

## Description:

US Digital's **SEI** bus is a simple, quick and convenient way of networking devices to an RS232 serial port or USB port.

The **AD2-B** adapter is available to interface to a RS232 port (9-pin DSUB) such as those in PCs. A wall-mount power supply furnishes the power for all devices on the **SEI** bus.

The **SEI-USB** adapter is available to interface to a USB port. The USB port provides power to the **SEI** devices; if needed, additional power can be supplied from a wall-mount power supply.

## Features:

- > Up to 15 devices on a single 6-pin telephone-type cable.
- > Uses standard PC data rates up to 115 Kbaud.
- > Software and source code available.
- > Rugged, simple, low cost.
- > US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.

## Cable Distance from AD2-B Adapter:

Devices	26 AWG cable	28 AWG cable
1	1000 ft	1000 ft
2	1000 ft	640 ft
3	670 ft	420 ft
5	400 ft	250 ft
10	200 ft	125 ft
15	125 ft	80 ft

**Caution:** Do not use voice type telephone cables; they commonly reverse the pin-out. The device network requires a star configuration (pin 1 to pin 1). We offer cables (26 AWG) of any length.

## Absolute Maximum Ratings:

Parameter	Min.	Max.	Units
Operating temperature	0	45	°C
Humidity (non-condensing)	0	95	%
Supply voltage (PWR)	0	16	Volts

> ESD warning: Normal handling precautions should be taken to avoid

Technical Data, Rev. 08.27.07, August 2007  
All Information subject to change without notice.

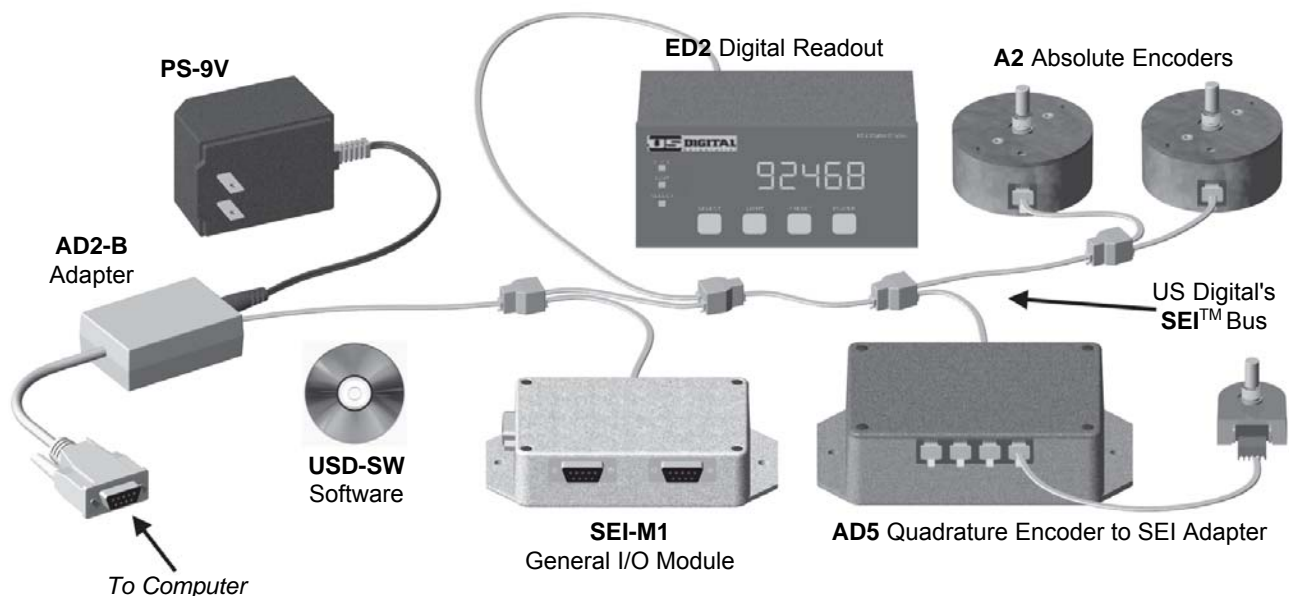
## Interface:

The **SEI** bus can support 1 to 15 devices on the **SEI** bus. The network configuration can be a chain, star, or a combination of both and does not require cable terminations.

The bidirectional data lines carry commands from the host computer and responses from the device(s). The format is 1 start bit, 8 data bits and 1 stop bit. The baud rate can be changed, but it always starts as 9600 baud after reset or power up. Since the data bus is bidirectional, the host must release the bus within 20 uSec after the last command byte to avoid contention with the device's response. The **AD2-B** adapter does this automatically and biases these lines with pull-up/down resistors to keep them in the inactive state when the bus is idle.

The busy lines are used for flow control. When a device is busy, it activates these lines in an open collector fashion by driving busy- low and busy+ high. They need to be biased at the host with pull-up/down resistors to keep them in the inactive state (busy+ with a resistor to ground, busy- with a resistor to +5V) when they are not driven. They are driven by the device which has been addressed as an acknowledgment of the command. They stay active until the command is completed. While a device drives the busy line, all other devices on the bus ignore the data flow. If a single device is on the bus, the busy lines can be ignored and pulled to the inactive state, but it is easier to communicate with it if they are connected.

The maximum cable length from the **SEI** adapter to any device should be limited to 1000 feet. If the baud rate used is higher than 19.2 kbaud, the length should be reduced proportionally, ie: 200 ft at 115 kbaud. Contact us for information about longer cables at high baud rates. The power supply requirement is 5.5 volts min., which should be considered carefully when long cables are used, because of the voltage drop caused by the cable's resistance (a typical 26 AWG telephone cable is 40 Ohms per 1000 feet). For example, the **SEI** adapter provides 8 volts worst case. Unless power is supplied at several points along the cable, each network branch from the **SEI** adapter should be limited in length depending on how many devices it supports. See table above.



**DC Electrical Specifications:**

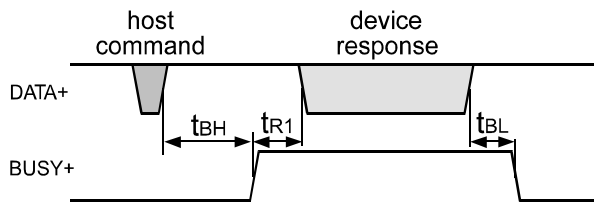
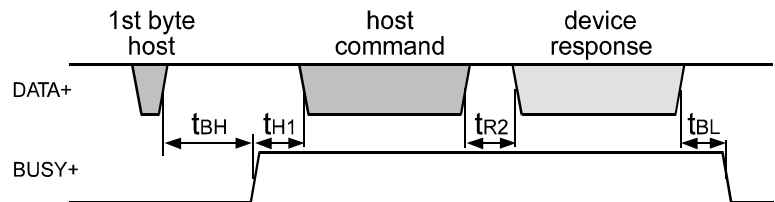
Parameter	Min.	Typ.	Max.	Units	Notes
Supply voltage (PWR)	5.5	-	16	Volts	
Differential output voltage  DataL - DataH  ,  Busy+ - Busy-	2.0	-	5.0	Volts	Load = 100 Ohms
Differential input voltage  DataL - DataH  ,  Busy+ - Busy-	0.2	-	5.0	Volts	
Common mode output voltage (DataH+DataL)/2, (Busy+Busy+)/2	2.0	2.5	3.0	Volts	Load = 100 Ohms
Common mode input voltage (DataH+DataL)/2, (Busy+Busy+)/2	-4.5	-	3.0	Volts	

**AC Electrical Specifications:**

Symbol	Description	Min.	Max.	Units	Note
TBH	Host command to busy active	0.01	1	mSec	1
TR1	Device response time (1 byte command)	0.01	1	mSec	
TR2	Device response time (Mult. byte command)	0.01	30	mSec	2
TBL	Busy release time	0.01	0.1	mSec	
TH1	Host response time	0	300	mSec	3

**Notes:**

- 1) After reset and other commands that have a longer recovery time, this timing can exceed the maximum, or the byte may even be ignored. See command descriptions for details.
- 2) Commands that access the on-board EEPROM to store new parameters can take up to this time limit; however, most commands are much shorter.
- 3) When the device is waiting for data from the host, it times out & aborts the command after 300 to 350 msec. (A2 rev 1.01 firmware: 30-35 msec).

**Single byte command diagram****Multiple byte command diagram****Functional Pin Description:**

Pin	Name	Description
1	GND	Ground, common for power, data and busy pairs.
2	Busy+	Bidirectional differential acknowledge line, active high (open source output, must be pulled down to ground). Analog+: Analog version: positive analog voltage output. *A2 analog option only.
3	Busy- Analog-	Bidirectional differential acknowledge line, active low (open drain output, must be pulled up to +5 Volt). Analog-: Analog version: analog signal ground, connected to GND pin. *A2 analog option only.
4	PWR	Power supply input.
5	DataL	Bidirectional differential data line, non-inverted, and is pulled high through a 10k-ohm resistor to pin 4 PWR.
6	DataH	Bidirectional differential data line, inverted, and is pulled low through a 10k-ohm resistor to pin1 GND.

**General Notes:**

- 1) The lines busy+ and busy- are differential, and they should not be terminated.
- 2) The lines dataL and dataH are RS485-type differential lines. They don't need to be terminated for cables up to 1000 ft long at 19.2 kbaud (proportionally shorter at higher baud rates, i.e. 200 ft at 115 kbaud). If terminated, make sure the lines are biased such that dataL is above dataH by at least 2 volts.
- 3) For implementations with long cables or several devices on the bus, the supply voltage at the host should be appropriately higher to compensate for voltage losses in the wires.
- 4) A "star" bus topology is discouraged, better performance may be obtained from a "daisy-chain" bus topology.
- 5) See the **SEI-UPS** uninterruptable power supply for the **SEI** bus data sheet for information on retaining power to **SEI** devices after a power failure.