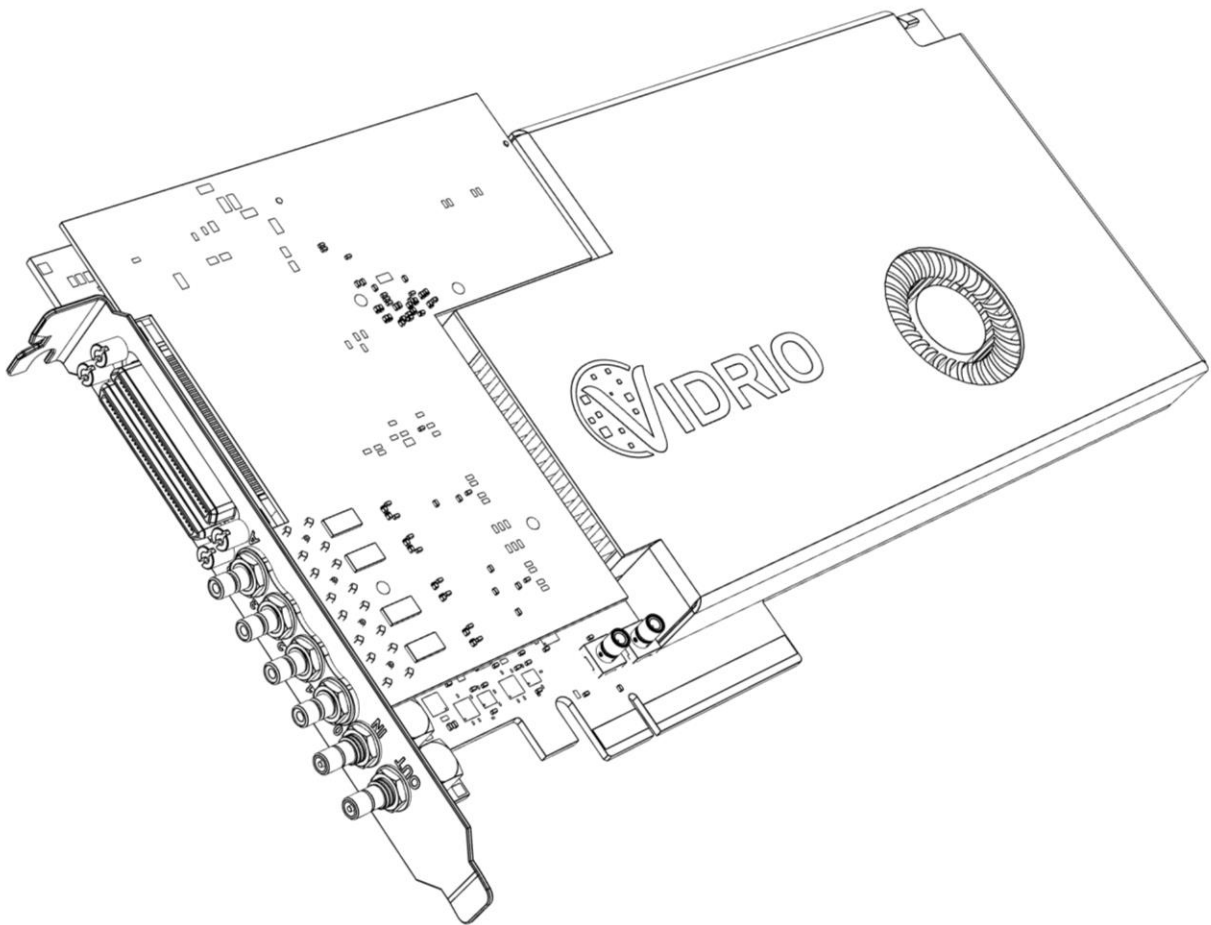


# vDAQ™

## Datasheet | Installation Guide



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## Introduction

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vDAQ™ is an-all-in one data acquisition / control system platform designed for applications that require high bandwidth analog signal digitization combined with high accuracy analog output. Combining various IO options onto a single FPGA platform enables low latency closed-loop control regimes. vDAQ™ offers a powerful Xilinx Kintex UltraScale FPGA for high performance real-time processing of data. On-board DDR3 DRAM and a high-speed PCI Express host interface provide flexible options for storing and transferring high bandwidth data streams. vDAQ™ comes with required cables and breakout accessory for signal connections.

## Technical Specifications

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### Xilinx Kintex Ultrascale FPGA

vDAQ™ is powered by a Xilinx Kintex UltraScale XCKU035 FPGA. The cutting edge UltraScale architecture is the first to offer ASIC-like clock distribution. Efficient routing resources facilitate higher device logic utilization to maximize computing potential.

Connection to the host PC is provided through a PCI Express Gen. 3 x4 interface, which offers up to 4 GB/s data throughput. vDAQ™ software supports 64 bit scatter-gather DMA data transfer.

vDAQ™ includes 4 GB of onboard DDR3 DRAM operating at 1600 MHz. Memory interface is capable of 12 GB/s throughput for local buffering of data.

### High-speed Analog Input

vDAQ™ includes high-speed analog input channels accessible from SMB terminals on the rear connector panel of the PCI Express card installed in the PC. Channels support switchable input ranges and an optional low pass filter that can be enabled by software with a variable cutoff frequency. Table 1 details the specifications of the high speed analog input channels.

**Table 1:** vDAQ™ high speed analog input specifications

Specification	Unit	
Number of Channels		4
Channel Resolution	Bits	14
Sampling Rate Range	MHz	62.5 – 125
Timing/Synchronization		Simultaneously Sampled
Input Range	Vpp	0.5 – 2
Input Impedance	Ω	50
Low Pass Filter Cutoff Frequency	MHz	1 – 63, FBW (Bypass)
Overvoltage Protection	V	±10

## Precision Analog Input

vDAQ™ includes precision analog input channels accessible from BNC connectors on the breakout accessory. Table 2 details the specifications of the precision analog input channels.

**Table 2:** vDAQ™ precision analog input specifications

Specification	Unit	
Number of Channels		12
Channel Resolution	Bits	16
Max. Sampling Rate	MHz	1
Timing/Synchronization		Independent
Input Range	V	±10
Input Impedance	GΩ	5
Overvoltage Protection <sup>1</sup>	V	±25

1. Overvoltage protection rating only valid when vDAQ is powered on

## Precision Analog Output

vDAQ™ includes precision analog output channels accessible from BNC connectors on the breakout accessory. Table 3 details the specifications of the analog output channels.

**Table 3:** vDAQ™ analog output specifications

Specification	Unit	
Number of Channels		12
Channel Resolution	Bits	16
Max. Sampling Rate	MHz	2
Timing/Synchronization		Independent
Output Range	V	±10
Output Current Drive	mA	20

## Digital Input/Output

vDAQ™ offers digital input/output lines divided into four groups. Two groups offer individual direction control for each line while the other two groups are group direction controlled. All DIO lines use 5V TTL logic level signaling. All digital lines are accessible from BNC connectors on the breakout accessory. Tables 4 and 5 detail the digital channel specifications.

**Table 4:** vDAQ™ digital input/output specifications (group 0 and 1)

Specification	Unit	Minimum	Typical	Maximum
Channels Per Group			8	
Direction Control			Independent	
Input Low Logic Level	V			1.0
Input High Logic Level	V	2.3		
Output Low Logic Level	V		0.0	0.6
Output High Logic Level	V	4.4	5.0	
Output current drive	mA	-16		16
Absolute Voltage Range	V	-0.5		5.5

**Table 5:** vDAQ™ digital input/output specifications (group 2 and 3)

Specification	Unit	Minimum	Typical	Maximum
Channels Per Group			8	
Direction Control			Group	
Input Low Logic Level	V			0.8
Input High Logic Level	V	2.0		
Output Low Logic Level	V		0.0	0.8
Output High Logic Level	V	4.0	5.0	
Output current drive	mA	-24		24
Absolute Voltage Range	V	-0.5		6.5

In addition to DIO lines, vDAQ™ includes a RTSI ribbon cable connector for connecting multiple DAQ cards inside the computer case. RTSI cable connector offers 16 individually direction controlled digital lines with 3.3 LVTTTL logic signaling.

## Clock Synthesis

vDAQ™ includes an onboard clock synthesis module for synchronizing high-speed analog front end to external clock sources. An external clock source can be connected at the SMB terminal on the rear connector panel of the PCIe card installed in the PC. External clocks can be multiplied and delayed in 370ps steps. Table 6 details the specifications of the clock input.

**Table 6:** vDAQ™ external clock input specifications

Specification	Unit	
Input Frequency	MHz	1 – 425
Input Impedance	Ω	50
Input Voltage	V <sub>pp</sub>	0.4 – 5.0

## Compatibility Requirements

vDAQ™ requires a desktop PC with one PCI Express x8 slot. While a physical x8 slot is required, only x4 link width will be utilized. One six pin PCI Express power connector is required. Power capacity of PC power supply should also be considered when adding vDAQ™ to a PC. vDAQ™ will draw 5 – 20 W depending on design loaded on FPGA. The host PC must run Microsoft Windows 10 or Windows 11 operating system.

## Hardware Setup

Hardware installation of PCIe card by licensed PC repair vendor is highly recommended. On-site installation from a Vidrio Technologies applications engineer can also be arranged by contacting Vidrio support ([support@vidriotech.com](mailto:support@vidriotech.com))



Installation of vDAQ™ into PC by licensed professional is highly recommended. Always wear a properly grounded ESD wrist strap while handling vDAQ™ and working inside a PC. Follow all safety procedures in PC manual while performing vDAQ™ installation.

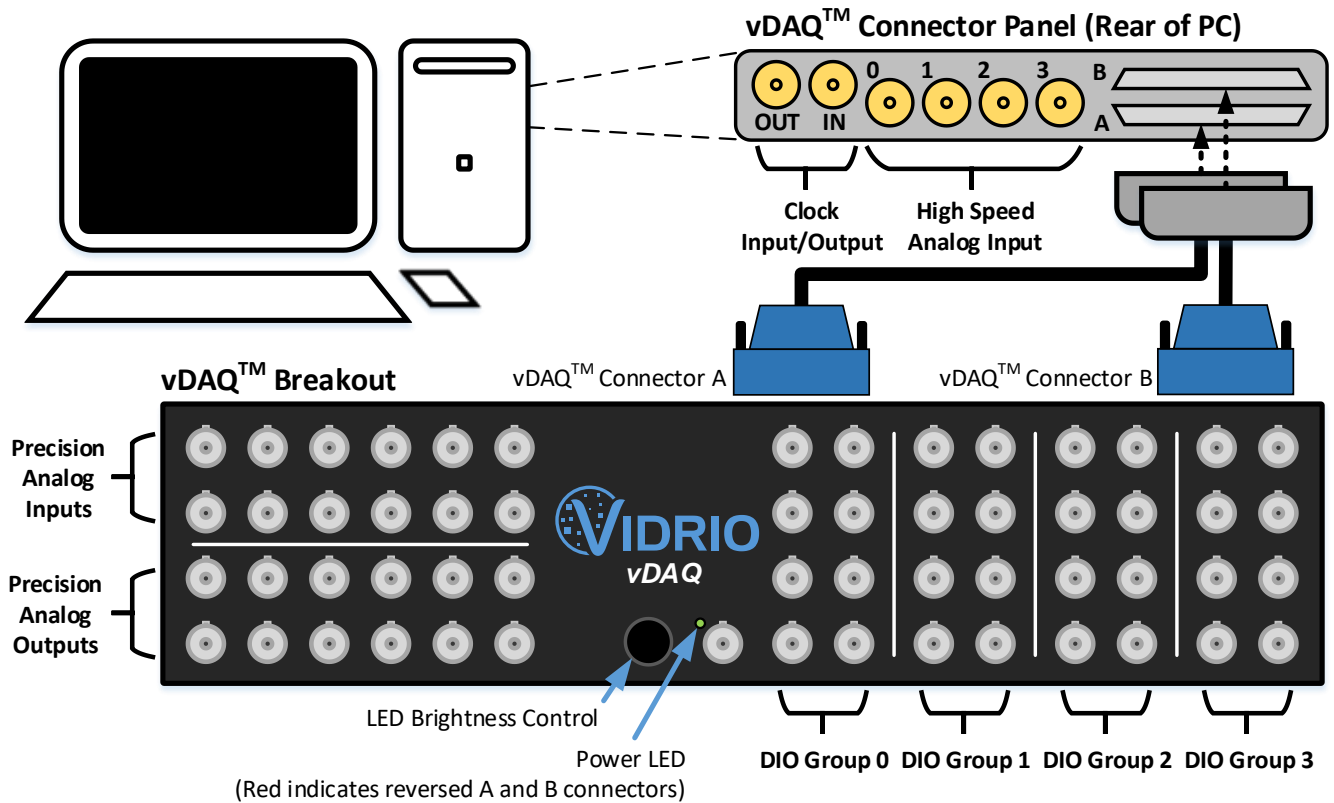
To install vDAQ™ into PC follow the steps below:

1. Fully power PC down
  - a. If PC power supply has a switch on the rear, leave power cord plugged in and flip switch to the off position
  - b. If PC power supply does not have a switch, unplug power cord. Ensure PC chassis is properly grounded before proceeding
2. Wait 5 minutes after removing power to begin installation
3. Open PC case to expose motherboard and PCI slot area
4. Remove and mounting brackets that block access to the PCI slot area
5. Identify a free PCI slot that is at least x8 width; remove black PCI slot cover corresponding to this slot
6. Locate a free 6-pin PCIe power plug from the power supply and plug into the 6-pin receptacle on the end of the vDAQ™
7. Insert the vDAQ™ card into the chosen PCIe slot and install mounting screw or appropriate case hardware to secure card to chassis
8. Ensure card is properly seated in slot, and not obstructed by cables or motherboard components underneath
9. Replace any mounting brackets removed in step 4
10. Replace case cover
11. Plug power cord back in if removed in step 1 and flip power switch back on if applicable

Once PCIe card is installed in PC, the breakout accessory must be connected. Rack mount is recommended for breakout accessory. Two cables must be connected between PCIe card connector plate and breakout, one labeled “A” and one labeled “B”. With the PC powered on, a green LED should illuminate on the front of the breakout when the cables are connected (if LED does not illuminate try turning brightness knob up). If LED turns red, check that the cables have not been reversed. Figure 1 shows a diagram of the vDAQ™ connections.



**WARNING:** Do not attempt to connect vDAQ™ to a breakout accessory for a different type of DAQ. Connecting the wrong breakout can cause damage to the vDAQ™. Only use the breakout and cables that are shipped with the vDAQ™.



**Figure 1:** vDAQ™ wiring diagram



**WARNING:** Always power PC/vDAQ™ on before powering on any external equipment connected at breakout accessory. When shutting system down, power off external equipment before powering off PC/vDAQ™.

## Software Installation

Once hardware is installed, vDAQ™ will appear in device manager as “PCI Data Acquisition and Signal Processing Controller”. To install the device driver follow the following procedure:

- 1.) Download device drivers from Vidrio Technologies website and extract zip file.
- 2.) From the device manager right click device and select “update driver”.
- 3.) Choose the option to browse for driver software.
- 4.) Select the location where the download was extracted and complete the installation.

Once software driver is installed, vDAQ™ will show up in Windows Device Manager under “Vidrio Technologies Data Acquisition Devices”.

## Connector Pinouts

The vDAQ™ uses two 68 pin high density connectors to provide access to the precision analog outputs, inputs, and DIO ports. While required cables and breakouts are included, the pinouts for the connectors are provided below. The included cables incorporate individually shielded twisted pairs for the analog signals and have a VHDCI style connector to interface with vDAQ card on one end, and a D type connector for the breakout on the other end.

**Table 7:** Connector A pinout

1. +5V	35. +5V
2. DGND	36. D0.0
3. DGND	37. D0.1
4. DGND	38. D0.2
5. DGND	39. D0.3
6. DGND	40. D0.4
7. DGND	41. D0.5
8. DGND	42. D0.6
9. DGND	43. D0.7
10. D1.0	44. D1.1
11. D1.2	45. D1.3
12. D1.4	46. D1.5
13. D1.6	47. D1.7
14. AGND	48. AO7
15. AGND	49. AO6
16. AGND	50. AO5
17. AGND	51. AO4
18. AGND	52. AO3
19. AGND	53. AO2
20. AGND	54. AO1
21. AGND	55. AO0
22. PLUG SENSE L	56. PLUG SENSE H
23. AI7 -	57. AI7 +
24. AGND	58. AGND
25. AI6 -	59. AI6 +
26. AI5 -	60. AI5 +
27. AGND	61. AGND
28. AI4 -	62. AI4 +
29. AI3 -	63. AI3 +
30. AGND	64. AGND
31. AI2 -	65. AI2 +
32. AI1 -	66. AI1 +
33. AGND	67. AGND
34. AI0 -	68. AI0 +

**Table 8: Connector B pinout**

1. +5V	35. +5V
2. DGND	36. D2.0
3. DGND	37. D2.1
4. DGND	38. D2.2
5. DGND	39. D2.3
6. DGND	40. D2.4
7. DGND	41. D2.5
8. DGND	42. D2.6
9. DGND	43. D2.7
10. D3.0	44. D3.1
11. D3.2	45. D3.3
12. D3.4	46. D3.5
13. D3.6	47. D3.7
14. AGND	48. NC
15. AGND	49. NC
16. AGND	50. NC
17. AGND	51. NC
18. AGND	52. AO11
19. AGND	53. AO10
20. AGND	54. AO9
21. AGND	55. AO8
22. PLUG SENSE H	56. PLUG SENSE L
23. NC	57. NC
24. AGND	58. AGND
25. NC	59. NC
26. NC	60. NC
27. AGND	61. AGND
28. NC	62. NC
29. AI11 -	63. AI11 +
30. AGND	64. AGND
31. AI10 -	65. AI10 +
32. AI9 -	66. AI9 +
33. AGND	67. AGND
34. AI8 -	68. AI8 +

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**ScanImage® Optimized Data Acquisition Systems:** Two-year warranty on parts and labor.

**ScanImage® Optimized vDAQ™ Data Acquisition System:** Two-year warranty on parts and labor.



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**ScanImage® Optimized vDAQ™ Data Acquisition System:** Extended warranties beyond two years are available for the data acquisition system and vDAQ at a cost of \$385 per year of extension up to 5 years. Extended warranties cover parts and labor.

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