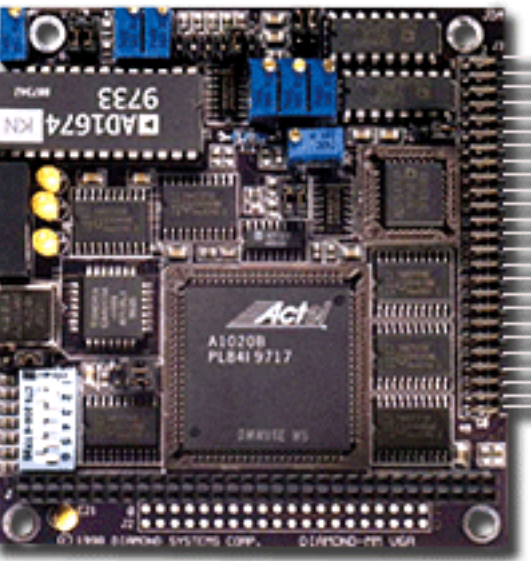


# Diamond MM-XT & Diamond MM-NA-XT

12/16-bit Analog I/O PC/104 Module



### 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
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 ±2/2 LSB
Relative accuracy	±1 LSB
Nonlinearity	±1 LSB, monotonic
Reset	All channels reset to 0V
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, 5.0 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	+5V±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

### specifications

**Attention to Details**  
Diamond-MM's design reveals a significant amount of attention to quality and details. As with all our analog I/O boards, Diamond-MM utilizes a 4-layer PCB with split analog and digital power and ground planes to minimize digital noise interference with the analog circuitry. 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.

**Rugged Design for the Real World**  
Diamond-MM was designed with real-world applications in mind. The analog inputs are protected against overvoltages up to ±35V, even with the power off. 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 (+5V @ 165mA) 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 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. Note: On any A/D converter, the input range is the same as the full-scale A/D range divided by the gain. On Diamond-MM, the full-scale A/D range is 0-5V in unipolar mode and ±5V in bipolar mode.

Unipolar		Bipolar	
Input Range	Resolution	Input Range	Resolution
0 - 10V	2.44mV	>±10V	4.88mV
0 - 5V	1.22mV	±5V	2.44mV
0 - 2.5V	0.61mV	±2.5V	1.22mV
0 - 1V	0.244mV	>±1V	.488mV
0 - 0.5V	0.122mV	±0.5	.244mV
Custom (10KΩ /R)/4096/V		Custom (10KΩ /R)/2048/V	

### description

Diamond-MM is the 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.

### I/O Header Pinout

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 Ground	17	18	VRef Out (+5V/-5V)
Analog Ground	19	20	Vout 0
Analog Ground	21	22	Vout 1
Analog Ground	23	24	+15V Output
-15V Output	25	26	VRef In 0
Analog Ground	27	28	VRef In 1
Counter 0 in	29	30	Digital Ground
Counter 0 Out	31	32	Counter 2 Out
Digital Out 7	33	34	Digital Out 6
Digital Out 5	35	36	Digital Out 4
Digital Out 3	37	38	Digital Out 2
Digital Out 1	39	40	Digital Out 0
Digital In 7	41	42	Digital In 6
Digital In 5	43	44	Digital In 4
Digital In 3	45	46	Digital In 2
Digital In 1	47	48	Digital In 0
+5V	49	50	Digital Ground

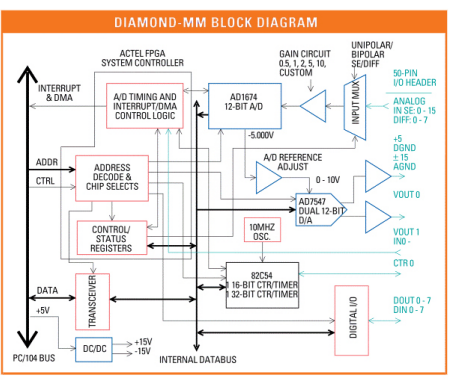
### Analog Output Ranges

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). Note: The -NA versions of Diamond-MM do not have analog outputs.

**A/D Conversion Methods and Rates**  
To provide flexibility in integrating with your application, Diamond-MM offers several methods of controlling 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 command, interrupt routine, or DMA transfer. Different conversion rates require the use of different transfer methods:  
Software command: 2,000/sec max (approx.)  
Interrupt routine: 20,000/sec max (approx.)  
DMA transfer: 100,000/sec max (board limit)

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

**Free Software**  
Diamond-MM comes with free driver software compatible with C and Basic languages. Example programs are included to get you started quickly. Some examples of the supported board operations are:  
• A/D conversion on single channel  
• A/D conversion scan on multiple channels  
• Interrupt-based A/D conversions  
• DMA A/D conversions  
• Analog output on single channel  
• Analog output on both channels  
• Program counter/timers  
• Digital input, bit and byte  
• Digital output, bit and byte



### Ordering Information



Part Number	Description
DMM-XT	DMM Extended temperature version
DMM-NA-XT	DMM-NA Extended temperature version

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DMM-XT	DMM Extended temperature version
DMM-NA-XT	DMM-NA Extended temperature version

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