FEATURES
- High-speed USB 2.0 A/D board at up to 500kHz
- All functions fully software configurable
- 16-bit resolution A/D converter
- Add channel capacity of 32 differential inputs per AIMUX32 board (up to four boards plus A/D board)
- Eight input ranges, unipolar or bipolar
- Real-time hardware autocalibration and oversampling for accurate data
- Unique channel-by-channel programmable gains
- Wide range of signal conditioning types per channel
- Data buffer for A/D
- Synchronous, asynchronous, timed trigger modes
- 16-bit programmable counter/timer
- Alternate embedded USB connector
- Two DB37F right-angle I/O connectors per board
- USB/104 form-factor for embedded OEM’s
- All required power drawn from USB port

FACTORY OPTIONS
- External power for high current capabilities
- DIN rail mounting provision
- OEM (board only) version with mounting holes 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-AI16-128A 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-AI16-128A is a 16-bit resolution A/D board set capable of speeds up to 500kHz (divided equally by the total number of conditioned channels in the board set) for the 32 single-ended or 32 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 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-AI16-128A data acquisition board set can be used in many 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-AI16-128A 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 analog input board to be added to any PCI-104 or PC/104 stack by connecting it to a 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-AI16-128A OEM board can also be installed using standoffs inside other enclosures or systems.

ACCESSORIES
The USB-AI16-128A is available with optional cable assemblies and screw terminal boards for easy-to-use, out of the box connectivity.

SOFTWARE
The module utilizes a high-speed custom function driver optimized for a maximum data throughput of 1MBps 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-AI16-128A board set is supported for use in most USB supported operating systems and includes a free Linux (including Mac OS X) and Windows 98es/Me/2000/XP/2003 compatible software package. This package contains sample programs and source code in Visual Basic, Delphi 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, and includes example LabVIEW VIs. Embedded OS support include Windows XPe.
**AIMUX-32**

**BLOCK DIAGRAMS**

**SPECIFICATIONS**

**Analog Inputs**
- **ADC Type**: Successive approximation
- **Sampling rate**:
  - USB-AI16-128A: 500K samples/sec (maximum aggregate)
  - USB-AI16-128E: 250K samples/sec (maximum aggregate)
- **Resolution**: 16-bit
- **Number of channels**: 32 single-ended or 32 differential per each of up to 4 AIMUX-32 boards
- **Bipolar ranges**: ±1V, ±2V, ±5V, ±10V (software selectable)
- **Unipolar ranges**: 0-1V, 0-2V, 0-5V, 0-10V (software selectable)
- **4-20mA or 10-50mA**: Factory installed (optional)
- **Board Calibration**:
  - VREF LOW: AGND
  - VREF HIGH: 9.90V ± 0.0299V
- **System Calibration**:
  - Program provided to calibrate entire system

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

**Environmental**
- **Operating Temp.**: 0°C to +70°C, optional -40°C to +85°C
- **Storage Temp.**: -40°C to +105°C
- **Humidity**: 5% to 90% RH, without condensation
- **Board Dimensions**: PC/104 format, 3.550" by 3.775" and mounting holes
- **Power required**: +5V at 330mA typical

**Counter/Timer**
- **Available Counters**: Counter 0
- **Type**: 62C54 programmable interval counter
- **Input Frequency**: 10MHz (max)
- **Counter size**: 16-bit
- **Clock**: Internal 10MHz or Externally supplied (software selectable; pulled-up)
- **Clock Period**: 100ns (min)
- **Clock Pulse Width High**: 30ns (min)
- **Clock Pulse Width Low**: 40ns (min)
- **Gate**: Externally supplied (pulled-up; active-high)
- **Output**: Externally supplied (pulled-up)
- **Voltage/Current**: Same as Digital I/O

**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**
- **USB-AI16-128A**: Advanced version, 16-Bit, 500kHz, with autocalibration (A/D board plus four AIMUX-32 boards)
- **USB-AI16-128E**: Economy version, 16-Bit, 250kHz, with software calibration (A/D board plus three AIMUX-32 boards)
- **USB-AI16-96A**: Advanced version, 16-Bit, 500kHz, with autocalibration (A/D board plus three AIMUX-32 boards)
- **USB-AI16-96E**: Economy version, 16-Bit, 250kHz, with software calibration (A/D board plus four AIMUX-32 boards)
- **USB-AI16-64A**: Advanced version, 16-Bit, 500kHz, with autocalibration (A/D board plus two AIMUX-32 boards)
- **USB-AI16-64E**: Economy version, 16-Bit, 250kHz, with software calibration (A/D board plus one AIMUX-32 board)
- **USB-AI16-32A**: Advanced version, 16-Bit, 500kHz, with autocalibration (A/D board plus one AIMUX-32 board)
- **USB-AI16-32E**: Economy version, 16-Bit, 250kHz, with software calibration

**Model Options**
- **-P**: External AC/DC adapter (power jack/regulator installed)
- **-QEM**: Board only (no enclosure)
- **-DIN**: DIN rail mounting provision
- **-T**: Extended Temperature Operation (-40°C to +85°C)
- **-Sx**: "x" = special number designator
  - 4-20mA or 10-50mA inputs
  - DIO lines can be configured with pull down resistors

**Accessories**
- STB-50: Screw terminal board
- CAB50F-6: 6' flat ribbon cable, female 50 pin connector
- MP104-DIN: DIN rail mounting provision
- USB-EEM-6: 6' USB Cable with Type A to mini type USB connector for embedded applications