



DIAMOND-MM



FEATURES

- ◆ 16 single-ended or 8 differential analog inputs
- ◆ 12-bit A/D resolution
- ◆ Bipolar and unipolar input ranges
- ◆ 100,000 samples/sec maximum A/D conversion rate
- ◆ External trigger capability
- ◆ Interrupt and DMA operation
- ◆ 2 analog outputs, 12-bit resolution
- ◆ 16 digital I/O lines (8 in, 8 out)
- ◆ On-board A/D pacer clock
- ◆ 1 16-bit general purpose counter/timer
- ◆ Requires only +5V power supply
- ◆ Software and technical manual included

FREE SOFTWARE

See Page 49 for Details

DIAMOND-MM is the low-cost workhorse of PC/104 data acquisition modules. It combines the most sought-after I/O features into a single board, including 16 analog inputs, 2 analog outputs, 12-bit resolution, pacer clock for timed A/D conversions, interrupt and DMA operation, and 16 digital I/O lines. Diamond-MM requires only +5V from the system power supply, consumes only 165mA, and is available from stock with either commercial or extended temperature operation.

Designed for the Real World

Diamond-MM was designed with real-world applications in mind. The analog inputs are protected against overvoltages up to $\pm 35V$, even with the power off. External as well as internal triggering can be used to perform A/D conversions. And the analog output range is adjustable to 5V, 10V, or a user supplied external reference. The digital outputs reset to 0 on power up or system reset to force the board into a known state and prevent undesirable system behavior. The board's single-supply, low-power design helps to minimize the cost of the system power supply. And perhaps best of all, Diamond-MM is available from stock in both Commercial (0-70°C) and Industrial (-40 to +85°C) temperature ranges.

Analog Outputs

Diamond-MM has 2 analog output channels. The full-scale analog output voltage range is unipolar and is preset to 0 - 5V. However, you can adjust this range anywhere from 0 - 4V to 0 - 10V by adjusting a potentiometer on the board. You can also supply an external reference signal to each DAC individually to select unique ranges for each output channel. If the reference signal is an AC waveform (e.g. an audio signal), then the DAC can be used as an attenuator (volume control). The -NA versions of Diamond-MM do not have analog outputs.

Analog Input Ranges

Diamond-MM supports multiple analog input voltage ranges, including both unipolar (+ only) and bipolar (+ and -) ranges. In addition, a gain amplifier circuit allows you to reduce the input range to handle smaller signals. To get the best resolution, select the smallest input range that is large enough to cover the entire range of your input signals. You can also install a resistor to customize the range exactly to your requirements.

ANALOG INPUT RANGES

Unipolar

Input Range	Resolution
0 - 10V	2.44mV
0 - 5V	1.22mV
0 - 2.5V	0.61mV
0 1V	0.244mV
0 - 0.5V	0.122mV
Custom	(10K Ω / R) / 4096) V

Bipolar

$\pm 10V$	4.88mV
$\pm 5V$	2.44mV
$\pm 2.5V$	1.22mV
$\pm 1V$	.488mV
± 0.5	.244mV
Custom	(10K Ω / R) / 2048) V



A/D Conversion Methods

To provide flexibility, A/D conversions. An A/D conversion can be triggered in 3 different ways: software command, external trigger, or on-board pacer clock. After the conversion is done, the data can be transferred from the board to system memory in 3 ways: software read command, interrupt routine, or DMA transfer. Different conversion rates require the use of different transfer methods:

Software read	2,000/sec
Interrupt routine	20,000/sec
DMA transfer	100,000/sec

DAS-16F Compatible

Diamond-MM has been designed to be software compatible with the Keithley/MetraByte DAS-16F PC Bus analog input board. The DAS-16F is compatible with many popular PC-based data acquisition programs, and so Diamond-MM will also work with those programs with no software changes required.

I/O HEADER

VIN 15/7-	1	2	VIN 7/7+
VIN 14/6-	3	4	VIN 6/6+
VIN 13/5-	5	6	VIN 5/5+
VIN 12/4-	7	8	VIN 4/4+
VIN 11/3-	9	10	VIN 3/3+
VIN 10/2-	11	12	VIN 2/2+
VIN 9/1-	13	14	VIN 1/1+
VIN 8/0-	15	16	VIN 0/0+
ANALOG GND	17	18	VREF OUT
ANALOG GND	19	20	VOU 0
ANALOG GND	21	22	VOU 1
ANALOG GND	23	24	+15V
-15V	25	26	VREF IN 0
ANALOG GND	27	28	VREF IN 1
CTR IN 0	29	30	DIGITAL GND
CTR OUT 0	31	32	CTR OUT 2
DOUT 7	33	34	DOUT 6
DOUT 5	35	36	DOUT 4
DOUT 3	37	38	DOUT 2
DOUT 1	39	40	DOUT 0
DIN 7	41	42	DIN 6
DIN 5	43	44	DIN 4
DIN 3	45	46	DIN 2/Gate 0
DIN 1	47	48	DIN 0/Gate 1/2
+5	49	50	DIGITAL GND

SPECIFICATIONS

Analog Inputs	
Number of inputs	8 differential or 16 single-ended (user selectable)
A/D resolution	12 bits (1/4096 of full scale)
Bipolar ranges	±10V, ±5V, ±2.5V, ±1V, ±0.5V, Custom
Unipolar ranges	0-10V, 0-5V, 0-2.5V, 0-1V, 0-0.5V, Custom
Input bias current	50nA max
Max. input voltage	±10V for linear operation
Overvoltage protection	±35V on any analog input
Nonlinearity	±1LSB, no missing codes
Conversion rate	100,000 samples per second max (with DMA operation)
Conversion trigger	Software trigger, internal pacer clock, or external TTL signal
Analog Outputs	
Number of outputs	2
D/A resolution	12 bits (1/4096 of full scale)
Output ranges	0-5V, adjustable, or external reference input
Output current	± 8mA max per channel
Settling time	4μS max to ±1/2 LSB
Relative accuracy	± 1 LSB
Digital I/O	
Number of inputs	8, HCT/TTL compatible
Input voltage	Logic 0: 0.0V min, 0.85 max Logic 1: 2.0V min, 5.0V max
Input current	±1μA max
Number of outputs	8, HCT/TTL compatible
Output voltage	Logic 0: 0.0V min, 0.33 max Logic 1: 3.8V min, 5.0V max
Output current	±4mA max per line
Counter/Timers	
A/D Pacer clock	32-bit down counter (2 82C54 counters cascaded)
Clock source	10MHz on-board source or external signal
General purpose	16-bit down counter (1 82C54 counter)
Interrupt/DMA trigger	End of A/D conversion
General	
Power supply	+ 5VDC ±10% @165mA typical
± 15V output current	± 10mA max with DACs unloaded
Operating temperature	0 to 70°C Standard, -40 to + 85°C Extended
Weight	3.3oz / 93g

DIAMOND-MM BLOCK DIAGRAM

