

### Product Datasheet 25

#### Features

- USB connected/powering, hot pluggable, 8 channel (opto-isolated) voltage input, 4 channel DIO & 4 channel power/signal relay card
- Low cost, small profile, stackable
- OS compatibility: Win98SE/ME/2K/XP/Vista/7/8/10/11, Windows CE, Mac OSX and Linux
- Example code downloads available for: Python LabVIEW, VB, VC, C#, JAVA, Agilent VEE & Delphi. Uses simple ASCII/Hex text command strings
- Two types of screw terminal connector available: Fixed screw terminal blocks or two-part (male/female), quick disconnect type connectors
- Same profile as our existing range of USB products. Several cards (of different types) from our existing range of USB card products could be stacked
- Opto-isolated DC voltage input range (Logic High): 5V to 18V (DC max), Logic Low 0V to 1.5V
- USB opto-isolation from Voltage Input & Relay channels to 2500V (ACV rms min). Uncommitted opto-isolated inputs allow complete electrical isolation if needed.
- LED status indicators for USB connection/power, Voltage Input channels and Relay activation status.
- 0V/5V available at screw terminal connectors for onward powering (300mA max), relay switching, contact closure purposes etc.
- Relays are SPDT, Form C, changeover type, with N/O, COM and N/C contacts taken to screw terminal blocks.
- Two types of relays available: 10A/240V AC power relay and 1A, high sensitivity (gold contact) signal relay (PCB tracking will handle 10 amps @ 240V AC, or 8A @ 30V DC)
- Screw terminal connector access to NO/C/NC relay contacts (4 onboard relays).
- Screw terminal and (14W) header connector access to 8 Voltage input and 4 DIO channels.
- Supplied with nylon feet.
- Optional clear cover & base also available
- Optional on-board voltage regulator.
- CE, RoHS, REACH & 3TG compliant



USB8VI4DIOxR V2 variant

#### Description

Low cost, general purpose, USB connected & powered, 8 channel optocoupled voltage input, 4 channel DIO and 4 channel relay cards. Voltage input and relay channels are opto-isolated.

Available with the option of two types of relays, a 240VAC/10Amp power relay, or a 30VDC/1A high sensitivity (gold contact) signal relay. PCB tracking is designed to handle 10 Amps on the power board and 3A on the signal board.

Also available with two types of screw terminal connector, a fixed screw terminal block (see image above) or a two-part male/female type (see image on page 3). The voltage input channels are also connected to two 14-way header connectors.

Optional 7V to 12V Vin onboard voltage regulator allows input voltage flexibility.

Example programs are available in Python, LabView, Visual C, Visual Basic, Agilent VEE and Delphi which demonstrate the functionality of the card.

#### New features for V2.x cards:

- Rx and Tx data indicators.
- Optional onboard voltage regulator.
- Updated USB interface circuitry.
- Reverse polarity protection on external voltage input.
- Many more orderable variants.

### Product Datasheet 25



**USB8VI4DIOxR + COVERUSB**

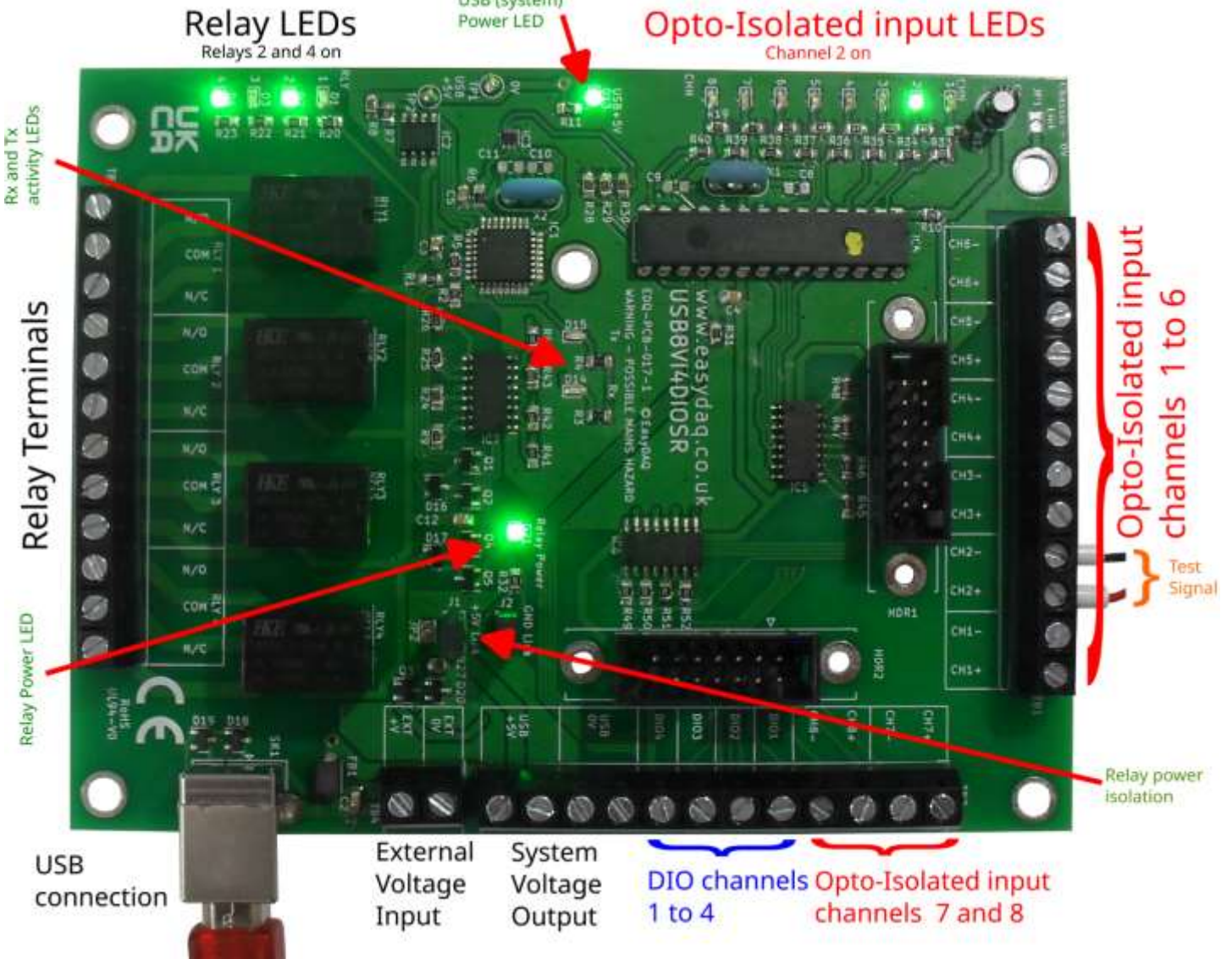
### Specifications

**Operating temp range**  
0-70°C

**Power**  
See Power Options section.

**Relays**  
See: *Specifications: Relays* table

**Dimensions**  
Dimensions 100mm (D) 130mm (W) 30mm (H) (inc. feet & 2 part conns), Weight 120g..

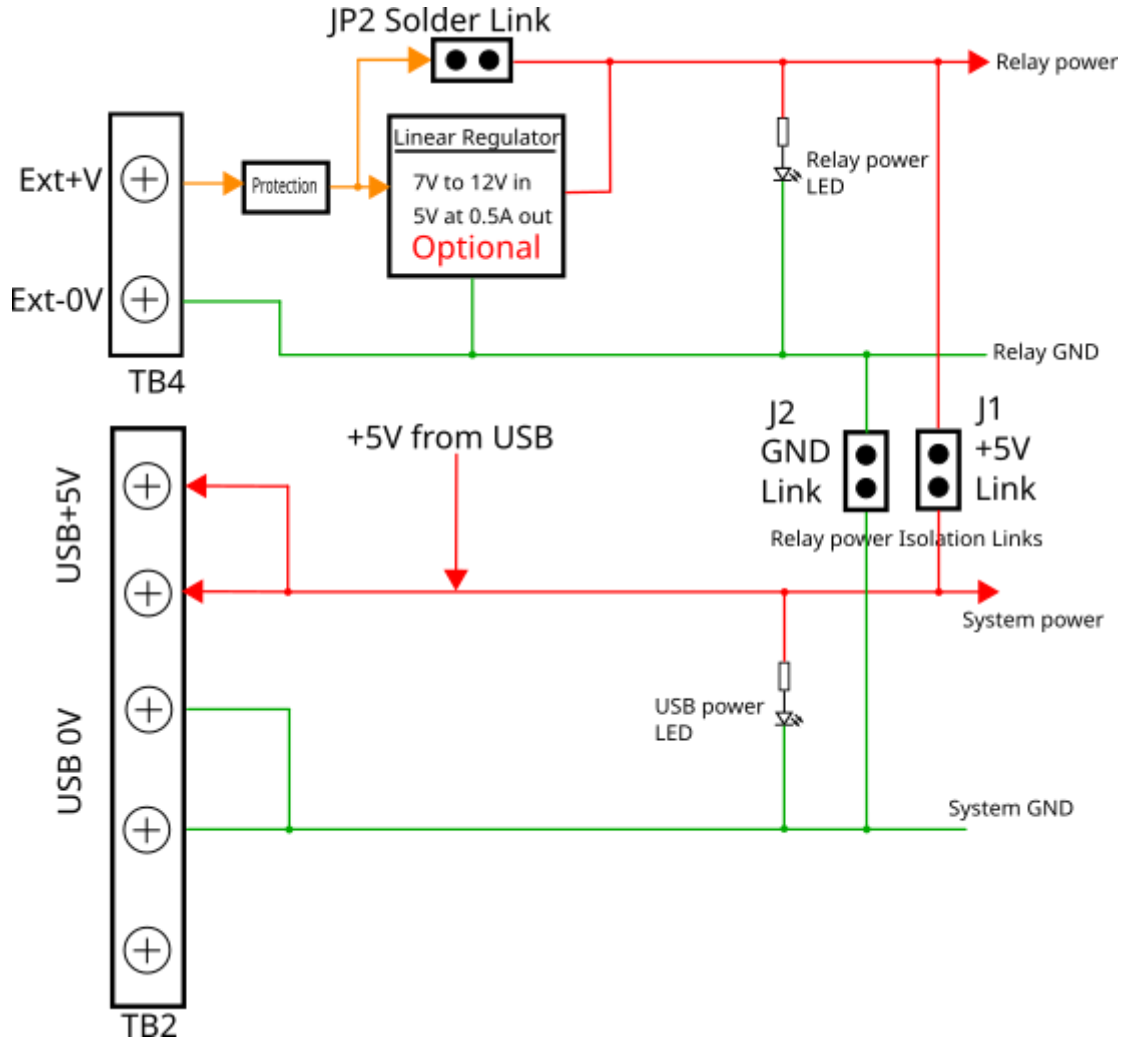


USB8VI4DIOxR Top View showing connections and indicators.

### Product Datasheet 25

#### Power Options:

The USB8VI4DIOxR has many powering options. The design of the USB8VI4DIOxR also allows for separation of the relay operating power from the processor and communications by means of 2 links separating the 0V and +V rails of each.



As Supplied, the USB8VI4DIOxR can be driven directly from a USB port. However, if the relays are 5V operating and all switched on then the total current of the board will be up to 300mA. While most USB ports can supply sufficient current to drive all 4 relays it may be desirable to use an external power supply and enable partial or full isolation between the system and relay power circuits.

The optional on-board linear regulator can also be used to drive external circuitry as long as the overall current consumption of the regulator is not exceeded.

The optional linear regulator has built in thermal overload protection. The recommended input voltage to this regulator is +7V to +12V DC. However, the regulator will handle up to +35V if the relay usage does not cause thermal overload.

It is recommended that careful attention be paid to the setup of the power supply to ensure reliable long-term operation.

Please contact EasyDAQ for help or more information if required.

**Product Datasheet 25**
**14 way connectors:**

The USB8VI4DIOxR card has 2, 14-way connectors called HDR1 and HDR2. They can be used as a simple multi-way connection to other equipment using IDC ribbon cables. These connectors are linked to TB1 and TB2 terminal blocks and board power supplied as follows:

HDR1 pin	Signal	HDR1 pin	Signal
1	CH1+	2	CH1-
3	CH2+	4	CH2-
5	CH3+	6	CH3-
7	CH4+	8	CH4-
9	CH5+	10	CH5-
11	CH6+	12	CH6-
13	System GND	14	System +5V

HDR2 pin	Signal	HDR2 pin	Signal
1	CH7+	2	CH7-
3	CH8+	4	CH8-
5	DIO1	6	DIO2
7	DIO3	8	DIO4
9	RA2 Reserved	10	RA3 Reserved
11	RA4 Reserved	12	RA5 Reserved
13	System GND	14	System +5V

**Firmware commands:**

The card is commanded via simple single ASCII characters (+ status byte). I.e. a 2=byte pair. These are commands that address each port of the PIC processor device (Hex equivalent shown in brackets).

The USB8VI4DIOxR has 2 ports known as B and C. Both these ports are set as input on power up.

**Port B, Optocoupled input commands:**

Command	Description	Notes
ASCII 'A' (41H), X	Read Port B (Char X=don't care. Device sends 1 byte of returned data).	
ASCII 'B' (42H), X	Set direction of Port B, 1=Input, 0= output. (i.e. where X=10111111 (AFH) = sets bit 7 as an output, the rest as inputs). Default is all bits are input.	Not required on USB8VI4DIOxR as Port B is only used for the optocoupled inputs
ASCII 'C' (43H), X	Write data X to Port B (i.e. X=00000001 (01H), sets channel 1 to active). Valid data bytes are latched by the card until a further valid data byte is written to it.	Not required on USB8VI4DIOxR as Port B is only used for the optocoupled inputs

**Port C, Relay and DIO commands:**

Command	Description	Notes
ASCII 'D' (44H), X	Read Port C (Char X=don't care). Device sends 1 byte of returned data.	Used for reading input bits of the USB8VI4DIOxR DIO. This data will appear in the upper 4 bits of the returned byte. The lower 4 bits will return the relay states as long as those bits are set as output
ASCII 'E' (45H), X	Set direction of Port C, 1=Input, 0= output. (i.e. where X=10111111 (AFH) sets bit 7 as an output, the rest as inputs).	Make sure that the bottom 4 bits are always "0" on the USB8VI4DIOxR as these are needed to control the 4 relays. The upper 4 bits can be set as input or output as required
ASCII 'F' (46H), X	Write data X to Port C (i.e. X=00000001 (01H), sets channel 1 to active). Valid data bytes are latched by the card until a further valid data byte is written to it.	This command controls the relays and outputs data on the DIO where the DIO pins have been set to output.



### Product Datasheet 25

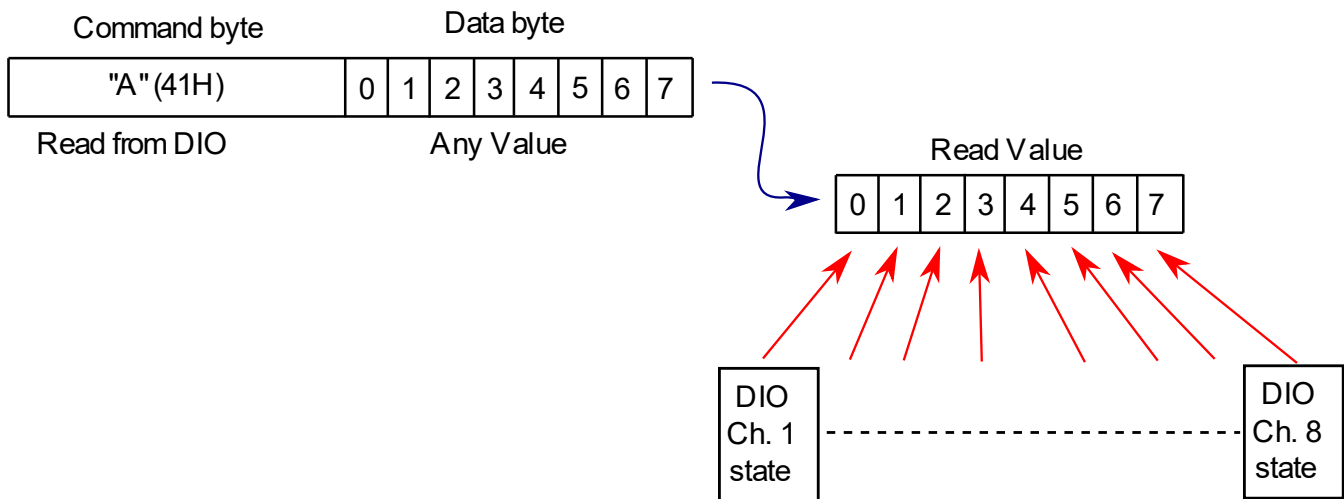
The 8 optocoupled voltage inputs are on Port B.

The 4 relays are addressed via the bottom 4 bits of Port C. See *Example 1.* below.

The 4 DIO are addressed via the top 4 bits of Port C

The card can be controlled using a Terminal emulator – see *Example 3.* below.

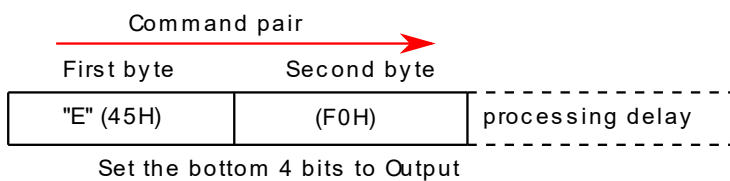
*Example 1.* Read data from the 8 bit optocoupled voltage inputs:



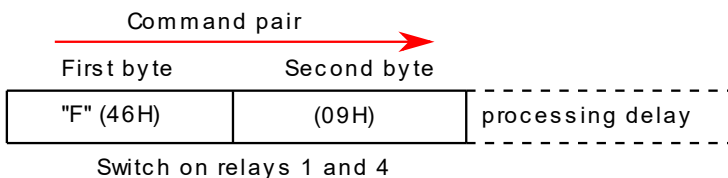
Data is return as a single byte except where specified (i.e. Read ADC commands return an ASCII string)...

*Example 2.* Switch on relays 1 and 4:

First, the port needs to be configured so that the bottom 4 bits of Port C that control the relays are set to output. This only needs to be done once after the board has been powered up or when controlling the directions of the DIO pins.



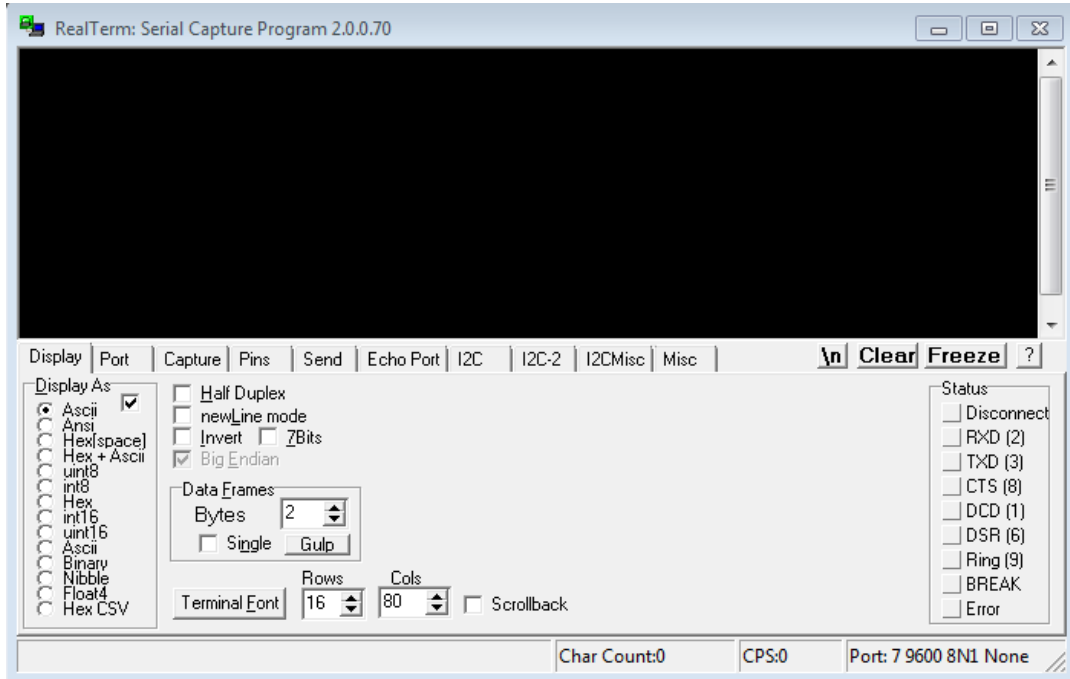
Note, if a pin direction is set to 1 it is an input (default) and if it is a 0 it is an output. Once the lower 4 bits of Port C have been configured as output pins then a command can be sent to control the relays:



Note. A processing delay of at least 10mS is required between each command pair.

### Product Datasheet 25

Example 3. Using the "RealTerm" Terminal emulator program on a Windows PC to switch on some relays. This example uses the "RealTerm" terminal emulator that can be found at <https://realterm.sourceforge.io/> Plug your USB8VI4DIOxR into a USB port and run up RealTerm.



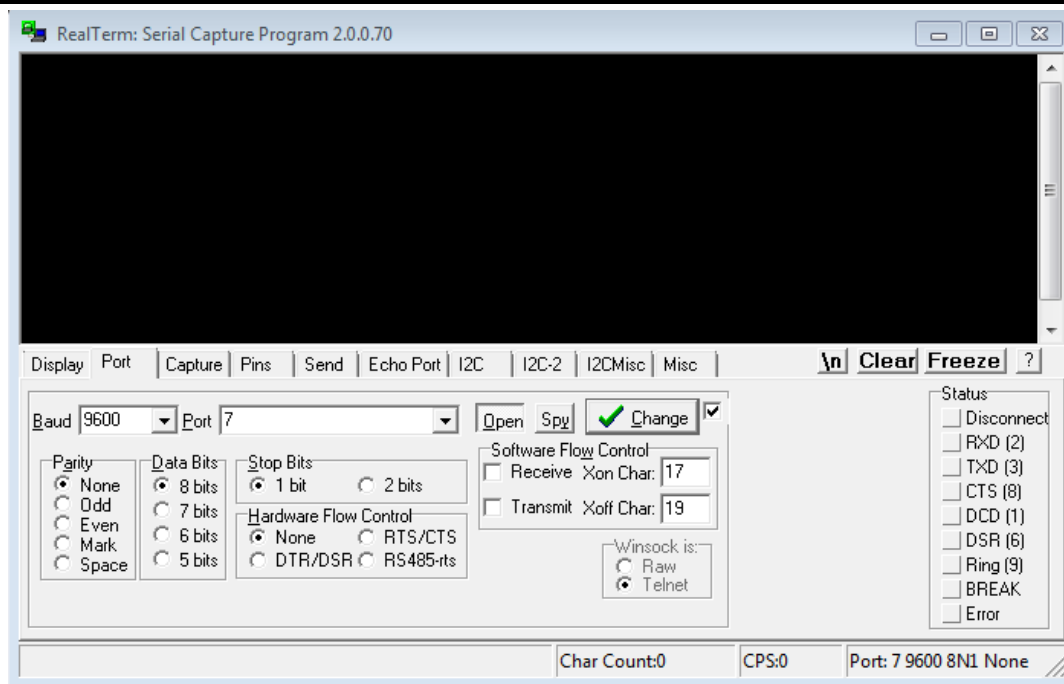
Select the port that your USB8VI4DIOxR is plugged into using the "Port" tab:

Note. In Microsoft Windows, the USB-Serial port number can be found by clicking on the Windows "Device Manager" > Ports (COM & LPT) tab. You should see one of the entries as "USB Serial Port (COMx)" where "x" is the port number.



In this case the USB8VI4DIOxR is on Com Port 7.

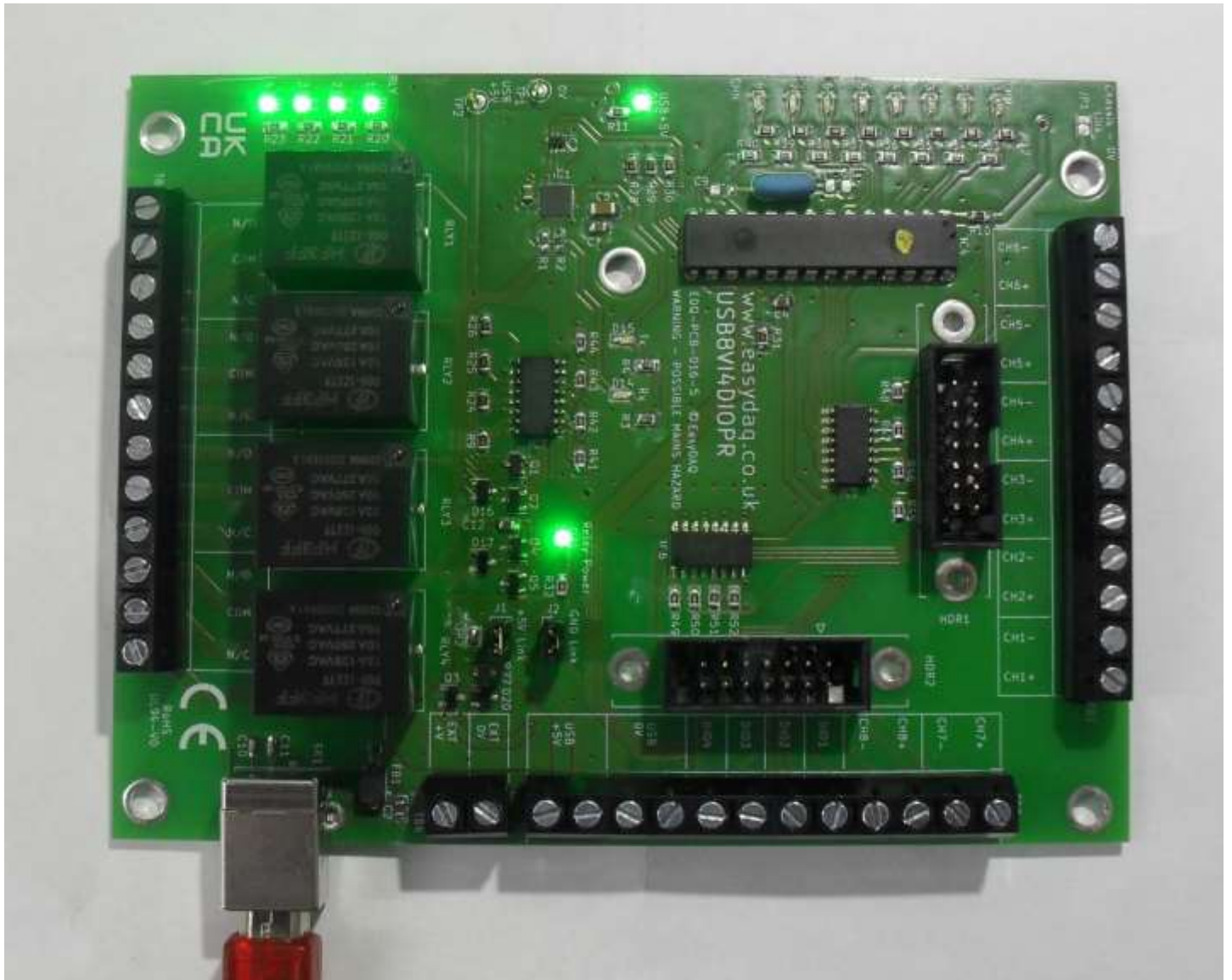
### Product Datasheet 25



Set the baud rate to 9600 (default for this board) and click on .

Click into the black display area and type "EP" in CAPITALS and without the quotes to set the bottom 4 bits to output. Then type "F?". Relays 1 to 4 should switch on:

NOTE. Do not use the return key or lower-case characters as this may confuse the simple command structure.



This works because ASCII for "?" has a value of 3F hex or 00111111 in binary. Only the bottom 4 bits, "1111", affect the relays so all 4 relays switch on.

Now type "FJ" and relays 1 and 3 will go off while relays 2 and 4 remain on.





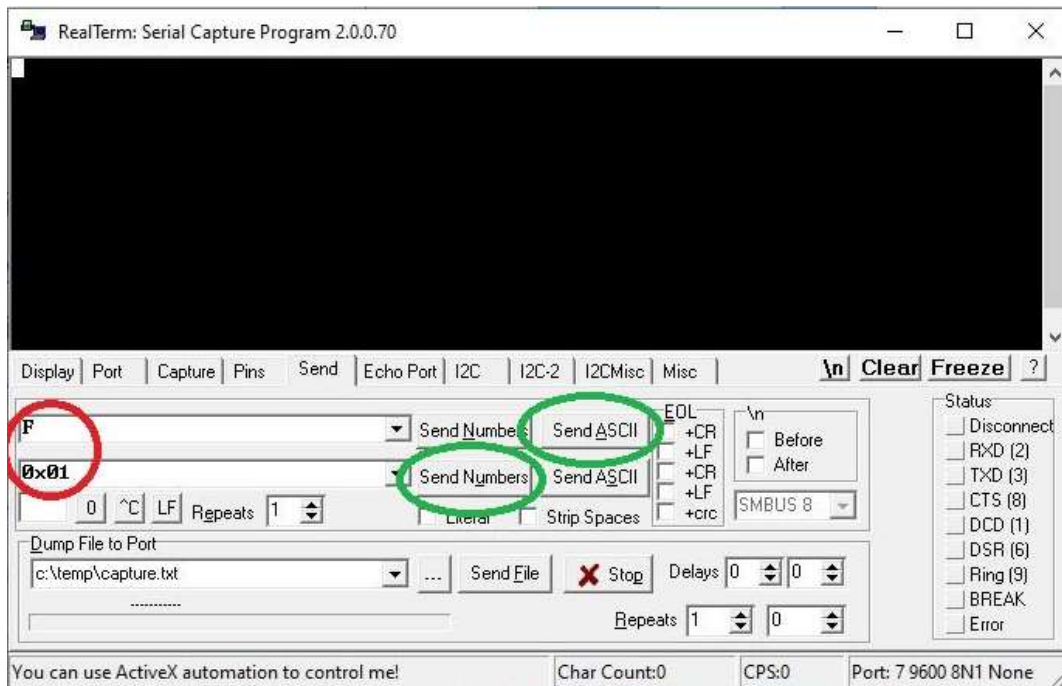
This works because ASCII for capital "J" has a value of 4A hex or 01001010 in binary. Again, the bottom 4 bits, "1010" control the relays so relays 1 and 3 are switched off.

All the relays of the USB8VI4DIOxR can easily be controlled using ASCII "Printable" characters but the top 4 bits are also being sent to the 4 bits of DIO.

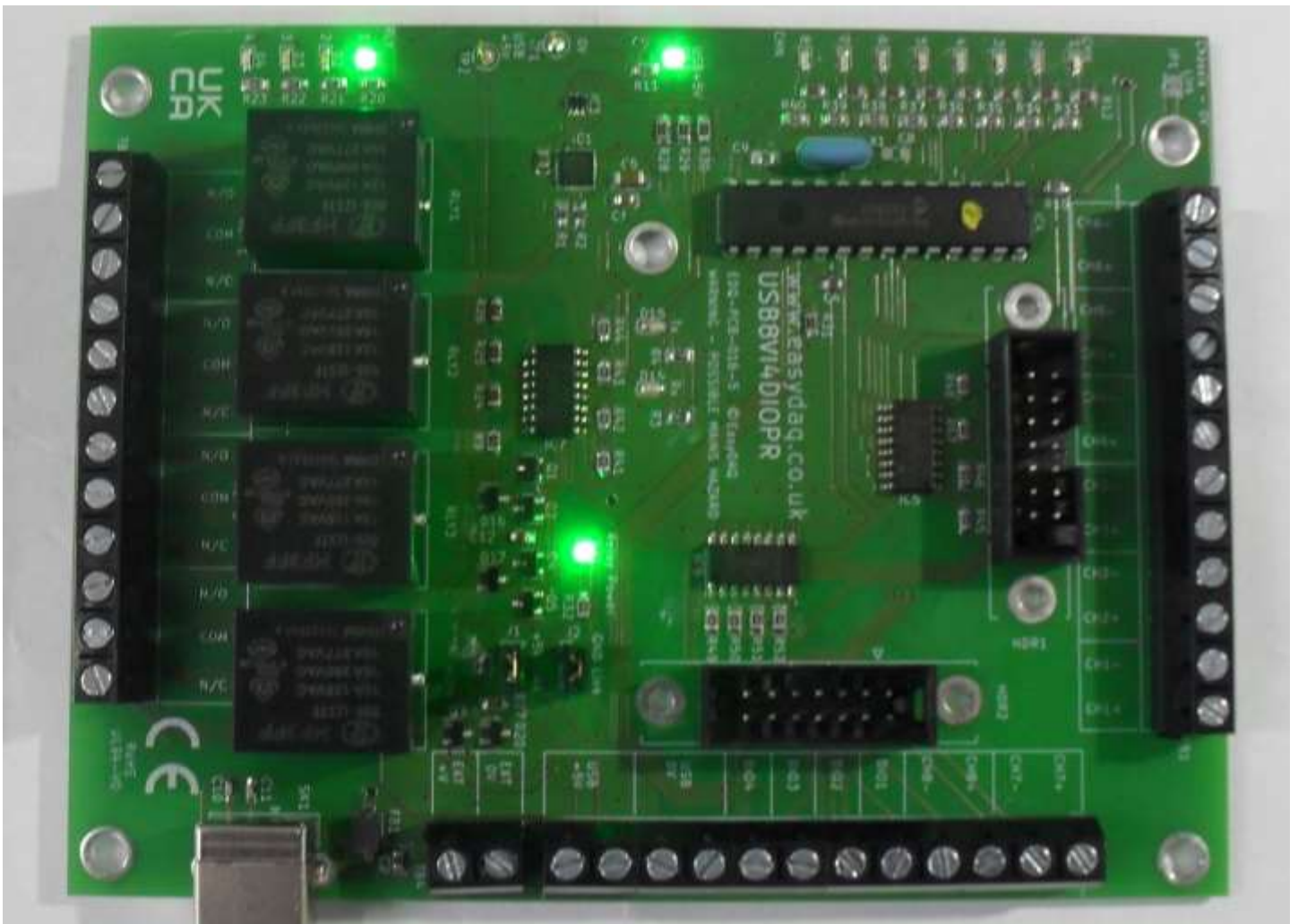
To avoid unwanted control of the DIO it is necessary to consider the top 4 bits. RealTerm has a useful feature which allows the full 8-bit range of values to be sent to the port.

Select the "Send" tab of RealTerm and enter "F" and "0x01:" as shown below highlighted in red:

### Product Datasheet 25



Now click on the top "Send ASCII" to send ASCII "F" then the lower "Send Numbers", both highlighted in green, to send 0x01 hex. This will result in just relay 1 being switched on:



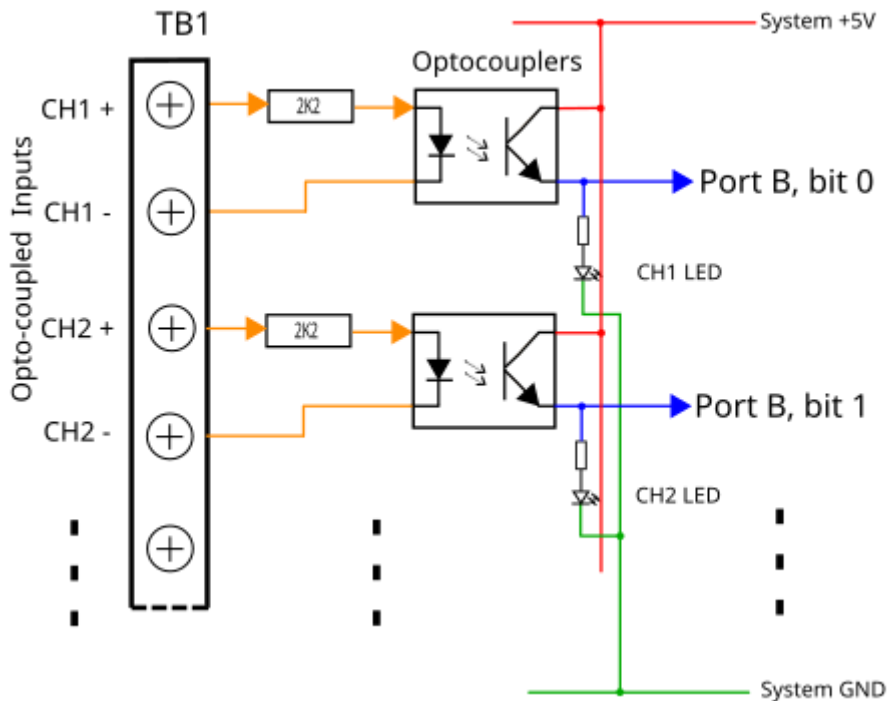
**4 bit DIO:**

The USB8VI4DIOxR has 4 bits of DIO on the top 4 bits of Port C and are linked to terminals on TB2. These are direct connections to the processor and use 5V logic levels.

The 4-bit DIO is controlled at the same time and in the same manner as the relays. You get the option to select any pin as input or output but you must ensure that the lower 4 bits of the direction data are all 0s to maintain control of the relays.

**8 channel optocoupled voltage inputs:**

The USB8VI4DIOxR has 8 channels of optocoupled inputs. The resulting logic signals are available on Port B. See Example 1 above on how to read the Port B values.



Channel 1 will appear on Port B, bit 0. Channel 2 will appear on Port B, Bit 1 etc. up to Channel 8 on Port B bit 7.

A signal level of between 5V and 16V will be registered as a logic 1 and a signal level of less than 1V will be registered as a logic 0.

Port B will be set as input as a default on power up so there is no need to set the port directions.

Reading Port B simply requires sending the command sequence ASCII 'A' (41H), x where "x" can be any value. The USB8VI4DIOxR will respond by returning a 1-byte value. See Example 1 above.



### Product Datasheet 25

#### Relays:

The 4 relays on the USB8VI4DIOxR have optically isolated drivers to eliminate any unwanted voltage or current spikes.

The **Power** relay USB8VI4DIOPR is fitted with 6V operating relays standard. The operating voltage of the relays can be selected to optimise power consumption of your system.

<i>Specifications: Power Relays</i>			
Parameter	5V Power relays	6V Power relays	12V Power relays
Rated coil voltage/current	5VDC/71mA each	6VDC/60mA each (50mA at 5V)	12VDC/30mA each
Must operate/release voltage	75%/10% of rated voltage		
Contact ratings	10A/240VAC or 8A 30VDC		
Contact resistance	100mΩ max		
Operate/release time	10mS/5mS		
Contact bounce period	0.6mS operate/ 7.2mS release		
Contact material	AgSnO <sub>2</sub>		
Operational life (min)	Mechanical 10 <sup>7</sup> / Electrical 10 <sup>5</sup>		
Contact arrangement	SPDT, Form C		

The **Signal** relay USB8VI4DIOSR is fitted with 5V operating relays standard. The operating voltage of the relays can be selected to optimise power consumption of your system.

<i>Specifications: Signal Relays</i>			
Parameter	5V Signal relays	12V Signal relays	24V Signal relays
Rated coil voltage/current	5VDC/40mA each	12VDC/16mA each	24VDC/8.3mA each
Must operate/release voltage	3.75V/0.5V	9V/1.2V	18V/2.4V
Insulation Resistance	Minimum 100MΩ 500V dc		
Contact ratings	1A 120V ac / 24V dc (100,000 operations) 3A 120V ac / 24V dc (50,000 operations)		
Contact resistance	Maximum 50mΩ (6V dc 0.1A)		
Operate/release time	5mS/5mS		
Contact material	AuAg overlay, Ag alloy		
Operational life (min)	Mechanical 10 <sup>7</sup> / Electrical 10 <sup>5</sup>		
Contact arrangement	SPDT, Form C		

Please contact us for datasheets of the relays that we use as standard and for any specific requirements.

#### RC Snubbers:

When using voltages in excess of 100V AC or DC or currents of more than 1A it is important to consider the use of snubbing circuits across the loads to reduce relay contact degradation and the creation of problematic RFI (Radio Frequency Interference) and EMC (Electromagnetic compatibility) issues.

As a minimum we recommend our [Suppressor 250VAC](#).

#### Board options:

The USB8VI4DIOxR can be customised to your requirements. Some examples are given in the order codes and others can be generated on request. However, there will be a minimum order quantity applied for some modifications.

The customisable elements are:

- **Processor code.** The code supplied can be modified to suit your purpose. Please contact us for details.
- **Regulator.** The board can be supplied with an optional onboard linear regulator. These variants are shown in the Order Codes section below.
- **Relay operating voltages.** As an alternative to the onboard regulator, the relays can be selected to suit your system if necessary. Please contact us for details.
- **1- or 2-part connectors.** The USB8VI4DIOxR can be supplied with 1- or 2-part connectors. These variants are shown in the Order Codes section below. If the system being built will need components changed easily then we recommend the 2-part horizontal or vertical connector options.



### Product Datasheet 25

**Order codes:**

Variant	Power /Signal	1 or 2 part	Optional Regulator	Description
<b>USB8VI4DIOPR</b>	Power	1	No	USB 8 channel opto-isolated VI, 4 DIO & 4 Power relays (10A), <b>Single part connectors.</b>
<b>USB8VI4DIOPR-2H</b>	Power	2 Horizontal	No	USB 8 channel opto-isolated VI, 4 DIO & 4 Power relays (10A), <b>2-part horizontal connectors</b>
<b>USB8VI4DIOPR-2V</b>	Power	2 Vertical	No	USB 8 channel opto-isolated VI, 4 DIO & 4 Power relays (10A), <b>2-part connectors</b>
<b>USB8VI4DIOPR+Reg</b>	Power	1	Yes	USB 8 channel opto-isolated VI, 4 DIO & 4 Power relays (10A), <b>Single part horizontal connectors.</b> Plus, <b>7V to 12V input linear regulator.</b>
<b>USB8VI4DIOPR-2H+Reg</b>	Power	2 Horizontal	Yes	USB 8 channel opto-isolated VI, 4 DIO & 4 Power relays (10A), <b>2-part horizontal connectors.</b> Plus, <b>7V to 12V input linear regulator.</b>
<b>USB8VI4DIOPR-2V+Reg</b>	Power	2 Vertical	Yes	USB 8 channel opto-isolated VI, 4 DIO & 4 Power relays (10A), <b>2-part vertical connectors.</b> Plus, <b>7V to 12V input linear regulator.</b>
<b>USB8VI4DIOSR</b>	Signal	1	No	USB 8 channel opto-isolated VI, 4 DIO & 4 Signal relays (10A), <b>Single part connectors.</b>
<b>USB8VI4DIOSR-2H</b>	Signal	2 Horizontal	No	USB 8 channel opto-isolated VI, 4 DIO & 4 Signal relays (10A), <b>2-part horizontal connectors</b>
<b>USB8VI4DIOSR-2V</b>	Signal	2 Vertical	No	USB 8 channel opto-isolated VI, 4 DIO & 4 Signal relays (10A), <b>2-part vertical connectors</b>
<b>USB8VI4DIOSR+Reg</b>	Signal	1	Yes	USB 8 channel opto-isolated VI, 4 DIO & 4 Signal relays (10A), <b>Single part connectors.</b> Plus, <b>7V to 12V input linear regulator.</b>
<b>USB8VI4DIOSR-2H+Reg</b>	Signal	2 Horizontal	Yes	USB 8 channel opto-isolated VI, 4 DIO & 4 Signal relays (10A), <b>2-part horizontal connectors.</b> Plus, <b>7V to 12V input linear regulator.</b>
<b>USB8VI4DIOSR-2V+Reg</b>	Signal	2 Vertical	Yes	USB 8 channel opto-isolated VI, 4 DIO & 4 Signal relays (10A), <b>2-part vertical connectors.</b> Plus, <b>7V to 12V input linear regulator.</b>

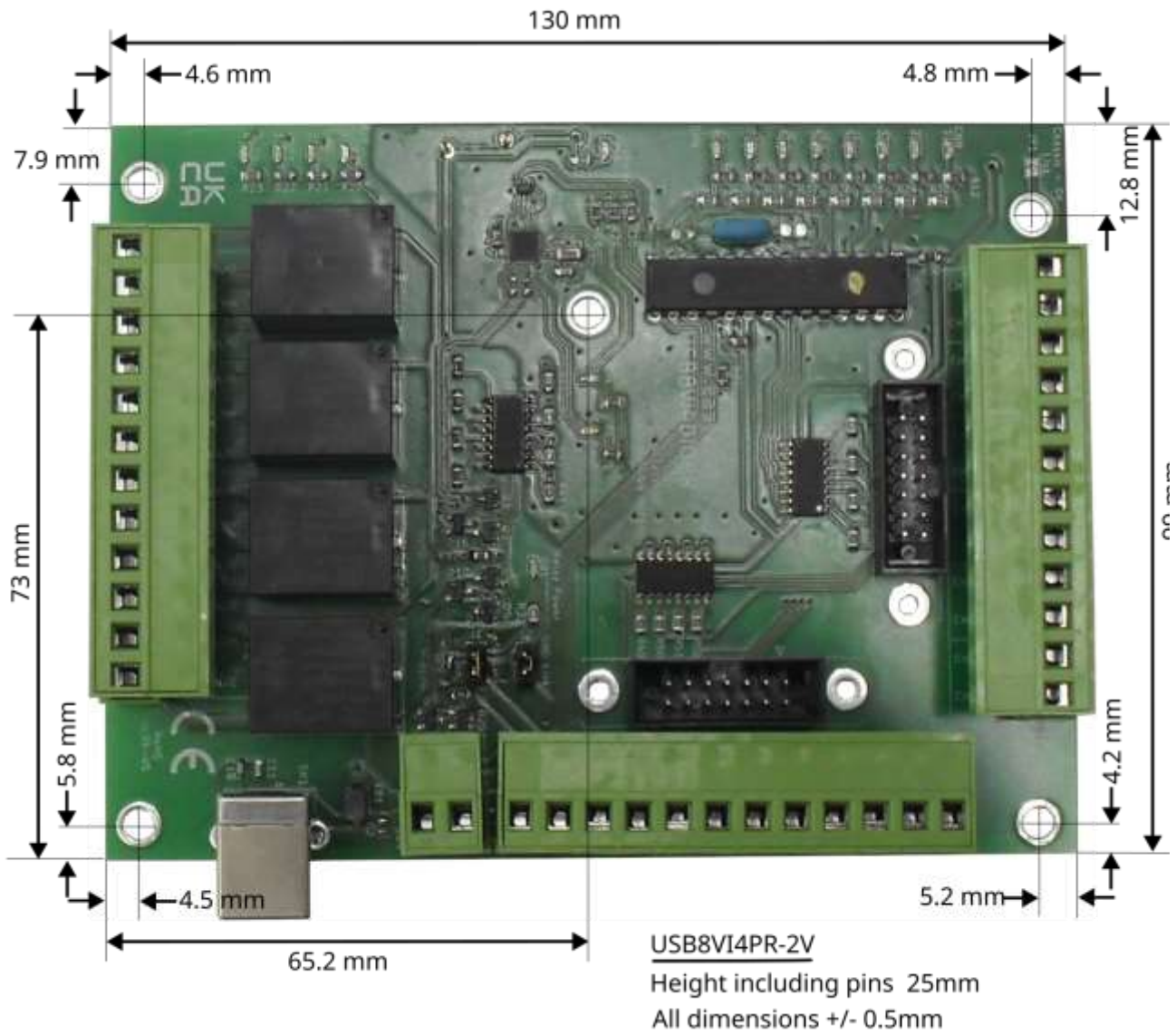
**Optional accessories**

- COVER8PRMx** for USB8VI4xR-2H
- COVER8PRMxDIN** for USB8VI4xR-2H with DIN rail fitting
- COVERUSB** for USB8VI4xR and USB8VI4xR-2V
- COVERUSBBDIN** for USB8VI4xR and USB8VI4xR-2V with DIN rail fitting



**USB8VI4PR-2V + COVER8USB**

**Product Datasheet 25**



**USB8VI4PR-2 top view with dimensions**



# USB8VI4DIOxR V2

Low cost Data Acquisition & Control products

## USB 8 channel opto VI & 4 DIO + 4 Relay card

### Product Datasheet 25

#### External Links:

ASCII: <https://en.wikipedia.org/wiki/ASCII>

RealTerm: <https://sourceforge.net/projects/realterm/>

Python test program: [USB8VI4xx relay test and port read V2.zip](#)

#### NOTE.

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EasyDAQ reserves the right to change the specification of their products at any time without prior notice.

Please contact us at [EasyDAQ.co.uk](http://EasyDAQ.co.uk) if you need any help with our products including older versions of this data sheet.

#### Document versions:

Version number	Date	Notes
V1.0		Original. 100/DA/2006/005P and 100/DA/2006/005S based boards.
V2.0	03/08/24	Updated to describe new V2.x (EDQ-PCB-016-x and EDQ-PCB-017-x) versions of the boards.