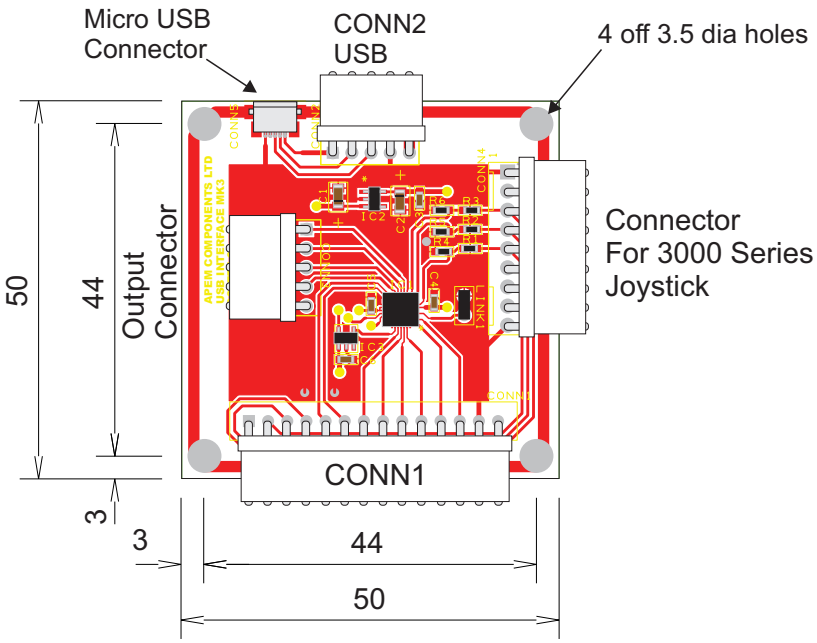
The Apem Components USB Joystick Interface is designed to connect a Joystick with up to 3 analogue axes, 16 buttons and 4 LEDs to a USB port on a PC or Mac®.

We have utilised a 'JoyWarrior' controller chip from Code Mercenaries® for controlling the USB

The interface is fully USB V1.1/2.0 and HID 1.1 compliant. It is compatible with standard system drivers, so no special drivers are required.

There are 3 analogue inputs for X, Y and Z axes with 12 bit resolution and connections for up to 8 directly connected pushbuttons or 16 in a matrix. There are 4 outputs for driving auxillary functions. The most common application would be for driving LED indicators.
Apem manufacture a huge range of LED indicators (Apem Q Series) and switch products. Please refer to www.apem.com for full details.

Interface board measurements and mounting points

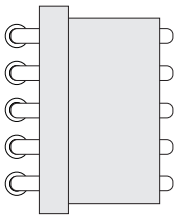


USB connection is made via either a 5 way 2.54mm pitch Molex® KK style header or a Micro USB type B socket on the board. A suitable USB cable (1.5m long) is included.
The joystick connects to Conn1, a 14 way 2.54mm pitch Molex KK style header.
A separate 9 way connector is fitted to allow direct connection of a 3000 Series Joystick having a standard connector.
4 open drain outputs are also available on a 5 way Molex KK style header to enable you to drive LEDs or other low current devices.

Please refer to the pin-outs below:

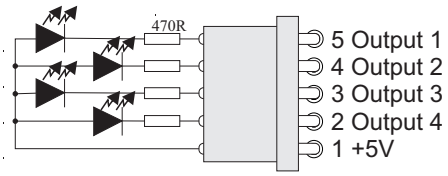
Conn 2 (USB) :

Pin 1 +5V
Pin 2 D-
Pin 3 D+
Pin 4 0V
Pin 5 Screen



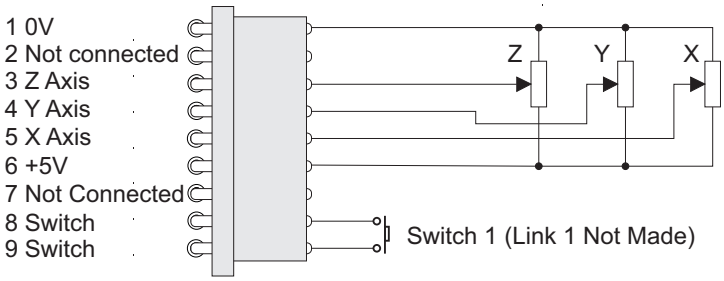
Note: The 4 external mounting holes are connected to the USB cable screen

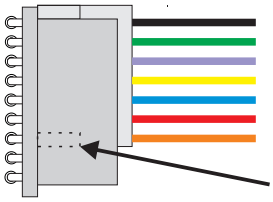
Output Connections:



Each Output is capable of sinking 15mA

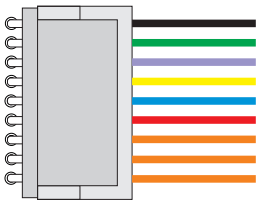
3000 Series Joystick Connector:





3000 Series without Pushbutton

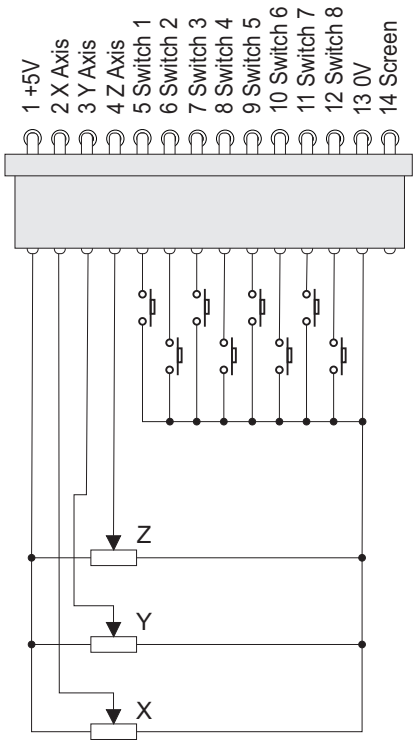
Cut Lug From Joystick Connector Housing



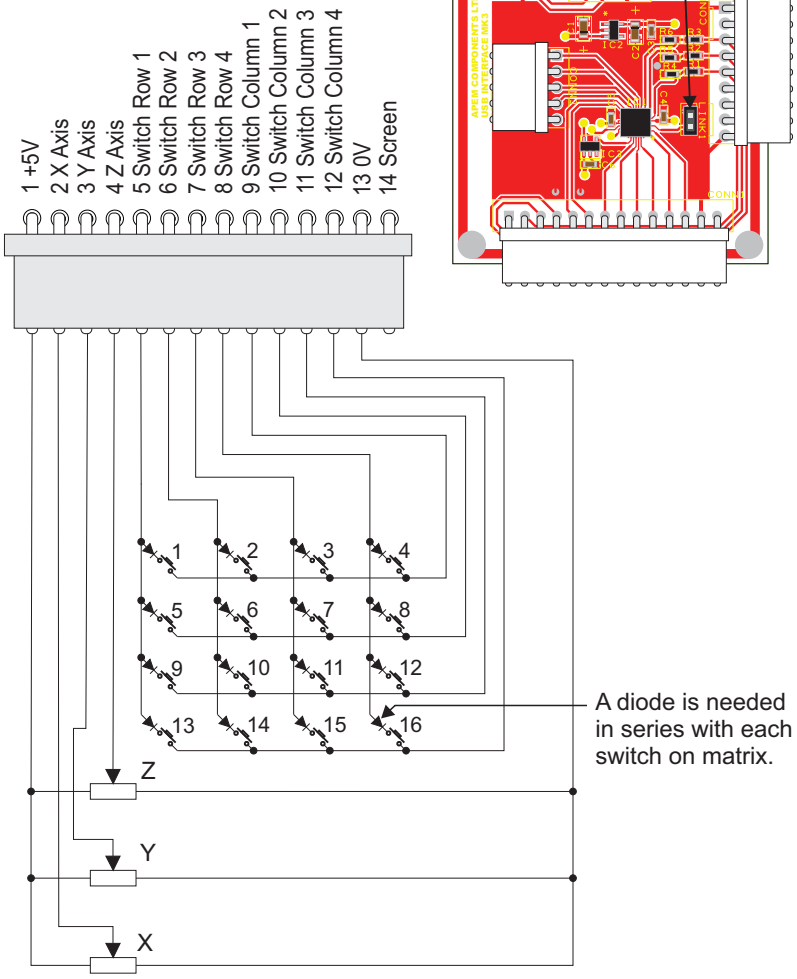
3000 Series with Pushbutton

Conn 1 Joystick:

Direct Switch Connection for 8 switches (Link 1 Not Made)



Matrix Switch Connection for 16 switches (Link 1 Made)



DATA FOR THE 'JOYWARRIOR® ' CHIPSET

Device Operation
By following the USB HID specifications JoyWarrior chips are able to work with most operating systems without the need to supply special drivers. Any operating system with support for USB HID game controllers will have the necessary drivers already in place.

Remote Wakeup
All JoyWarrior chips support the remote wakeup feature. They are able to wake the host computer from sleep state if the host operating system does enable this feature.
Remote wakeup is initiated by JoyWarrior if any button is pressed or if any switch of the direction pad closes. Changes on the analog axes are not detected.

Joystick axis orientation
USB specifies the axis orientation as follows:
For the X axis values should increase for left to right movement, Y axis values increase for far to near movements (i.e. pulling the stick gets you larger values), Z axis values should increase for high to low movement.
Higher voltage values at the analog inputs translate to higher axis values.

Auxiliary outputs
The JoyWarrior28A12L
has four auxiliary outputs that may be used to drive LED indicators or for other applications.
The outputs are active low. This means the outputs are low when active and high when idle.
Setting the outputs is done by sending a four byte Feature report to the joystick device. In most cases this can be done via standard file I/O functions.
The outputs are set by one byte each, the first byte sets Aux0, second Aux1 etc.
The bits in the bytes do have the following meaning:
7 - reserved, write 0
6 - reserved, write 0
5 - reserved, write 0
4 - reserved, write 0
3 - Invert blink mode
2 - reserved, write 0
1 - Mode MSB
0 - Mode LSB

The mode bits determine the behaviour of the output. Following are the combinations (MSB/LSB):
00 - Output idle (high)
01 - Output static on (low)
02 - Fast blink mode (1/8th second on/off)
03 - Heartbeat blink mode

Heart beat mode switches the output low for 1/16th second, then high for 1/16th, again low for 1/16th and then idles high for 13/16th seconds.

The invert bit reverts the ouput status for the blink modes (no effect on static on/off), this allows to have two indicators blink in an exactly alternating pattern.

The output status and blinking is maintained by the JoyWarrior without further host interaction until a new configuration is sent.

All outputs go to idle when the JoyWarrior enters suspend mode.

Absolute Maximum Ratings

Storage Temperature ..... -65°C to +150°C
Ambient Temperature with power applied..... -40°C to +85°C
Supply voltage on Vcc relative to Gnd ..... -0.3V to +4V
DC input voltage..... -0.3V to +4V
Maximum current into all ports..... 80mA
Power Dissipation..... Max.170mW
Static discharge voltage..... >2000V
Latch-up current ..... >200mA

DC Characteristics

	Parameter	Min	Max	Units	Remarks
V_{cc}	Operating Voltage	2.0	3.6	V	Typ. 3.3V
I_{cc}	Operating Supply Current		25	mA	
I_{sb}	Suspend Mode Current		350	µA	Internally Active
I_{ol}	Sink Current on interface Pins		25	mA	max. combined all pins 80mA
I_{olen}	Sink Current on /EN Pin		25	mA	max. combined all pins 80mA
V_{ol8}	Output Low Voltage		0.4	V	I=8mA
V_{oh8}	Output High Voltage	V_{ddi}-0.4		V	I=8mA
V_{ol20}	Output Low Voltage		1.3	V	I=20mA
V_{oh20}	Output High Voltage	V_{ddi}-1.3		V	I=20mA
R_{up}	Pull up / down Resistors	25	55	kΩ	typ. 40kΩ
V_{ith}	Input Threshold Resistors	0.7xV_{ddi}		V	

USB VendorID and ProductID

By default all JoyWarrior chips are shipped with the USB VendorID of Code Mercenaries ($7C0 or decimal 1984) and a fixed ProductID.

Following is the ProductID for the JoyWarrior controller:

JoyWarrior28A12L	$1181

Using the Joystick to Control the Mouse Pointer and Defining the Function of the Buttons

There are software utilities available to download from the internet that allow the user to define the function of the buttons as well as allowing the joystick to control the mouse pointer.

Joystick to mouse conversion…….

'Joystick To Mouse'
http://www.imgpresents.com/joy2mse/j2m.htm

'Joystick 2 Mouse V3'
http://www.tucows.com/preview/292788

Joystick Configuration & Keyboard mapping……..

'Total Game Control'
http://www.newfreedownloads.com/Games/Tools-and-Editors/Total-Game-Control.html

'Pinnacle Game Profiler'
http://www.pinnaclegameprofiler.com

'AutoHotKey' (Assigns macros to mouse keyboard and joystick)
http://www.newfreedownloads.com/Windows-Utilities/Automation/AutoHotkey.html

Program for testing the interface and the four outputs.....

'SimpleHIDWrite'
http://janaxelson.com/files/SimpleHIDWrite3.zip

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