unused at present.
TRIG	Green	Lit when a valid trigger signal is being received.
	Red	Unused at present.
S1	Green	Unused at present. Available for user use.
	Red	Unused at present. Available for user use.
S2	Green	Heartbeat – flashes to indicate Linux activity.
LD	Green	Lights approximately 20s after power-up to indicate FPGA loaded. If unlit after this, check the validity of the SD card image or check the Console for error messages.
PWR	Green	Lit when digital power supplies are all valid.

Table 1: Front Panel LEDs

## 3 Front Panel Features

### 3.1 Clock [CLK]

The ACQ2206 accepts a clock input signal via a centre-positive single-pin LEMO 00 Series Mini Coax connector (part EPL.00.250.NTN). Mating plugs should be compatible with this part.

### 3.2 Trigger [TRG]

The ACQ2206 accepts a trigger input signal via a centre-positive single-pin LEMO 00 Series Mini Coax connector (part EPL.00.250.NTN). Mating plugs should be compatible with this part.

### 3.3 Auxilliary Connectors[AUX1 AUX2]

These are two I/O signals, input only when configured as Opto-Coupled. These signals can be used to provide additional synchronisation inputs or can be used to output signals from the ACQ2206, for example Clock and or Trigger. Further details can be found in the user guide at [D-TACQ Resource / User Guides](#).

### 3.4 TTL or Opto-Coupled Signals

All Front Panel LEMO input signals can be configured as either 5V TTL inputs or Opto-Coupled inputs. The Opto-Coupled inputs are of type TLP2367. See Table 4 below for the Opto-Coupler characteristics; if higher input voltages are required a user in-line resistor may be used to reduce the input voltage at the connector. Contact [support@d-tacq.com](mailto:support@d-tacq.com) to verify any setup.

The factory shipping settings on the Top Deck Switches are as follows

Signal	Default Setting
Clock	Opto-Coupled Input
Trigger	Opto-Coupled Input
AUX1	TTL Input/Output
AUX2	TTL Input/Output

Table 2: Front Panel I/O Default Switch Positions

When configured as TTL inputs or outputs the signals have the following electrical specification. Note Clock and Trigger are input only.

Parameter	Value
TTL Input Low Voltage	< 1.5V <sup>1</sup>
TTL Input High Voltage	> 3.5V <sup>1</sup>
Minimum Input Voltage	-0.5V <sup>2</sup>
Maximum Input Voltage	5.5V <sup>2</sup>
TTL Output Low Voltage	< 0.55V <sup>3</sup>
TTL Output High Voltage	> 3.8V <sup>3</sup>
TTL Max Output Current	24 mA

<sup>1</sup> Trigger Input has a guaranteed hysteresis of 700mV

<sup>2</sup> Inputs have under/over voltage protection up to 100mA

<sup>3</sup> Output Voltages at specified Max Current

Table 3: TTL Input and Output Characteristics

When configured as Opto-Coupled inputs the signals have the following electrical specification.

Parameter	Value
Input Low Voltage	< 0.6V
Input High Voltage	> 4V
Minimum Input Voltage	-5V
Maximum Input Voltage	9V
Min ON LED Current	4 mA
Max LED Current	15 mA

Table 4: Opto-Coupled Input Characteristics

Each signal is independently selected for TTL or Opto-coupled using individual switches on the FP Top-Deck. This board is accessed by removing the top cover of the ACQ2206 and is located immediately behind the Front Panel LEMO connector.

Selecting the signalling type for each signal required two switches to be set as follows.

Setting	SWAn	SWBn
Opto-Coupled Input	B	B
Bypass/TTL Input/Output	A	A

Table 5: Front Panel TTL / Opto Switch Positions

The Top Deck Switches are shown in the picture below.

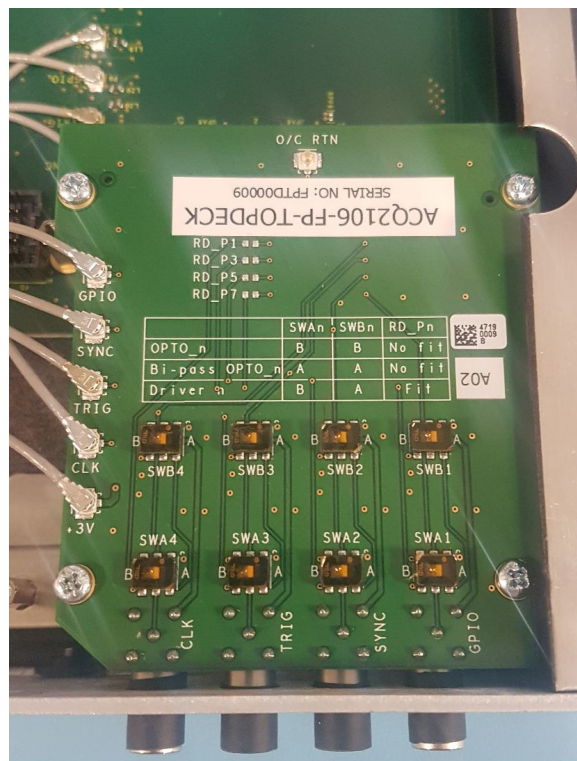


Figure 4: Top Deck Switches

### 3.5 Air Inlets

The row of slots above the module front panel sites allow air to enter ACQ2206, drawn across the cards by the rear fans. Do not cover the air inlets.



## 4 Rear Panel

The ACQ2206 rear panel is shown below.

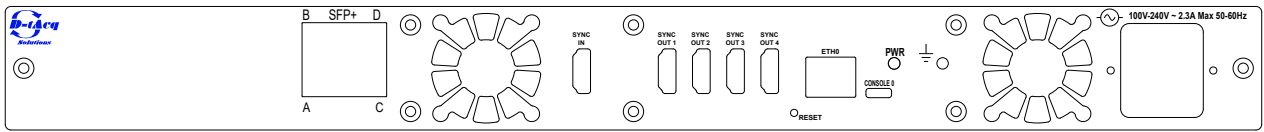


Figure 5: Rear Panel

Typical connections to the Rear Panel are shown in the picture below.



Figure 6: Rear Panel Connections

This picture shows (from left to right):

- A SFP+ Cable plugged into the "A" socket
- HDMI Cables plugged into the IN Connector and to the OUT 1 Connector
- A CAT 5e Cable plugged into the ETH0 Connector
- A micro USB cable plugged into the CONSOLE connector
- A IEC Power connector plugged into the micro USB cable plugged power inlet

## 5 Rear Panel Features

### 5.1 Power and Chassis Stud

Power is provided to ACQ2206 by a standard IEC 3 pin AC inlet. A rocker switch allows the ACQ2206 to be powered on or off.

#### **⚠ WARNING**

**For protection from electrical shock, the power cord ground must not be defeated. If only a two-contact electrical outlet is available, connect the system's chassis ground stud (adjacent to the power supply see Figure 5 ) to a good earth ground.**

The ground stud is located next to the earth symbol :



A green Power on LED is provided to indicate that the power is on.

### 5.2 Console [CONSOLE]

ACQ2206 uses an FTDI FT232R USB-Serial converter for console access via a Micro USB port. Please see the FTDI website for drivers. Serial Console settings are as follows.

Name	Setting
Baud Rate	115200
Data Bits	8
Parity	No
Stop Bits	1
Flow Control	None

Table 6: Serial Console Settings

### 5.3 Ethernet [ETH]

A single gigabit Ethernet port is provided that accepts standard RJ45 connectors.

### 5.4 Reset [RESET]

The Reset Push Button is recessed, use a paper clip or pin to push the reset button if required.

### 5.5 Sync Bus [SYNC OUT] [SYNC IN]

ACQ2206 provides 5 Sync Bus connectors allowing multiple units to be chained together. The bus uses standard HDMI cables (typically provided by the customer) and has one input port and 4 output ports these are labelled SYNC IN and SYNC OUT 1 ... SYNC OUT4.

The sync bus uses +3.3V CMOS logic and is compatible with D-TACQ ACQ1001, ACQ1002 and ACQ2106 carriers. Breakout modules (TERM05, TERM10, TERM11 see [Termination Modules](#)) providing various connector and signal options are also available.

The sync ports may also be used for digital I/O in some customer applications. Please contact [support@d-tacq.com](mailto:support@d-tacq.com) for details.

**Please note the system is not capable of connecting to a monitor – the ports may only be used for digital I/O.**

The pinouts and functionality are described as follows.

Pin	Name	Description	
		Output Connector	Input Connector
1	Sync	Synchronisation Output	Synchronisation Input
4	Trigger	Trigger Output	Trigger Input
7	GPIO	General Purpose Output	General Purpose Input
10	CLK	Clock Output	Clock Input
19	Cable Detect	Allows master to detect the presence of a slave device.	Ground (0VD)
18	+3.3V	+3.3V input from slave to power output signals	+3.3V output to master to power output signals
13,14,15,16	NC	Not connected	
2,3,5,6,8,9,11,12,17	GND	Ground (0VD)	

Table 7: HDMI Connector Pin Out

## 5.6 High-speed Comms [SFP+]

ACQ2206 is capable of providing multiple high-speed comms options. This is provided by an optional auxiliary module that is connected to the Main ACQ2206 PCB inside the enclosure. The available modules are summarised below, contact [support@d-tacq.com](mailto:support@d-tacq.com) for more details.

- MGT483 - Up to four SFP+ Fiber ports. Standard Configuration is
  - 2 x Xilinx Aurora Ports for connection to a Host Computer with D-TACQ [AFHBA404](#)  
Uses Ports A & B by default
  - 1 x White Rabbit Gigabit Ethernet Port.  
Uses Port C by default
  - 1 x Fibre Gigabit Ethernet 1000Base-X or HUDP (Hardware UDP) Gigabit Ethernet Port.  
Uses Port D by default
- MGT483-10G - Two SFP+ Fiber ports. High Speed Comms configuration is
  - 1 x White Rabbit Gigabit Ethernet Port.  
Uses Port C by default
  - 1 x 10G Fibre Ethernet 10GBase-X HUDP (Hardware UDP) Port.  
Uses Port D by default
- MGT508 - Intelligent board with up to four SFP+ Fiber ports, 2xUSB 3 ports, and up to 16GBytes of Memory

The SFP Connectors and LEDs of the MGT483 are shown in the diagram below.

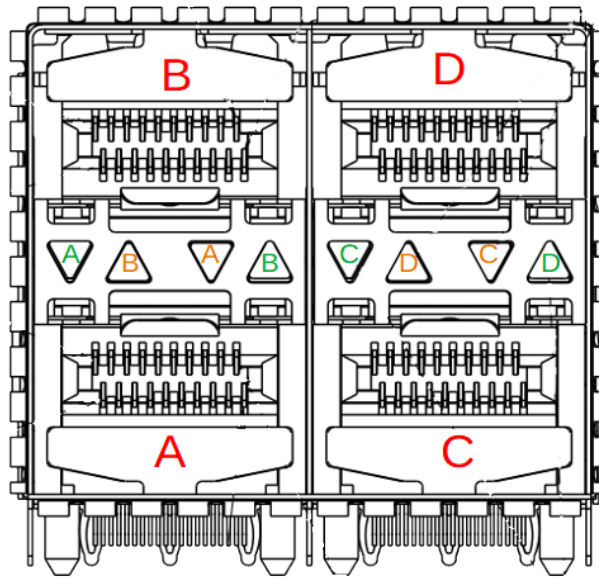


Figure 7: SFP Connectors and LEDs

The default LED behaviour is as follows.

- Green LED (A B C D) = SFP Module Present
- Amber LED (A B C D) = SFP Module is Enabled

## 5.7 Fans

Fan outlets help keep ACQ2206 cool, drawing air across the modules from front to back. Do not cover the fan outlets.

Airflow may be reversed as a factory option.

## 6 ELF/FMC and MGT Module Replacement

The modular ELF or FMC modules and the MGT module may be replaced by the user. Contact [support@d-tacq.com](mailto:support@d-tacq.com) for more detailed instructions.

### WARNING

**The system should be disconnected from the mains supply and ESD precautions taken before attempting to open the ACQ2206 Assembly.**

Third-party modules may not be compatible with the D-TACQ mechanical superset of the FMC specification and undesired effects may occur. ACQ2206 includes power rails on the mezzanine connectors for D-TACQ ELF modules and therefore only uses certain pins for FPGA connections. Please contact D-TACQ to check compatibility if you wish to use third-party FMC modules with ACQ2206. A better option may be to use ACQ1001Q-FMC (single-site carrier), ACQ1002R-FMC or ACQ1002S-FMC (both dual-site: 1x FMC, 1x ELF) which are all fully compliant with the FMC standard.

ACQ2206 is a complex electronic assembly. Special care should be taken in handling. The cards are susceptible to damage by ESD and improper power connections or FPGA configurations.

1. Ensure the correct FPGA image is available for the new module configuration.
2. Ensure the system is disconnected from the mains.
3. Ensure ESD precautions (chassis and body grounding) are taken before and during the opening of the case.
4. Please be extremely careful to ensure correct module alignment when plugging in the modules to avoid mezzanine module pin damage.

### 6.1 Case Opening

1. Remove the 6 screws on the top panel.
2. Remove the 3 screws at the top of each of the front and rear panels.
3. Lift the lid off.

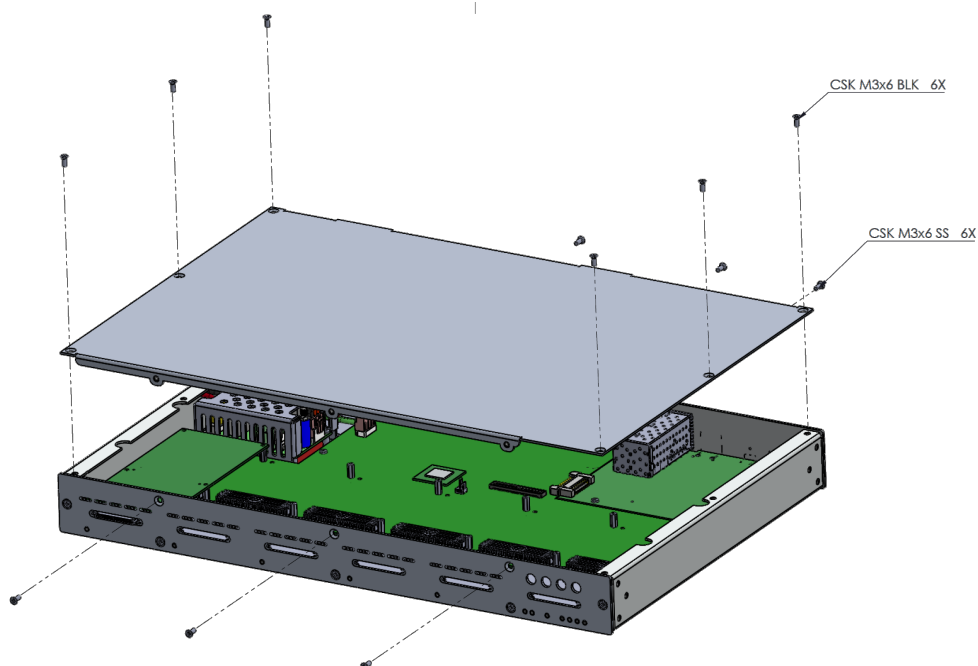


Figure 8: ACQ2206 Top Cover Removal

The case with the lid off should appear as per the diagram below, shown with a D-TACQ ELF module in Site 1.

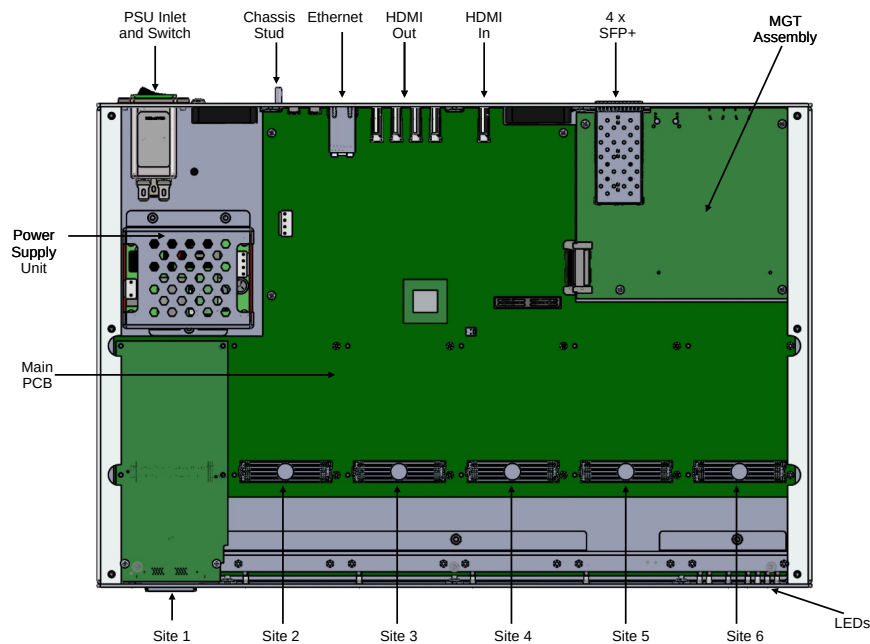


Figure 9: ACQ2206 Open Case View

## 6.2 ELF/FMC Mezzanine Module Removal

1. Remove the 2 screws locks at the front.
2. Remove the 4 screws at the front and rear of the module. Remove the 2 screws in the centre of D-TACQ Extended Length modules.
3. Carefully lift the card away from the mezzanine connector. Note that not a lot of force is required to do this and the module should not bend.
4. Nudge the module out from the front panel.

### 6.2.1 Card replacement Detail VHDCI Connector

When fitting a new module with a VHDCI connector an adhesive backed VHDCI SHIM (part number: 1350-1093-001) is required as shown in the diagram below.

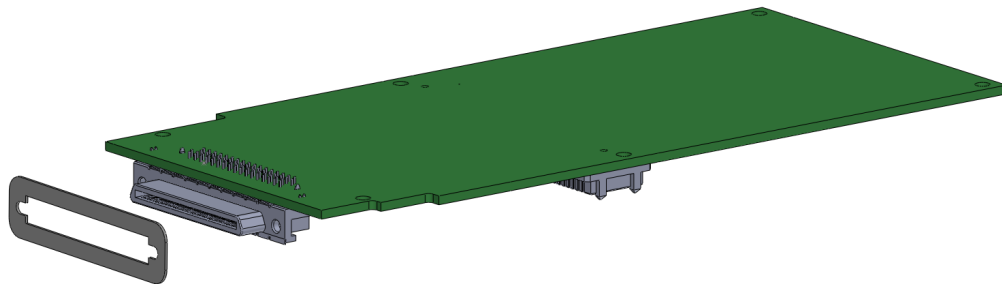


Figure 10: VHDCI Shim on ELF Module



Use the screw locks and secure the module to the Front Panel to give the final assembly shown below.



Figure 11: VHDCI Screwlocks

Close the Case as follows:

1. Follow the instructions in Section 6.1 in reverse order.
2. Ensure the correct FPGA and Software images are installed prior to powering up.

### 6.3 MGT Card replacement

1. Loosen the rear panel screws to allow the SFP cage to be pushed away from the panel.
2. Remove the screws to the MGT Mezzanine as shown in the the picture below.
3. Slide the MGT board from MGT connector by pulling the board towards the side panel.
4. Lift up the MGT mezzanine and slide it out of the enclosure.
5. Fit the new mezzanine by following these instructions in reverse.

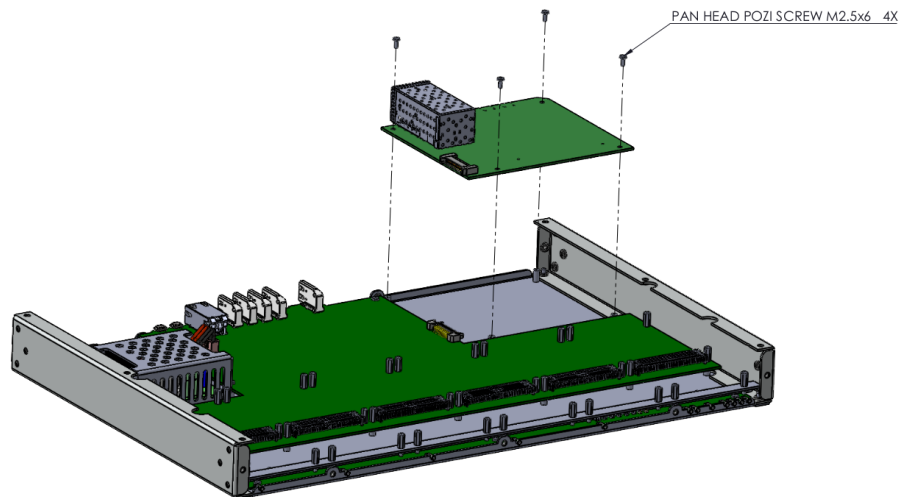


Figure 12: MGT Removal/Replacement

Close the case as follows:

1. Follow the instructions in Section 6.1 in reverse order.
2. Ensure the correct FPGA and Software images are installed prior to powering up.

## 7 Specifications

Parameter	Description
Form Factor	Standard 1U 19" Chassis <sup>1</sup>
Power Input	Standard IEC 60320 C14 AC Inlet
AC Input	100-240V~2.3A Max 50-60Hz
Power Consumption	Dependent on payload but typically 15-25W + 10W per site. Maximum 114W <sup>2</sup>
Environmental	0°C - 50°C Operational -10°C - 85°C Non-Operational
Standard Case Dimensions	Width 441 mm x 296 mm Depth x 1U High
Channel Panel Case Dimensions	Width 441 mm x 316 mm Depth x 1U High

<sup>1</sup> 2U Configurations available for additional connector options

<sup>2</sup> Maximum power de-rated for input voltage below 120V. Contact [support@d-tacq.com](mailto:support@d-tacq.com) for details.

Table 8: ACQ2206 Specifications

### 7.1 Declaration of Conformity

The ACQ2206 complies with International safety and EMC requirements.

Declarations of Conformity for this product and for other D-TACQ products can be found on the website

See [Declarations of Conformity](#)

**Note: The ACQ2206 Standards approval is pending at this time, the web link is not active**

### 7.2 Warranty

© D-TACQ Solutions Ltd.

The material contained in this document is provided "as is", and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, D-TACQ disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

D-TACQ shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein.

Should D-TACQ and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control. This equipment is not suitable for use in locations where children are likely to be present.

## 8 Mounting Options

ACQ2206 mounts in a 19" rack. Please contact [support@d-tacq.com](mailto:support@d-tacq.com) for options.

Mounting of the 19" rack mount lugs are shown in the diagrams below, these are on on both the left and right of the case.



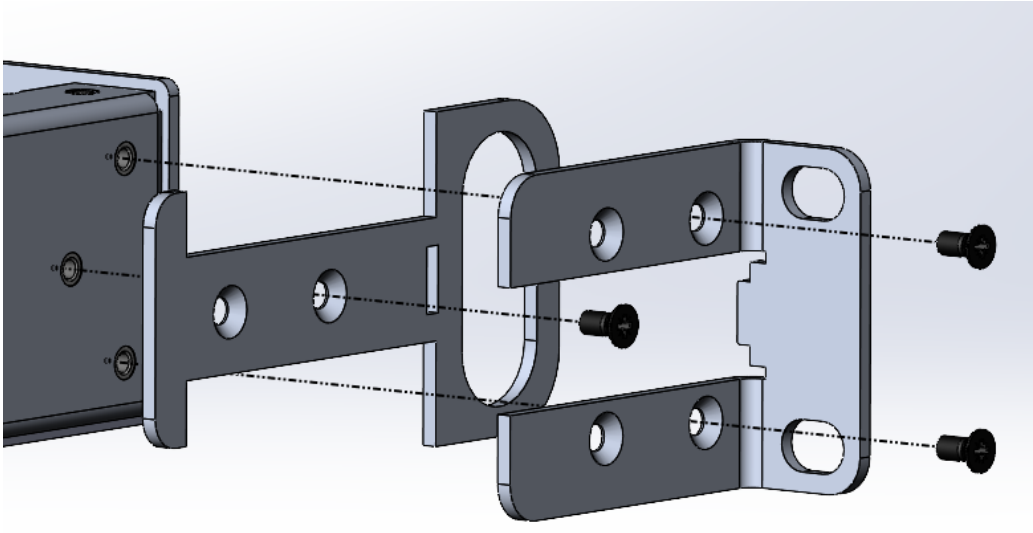


Figure 13: Standard Case Rack Mount

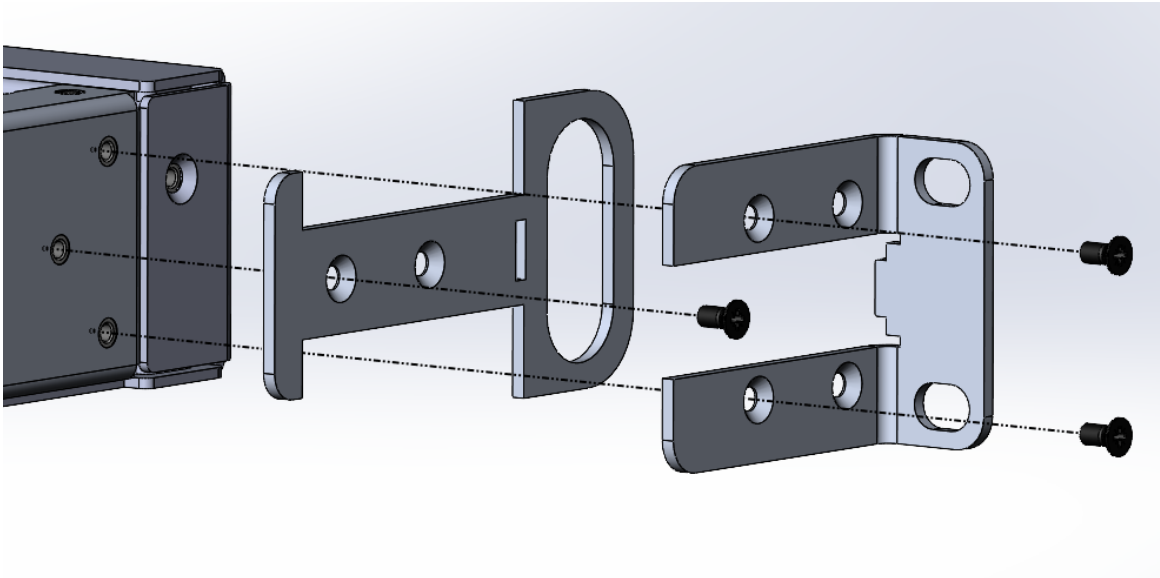


Figure 14: Channel Panel Case Rack Mount

## 9 Dimensions

The dimensions of the Standard case and the Channel Panel case are shown below.

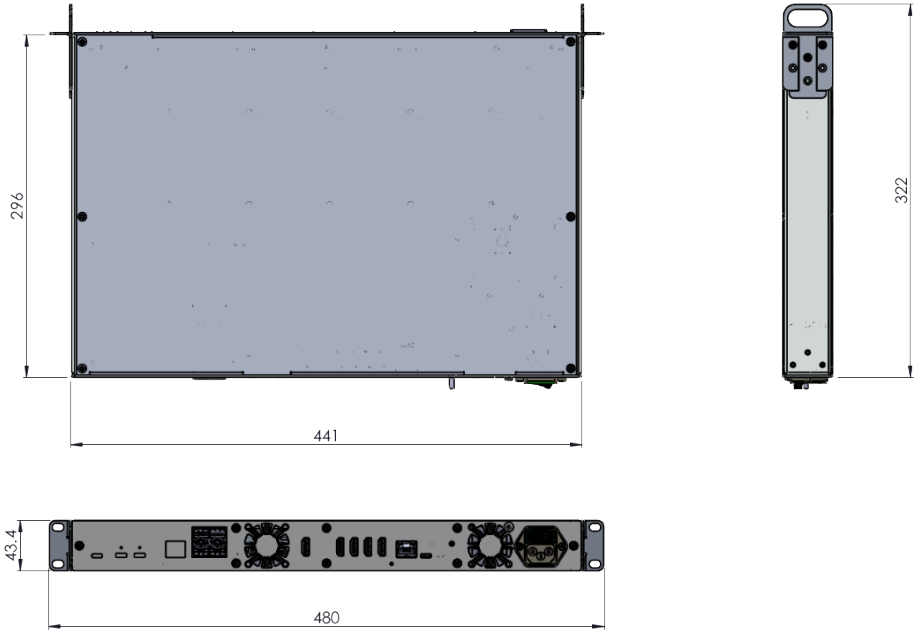


Figure 15: ACQ2206 Standard Case Dimensions (mm)

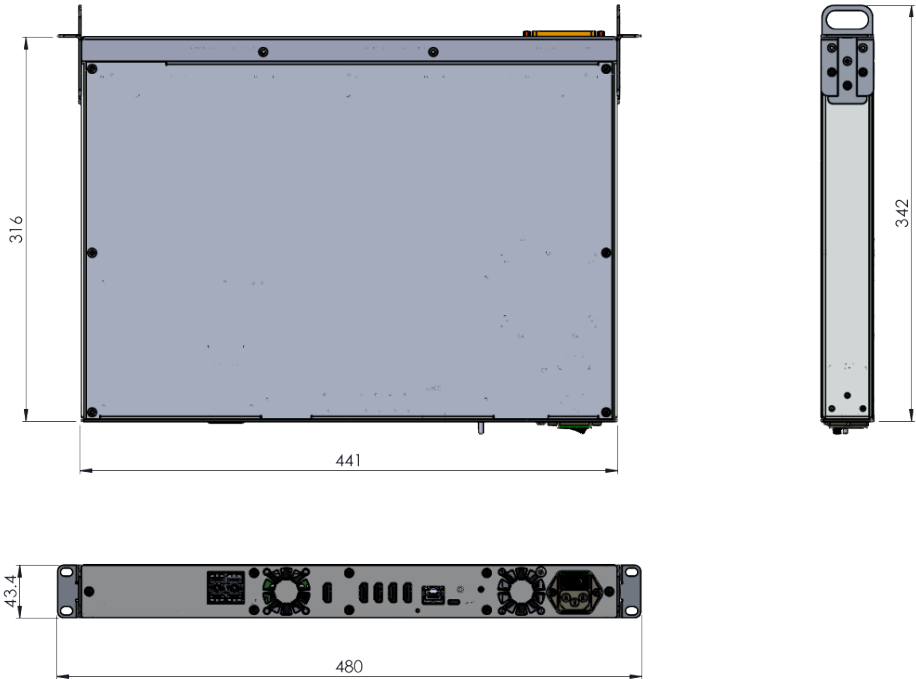


Figure 16: ACQ2206 Channel Panel Case Dimensions (mm)

## 10 Changelog

### Revision History

Revision	Date	Author(s)	Description
1	February 2023	JMcL	Initial Draft
1b	May 2023	JMcL	Updates to AC Input Voltage
2	June 2023	JMcL	Updates to AC Input
3	August 2023	JMcL	Include Channel Panel Dimensions
4	October 2023	JMcL	Added Top Cover Removal Diagram
5	November 2023	JMcL	Added SFP LED Detail
6	December 2023	JMcL	Added MGT Removal and Replacement
7	June 2024	JMcL	Added detail on Earth Symbol for Grounding Stud, Updated Warranty
8	September 2024	JMcL	Updated Electrical Specification
9	October 2024	JMcL	Additional Front and Rear Panel connection details