16-INPUTS for RASPBERRY PI

USER'S GUIDE VERSION 1.0

SequentMicrosystems.com

GENERAL DESCRIPTION

The 16-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 128 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 16-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 AC/DC signals
- Eight layer stackable to 128 inputs
- LED Indicators on each group of 8 inputs
- Pluggable connectors (26-16AWG wires) on all inputs
- 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 16-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. 16-INPUTS card for Raspberry Pi
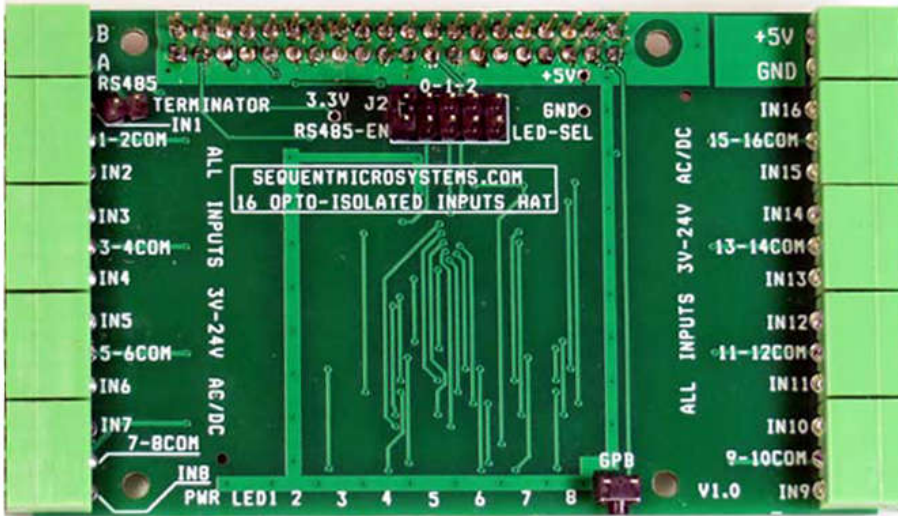
2. Mounting hardware

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

3. Two jumpers.

   You do not need the jumpers when using only one card. See STACK LEVEL JUMPERS section if you plan to use multiple cards

4. All the required female mating connectors.
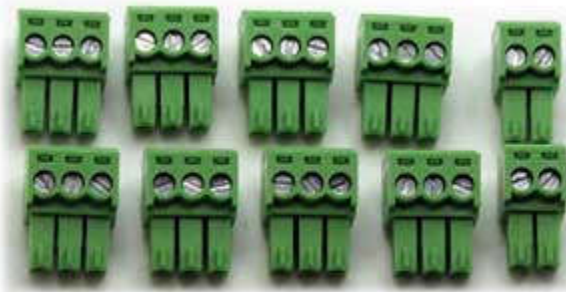
QUICK START-UP GUIDE

1. Plug your 16-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 4-RELAYS software from github.com:

    a. ~$ git clone https://github.com/SequentMicrosystems/16inpind-rpi.git

    b. ~$ cd /home/pi/16inpind-rpi

    c. ~/16inpind-rpi$ sudo make install

4. ~/16inpind-rpi$ 16inpind

    The program will respond with a list of available commands.

BOARD LAYOUT
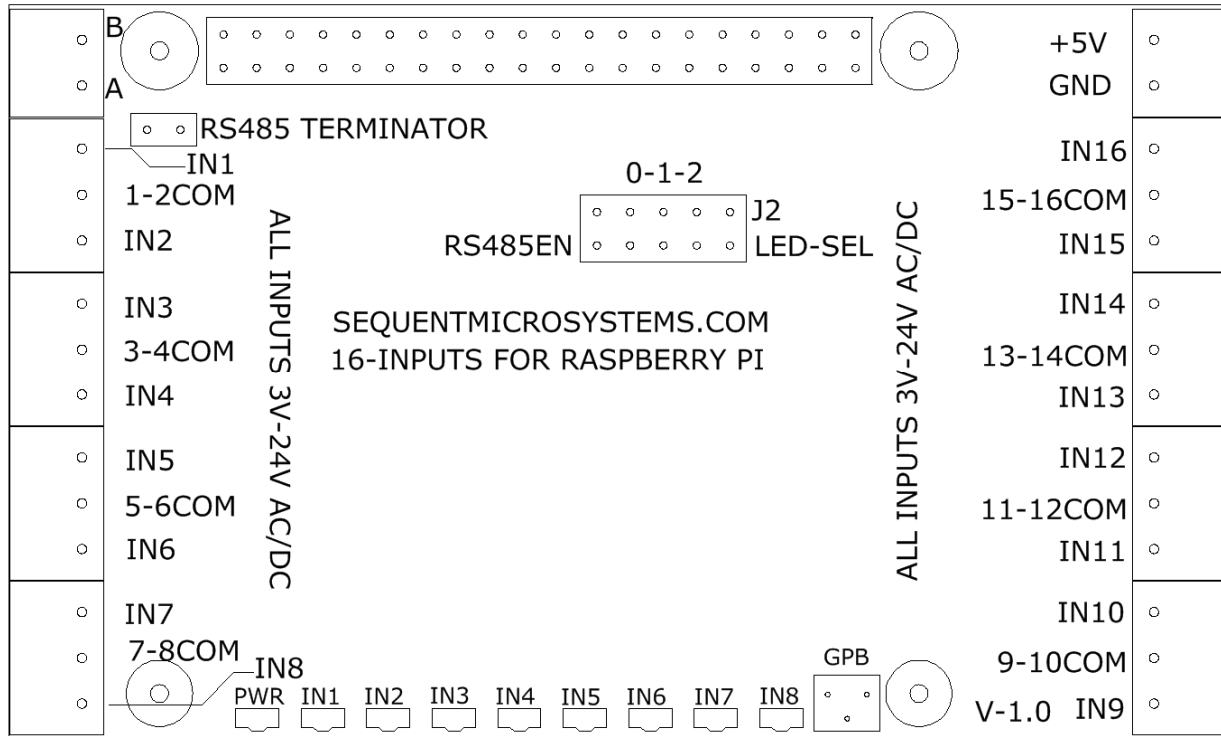
The 16-INPUTS card comes with appropriate mounting hardware. Up to eight cards can be stacked on top of one Raspberry Pi.

Eight LEDs indicate the status of their respective inputs. A LED is lit when the corresponding input is active . Groups of 8 inputs (1-8 or 9-16) can be connected to the eight LEDs by installing the LED-SEL jumper on the J2 connector, or by toggling pin 29 (GPIO05) of the Raspberry Pi GPIO connector.

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 middle 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.

STACK LEVEL JUMPERS

The 16-INPUTS card is controlled by Raspberry Pi using only the I2C interface. The card occupies the address space 0xXX - 0xXX. The local address can be configured using the Stack Level Jumpers. Two jumpers are provided for your convenience. 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 is selecting the stack level of the card, as follows:
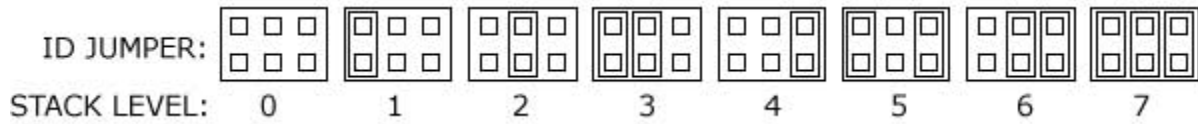
RS-485 COMMUNICATION

The 16-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 16-INPUTS card requires +5V power, supplied either from the Raspberry Pi expansion bus, or from its own pluggable connector. The on-board relays are powered by the +5V (See Schematic).

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

16-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 16-INPUTS card can be stacked up to eight levels. A multi-stack configuration can be powered from any of the cards.

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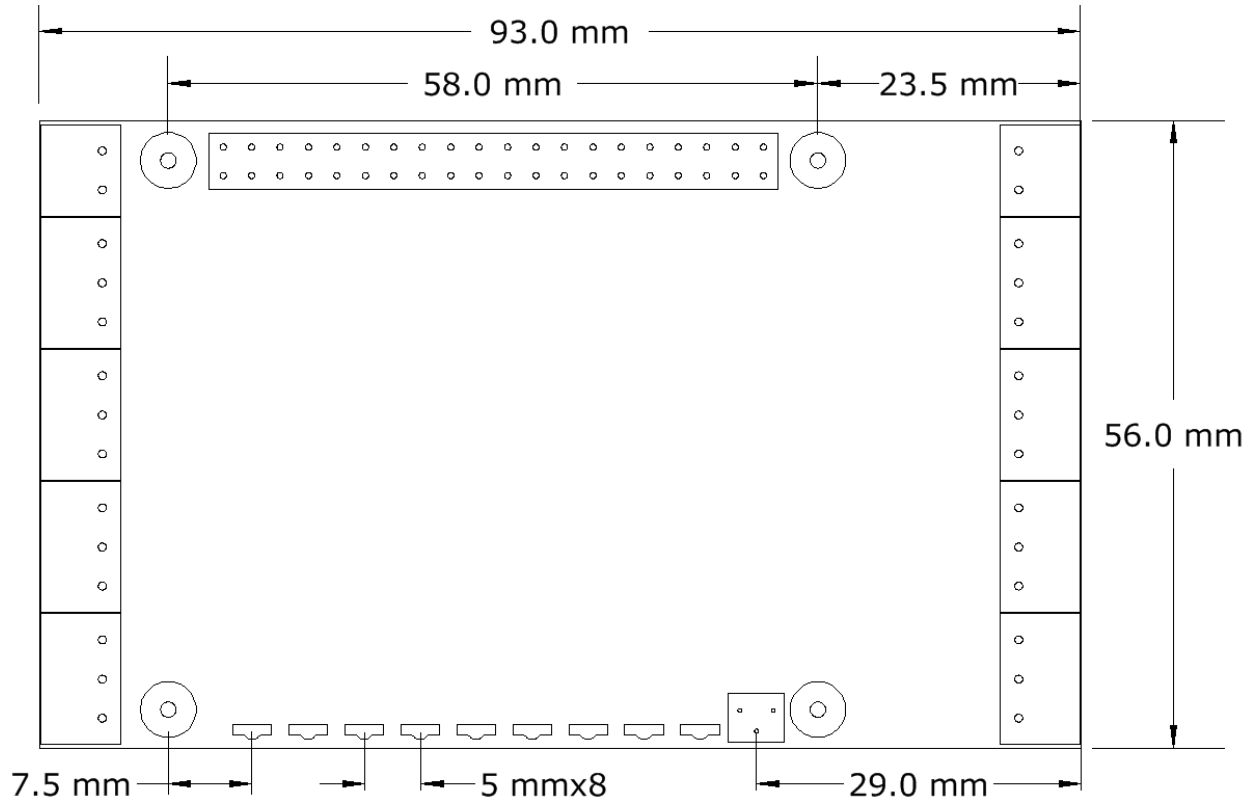
The card is compatible with any card manufactured by Sequent Microsystems and can be mounted in any order. You may also intermix cards from other vendors, assuming they do not use the same I2C address. It can be installed in the 3D-printable modular enclosure available for download from our website.

SOFTWARE SETUP

The 16-INPUTS card occupies the I2C addresses from 0x38 to 0x3F.

1. Have your Raspberry Pi ready with the latest OS.

2. Enable I2C communication:

~$ sudo raspi-config

1. Change User Password	Change password for default user
2. Network Options	Configure network settings
3. Boot Options	Configure options for start-up
4. Localisation Options	Set up language and regional settings to match..
5. Interfacing Options	Configure connections to peripherals
6. Overclock	Configure overclocking for your Pi
7. Advanced Options	Configure advanced settings
8. Update	Update this tool to the latest version
9. About raspi-config	Information about this configuration

P1	Camera	Enable/Disable connection to the Raspberry Pi Camera
P2	SSH	Enable/Disable remote command line access to your Pi
P3	VNC	Enable/Disable graphical remote access to your Pi using...
P4	SPI	Enable/Disable automatic loading of SPI kernel module
P5	I2C	Enable/Disable automatic loading of I2C kernel module
P6	Serial	Enable/Disable shell and kernel messages to the serial port
P7	1-Wire	Enable/Disable one-wire interface
P8	Remote GPIO	Enable/Disable remote access to GPIO pins

3. Install the 16inpind software from github.com:

~$ git clone https://github.com/SequentMicrosystems/16inpind-rpi.git

4.   ~$ cd /home/pi/16inpind-rpi

5.   ~/16inpind-rpi$ sudo make install

6.   ~/16inpind-rpi$ 16inpind

The program will respond with a list of available commands.

Type "16inpind -h" for online help.

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

1.   ~$ cd /home/pi/16inpind-rpi

2.   ~/16inpind-rpi$ git pull

3.   ~/16inpind-rpi$ sudo make install