

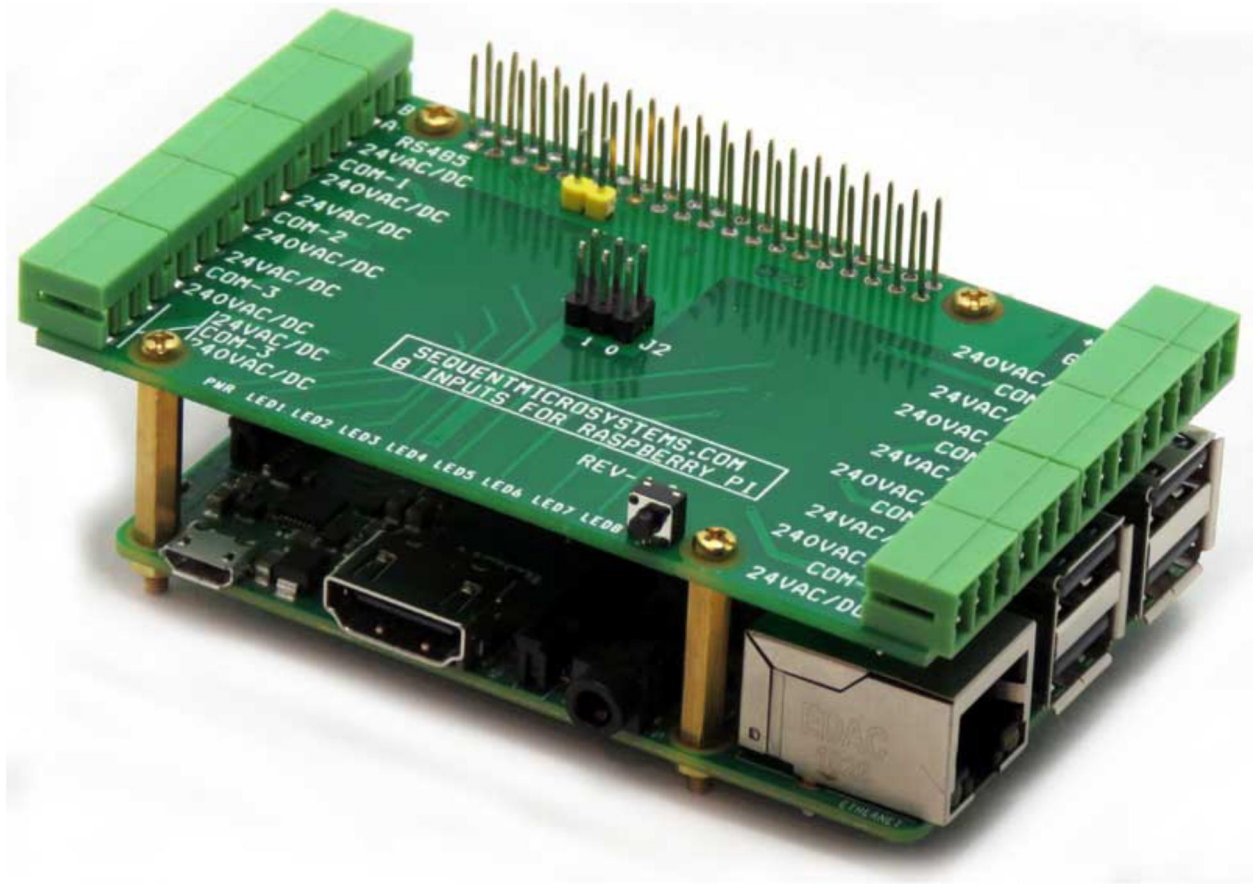
## 8-HV-INPUTS for RASPBERRY PI

### USER'S GUIDE VERSION 1.0

[SequentMicrosystems.com](http://SequentMicrosystems.com)

GENERAL DESCRIPTION .....	2
FEATURES.....	3
WHAT IS IN YOUR KIT .....	4
QUICK START-UP GUIDE .....	5
BOARD LAYOUT .....	6
INTERRUPTS .....	6
STACK LEVEL SETTINGS .....	7
RS-485 COMMUNICATION .....	7
POWER REQUIREMENTS.....	7
MECHANICAL SPECIFICATIONS.....	9
SOFTWARE SETUP .....	10

## GENERAL DESCRIPTION



The 8-INPUTS card is a stackable expansion card for Raspberry Pi. It is compatible with all Raspberry Pi versions from Zero to 4. It offers a compact and inexpensive solution for adding up to 64 universal inputs to your Raspberry Pi project. Optically isolated inputs can process signals from 3V to 24V, or from 120V to 240V, AC or DC.

Pluggable connectors make the card easy to use when multiple cards are stacked up.

Each input has a corresponding LED installed on the long side of the card which turns on when the input is activated. A LED also shows when power is applied to the board. A pushbutton permits the user to issue a command to Raspberry Pi or to shut it down (a script is required for the desired application).

The card has also an RS485 driver which can communicate with other industrial equipment using the MODBUS protocol.

Mechanically, the 8-INPUTS card adheres to the Sequent Microsystems Modular Industrial format. It can be installed in the free 3D printable stackable enclosure. All the cards in this format have the same mechanical specifications.

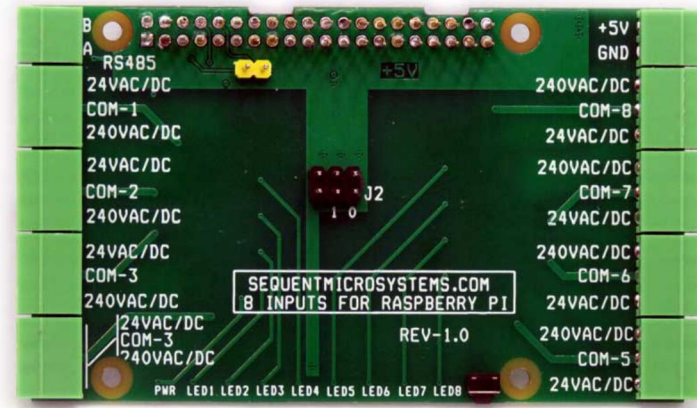
## FEATURES

- Eight universal optically-isolated inputs
- Read 3V-24V or 120V-240V AC/DC signals
- Eight layer stackable to 64 inputs
- LED Indicators on each input
- Pluggable connectors (26-16AWG wires) on all inputs and relay contacts
- RS485 Port with TVS protection
- Command Line, Node-RED and Python Drivers

Up to eight cards can be stacked on top of one Raspberry Pi. The 8-INPUTS cards share a serial I2C bus using only two of the Raspberry Pi's GPIO pins to manage all eight cards. This feature leaves the remaining 24 GPIOs available for the user.

## WHAT IS IN YOUR KIT

### 1. 8-INPUTS Card for Raspberry Pi



### 2. Mounting hardware

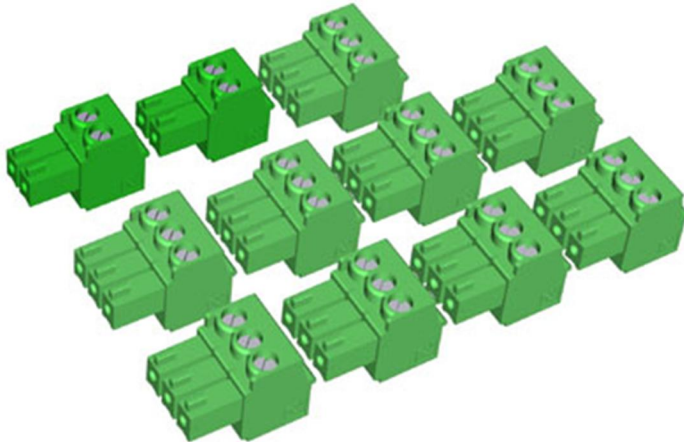
- a. Four M2.5x18mm male-female brass standoffs
- b. Four M2.5x5mm brass screws
- c. Four M2.5 brass nuts



### 3. Two jumpers.



### 4. All the required female mating connectors.

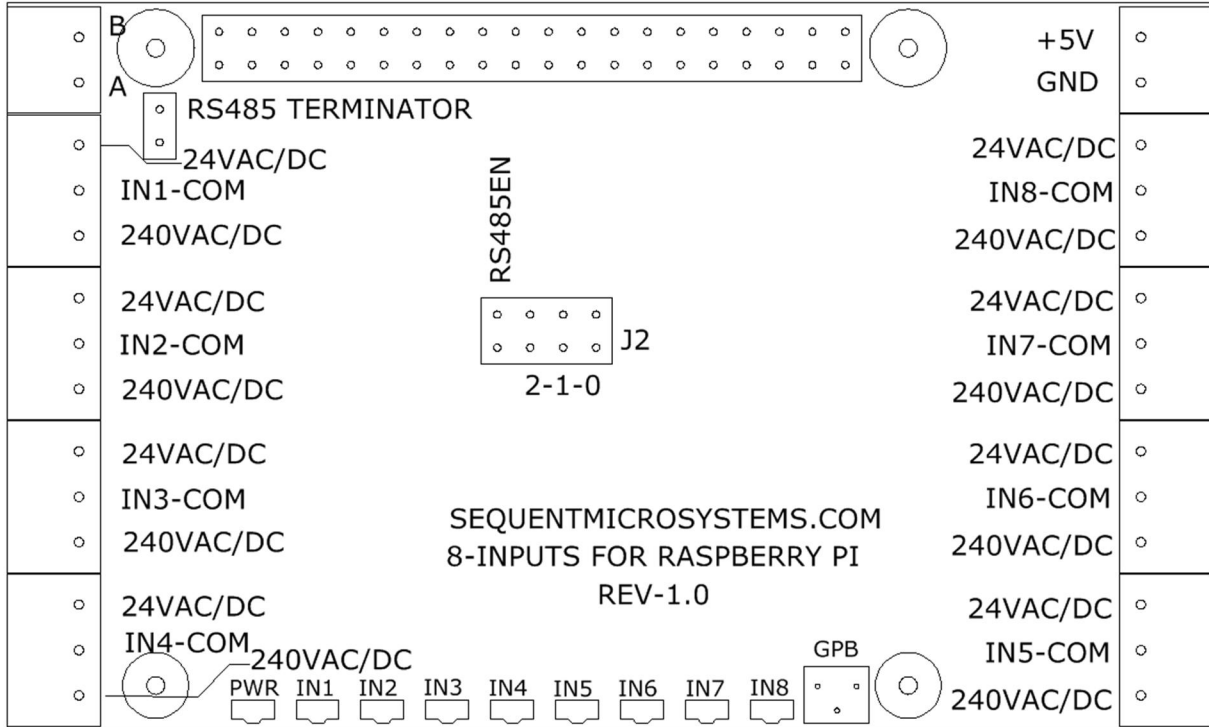


## QUICK START-UP GUIDE

1. Plug your 8-INPUTS Card on top of your Raspberry Pi and power up the system.
2. Enable I2C communication on Raspberry Pi using raspi-config.
3. Install the 8-INPUTS software from github.com:
  - a. ~\$ `git clone https://github.com/SequentMicrosystems/8inputs-rpi.git`
  - b. ~\$ `cd /home/pi/8inputs-rpi`
  - c. ~/8inputs-rpi\$ `sudo make install`
4. ~\$ `8inputs`

The program will respond with a list of available commands.

## BOARD LAYOUT



The 8-INPUTS card comes with appropriate mounting hardware. Up to eight cards can be stacked on top of one Raspberry Pi.

Eight LEDs indicate the status of their respective inputs. A LED is lit when the corresponding input is active. The General Purpose Pushbutton GPB is connected to pin 37 of the Raspberry Pi GPIO connector (GPIO26). In order to use the pushbutton you need to write a shell script to accomplish the desired function.

The three right-most positions of the J2 jumper are used for selecting the stack level (see next section). The left position is used for the RS485 port. The port is driven by the serial pin of Raspberry Pi. Install the jumper if you want to use the RS485 port. Remove the jumper if the serial port of Raspberry Pi is used for another purpose.

## INTERRUPTS

Transition of any input is causing pin 29 of the GPIO expander to go low. If you do not want to poll all the inputs, you need to write an interrupt handler to detect the change.

## STACK LEVEL SETTINGS

Up to eight 8-INPUTS Cards can be installed on top of one Raspberry Pi. The 8-INPUTS Card shares the same I2C address with the 8-RELAYS, 8-MOSFETS, 16-INPUTS AND 16-RELAYS cards. If a combination of these cards is used in the same stack, a total of eight cards can be installed.

The 8-INPUTS card is controlled by Raspberry Pi using only the I2C interface. The card occupies the address space 0x20 - 0x27. The local address can be configured using the Stack Level Jumpers or DIP switches. A maximum stack of eight cards requires a total of 12 jumpers.

Cards can be installed on Raspberry Pi in any order. The 3 position jumper or DIP switch is selecting the stack level of the card, as follows:

JMP/SW	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	ON	OFF
STACK LEVEL	0			1			2			3		
I2C ADDR.	0x27			0x26			0x25			0x24		

JMP/SW	OFF	OFF	ON	ON	OFF	ON	OFF	ON	ON	ON	ON	ON
STACK LEVEL	4			5			6			7		
I2C ADDR.	0x23			0x22			0x21			0x20		

To find out the stack level of all the cards installed in your system run the command line with the “-list” option.

## RS-485 COMMUNICATION

The 8-INPUTS cards card contains a standard RS485 transceiver which can be accessed by the serial port of the Raspberry Pi. In order to enable communication, the jumper labeled RS485EN on J2 connector needs to be installed.

## POWER REQUIREMENTS

The 8-INPUTS card requires +5V power, supplied either from the Raspberry Pi expansion bus, or from its own pluggable connector.

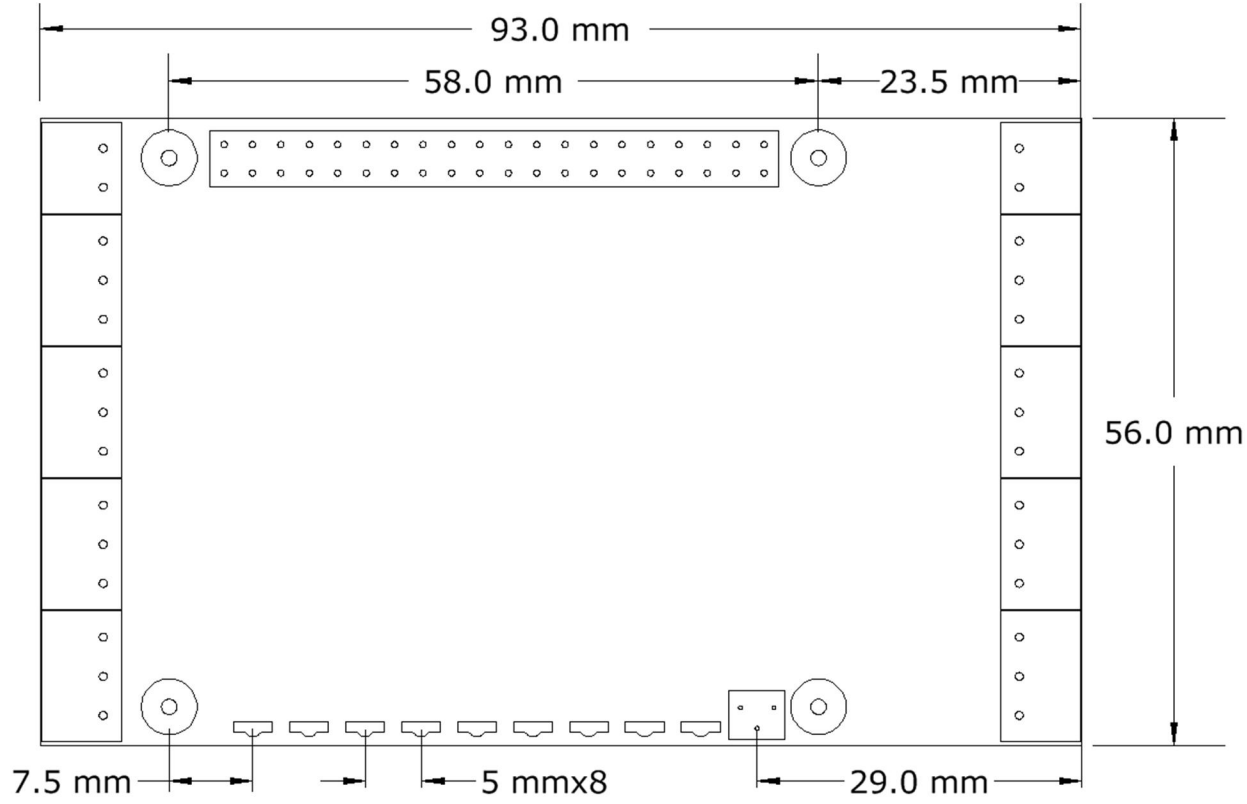
Raspberry Pi current consumption: 250 mA @ +5V (could be as high as 2A)

8-INPUTS Card current consumption: 10 mA @ +5V

The connector which powers the card can supply up to 4A and is protected by a 3A resettable fuse. We recommend using a 5V regulated power supply rated at 3A or higher. The 8-INPUTS card can be stacked up to eight levels. A multi-stack configuration can be powered from any of the cards.



# MECHANICAL SPECIFICATIONS



The card is compatible with any card manufactured by Sequent Microsystems and can be mounted in any order. You may also mix cards from other vendors, assuming they do not use the same I2C address. It can be installed in the 3D-printable modular enclosure available for download from our website.

## SOFTWARE SETUP

The 8-INPUTS card occupies the I2C addresses from 0x20 to 0x27.

1. Have your Raspberry Pi ready with the [latest OS](#).
2. Enable I2C communication:
  - a. `~$ sudo raspi-config`
  - b. 1. Change User Password      Change password for default user
  - c. 2. Network Options            Configure network settings
  - d. 3. Boot Options                Configure options for start-up
  - e. 4. Localisation Options        Set up language and regional settings to match..
  - f. 5. Interfacing Options         Configure connections to peripherals
  - g. 6. Overclock                  Configure overclocking for your Pi
  - h. 7. Advanced Options          Configure advanced settings
  - i. 8. Update                        Update this tool to the latest version
  - j. 9. About raspi-config         Information about this configuration
  
  - k. P1      Camera            Enable/Disable connection to the Raspberry Pi Camera
  - l. P2      SSH                  Enable/Disable remote command line access to your Pi
  - m. P3      VNC                    Enable/Disable graphical remote access to your Pi using...
  - n. P4      SPI                  Enable/Disable automatic loading of SPI kernel module
  - o. P5      I2C                    Enable/Disable automatic loading of I2C kernel module
  - p. P6      Serial                Enable/Disable shell and kernel messages to the serial port
  - q. P7      1-Wire                Enable/Disable one-wire interface
  - r. P8      Remote GPIO        Enable/Disable remote access to GPIO pins

3. Download the 8inputs software from github.com:

```
~$ git clone https://github.com/SequentMicrosystems/8inputs-rpi.git
```

4. `~$ cd /home/pi/8inputs-rpi`
5. `~/8inputs-rpi$ sudo make install`
6. `~$ 8inputs`

The program will respond with a list of available commands.

Type "`8inputs -h`" for online help.

After installing the software, you can update it to the latest version with the commands:

1. `~$ cd /home/pi/8inputs-rpi`
2. `~/8inputs-rpi$ git pull`
3. `~/8inputs-rpi$ sudo make install`