

ProDAQ Signal Conditioning Units

ProDAQ 5716 16-Channel Bridge Signal Conditioning Unit



OVERVIEW

The ProDAQ 5716 is a 1U high rack-mountable signal conditioning box for standard 19 inch racks. It provides signal conditioning for up to 16 strain gage or IEPE sensors. Either one ProDAQ 3416 16-Channel 24-bit Sigma-Delta ADC Function Card or up to two ProDAQ 3424 8-Channel 24-bit Sigma-Delta ADC Function Cards may be connected to the unit.

The 5716 has full-bridge, half-bridge and quarter-bridge completion as standard. Built-in high precision resistors of 120 Ω and 350 Ω as well as sockets for user installable resistors allow for flexible bridge completion.

The bridge signal conditioning provides a per-channel programmable excitation voltage of up to 20V. The positive side excitation is programmable from 0 to +10V while the negative side excitation is programmable from 0 to -10V. Both sides are independent and have a resolution of 150 μ Volts. This allows the user to set the Common Mode point to 0V, thus reducing the effects of Common Mode voltage on signal accuracy.

By using remote sense lines per channel any losses due to lead resistance will be automatically compensated. The excitation voltage can be readback and calibrated using the ADC Function Card for highest excitation accuracy. The channel excitation has a built-in current limit which, if reached, is signalled both on the front panel of the 5716 via an LED and simultaneously in software.

Every channel of the 5716 has a trifilar common mode filter to remove high-frequency common mode signals. It has programmable gains of 1, 10, 100 and 1000 which are automatically combined with the gain of the ADC Function Card to provide a wide number of input ranges. Each channel contains both AC and DC coupling as standard. To aid with offset removal the 5716 has a per-channel Autobalance feature, thus maximising Dynamic Range. The signal bandwidth of each channel is greater than 100kHz while still maintaining excellent DC accuracy.

Each input channel is equipped with a shunt calibration resistor that simulates a known strain on the gage. Each channel contains, as standard, IEPE signal conditioning circuitry. Both TEDS class 1 and class 2 are also supported as standard. Two different connector options are available, RJ45 and the Lemo 1B series.

Features & Benefits

- ▶ **1U, 19 in. rack-mount break-out box** for ProDAQ ADC function cards
- ▶ **Bridge completion** for full, half and quarter-bridge strain gauges
- ▶ **16 strain gage inputs** with programmable excitation
- ▶ Remote or internal **sensing**
- ▶ Built-in shunt **calibration and autobalancing**
- ▶ **IEPE (ICP™) and TEDS** support

For more information, visit www.bustec.com.

Learn more about the **ProDAQ 5716** on our website by scanning the code below.



SPECIFICATIONS

INPUT CHARACTERISTICS

Number of Channels	16 (1 x 16 or 2 x 8)
Bridge Configurations	Full-Bridge, Half-Bridge, Quarter-Bridge
Bridge Completion Resistor	120 Ω, 350 Ω, Custom (User installable)
Quarter-Bridge Completion Resistor Specifications	0.02% 10ppm/° C 0.5W
Half-Bridge Completion Resistor Specifications	0.05% 2ppm/° C
Excitation Type	Constant Voltage
Excitation Range	0 to ±10 V, Independant Positive and Negative Supplies
Excitation Current	max. 50 mA per channel
Excitation Resolution	16-bit (152μV)
Excitation Accuracy, 20V, 1kOhm Bridge, Remote Sensing, 3416-AA calibrated	±380μV typical (±0.002% FSR) ±800μV max. (±0.004% FSR)
Sensing	Remote or Internal
Bridge Balancing	Automatic
Shunt Calibration	50 kOhm, 0.1% per channel
Input Range, Full Bridge, 5V Excitation, Gain 100, Gage Factor of 2	±10,000μE
Input Range, Full Bridge, 10V Excitation, Gain 10, Gage Factor of 2	±50,000μE
Input Range, Quarter Bridge, 5V Excitation, Gain 100, Gage Factor of 2	±40,000μE
Input Signal Type	Differential or Single-Ended
Channel Gain	1, 10, 100 and 1000
Input Resistance	10MΩ
Signal Path Coupling	AC or DC
Common Mode Voltage	±10V DC Coupling ±60V AC Coupling
Input Signal Full Power Bandwidth, All gains	>100kHz
Common-mode Filter	Trifilar Choke
IEPE (ICP™) Support	Yes
IEPE (ICP™) Current	4.7 mA typ.
TEDS	Class 1 and 2 supported
Input Signal Connectors	5716-Ax: LEMO Series 1B, 8-pin 5716-Bx: RJ45, 8-pin
Output Signal Connector, 3416	1 x 50-pin female SCSI connector
Output Signal Connectors, 3424	2 x 50-pin female SCSI connectors
Warm-up Time	30 min.

PHYSICAL CHARACTERISTICS

Dimensions	19 in. rack-mount, height 1U
------------	------------------------------

POWER SUPPLY

Power Supply	90 V/264 V AC 47-63 Hz
--------------	------------------------

ENVIRONMENTAL

Temperature	0°C to +50°C (operational) -40°C to +70°C (storage only)
Humidity	10% - 90% (non-condensing)

WARRANTY PERIOD

12 months (extended periods available at additional cost)

Did You Know?

- ▶ **Lord Kelvin** first reported on a relationship between strain and the resistance of wire conductors in 1856. The first notable use of bonded resistance strain gauges was made by Charles Kearns in the early 1930s. Kearns used carbon composite resistors, which were ground flat, mounted on an insulating strip and cemented to propeller blades in order to measure vibration. These devices were not very accurate due to poor resistance stability with both temperature and time.
- ▶ In the late 1930s, **Arthur Ruge** and **Edward Simmons**, working independently, both discovered that it was possible to bond small diameter wires made of electrical resistance alloys to a structure in order to measure surface strain.
- ▶ In 1952 **Saunders-Roe** in the UK developed the idea of making a strain gauge by etching the pattern for the gauge from a thin foil. The advantage of this approach was smaller size and lower production cost. This allowed much more extensive use of strain gauges and foil type gauges are the most common type in use today.

5716 OPERATION SPECIFICATIONS USING 3416

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
DC Accuracy (RTI) All Gains			$\pm(13+310/G)$	$\pm(25+600/G)$	μV
Input Offset Error					
Gain 1			± 40	± 120	μV
Gain 10			± 35	± 110	μV
Gain 100, 1000			± 12	± 25	μV
Full Scale Error					
Gain 1			± 0.003	± 0.007	%
Gain 10			± 0.003	± 0.01	%
Gain 100			± 0.006	± 0.02	%
Gain 1000			± 0.1	± 0.3	%
CMRR					
Gain 1		80	87		dB
Gain 10		86	96		dB
Gain 100		88	99		dB
Gain 1000		74	85		dB
Input Resistance			10		$\text{M}\Omega$
Signal Bandwidth					
0.1dB	with 3416-BA, all gains			4.5	kHz
3dB				5	kHz
THD					
Gain 1	$f_{in}=97.6\text{Hz}$, 0.9FSV _{PP} 5kHz Bandwidth		0.0012		%
Gain 10			0.0013	0.0015	%
Gain 100			0.0014		%
Gain 1000			0.0045		%
SNR					
Gain 1	$f_{in}=97.6\text{Hz}$, 0.9FSV _{PP} 5kHz Bandwidth		104		dB
Gain 10			98		dB
Gain 100			91		dB
Gain 1000			72		dB
Crosstalk	120 Ω to Ground, 1kHz FS signal on all other channels, Gain 1		-110		dB

About VXI and LXI

- **The VXIbus** (VME EXtensions for Instrumentation) provides a time-tested bus you can trust to support your automated test and measurement needs. Established in 1987, it is a well conceived, established and proven platform for data acquisition and test, based on the industry standard VMEbus. For more details visit www.vxibus.org.
- **LXI** (LAN EXtensions for Instrumentation) combines the advantage of Ethernet with the simplicity of GPIB. LXI combines features of GPIB instruments with modular instrumentation by providing high performance test and measurement solutions based on a LAN interface. By utilizing the IEEE1588 Standard for A Precision Clock Synchronization Protocol, LXI Instruments allow you to build scaleable distributed and fully synchronized networked measurement and control systems. For more details visit www.lxistandard.org.

5716 OPERATION SPECIFICATIONS USING 3424

PARAMETER	CONDITIONS	TYP	MAX	UNITS
DC Accuracy (RTI) All Gains		$\pm(13+1110/G)$	$\pm(30+2000/G)$	μV
Input Offset Error				
Gain 1		± 270	± 900	μV
Gain 10		± 40	± 130	μV
Gain 100		± 22	± 50	μV
Gain 1000		± 21	± 41	μV
Full Scale Error				
Gain 1, 10		± 0.01	± 0.03	%
Gain 100		± 0.01	± 0.04	%
Gain 1000		± 0.12	± 0.31	%
Signal Bandwidth, 0.1dB	with 3424-BB			
Gain 1, 10, 100		100		kHz
Gain 1000 (1000 x 1)		60		kHz
Gain 1000 (100 x 10)		100		kHz
THD				
Gain 1	$f_{in}=1kHz, 0.9FSV_{pp}$ 20kHz Bandwidth	0.002		%
Gain 10		0.0025		%
Gain 100		0.0025		%
Gain 1000		0.008		%
SNR				
Gain 1	$f_{in}=1kHz, 0.9FSV_{pp}$ 20kHz Bandwidth	105		dB
Gain 10		97		dB
Gain 100		85		dB
Gain 1000		65		dB
Crosstalk				
$f_{in}=1kHz$	120 Ω to Ground, FS signal on all other channels, Gain 1	-102		dB
$f_{in}=10kHz$		-96		dB
$f_{in}=20kHz$		-87		dB

Ordering Information

- ▶ **5716-AA** 16-ch bridge signal conditioning unit (LEMO inputs)
- ▶ **5716-BA** 16-ch bridge signal conditioning unit (RJ45 inputs)

Related Products

- ▶ **6100-xx** LXI function card carrier
- ▶ **3180-AA** Ultra-performance motherboard module
- ▶ **3416-xx** 16-ch, 24-bit, sigma-delta ADC function card
- ▶ **3424-xx** 8-ch, 24-bit, sigma-delta ADC function card
- ▶ **8010-Ax** SCSI connector cables

Contact Bustec

- ▶ **Europe**
Bustec Ltd.
Bustec House
Shannon, Co. Clare
Ireland

T +353 61 707 100
F +353 61 707 106
E sales@bustec.com

- ▶ **North America**
Bustec, Inc.
1507 East Valley Parkway
Suite 3-412
Escondido, CA 92027
U.S.A.

T 909. 797.0484
F 760. 751.1284
E sales@bustec.com