USB 24A / 48C / 72A / 96C / 120A

✱ general description

The USB 24A, 48C, 72A, 96C & 120A are Universal Serial Bus or USB type digital input / output and counter-timer data acquisition devices. They are part of the µDAQ range of products. These devices are used to do digital control, pulse counting and digital pulse generation. The device connects to a normal USB port making it portable and quick to install. The devices support both USB 1.1 full speed and USB 2.0 full speed.

All USB products ships with the EDR Enhanced Software Development Kit containing the EDR Enhanced Application Program Interface (API). The EDR Enhanced API implements a standard function set ensuring that all functionality stays the same for different bus types. This allows for switching between USB and other bus topologies, like PCI, without any software change.

Figure 1 USB 96C

✱ features

- USB 2.0 full speed compatible
- Portable and easy to install.
- Support for up to 120 digital I/O lines.
- Support for up to 6 counter-timers
- 16-bit programmable down counters
- Each counter has an external clock line and gate
- Six programmable counter modes
- Automatic programmable I/O port direction
- USB bus powered or by external power supply depending on model
- Dimensions:
  - 24A / 48C / 72A: 45(H) x 80(W) x 148(L) mm
  - 120A / 96C: 60(H) x 80(W) x 148(L) mm

✱ ordering information

Device	Counters	Digital IO	Power Type	Tempe Range	Bus Type
USB 24A	0	24	USB Bus	0°C-70°C	USB 1.1 & USE 2.0 Full speed
USB 48C	6	48	External PSU	0°C-70°C	USB 1.1 & USE 2.0 Full speed
USB 72A	0	72	USB Bus	0°C-70°C	USB 1.1 & USE 2.0 Full speed
USB 96C	6	96	External PSU	0°C-70°C	USB 1.1 & USE 2.0 Full speed
USB 120A	0	120	External PSU	0°C-70°C	USB 1.1 & USE 2.0 Full speed

✱ absolute maximum electrical ratings

Parameter	Symbol	Condition	Rating			Unit
Digital Input Voltage	Vdi	with respect to ground	-0.5 to 5.5			V
Digital Output Voltage	Vdo		-0.5 to 5.5			V
Digital Output Current	Vdoc		±2.0			mA
Storage Temperature	Tst	-	-50 to 150			°C
Operating Temperature	Tot	-	0 to 70			°C
Power Requirements:	Pd	Ta = 25°C	**Min**	**Typ**	**Max**	
USB 24A			-	50	100	mA
USB 48C			-	300	400	MA
USB 72A			-	60	210	MA
USB 96C			-	315	515	MA
USB 120A				70	320	mA

✱ universal serial bus (USB) characteristics

Parameter	Property
Bus type	USB 1.1 Full Speed
Bus speed	12 Mbps
Compatibility	USB 1.1 & USB 2.0 Full Speed
Interface Controller	USB Endpoint Compliant
Voltage	5 Votl
Endpoints	1 x Control Endpoint 1 x Bulk Endpoint 1 x Interrupt Endpoint*

*** Depends on model**

✱ digital I/O & counter timer electrical characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input High	Vih	Ta = 25°C with respect to ground	2.2		5.5	V
Input Low	Vil		-0.3		0.8	V
Output High	Voh		3.7	5.0		V
Output Low	Vol			0.0	0.4	V
Output Source/Sink Current	Io				2.0	mA
Input Source/Sink Current	Ii		-1		1	uA

✱ digital I/O properties

Parameter	Type
Logic Compatibility	5V & 3.3V TTL Logic Levels
Device Compatibility	Intel 82C55
Maximum read / write speed	< 3ms *
Number of channels:	**Channels**
USB 24A	24 I/O @ 3 x 8-bit
USB 48C	48 I/O @ 6 x 8-bit
USB 72A	72 I/O @ 9 x 8-bit
USB 96C	96 I/O @ 12 x 8-bit
USB 120A	120 I/O @ 15 x 8-bit

***** Dependant on Operating System I/O call access time

✱ counter-timer properties

Parameter	Type
Logic Compatibility	5V & 3.3V TTL Logic Levels
Device Compatibility	Intel 82C54
Maximum read / write speed	* < 3ms
Number of channels:	**Channels**
USB 24A	0
USB 48C	6
USB 72A	0
USB 96C	6
USB 120A	0

***** Dependant on Operating System I/O call access time

✱ software operation characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Digital read operation	Dir	Directly connected to host		< 3		Milliseconds
Digital write operation	Dow			< 3		Milliseconds
Counter read operation	Cr			< 3		Milliseconds
Output write operation	Cw			< 3		Milliseconds
Interrupt latency	Ir			< 6		Milliseconds

✱ operation

The diagram below shows a typical setup of how to connect too an USB MicroDAQ device. The device is connected to a USB host, normally a personal computer. Depending on the model an external power supply might be necessary. The device supports digital input and output commands, counter-timer command and interrupt via USB bulk commands.

The device can be used to switch relays, mechanical or solid-state. The output is a normal TTL signal therefore the line needs to be buffered to be able to drive the relay. Each application will differ but for a common solution the PC38V will serve as an I/O buffer module. For a more standard installation make use of the PC38G, a mechanical relay module, or the PC37D, a solid-state relay module.

The USB MicroDAQ can also be used to monitor digital inputs. A simple interface is a normally open switch with a pull-up resistor. In this case the line will stay high until the switch is closed. For digital inputs the best option would be to optically isolate it. For this purpose the PC43E can be used. This is an eight-channel optical-isolation module.

The counter-timers can be used to count pulses or to generate them. The counters can generally only be used to calculate slower or short burst signals. The is because there is a latency when making an I/O call the bulk still needs to be passed through the USB sub-system. Read and Write access times of three to four milliseconds can be expected.

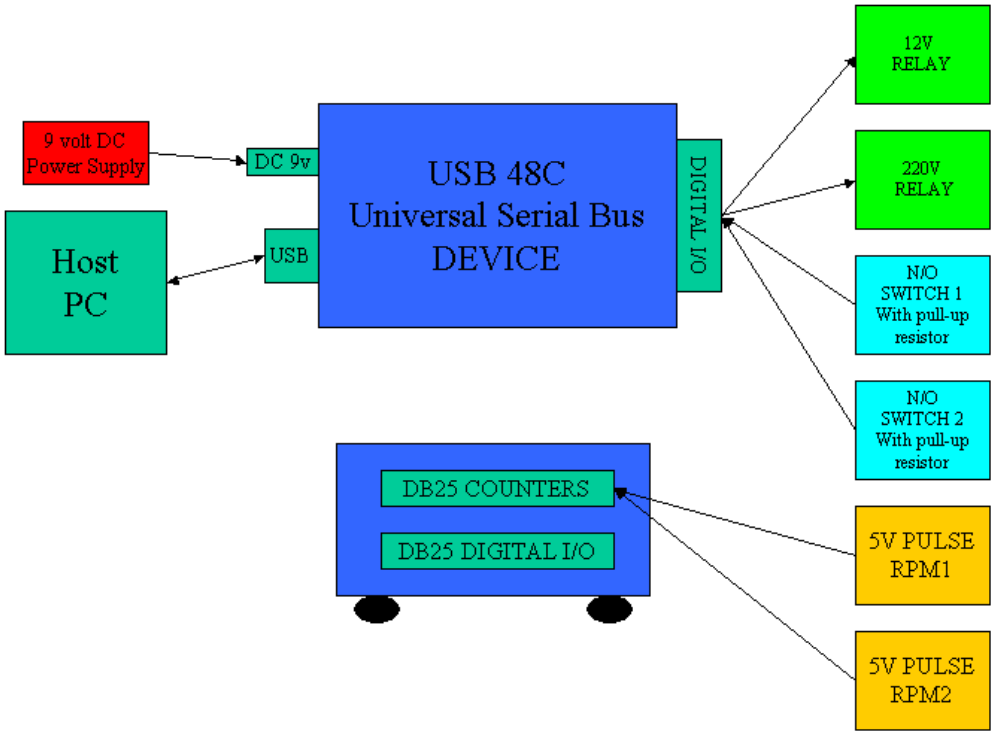

Figure 2 Typical Setup

✱ optional accessories

The USB µDAQs can be used with a wide range of accessories. The table below shows a list of accessories that are compatible with the digital I/O and counter timer USB series of devices.

ADPT-25-S	Short MicroDAQ mini Screw Terminal Adaptor
ADPT-25-M	Medium MicroDAQ mini Screw Terminal Adaptor
DB25M/F	DB25 (M) to DB25 (F) Multi-core Screened Cable
ADPT-2526	DB25 (F) & IDC26 (M) to 27way Screw Terminal Adaptor
PC-52A2	Multi I/O Adaptor (2x) 8ch; (4x) 4ch Analog I/P; (1x) 4ch Analog O/P
PC-43A2	Multi I/O Adaptor (1x) 16ch; (3x) 8ch Digital I/O
PC-37D	8 Channel Opto-22 Solid State Relay Module
PC-37E	16 Channel Opto-22 Solid State Relay Module
PC-37F	24 Channel Opto-22 Solid State Relay Module
PC-38X	24 Channel I/O Driver Module
PC-43E	8Channel Digital Opto-Isolator I/P Module
PC-43B	16 Channel Digital Opto-Isolator I/P Module
PC-43C	24 Channel Digital Opto-Isolator I/P Module

✱ software support

All µDAQ products are supported by the EDR Enhanced Software Development Kit and have operating system drivers for Windows and Linux. The EDR Enhanced SDK provides many examples for all popular programming environments.

The EDR Enhanced API implements all USB functionality through the operating system driver. No specific knowledge of USB is needed. All functionality is transparent to the user or programmer and is exported through a simple set of functions. This enables the user to read and write digital I/O ports and counters and also to configure them. Interrupt functionality are also common across all bus topologies making it easy to switch from PCI to USB.

Development support

- C++, Windows and Linux
- Borland Delphi
- Borland C++ builder
- Visual Studio .NET
- KDevelop & QT
- Testpoint
- Labview
- Agilent VEE

✱ contact details

Eagle Technology

Postal Details:
31-35 Hout Street
Cape Town
South Africa

Phone: +27 21 423 4943
Fax +27 21 424 4637

Email: eagle@eagle.co.za
http://www.eagledaq.com

✱ document history

The table below lists the document history. A minor revision change will indicate document errors that are edited. A major revision change will indicate an update or change to the document contents or structure.

Revision	Date	Comments
1.0	02/11/2005	Original Release.

✱ copyright and trademarks

✱ disclaimer