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# Low-Cost Multifunction I/O – 50 kS/s, 12-Bit, 8 Analog Inputs

## DAQCard-500

**Analog Inputs**
*8 single-ended*
*50 kS/s sampling rate*
*12-bit resolution*

**Digital I/O**
*8 (5 V/TTL) lines*

**Counter/Timers**
*Two, 16-bit resolution*

**Driver Software**
*NI-DAQ*
*Windows 2000/NT/9x*
*Mac OS*

**Application Software**
*LabVIEW*
*LabWindows/CVI*
*ComponentWorks*
*VirtualBench*
*Measure*
*BridgeVIEW*
*Lookout*




**Make sure you consider our new low-cost 12-bit E Series products – refer to page 239.**

| Bus | Analog Inputs | Resolution | Sampling Rate | Input Range | Analog Outputs | Resolution | Output Rate | Output Range | Digital I/O | Counter/ Timers | Triggers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PCMCIA | 8 SE | 12 bits | 50 kS/s | ±5V | – | – | – | – | 8 | 2, 16-bit | – |

***Table 1. DAQCard-500 Channel, Speed, and Resolution Specifications*** *(refer to page 318 for more detailed specifications)*

## Overview

*The DAQCard-500 is a low-cost, multifunction I/O device. You get up to 50 kS/s, 12-bit performance on 8 single-ended analog inputs. This device also features two 16-bit, 10 MHz counter/timers and 8 digital I/O lines.*

## Hardware

### Analog Input

*The DAQCard-500 has 8 single-ended analog input channels. The input circuitry has input overvoltage protection of ±25 V powered on or powered off. Voltage input range is ±5 V.*

*The DAQCard-500 has a 12-bit ADC with analog signal resolution of 2.44 mV in the ±5 V range. The output of the ADC is automatically sign-extended to 16 bits. The ADC performs 20 µs conversions with single-channel and multichannel aggregate acquisition sampling rates up to 50 kS/s.*

*The DAQCard-500 performs both single A/D conversions and multiple A/D conversions of a fixed number of samples. A 16-word deep FIFO buffers the data during multiple A/D conversions to prevent data loss due to bus latency. During continuous, sustained data acquisition, you can achieve throughput rates of 25 kS/s in DOS and 10 kS/s in Windows.*

*An onboard counter/timer generates the sample interval clock with a resolution of 1 µs and controls the timing of multiple A/D conversions. As an alternative, an external signal can generate timing for the sample interval.*

*Data acquisition with the DAQCard-500 is available in two modes: 1) continuous acquisition of a single channel, or 2) multichannel acquisition with continuous scanning. In both modes, the number of samples must be counted in software.*

*You can scan any number of channels between 2 and 8 in the multichannel acquisition mode. These channels are scanned in a round-robin sequence, taking one reading per interval. Scanning always occurs in the same order – from the highest channel specified through channel 0.*

*You can retrieve a reading from the DAQCard-500 as each A/D conversion is available in the FIFO or periodically, using one of the counter/timer channels.*

### Digital I/O

*The DAQCard-500 has a 4-bit input and a 4-bit output port. These ports can directly drive Darlington transistors for high-current applications. The digital I/O ports are 5 V/TTL compatible. The output port can source or sink 4 mA on each line.*

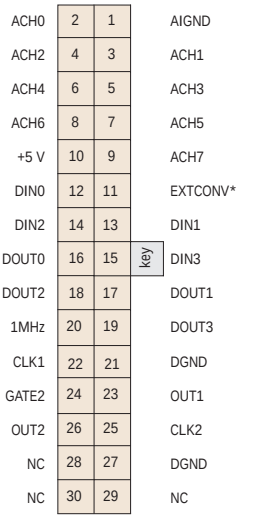



***Figure 1. DAQCard-500 I/O Connector***




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# Low-Cost Multifunction I/O – 50 kS/s, 12-Bit, 8 Analog Inputs

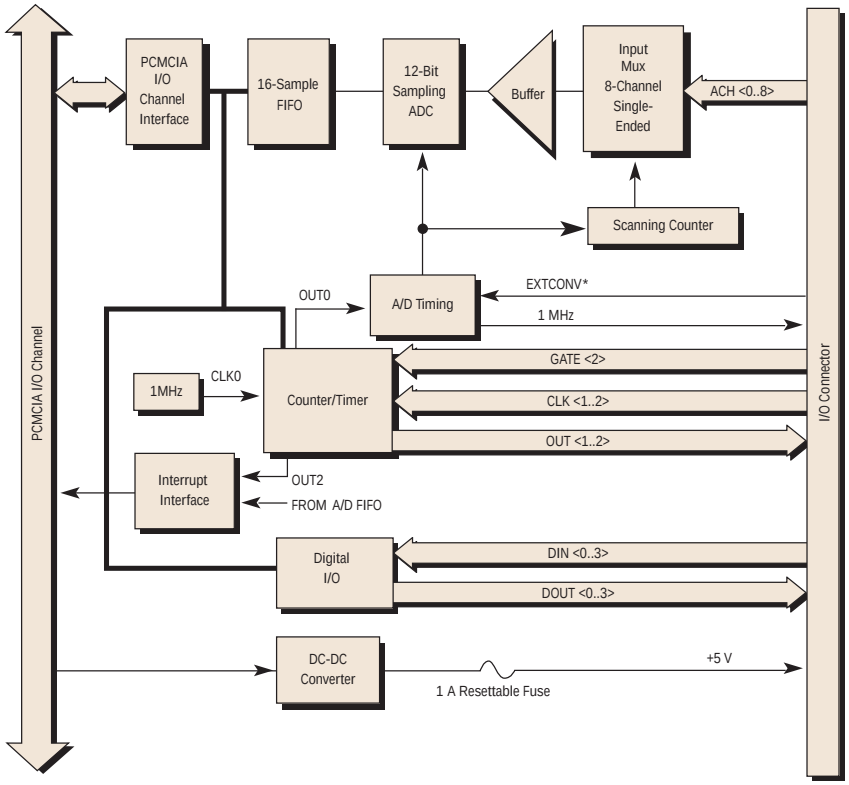



*Figure 2. DAQCard-500 Hardware Block Diagram*

### Counter/Timer

*The DAQCard-500 uses an 82C54 programmable interval timer (PIT) for counting and timing. The PIT contains three independent 16-bit counter/ timers. One of the counters (counter 0) is dedicated to A/D timing. You can use the other two counter/timers for general time-related functions, such as clock output, pulse output, and event and frequency measurements. The clock source of counter 0 is tied internally to a 1 MHz clock, so that an external clock is not always required. For applications that require an external clock, this 1 MHz clock is available on the I/O connector for use with other counters.*

### I/O Connector

*The DAQCard-500 uses the CB-27, a 27-pin screw terminal block (see Figure 1). The PR27-30F cable connects to the DAQCard-500 and CB-27. ACH<0..7> are eight analog input channels referenced to AIGND. EXTCONV* can control individual A/D conversions externally. CLK<1..2>, GATE<2>, and OUT<1..2> are the counter clock, gate, and output, respectively. DOUT<0..3> are the four digital output lines and DIN<0..3> are the four digital input lines. All digital lines are referenced to digital ground (DGND). The fused +5 VDC line can drive external signal conditioning circuitry.*

**Make sure you consider our new low-cost 12-bit E Series products – refer to page 239.**

**Refer to page 318 for more detailed specifications.**

## Ordering Information

***DAQCard-500*** *and NI-DAQ for*

*Windows 2000/NT/9x.....777086-01*

*Mac OS .....777086-02*

*Includes NI-DAQ for Windows 2000/NT/9x on CD unless otherwise noted. See pages 192 and 210.*

## Example Configurations

| DAQ Board | Cable (page 297) | Accessory (page 293) |
|---|---|---|
| DAQCard-500 | PR27-30F (777131-01) | CB-27 (777100-01) |

*For more detailed cable and accessory options, refer to pages 286-299.*





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# Specifications

## DAQCard-500

*These specifications are typical at 25 °C unless otherwise stated.*

### Analog Input

**Input Characteristics**

*Number of channels* ..... *8 single-ended*
*Type of ADC* ..... *Successive approximation*
*Resolution* ..... *12 bits, worst-case code range -2,021 to +2,020 (due to software calibration)*
*Maximum sampling rate* ..... *50 kS/s; 25 kS/s sustained under DOS, 10 kS/s sustained under Windows*
*Input signal ranges* ..... *±5 V*
*Input coupling* ..... *DC*
*Overvoltage protection* ..... *±25 V powered on, ±25 V powered off*
*Inputs protected* ..... *ACH<0..7>*
*FIFO buffer size* ..... *16 samples*
*Data transfers* ..... *Interrupts, programmed I/O*

**Transfer Characteristics**

*Relative accuracy* ..... *±1.5 LSB typical, ±2.5 LSB max*
*DNL* ..... *±0.7 LSB typical, ±1 LSB max*
*INL* ..... *±0.7 LSB typical, ±1 LSB max*
*No missing codes* ..... *12 bits, guaranteed*
*Offset error*
*After software calibration* ..... *±1 LSB*
*Gain error (relative to calibration reference)*
*After software calibration* ..... *±0.045% of reading typical, ±0.09% max*

**Amplifier Characteristics**

*Input impedance* ..... *1 GΩ in parallel with 40 pF*

**Dynamic Characteristics**

*Settling time to ±0.024% (±1 LSB)*
*for full-scale step* ..... *20 µs*
*System noise* ..... *0.5 $LSB_{rms}$*

**Stability**

*Recommended warm-up time* ..... *15 minutes*
*Offset temperature coefficient* ..... *10 ppm/°C max*
*Gain temperature coefficient* ..... *15 ppm/°C max*

### Digital I/O

*Number of channels* ..... *4 input and 4 output*
*Compatibility* ..... *5 V/TTL*
*Digital logic levels*

| Level | Minimum | Maximum |
|---|---|---|
| Input low voltage | 0 V | 0.8 V |
| Input high voltage | 2 V | 5 V |
| Output low voltage ($I_{out}$ = 4 mA) | – | 0.9 V |
| Output high voltage ($I_{out}$ = 4 mA) | 3.3 V | – |

### Timing I/O

*Number of channels* ..... *3 counter/timers (1 dedicated to analog input)*
*Resolution* ..... *16 bits*
*Compatibility* ..... *5 V/TTL, gate and source pulled high with 100 kΩ resistors*
*Base clocks available* ..... *1 MHz*
*Base clock accuracy* ..... *±0.01%*
*Maximum source frequency* ..... *10 MHz*
*Minimum source pulse duration* ..... *50 ns*
*Minimum gate pulse duration* ..... *50 ns*
*Data transfers* ..... *Programmed I/O*

### Bus Interface ..... *Slave*

### Power Requirement

*+5 VDC (±5%)* ..... *60 mA in active mode*
*20 mA in stand-by mode*
*Power available at I/O connector* ..... *+5 VDC, 500 mA*

### Physical

*Dimensions* ..... *Type II PC Card*
*I/O connector* ..... *27-pin male*

### Environment

*Operating temperature* ..... *0 to 50 °C, should not exceed 50 °C while in PCMCIA slot*
*Storage temperature* ..... *-20 to 70 °C*
*Relative humidity* ..... *10% to 90% noncondensing*

### Certifications and Compliances

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