threeml

Compatible with
Raspberry Pi

RHUBARB AD1d openIIOT

Rhubarb openIIOT (Industrial Internet of Things) is an industrial interface board designed to be compatible with the Raspberry Pi family of Single Board Computers (SBCs). The Rhubarb marries industrial resilience to well-proven, advanced IoT development technologies found in the RaspberryPi ecosphere, enabling safe and creative industrial application development.

The Rhubarb AD1d is compatible with the Raspberry Pi 1 A+/ B+, Raspberry Pi 2 Model B, Raspberry Pi 3 Model B/B+, and the Raspberry Pi Zero.

USES

- Small form factor operator workstations that require simple I/O
- Low power data collection that syncs data in real time back to a master server or database
- Temporary, low cost, and quickly deployed control systems
- Visual display systems (signage) that use real time I/O to change a webpage or sign output
- Prototype programmable action controller (PAC) for machine or process development

FEATURES

- Wide input power range (10-30VDC) with both over current and transient voltage protection
- Integrated Real Time Clock
- 12 fully isolated (up to 5KV) and filtered differential DC inputs
- 4 differential 4-20mA or 0-10VDC analog inputs (12-18 bit resolution, configurable)
- 2 relay outputs rated at 2A, 250VAC, 220VDC - Max
- 2 open collector outputs rated up to 50V 300mA Max

PHYSICAL DIMENSIONS

- Length 142 mm
- Width 65 mm
- Height 25mm with Raspberry Pi

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TECHNICAL SPECIFICATIONS

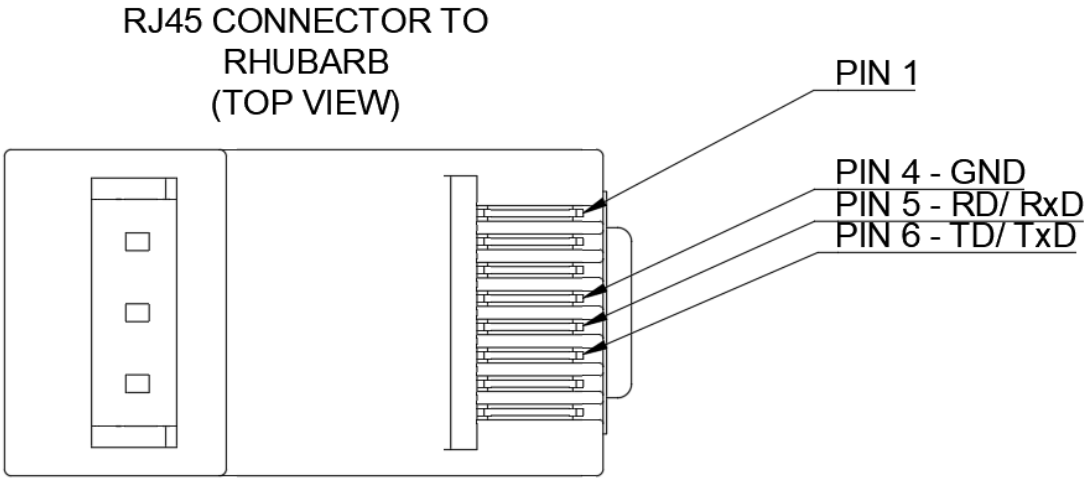
Supply Voltage	10-30VDC, 2.0A Max, 300mA typical Reverse wiring protection
Digital Input Specifications	12 x differential optically isolated PNP or NPN inputs filtered at 50 kHz Inputs require 15mA of current to operate Input voltage range 10VDC- 30VDC Reverse wiring protection
Analog Input Specifications	4x differential isolated analog inputs. Configurable via jumper to be either 4-20mA or 0-10VDC. 12-18 bit resolution, configurable, 15 Hz sampling rate **Jumper pins 1 & 2 = 4-20mA** **Jumper pins 3 & 4 = 0-10V**
Relay Output Specifications	2 x relay outputs rated at 2A, 250VAC, 220VDC Max **Relays are not intended to drive large inductive loads**
Open Collector Output Specifications	2x optically isolated open collector outputs rated up to 50V, 300mA. Maximum output frequency of 20kHz. * RT Linux recommended for pulse train/ PWM applications
Operating Temperature	0°C to 70°C (Rhubarb is designed to operate to 85C, but some components on the Raspberry Pi are not tested past 70C)
Serial Output	Isolated RS-232 via RJ45 (EIA/TIA-561 pinout) connection. Use for RPi serial terminal or other serial peripherals.
Compatible Raspberry Pi Hardware	Raspberry Pi 1 A+/ B+, Raspberry Pi 2 Model B, Raspberry Pi 3 Model B/B+, and the Raspberry Pi Zero.

RASPBERRY PI AUDIO & VIDEO I/O

For a full list of I/O (audio, video, serial, and more) available on the Raspberry Pi, consult these pages:

https://www.raspberrypi.org/products/

RS232 PINOUT



FOR OTHER PIN ASSIGNMENTS,
CONSULT EIA/TIA-561.

RJ45 PIN	DB9 PIN
4	5
5	3
6	2

PROGRAMMING/ GETTING STARTED

At heart, the Raspberry Pi is a fully featured (and exceptionally capable) Linux computer. As such, it is programmable in just about any computer language available in the Debian package repository (https://packages.debian.org). These languages are, but are certainly not limited to, Python, C, C++, PHP, Java, Javascript, and many, many more.

If you have purchased your Rhubarb without a Raspberry Pi, it is highly recommended that you use the following guide to get started:

https://www.raspberrypi.org/learning/software-guide/

From a programming perspective, ThreeML highly recommends using the wonderful WiringPi library to interact with the Raspberry Pi's GPIO. That library may be found here:

http://wiringpi.com

ThreeML recommends using the following I2C user space library for interacting with the MCP3424 ADC:

https://github.com/alexyoung91/mcp3424

Videos showing more in-depth information may be found on ThreeML's YouTube page.

RESOURCES

Raspberry Pi Foundation Getting Started Guide
https://www.raspberrypi.org/learning/software-guide/

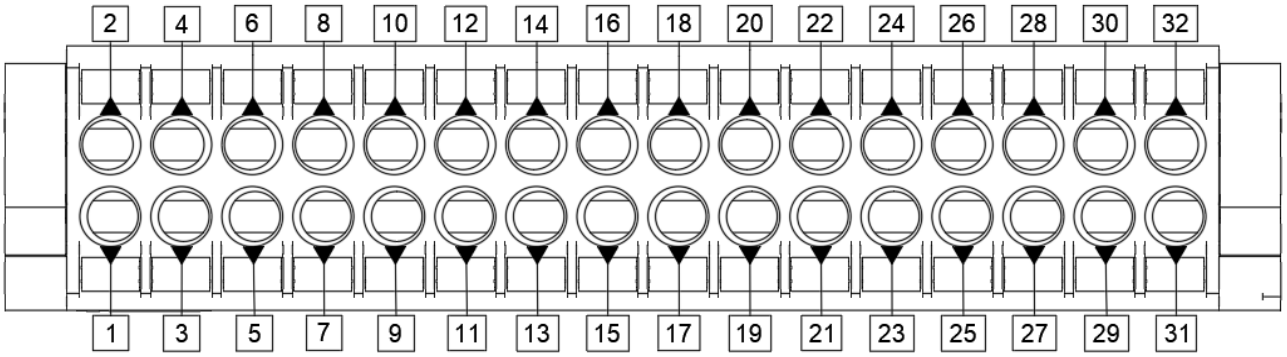
WiringPi
http://wiringpi.com

WiringPi C Programming Examples
https://projects.drogon.net/raspberry-pi/gpio-examples/

Debian Linux Documentation
https://www.debian.org/doc/

I/O CONNECTOR PIN OUT

BOARD TOP



*** ANALOG INPUT FUNCTION SET BY PHYSICAL JUMPER ON BOARD**

*** AT LEAST ONE (1) DC COM NEEDS TO BE CONNECTED FOR INPUTS TO FUNCTION**
*** RPI INTERNAL PULLDOWN RESISTORS MUST BE ENABLED FOR ALL GPIO**
*** CONNECTOR WIRE SIZE 16-24 AWG (FERRULES NOT RECOMMENDED)**

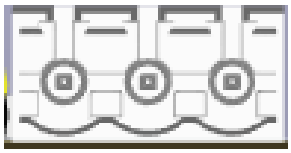
Position	Wiring Pi	Broadcom (BCM)	Function	Notes
1	--	--	Analog 1 +	MCP3424 Channel 1, accessed over i2c (default 4-20ma)
2	--	--	Analog 1 -	—
3	--	--	Analog 2 +	MCP3424 Channel 2, accessed over i2c (default 4-20ma)
4	--	--	Analog 2 -	—
5	--	--	Analog 3 +	MCP3424 Channel 3, accessed over i2c (default 4-20ma)
6	--	--	Analog 3 -	--
7	--	--	Analog 4 +	MCP3424 Channel 4, accessed over i2c (default 4-20ma)
8	--	--	Analog 4 -	—
9	--	--	DC COM	Digital Input DC Common
10	--	--	DC COM	Digital Input DC Common
11	--	--	DC COM	Digital Input DC Common
12	--	--	DC COM	Digital Input DC Common
13	0	17	Input 1	—
14	2	27	Input 2	—
15	3	22	Input 3	—

16	21	05	Input 4	—
17	22	06	Input 5	—
18	23	13	Input 6	—
19	24	19	Input 7	—
20	25	26	Input 8	—
21	1	18	Input 9	—
22	5	24	Input 10	—
23	4	23	Input 11	—
24	6	25	Input 12	—
25	26	12	Output 1 +	Relay output
26			Output 1 -	Relay output
27	27	16	Output 2 +	Relay output
28			Output 2 -	Relay output
29	28	20	Output 3 +	MOSFET Output
30			Output 3 -	MOSFET Output
31	29	21	Output 4 +	MOSFET Output
32			Output 4 -	MOSFET Output

POWER CONNECTOR PIN OUT

(BOARD TOP)

(BOARD I/O CONNECTOR)



*** POSITIONS ARE NUMBERED LEFT TO RIGHT, 1-3**
*** CONNECTOR WIRE SIZE 12-22 AWG**

Position	Function
1	DC 10-30V
2	DC COM
3	EARTH GROUND

DISCLAIMER

The products and application data described in this data sheet are useful in a wide variety of different applications. Therefore, the user and others responsible for applying these products described herein are responsible for determining the acceptability for each application. While efforts have been made to provide accurate information within this manual, 3ML LLC assumes no responsibility for the application or the completeness of the information contained herein.

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OTHER LEGAL STUFF

Raspberry Pi is a trademark of the Raspberry Pi Foundation
Rhubarb openIOT is not endorsed, sponsored by or associated with the Raspberry Pi Foundation
Debian is a registered trademark of Software in the Public Interest, Inc.

CONTACT & SUPPORT

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