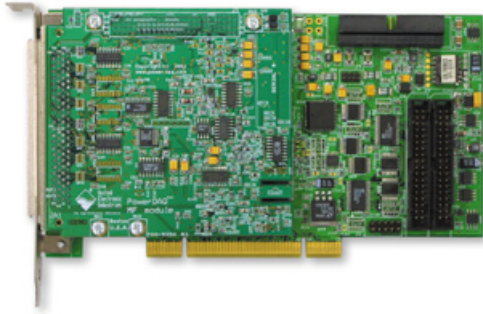


PowerDAQ PCI Multifunction Boards



Features:

- 16 or 64 single-ended or 8/32 differential A/D channels
- 2.2MS/s to 3.0MS/s sampling rate
- 12- or 14-bit resolution
- Upgradable FIFOs
- Gains 1, 10, 100, 1000 or 1, 2, 4, 8
- Two 12-bit analog outputs
- 32 digital I/O lines
- Three 16-bit counter/timers
- Simultaneous operation of all subsystems
- Stream-to-disk capability
- Supports 3.3V and 5V PCI bus

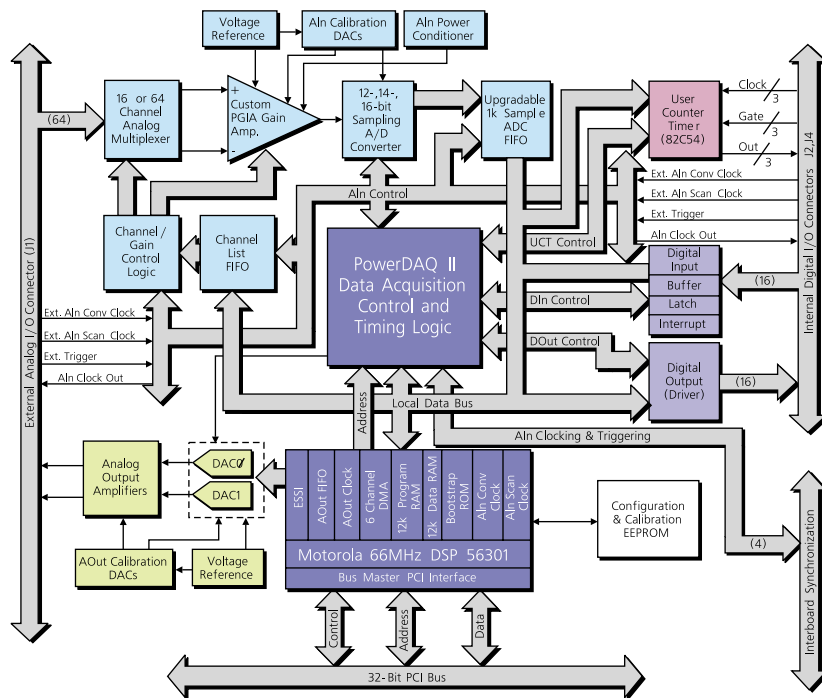
General Description

When you know you'll be setting up a stimulus/response test, when you know you'll be implementing a closed-loop system or if you just want to be ready for any kind of testing situation, a multifunction board is the logical choice. Our PD2-MF Series boards pack everything you'll likely need: as many as 64 single-ended/32 differential analog inputs running at speeds up to 3 MS/s, dual analog outputs, 32 digital I/O lines plus three counter/timers available to users.

To allow all these I/O subsystems to run simultaneously without loading down the host CPU, MF Series cards run under control of a Motorola DSP. Thus you can collect analog samples while generating waveforms yet have the resources to perform digital I/O and run the counter/timers – all at the same time. Operating in this fashion presents no constraints on setup parameters, either: a custom PGIA (programmable-gain instrumentation amplifier) design runs any or all channels at different gains without the need to trade off peak throughput rate or accuracy.

We supply a complete set of drivers for all popular programming languages and third-party applications including LabVIEW and Agilent VEE – and at no additional charge! The support package also comes with example programs, complete with source code, that are so extensive that some of them might be enough to solve your problem straight out of the box.

To achieve optimum performance under Windows, we wrote the boards' 32-bit driver from scratch without relying on any legacy code. This advanced protocol-based driver works with shareable buffers in system RAM and makes obsolete traditional register-based drivers and double-buffering schemes. MF Series boards can stream data to disk continuously, gap-free, at the hardware's peak acquisition rates!



PowerDAQ PD2-MF Block Diagram

PowerDAQ PCI Multifunction Boards

Technical Specifications:

Analog Inputs

PD2-MF-xx-	2M/14H	3M/12x
Resolution	14 bits	12 bits
Number of Channels		
Single-Ended	16 or 64	
Differential	8 or 32	
Max Sampling Rate	2.2 MS/s	3 MS/s
Onboard FIFO	4k samples	16k samples
Channel-Gain List	256 entries	256 entries
Input Ranges	0-5V, 0-10V, ±5V, ±10V (software selectable)	
Programmable Gains	H=1, 2, 4, 8	L=1, 10, 100, 1000 H=1, 2, 4, 8
Drift		
Zero	±30 µV/°C	
Gain	±30 ppm/°C	
Error		
Zero	±1 LSB calibrated @ G1	
Gain	±1 LSB @ G1; 0.1% - all other gains	
Input Impedance	10 MΩ	
Input Bias Current	±20 nA	
Input Overvoltage	±20V, 2000V ESD, 10 mA max	
A/D Conversion Time	0.45 µs	283 ns
A/D Settling Time	0.37 µs	250 ns
DC Accuracy		
Nonlinearity	±2 LSB	±1 LSB
System Noise	1.2 LSB	0.8 LSB
AC Accuracy		
Effective Number of Bits	12.2	11.2
Total Harmonic Distortion + Nonlinearity + Noise	76 dB	72 dB
Channel Crosstalk	-80 dB @ 1 kS/s	
Clocking and Trigger Input		
Max. CV Clock Aggregate Throughput vs Gain:		
Gain	Speed @ ENOBs	
1	2.2 MS/s @ 12.8	3.0 MS/s @ 11.2
2	2.1 MS/s @ 12.2	3.0 MS/s @ 11.0
4	2.0 MS/s @ 11.5	2.8 MS/s @ 10.5
8	1.8 MS/s @ 11.0	2.4 MS/s @ 10.4
10	n/a	1.7 MS/s @ 10.3
100	n/a	0.8 MS/s @ 10.2
1000	n/a	0.2 MS/s @ 10.0
Minimum Pulse Width	20 ns	
External Digital (TTL) Trigger		
High-level Input Voltage	2.0V min	
Low-level Input Voltage	0.8V min	
Minimum Pulse Width	20 ns	

General Specifications and Connectors

PD2-MF-xx (all models)	
Power Requirements	5V
Physical Dimensions	10.5" x 3.8" (262 x 98 mm)
Environmental	
Operating Temperature Range	0 to 70°C
Storage Temperature Range	-25 to 85°C
Relative Humidity	to 95%, noncondensing

Analog Outputs

PD2-MF-xx (all models)	
Number of Channels	2
Resolution	12 bits
Update Rate	200 kS/s per channel
Onboard FIFO Size	2k samples (on DSP)
Analog Output Range	±10V
Error	
Gain	±1 LSB
Zero	Calibrated to 0
Current Output	±20 mA max
Output Impedance	0.3Ω typ
Capacitive Drive Capability	1000 pF
Nonlinearity	±1 LSB
Protection	Short circuit to analog ground
Power-On Voltage	0V ±10mV
Setting Time to 0.01% of FSR	10 µs, 20V step; 1 µs, 100mV step
Slew Rate	30 V/µs

Counter/Timer

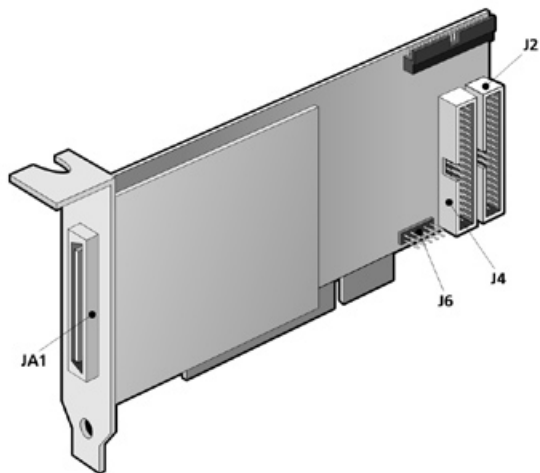
PD2-MF-xx (all models)	
Number of Channels	3 (Intel 82C54)
Resolution	16 bits on each counter
Clock Inputs	
Software Configurable	1 MS/s - int.; ≤10 MS/s - ext.
High-Level Input Voltage	2.0V min
Low-Level Input Voltage	0.8V max
High-Level Input Current	20 µA
Low-Level Input Current	-20 µA
Gate Inputs	
Maximum Pulse Width	100 ns (High) 100 ns (Low)
Counter Outputs (inverted)	
Output Driver High Voltage	2.5V min (I _{OH} = 24 mA)
Output Driver Low Voltage	0.55V max (I _{OH} = 48 mA)

Digital I/O

PD2-MF-xx (all models)	
Input Bits (8 can generate IRQ)	16
Output Bits	16
Inputs	
High-Level Input Voltage	2.0V
Low-Level Input Voltage	0.8V
High-Level Input Current	20 µA
Low-Level Input Current	-20 µA
Outputs	
Output Driver High Voltage	2.5V min, 3.0V typ (I _{OH} = -32 mA)
Output Driver Low Voltage	0.55V max (I _{OL} = 64 mA)
Current Sink	-32/64 mA max; 250 mA per port
Pulse Width	20 ns min, interrupt bit latched on rising, falling or either edge
Power-On Voltage	Logic Zero

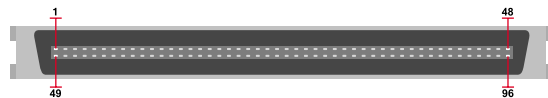
PowerDAQ PCI Multifunction Boards

Layout, Connectors, Pinout Diagrams



**JA1 – PCR-E96LMD (Male)
96-pin connector:**

AGND	49	1	AGND
AOUT0	50	2	AGND
AGND	51	3	AGND
AOUT1	52	4	AGND
AGND	53	5	DGND
AGND	54	6	AGND
AIN54	55	7	AIN55
AIN52	56	8	AIN53
AIN50	57	9	AIN51
AIN48	58	10	AIN49
AIN39	59	11	AGND
AIN37	60	12	AIN38
AIN35	61	13	AIN36
AGND	62	14	AIN34
AIN32	63	15	AIN33
AIN22	64	16	AIN23
AIN20	65	17	AIN21
AIN19	66	18	AGND
AIN17	67	19	AIN18
AIN7	68	20	AIN16
AGND	69	21	AIN6
AIN4	70	22	AIN5
AIN2	71	23	AIN3
AIN0	72	24	AIN1
AGND	73	25	AGND
+5V	74	26	TRIG_IN
CV_START_IN	75	27	CV_CL_START_OUT
AGND	76	28	NC
NC	77	29	AGND
AIN63	78	30	CL_START_IN
AIN61	79	31	AIN62
AGND	80	32	AIN60
AIN58	81	33	AIN59
AIN56	82	34	AIN57
AIN46	83	35	AIN47
AIN45	84	36	AGND
AIN43	85	37	AIN44
AIN41	86	38	AIN42
AIN31	87	39	AIN40
AIN30	88	40	AGND
AIN28	89	41	AIN29
AIN26	90	42	AIN27
AGND	91	43	AIN25
AIN15	92	44	AIN24
AIN13	93	45	AIN14
AIN11	94	46	AIN12
AIN10	95	47	AGND
AIN8	96	48	AIN9



**J2 – IDC-40 (Male)
40-pin connector:**

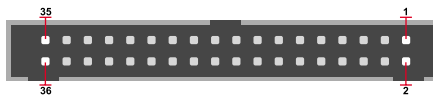
CTR0 IN	1	2	CTR2 IN
CTR0 OUT	3	4	CTR2 GATE
CTR0 GATE	5	6	CTR2 IN
CTR1 IN	7	8	CTR1 GATE
CTR1 OUT	9	10	+5V
DIN0	11	12	DGND
DIN1	13	14	DOUT0
DIN2	15	16	DOUT1
DIN3	17	18	DOUT2
DIN4	19	20	DOUT3
DIN5	21	22	DOUT4
DIN6	23	24	DOUT5
DIN7	25	26	DOUT6
DGND	27	28	DOUT7
CL_START_IN	29	30	DGND
CV_START_IN	31	32	CV_START_OUT
DGND	33	34	CL_DONE_OUT
CL_START_OUT	35	36	DGND

**J4 – IDC-40 (Male)
40-pin connector:**

DGND	1	2	DGND
DGND	3	4	DGND
DGND	5	6	DGND
DGND	7	8	DGND
DGND	9	10	+5V
DIN8	11	12	DGND
DIN9	13	14	DOUT8
DIN10	15	16	DOUT9
DIN11	17	18	DOUT10
DIN12	19	20	DOUT11
DIN13	21	22	DOUT12
DIN14	23	24	DOUT13
DIN15	25	26	DOUT14
DGND	27	28	DOUT15
DGND	29	30	DGND
DGND	31	32	DGND
DGND	33	34	DGND
DGND	35	36	DGND

**J6 – 0.1" 2x5 Header
10-pin connector:**

CV_START_OUT	1	2	DGND
CL_START_OUT	3	4	DGND
CV_START_IN	5	6	DGND
CL_START_IN	7	8	DGND
NC	9	10	NC



Ordering Information:

PD2-MF-16-2M/14H	2.2 MS/s, 14-bit, 16SE/8DI A/D, gains: 1,2,4,8; two 12-bit D/As; 3 counter/timers; 32 digital I/O
PD2-MF-64-2M/14H	2.2 MS/s, 14-bit, 64SE/32DI A/D, gains: 1,2,4,8; two 12-bit D/As; 3 counter/timers; 32 digital I/O
PD2-MF-16-3M/12L	3 MS/s, 12-bit, 16SE/8DI A/D, gains: 1,10,100,1000; two 12-bit D/As; 3 counter/timers; 32 digital I/O
PD2-MF-16-3M/12H	3 MS/s, 12-bit, 16SE/8DI A/D, gains: 1,2,4,8; two 12-bit D/As; 3 counter/timers; 32 Digital I/O
PD2-MF-64-3M/12L	3 MS/s, 12-bit, 64SE/32DI A/D, gains: 1,10,100,1000; two 12-bit D/As; 3 counter/timers; 32 digital I/O
PD2-MF-64-3M/12H	3 MS/s, 12-bit, 64SE/32DI A/D, gains: 1,2,4,8; two 12-bit D/As; 3 counter/timers; 32 digital I/O

Upgrade FIFO

PD-16KFIFO	(Included with 3M series) Upgrade 1K FIFO to 16K FIFO
PD-32KFIFO	Upgrade 1K FIFO to 32K FIFO
PD-64KFIFO	Upgrade 1K FIFO to 64K FIFO

Accessories

PD-BUFF-16	16 unity gain operational amplifiers (improves settling time)
PD-BUFF-64	64 unity gain operational amplifiers (improves settling time)