



Hardware Installation Guide

ACQ2106

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

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Table of Contents

1	Overview.....	3
1.1	Product Description.....	3
1.2	Variations and Comms Options.....	3
1.3	Glossary.....	3
2	Front Panel.....	4
2.1	ACQ2106 Type 1.....	4
2.2	ACQ2106 Type 2.....	4
2.3	D-TACQ ELF/FMC Sites.....	4
2.4	LEDs.....	4
2.5	Front Panel Connectors.....	5
2.5.1	Type 1 Front Panel.....	5
2.5.1.1	Clock.....	5
2.5.1.2	Trigger.....	5
2.5.2	Type 2 Front Panel.....	5
2.5.2.1	TTL or Opto-Coupled Signals.....	5
2.5.2.2	Aux and GPIO.....	5
2.6	Air Inlets.....	6
3	Rear Panel.....	6
3.1	Console.....	6
3.2	Sync Bus.....	6
3.3	High-speed Comms.....	7
3.4	USB.....	7
3.5	Ethernet.....	7
3.6	Reset.....	7
3.7	Power.....	7
3.8	Fans.....	7
4	D-TACQ ELF/FMC Card Replacement.....	8
4.1	Case Opening.....	8
4.2	Mezzanine Card Removal.....	8
4.3	Card replacement and Case Closing.....	8
5	Specifications.....	9
6	Mounting Options.....	10
7	Dimensions.....	11
8	Changelog.....	12

1 Overview

1.1 Product Description

ACQ2106 is a 1U, 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. ACQ2106 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.

Please note the ACQ2106 is not recommended for use with third-party FMC modules.

1.2 Variations and Comms Options

ACQ2106 can be configured for multiple high-speed comms options. For other options including PCIe or local storage please contact D-TACQ.

Product Name	Description
ACQ2106+SFP4	Connectivity via up to 4x 5Gbps SFP+ Fiber Optic ports.

Analog voltage is set to $\pm 13V$ as standard, but please contact D-TACQ for alternatives.

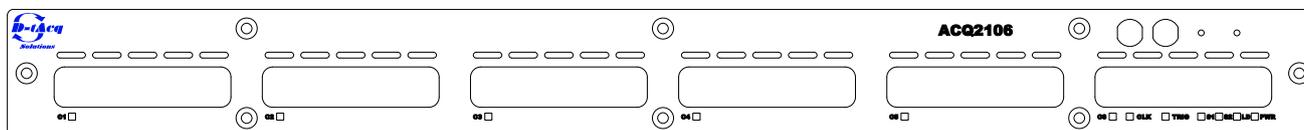
1.3 Glossary

- *FMC*: [FPGA Mezzanine Card, ANSI/VITA 57.1](#)
- [Xilinx ZYNQ SoC](#)
- *FPGA*: Field Programmable Gate Array
- *LPC*: FMC Low Pin Count wiring standard
- *ULPC*: FMC Ultra Low Pin Count (D-TACQ)
- *DLPC*: FMC Ultra Low Pin Count with extra signalling per site (D-TACQ)
- Extended, *ELF*: D-TACQ Mechanical Superset of FMC Standard

2 Front Panel

2.1 ACQ2106 Type 1

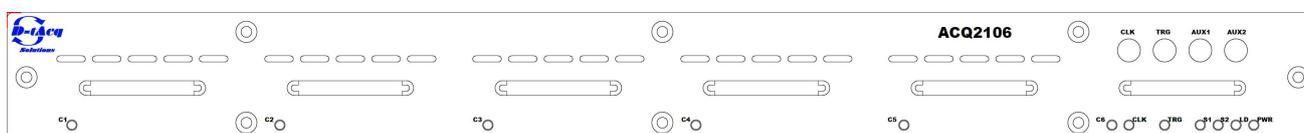
This is the original ACQ2106 Front Panel Manufactured until early 2020. The Front Panel appearance is shown below



Drawing 1: Type 1 ACQ2106 Front Panel

2.2 ACQ2106 Type 2

This is the updated ACQ2106 Front Panel Manufactured from early 2020. The Front Panel appearance is shown below, for 6 VHDCI cut outs.



Drawing 2: Type 2 ACQ2106 Front Panel

2.3 D-TACQ ELF/FMC Sites

ACQ2106 has space for six D-TACQ ELF/FMC modules. Please note the sites are not recommended for third-party FMC modules. Please contact D-TACQ for details on our range of modular data acquisition cards, and see section 4 for details on field replacement.

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	Red	Card present, invalid configuration. Analog Power disabled if any card is invalid.
	Green	Card present, valid configuration. Analog power enabled if all cards are valid.
CLK	Red	Unused at present.
	Green	Lit when a valid clock signal is in use.
TRIG	Red	Unused at present.
	Green	Lit when a valid trigger signal is being received on the rear panel connector.
S1	Red	Unused at present. Available for user use.
	Green	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.

2.5 Front Panel Connectors

2.5.1 Type 1 Front Panel

2.5.1.1 Clock

ACQ2106 accepts a clock 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.

ACQ2106 can also provide up to two additional front panel connections if required. Contact D-TACQ for more information.

It is common practice for customers to manufacture their own cables to fit in with their own requirements.

2.5.1.2 Trigger

ACQ2106 accepts a trigger 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.

ACQ2106 can also provide up to two additional front panel connections if required. Contact D-TACQ for more information.

It is common practice for customers to manufacture their own cables to fit in with their own requirements.

2.5.2 Type 2 Front Panel

Type 2 Front panel provides up to 4 Front Panel LEMO connectors these provide the same Clock and Trigger functionality as Type 1 but with additional features:

2.5.2.1 TTL or Opto-Coupled Signals

All Front Panel LEMO input signals can be configured as either original 3.3V(or 5V) TTL inputs or opto-coupled inputs.

The Opto-coupled inputs are of type TLP2367 5V inputs. The minimum input voltage is 4.5V and the maximum input voltage of 6V; the source must supply at least 6mA to ensure correct operation. If higher voltages are required a user in-line resistor may be used to reduce the input voltage at the connector contact D-TACQ to verify any setup.

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 ACQ2106 and is located immediately behind the Front Panel LEMO connectors

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

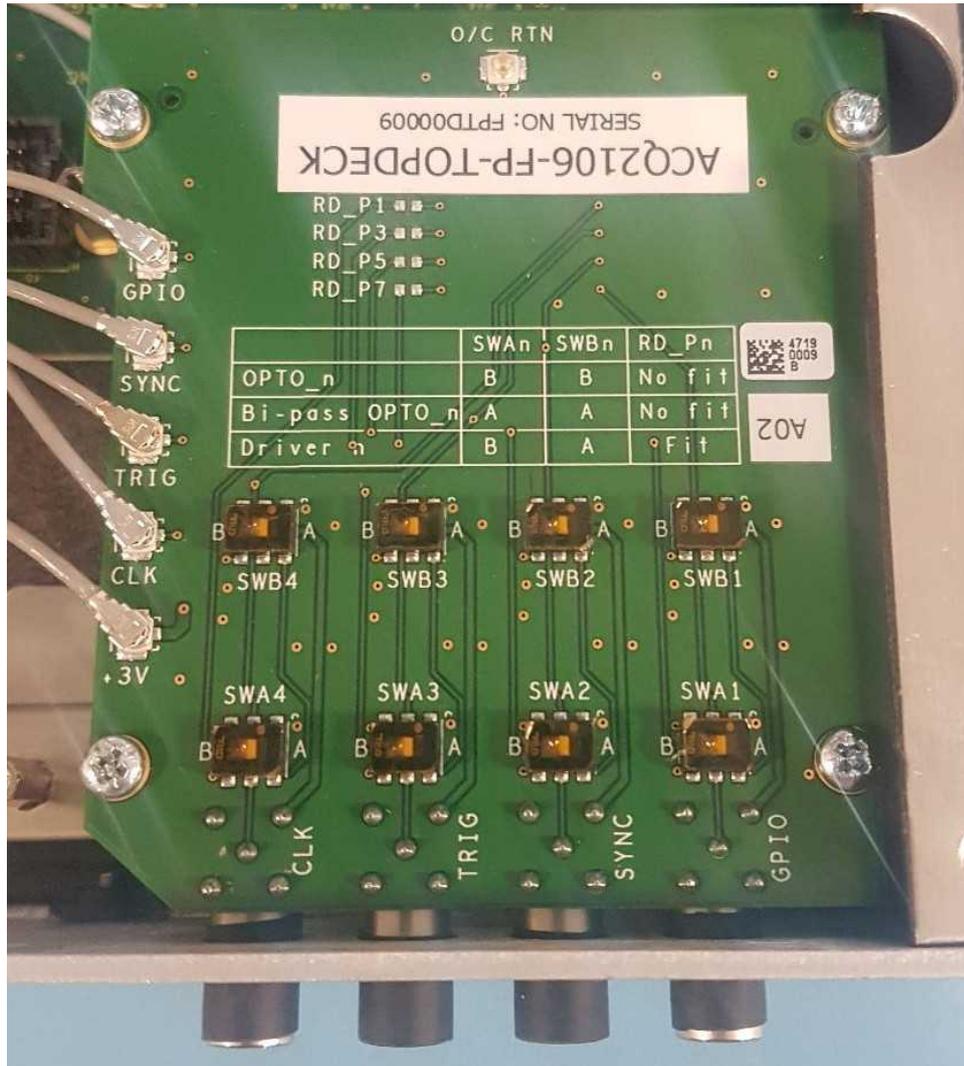
	SWAn	SWBn
Opto-Coupled Input	B	B
Bypass/TTL Input	A	A

2.5.2.2 Aux and GPIO

These two signal are 3.3V TTL 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 ACQ2106, for example Clock and or Trigger. Further details can be

found in the user guide at http://d-tacq.com/details_page.php?prod_id=contact&page_id=2



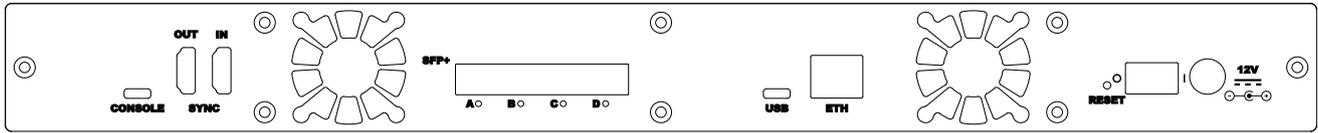
Type2 Front panel, CLK/TRG/AUX Lemo Connections Detail

2.6 Air Inlets

The row of slots above the module front panel sites allow air to enter ACQ2106, drawn across the cards by the rear fans. Do not cover the air inlets.

3 Rear Panel

From left to right, the ACQ2106 rear panel is shown below.



Drawing 3: Typical ACQ2106 Rear Panel

3.1 Console

ACQ2106 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

3.2 Sync Bus

D-TACQ provides two Sync Bus connectors allowing multiple units to be chained together. The bus uses standard HDMI cables (typically provided by the customer) and has two ports – one input, one output.

The sync bus uses +3.3V CMOS logic and is compatible with D-TACQ ACQ1001, ACQ1002 and ACQ2006 carriers. A breakout module (TERM05) providing Pluggable Terminal Block (PTB) or BNC connectors is also available.

The sync ports may also be used for digital I/O in some customer applications and devices are able to communicate over I²C if required. Please contact D-TACQ 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.

<i>Pin</i>	<i>Name</i>	<i>Description</i>	
		<i>Output</i>	<i>Input</i>
1	Sync	Synchronisation Output	Synchronisation Input
4	Trigger	Trigger Output	Trigger Input
7	GPIO	General Purpose Output. May be switched to an input if desired.	General Purpose Input. May be switched to an output if desired.
10	Clock	Clock Output	Clock Input
15	SCL	I ² C Master Clock Output	I ² C Slave Clock Input
16	SDA	I ² C Master Data	I ² C Slave Data
19	Cable Detect	Allows master to detect the presence of a slave device.	Ground (0VD)
18	+V	+3.3V for powering auxiliary devices. Current-limited to 100mA.	NC – Not Connected
2, 3, 5, 6, 8, 9, 11, 12, 17	GND	Ground (0VD)	
13, 14	NC	Not Connected	

3.3 High-speed Comms

ACQ2106 is capable of providing multiple high-speed comms options. Up to four SFP+ Fiber ports may be provided. PCIe or other data protocols are available - contact D-TACQ for more details.

3.4 USB

ACQ2106-EU contains a USB 2.0 OTG port capable of being a host or a standard device, allowing use of external storage, for example. To allow both configurations, ACQ2106 contains a USB port of type micro-AB, accepting either micro-A or micro-B connectors.

3.5 Ethernet

A single gigabit Ethernet port accepts standard RJ45 connectors.

3.6 Reset

Use a paper clip or pin to push the reset button if required.

3.7 Power

Power is provided to ACQ2106 by an external 12V regulated DC supply capable of outputting approximately 80W, although a supply capable of a minimum of 30W may be used depending on payload. A rocker switch allows ACQ2106 to be powered on or off.

The socket accepts a standard DC barrel connector, centre-positive, 2.5mm internal diameter, 5.5mm external diameter, with length a minimum of 10.5mm.

The power supply's input Earth should be connected to the output 0VD.

3.8 Fans

Fan outlets help keep ACQ2106 cool, drawing air across the modules from front to back. Do not cover the fan outlets.

4 D-TACQ ELF/FMC Card Replacement

The modular ELF or FMC cards may be replaced by the user. Contact D-TACQ for more detailed instructions.

Warning!

Third-party cards may not be compatible with the D-TACQ mechanical superset of the FMC specification and undesired effects may occur. ACQ2106 includes power rails on the mezzanine connectors for D-TACQ ELF cards and therefore only uses certain pins for FPGA connections.

Please contact D-TACQ to check compatibility if you wish to use third-party FMC cards with ACQ2106. 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.

ACQ2106 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 ESD precautions (chassis and body grounding) are taken before and during the opening of the case.
2. Please be extremely careful to ensure correct card alignment when plugging in the cards to avoid mezzanine card pin damage.

4.1 Case Opening

1. Remove the 12 screws which hold on the lid.

4.2 Mezzanine Card Removal

1. Remove the 2 screws on the underside at the front. The two on the top at the front may be left attached.
2. Remove the 2 screws on top at the rear of the card. Remove the 2 screws in the centre of D-TACQ Extended Length cards.
3. Carefully lift the card away from the mezzanine connector. Note that not a lot of force is required to do this and the card should not bend.
4. Jog the card out from the front panel.

4.3 Card replacement and Case Closing

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

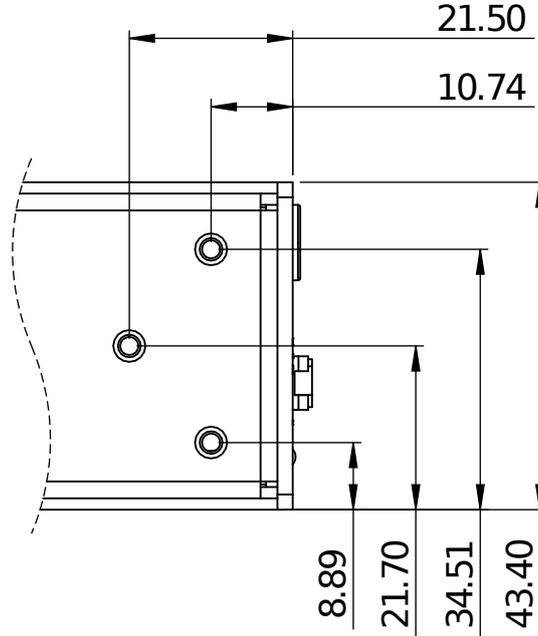
5 Specifications

<i>Parameter</i>	<i>Value</i>
Form Factor	Standard 1U 19" Chassis
Power Source	External 12V DC
Power Consumption	Dependent on payload but typically 15-25W + 10W per site.
Environmental	0–50°C Operational -10–85°C Non-Operational
Front Panel Clock	5V or 3.3V TTL
Front Panel Trigger	5V TTL

6 Mounting Options

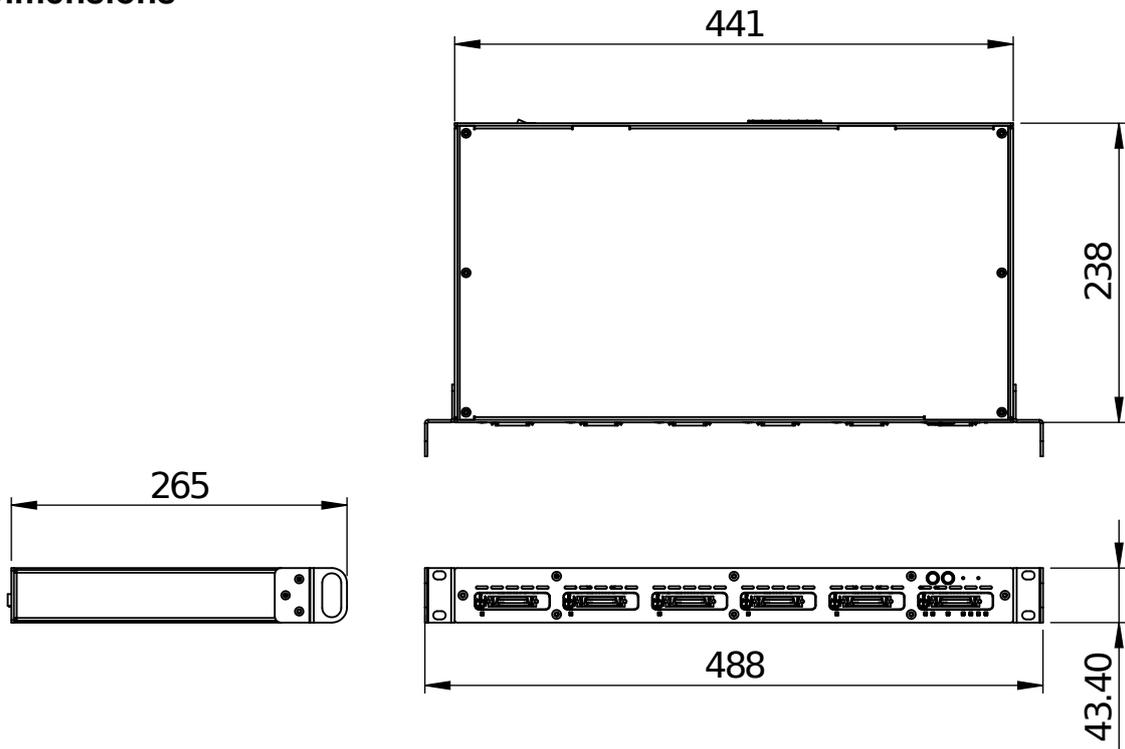
ACQ2106 mounts in a 19" rack. Alternatively, the custom-built case allows standalone use with optional tilting feet. Please contact D-TACQ for options.

Mounting points for the 19" lugs are in the following locations, on both the left and right of the case.



Drawing 4: ACQ2106 Mounting Point Locations

7 Dimensions



Drawing 5: ACQ2106 Case Dimensions

8 Changelog

<i>Date</i>	<i>Rev</i>	<i>Section</i>	<i>Changes</i>	<i>Author</i>
Mar 3, 2015	1		Initial release.	Peter Johnston
May 2020	2		Update to Rev 2 fp	John McLean