



## USB-AI16-16A - High Speed Multifunction 16-Bit Analog Input

### FEATURES

- High-speed USB 2.0 device, sampling rate to 500kHz
- All functions fully software configurable
- 16-bit resolution A/D converter
- 16 single-ended or 8 differential inputs
- Eight input ranges, unipolar or bipolar
- Real-time hardware auto-calibration and oversampling for accurate data
- Unique channel-by-channel programmable gains
- Data buffer for A/D
- Synchronous, asynchronous, timed trigger modes
- 16 high-current digital I/O lines
- 16-bit programmable counter/timer
- Alternate embedded USB connector
- USB/104 form-factor for embedded OEM's
- Small (4" x 4" x 1.25") rugged industrial enclosure
- All required power drawn from USB port

### FACTORY OPTIONS

- External power for high current capabilities
- DIN rail mounting provision
- OEM (board only) version with PC/104 mounting holes and PCB footprint for added flexibility in embedded applications
- Current ranges (4-20mA, 10-50mA) S.E. or Diff
- Extended Temperature Operation -40 to +85°C



### FUNCTIONAL DESCRIPTION

The USB-AI16-16A is an ideal solution for adding portable, easy-to-install high-speed analog and digital I/O capabilities to any computer with a USB port. The unit is a USB 2.0 high-speed device, offering the highest speed currently available with the USB bus. The USB-AI16-16A is a 16-bit resolution A/D board capable of speeds up to 500kHz for its 16 single-ended or 8 differential analog inputs. Each channel can be independently software configured to accept 8 different input ranges. Additionally, each channel includes its own analog ground pin on the I/O connector which is helpful in reducing noise. A unique, real-time internal calibration system allows the card to continually compensate for offset/gain errors giving a more accurate reading. The unit is plug-and-play allowing a quick connection whenever you need additional I/O on the convenience of a USB port.

This small, compact, multifunction I/O board provides the user with everything needed to start acquiring, measuring, analyzing and monitoring in a variety of applications. The USB-AI16-16A data acquisition board can be used in many current real-world applications such as embedded equipment monitoring, precision PC-based and portable environmental measurements, and mobile data acquisition. Additional features include 16 digital I/O lines and a programmable 16-bit counter. The counter can be configured in a variety of modes and has the ability to use external signals to trigger and control the scanning of its inputs.

The USB-AI16-16A is designed to be used in rugged industrial environments but is small enough to fit nicely onto any desk or testing station. The board is PC/104 sized (3.550 by 3.775 inches) and ships inside a steel powder-coated enclosure with an anti-skid bottom.

### OEM USB/104 FORM FACTOR

The OEM (board only) version is perfect for a variety of embedded applications. What makes the OEM option unique is that its PCB size and mounting holes match the PC/104 form factor (without the bus connections). This allows our rugged digital board to be added to any PCI-104 or PC/104 stack by connecting it to a simple USB port usually included on-board with embedded CPU form factors such as EBX, EPIC, and PC/104. This is especially important since many newer CPU chipsets do not support ISA and have plenty of USB ports. The USB-AI16-16A OEM board can also be installed using standoffs inside other enclosures or systems.

### ACCESSORIES

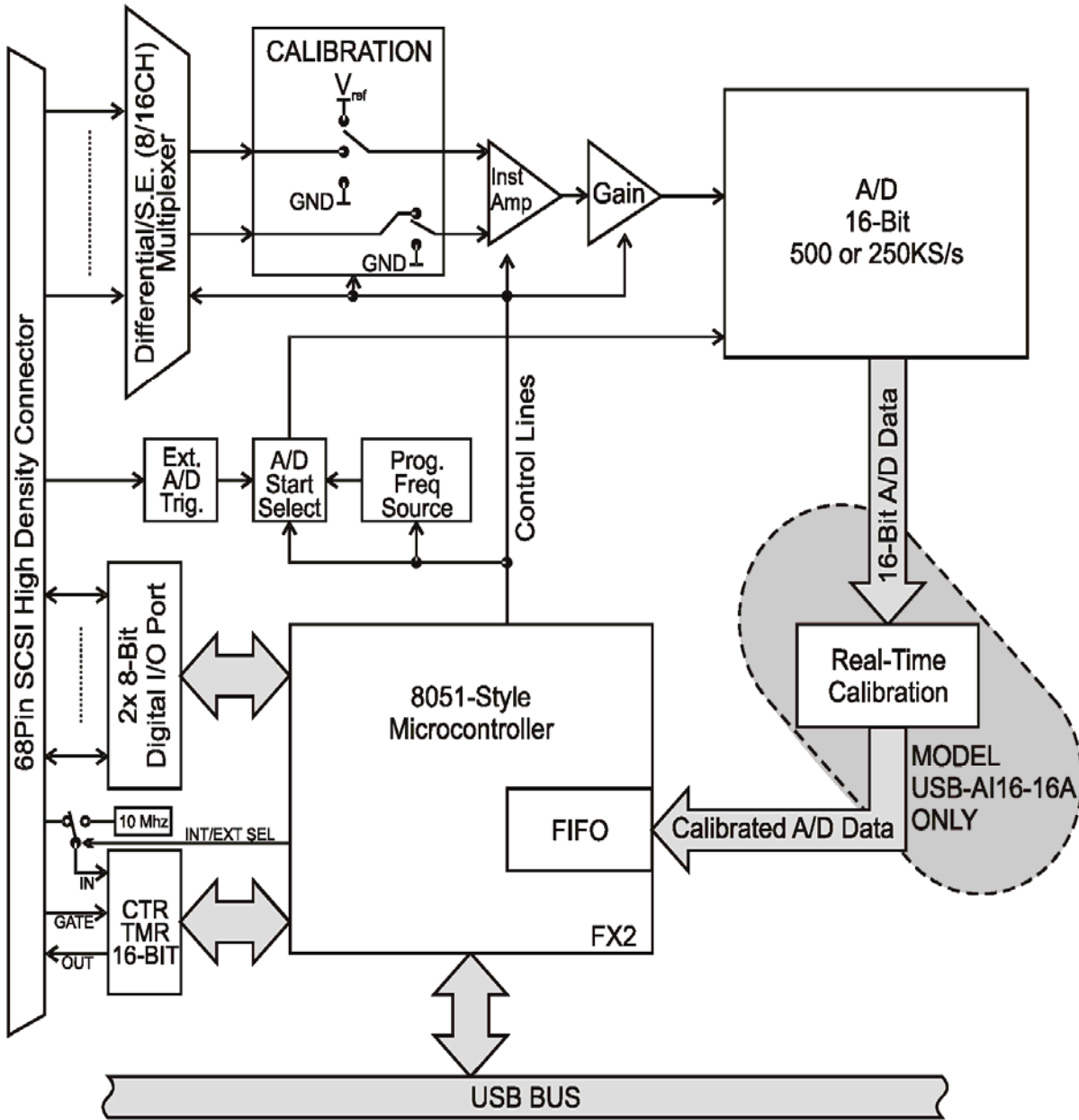
The USB-AI16-16A is available with optional cable assemblies and screw terminal boards for easy-to-use, out of the box connectivity.

### SOFTWARE

The USB-AI16-16A is plug-and-play which allows quick connect or disconnect whenever you need additional I/O on your USB port. The module utilizes a high-speed custom function driver optimized for a maximum data throughput that is 50-100 times faster than the USB human interface device (HID) driver used by many competing products. This approach maximizes the full functionality of the hardware along with capitalizing the advantage of high-speed USB 2.0. The USB-AI16-16A is supported for use in most USB supported operating systems and includes a free Linux and Windows 98se/Me/2000/XP/2003 compatible software package. This package contains sample programs and source code in Visual Basic, Delphi, C++ Builder, and Visual C++ for Windows. Also incorporated is a graphical setup program in Windows. Third party support includes a Windows standard DLL interface usable from the most popular application programs. Embedded OS support include Windows XPe.



BLOCK DIAGRAM





## Specifications

### Analog Inputs

<b>ADC Type</b>	Successive approximation
<b>Sampling rate</b>	USB-AI16-16A 500Ksamples/sec (maximum aggregate) USB-AI16-16E 250Ksamples/sec (maximum aggregate)
<b>Resolution</b>	16-bit
<b>Number of channels</b>	16 single-ended or 8 differential (software selectable)
<b>Bipolar ranges</b>	±1V, ±2V, ±5V, ±10V (software selectable)
<b>Unipolar ranges</b>	0-1V, 0-2V, 0-5V, 0-10V (software selectable) 4-20mA or 10-50mA Factory installed (optional)
<b>Board Calibration</b>	VREF LOW: AGND VREF HIGH: 9.90V ± 0.0299V System Calibration Program provided to calibrate entire system
<b>Calibration Hardware</b>	USB-AI16-16A Calibrated real-time output for offset/gain errors USB-AI16-16E NONE
<b>Input impedance</b>	1M
<b>A/D Start Sources</b>	Software Start, Timer Start, and External Start Trigger (rising or falling edge; software selectable)
<b>A/D Start Enable</b>	Externally supplied (pulled-up; active-high )
<b>A/D Start Types</b>	Single Channel or Scan (software selectable)
<b>Channel Oversamp</b>	0-255 consecutive samples/channel
<b>Over volt protection</b>	-40 to +55V
<b>Crosstalk</b>	No crosstalk present below 400KHz -60dB @ 500KHz

### Digital I/O

<b>Lines</b>	16 inputs or outputs in groups of 8 (pulled-up)
<b>Input voltage</b>	Logic low: 0V(min) to 0.8V(max) Logic high: 2V(min) to 5V(max)
<b>Input current</b>	±20: A (max)
<b>Output voltage</b>	Logic low: 0V(min) to 0.55V(max) Logic high: 2V(min) to 5V(max)
<b>Output current</b>	Logic low: 64mA(max) sink Logic high: 32mA(max) source

### Counter/Timer

<b>Available Counters</b>	Counter 0
<b>Type:</b>	82C54 programmable interval counter
<b>Input Frequency</b>	10MHz (max)
<b>Counter size</b>	16-bit
<b>Clock Internal</b>	10MHz or Externally supplied (software selectable; pulled-up)
<b>Clock Period</b>	100ns (min)
<b>Clock Pulse Width High</b>	30ns (min)
<b>Clock Pulse Width Low</b>	40ns (min)
<b>Gate</b>	Externally supplied (pulled-up; active-high)
<b>Output</b>	External (pulled-up)

### Input/Output

<b>Voltage/Current</b>	Same as Digital I/O
------------------------	---------------------

### Environmental

<b>Operating Temperature</b>	0° to +70°C, optional -40° to +85°C
<b>Storage Temperature</b>	-40° to +105°C
<b>Humidity</b>	5% to 90% RH, non-condensing
<b>Board Dimensions</b>	PC/104 format, 3.550" by 3.775" and mounting holes
<b>Power required</b>	+5V at 330mA typical

### The following items are included with your shipment

- Board installed in labeled enclosure
- 6' USB cable
- Software Master CD (PDF user manual installed with product package)
- Printed USB I/O Quick-Start Guide

### Ordering Guide

<b>USB-AI16-16A</b>	Advanced version, 16-Bit, 500kHz, with auto calibration
<b>USB-AI12-16E</b>	Standard version, 16-Bit, 250kHz, with software calibration

### Model Options

<b>-P</b>	External AC/DC adapter (power jack/regulator installed)
<b>-OEM</b>	Board only (no enclosure)
<b>-DIN</b>	DIN rail mounting provision
<b>-T</b>	Extended Temperature Operation (-40° to +85°C)
<b>-S0x</b>	"x" = special number designator - 4-20mA or 10-50mA inputs - 16 current inputs when factory configured as single-ended - 8 current inputs when factory configured as differential - DIO lines can be configured with pull down resistors

### Accessories

<b>STB-68</b>	Screw terminal board
<b>C68PS18L</b>	68-Pin SCSI 18" shielded cable
<b>MP104-DIN</b>	DIN rail mounting provision
<b>CUSB-OTG-6</b>	6' USB Cable with Type A to mini type OTG connector for embedded applications