# 1-Wire Host

User Manual

*July 2015*

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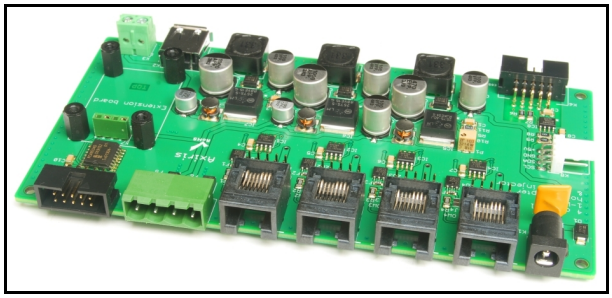
# Revision History

| Date | Authors | Description |
|---|---|---|
| 2015-03-28 | Peter S'heeren | Initial release. |
| 2015-07-09 | Peter S'heeren | Added section about 1-Wire Host GPIO program. Second release. |

# 1 Features



- 1-Wire adapter with four independent 1-Wire masters.
- 1-Wire connections using standardized RJ45 jacks.
- I2C bus interface, up to 400 kHz.
- I2C master and local I2C bus are galvanically isolated.
- Eight general-purpose digital I/O lines are available on a dedicated connector.
- Three on-board power supplies including a power injector.
- Area for I2C-based extension board (real-time clock, additional 1-Wire controller, extra I/O lines, …).

Applications include:

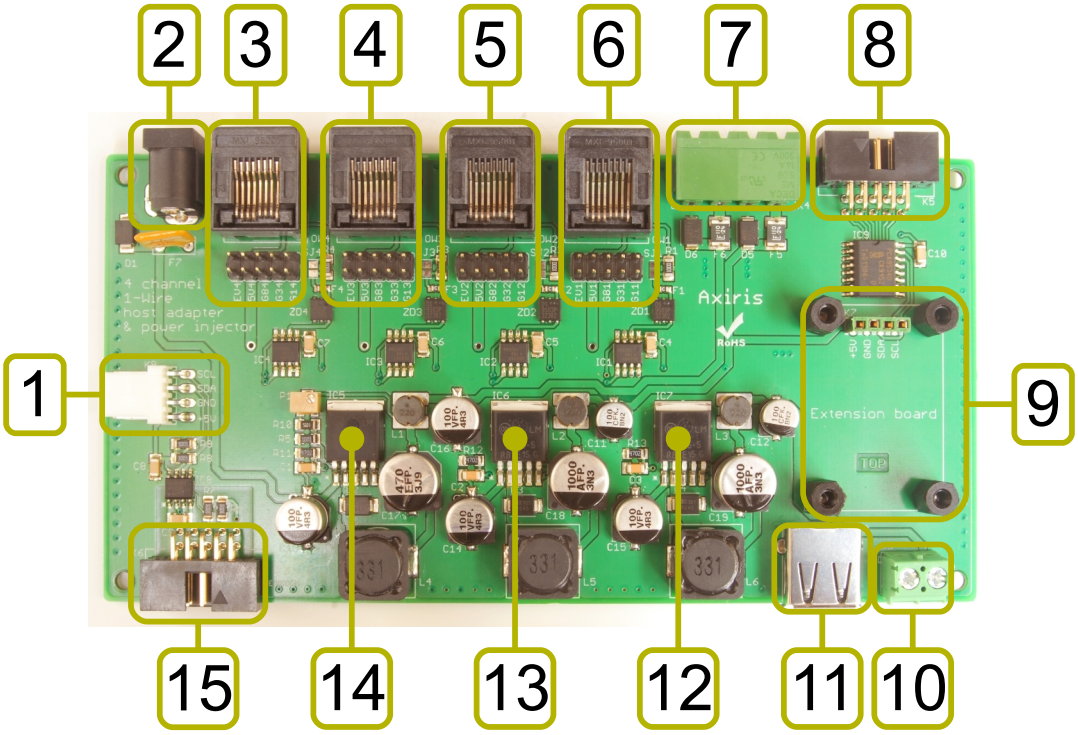
- Industrial automation.
- Server room monitoring.
- Weather station.
- Home automation.

# 2 Technical Specifications

| | |
|---|---|
| **Dimensions** | 158 mm x 83 mm x 20 mm (W x D x H) |
| **Weight** | 102 g |
| **Power Supply** | 24 VDC, 1.8 A min.<br>Connector type 5.5 x 2.5 ⊖⊂⊕ |

# 3 1-Wire Host

## *Board Overview*




| Mark | Label | Description |
|---|---|---|
| 1 | K8 | I2C bus connector |
| 2 | K1 | Power supply input connector, type 5.5 x 2.5 |
| 3 | OW4, SJ4 | DS2482-100 1-Wire controller D connector, jumper settings |
| 4 | OW3, SJ3 | DS2482-100 1-Wire controller C connector, jumper settings |
| 5 | OW2, SJ2 | DS2482-100 1-Wire controller B connector, jumper settings |
| 6 | OW1, SJ1 | DS2482-100 1-Wire controller A connector, jumper settings |
| 7 | K4 | Power outputs connector |
| 8 | K5 | General-purpose I/O lines male connector |
| 9 | K7 | Extension board connector and mounting area |
| 10 | K3 | Power output for single board computer |
| 11 | K2 | Power output for single board computer (same as K3) |
| 12 | - | On-board power supply #1 |
| 13 | - | On-board power supply #2 |
| 14 | - | On-board power supply #3 |
| 15 | K6 | Connector for I2C master |

## On-board Power Supplies (mark 12, 13, 14)

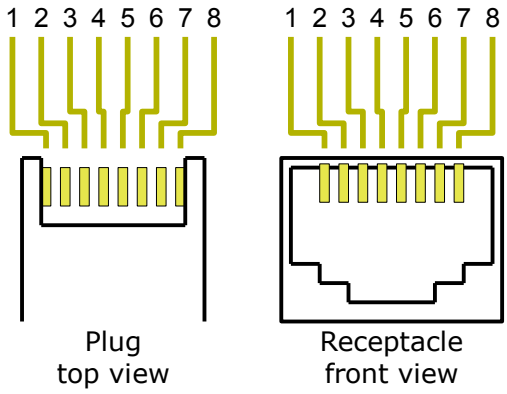
The 1-Wire Host embeds three on-board power supplies:

- #1: 8 – 20 V, 1 A, routed to the 1-Wire RJ45 connectors.
- #2: 5 V, 1 A, routed to the RJ45 1-Wire connectors.
- #3: 5 V, 2 A, provided for power a single board computer.

Adjust potentiometer P1 to control the output voltage of power supply #1.

## 1-Wire RJ45 Connectors (OWn) and Jumpers

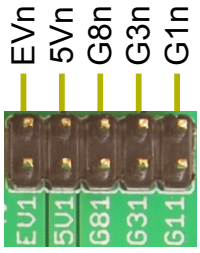
| Mark | Description |
|---|---|
| 1 | Selectable GND |
| 2 | Selectable +5 V power |
| 3 | Selectable GND |
| 4 | 1-Wire DQ (data) |
| 5 | 1-Wire ground |
| 6 | N.C. |
| 7 | Selectable 8-20 V power |
| 8 | Selectable GND |




Each RJ45 connector exposes a 1-Wire channel to the outside world. Each 1-Wire channel has a dedicated 1-Wire controller, hence all channels operate independently and concurrently.

A set of jumpers select the signals being routed to pins 1, 2, 3, 7 and 8. A closed jumper routes the signal, an opened jumper doesn't.

| Mark | Description |
|---|---|
| EVn | 8-20 V power to pin 7 |
| 5Vn | 5 V power to pin 2 |
| G8n | Route ground to pin 8 |
| G3n | Route ground to pin 3 |
| G1n | Route ground to pin 1 |




Jumper EVn routes the output of on-board power supply #1 to the connector. Jumper 5Vn routes the output of on-board power supply #2 to the connector.

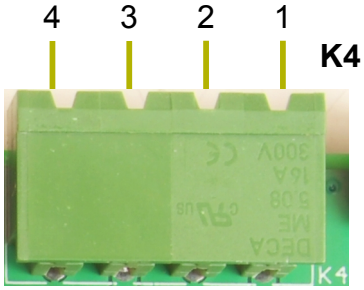
## Power Output for Single Board Computer (K2, K3)

| Mark | Description |
|---|---|
| GND | Ground |
| +5V | +5 V output |


K2 and K3 provide power generated by power supply #3. Their main function is to provide power to the single board computer that controls the 1-Wire Host.

## Power Outputs Connector (K4)

| Mark | Description |
|---|---|
| 1 | 5 V (power supply #1) |
| 2 | Ground |
| 3 | 8-20 V (power supply #2) |
| 4 | Ground |

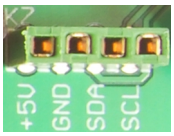



K4 allows one to directly draw power from power supply #1 and #2.

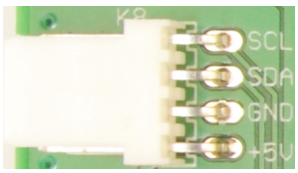
Ground pins 2 and 4 are interconnected.

## I2C Bus Extension Connectors (K7, K8)

| Mark | Description |
|---|---|
| +5V | 5 V output |
| GND | Ground |
| SDA | I2C serial data |
| SCL | I2C serial clock |




K7

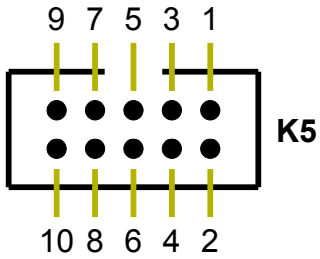



K8

These connectors are points for adding I2C devices to the 1-Wire Host.

## General-purpose I/O Lines (K5)

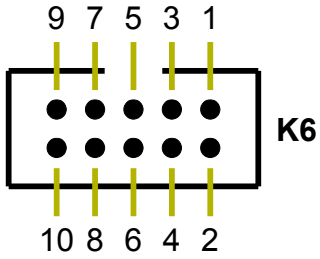
| Mark | Description |
|---|---|
| 1 | GPIO line P0 |
| 2 | GPIO line P1 |
| 3 | GPIO line P2 |
| 4 | GPIO line P3 |
| 5 | GPIO line P4 |
| 6 | GPIO line P5 |
| 7 | GPIO line P6 |
| 8 | GPIO line P7 |
| 9 | Ground |
| 10 | 5 V output |




This box header brings out the general-purpose digital I/O lines of the PCA9534.

## Connector for I2C Master (K6)

| Mark | Description |
|---|---|
| 1 | Vcc input |
| 2 | N.C. |
| 3 | I2C serial data (SDA) |
| 4 | N.C. |
| 5 | I2C serial clock (SCL) |
| 6 | Ground |
| 7 | N.C. |
| 8 | N.C. |
| 9 | N.C. |
| 10 | N.C. |




K6 is the connection point for the I2C master that controls the 1-Wire Host. The I2C master can operate at 3.3 V or 5 V; the board performs level conversions between the master voltage and the 5 V on the local I2C bus.

The I2C master and the local I2C bus are galvanically isolated. Note that in case the controlling SBC is powered by the 1-Wire Host, the I2C master and the local I2C bus will share the same ground thereby nullifying the galvanic isolation.

# 4 I2C Bus

## Slave Addresses

The local I2C bus operates at 5 V level. The bus interconnects a set of on-board I2C devices. The slave addresses are:

| Address | Slave Device |
|---|---|
| 0011000b | 1-Wire controller A, DS2482-100, 1 channel |
| 0011001b | 1-Wire controller B, DS2482-100, 1 channel |
| 0011010b | 1-Wire controller C, DS2482-100, 1 channel |
| 0011011b | 1-Wire controller D, DS2482-100, 1 channel |
| 0100000b | 8-bit I/O expander, PCA9534 |

Additional I2C slave devices are possible:

- Connector K7 provides a mount point for an extension board.
- K8 provides an access point to the I2C bus.

## Bus Speed

The 1-Wire Host supports a maximum bus speed of 400 kHz.

## 1-Wire Controllers

The four 1-Wire controllers allow software to communicate with four 1-Wire slaves concurrently.

## I/O Expander

The I/O expander chip adds 8 general-purpose digital I/O pins to the 1-Wire Host.

# 5 Software

## *1-Wire Host GPIO*

This program provides command line parameters for controlling the PCA9534 chip. It runs on Linux.

You can download the program from the Axiris website. A comprehensive read-me is included.

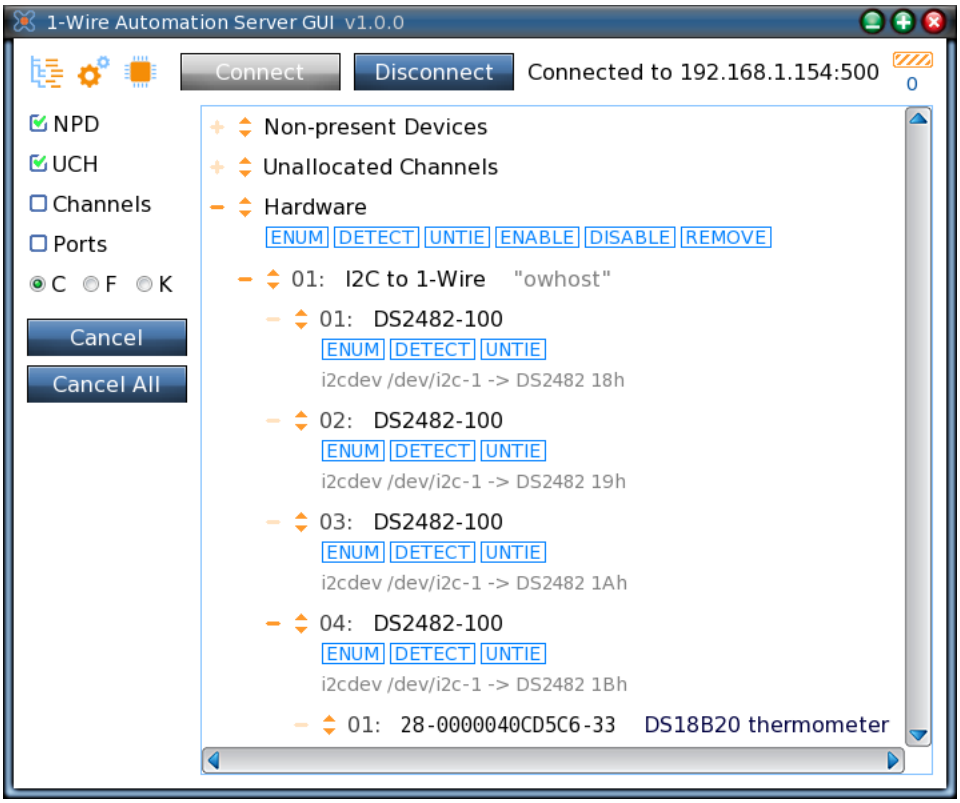
## *1-Wire Automation Software*

The 1-Wire Automation Software supports the 1-Wire Host. Client command **Adapter Add** is central in adding the adapter to the server.

### BeagleBone Black

With a BeagleBone Black acting as the controlling SBC, the 1-Wire Host connects to I2C bus /dev/i2c-1. The adapter is added as follows:

```
adapter "owhost" add i2cdev "/dev/i2c-1" ds2482 18h ds2482 19h ds2482 1Ah
ds2482 1Bh
```




This picture shows the device path of each 1-Wire controller on the 1-Wire Host.

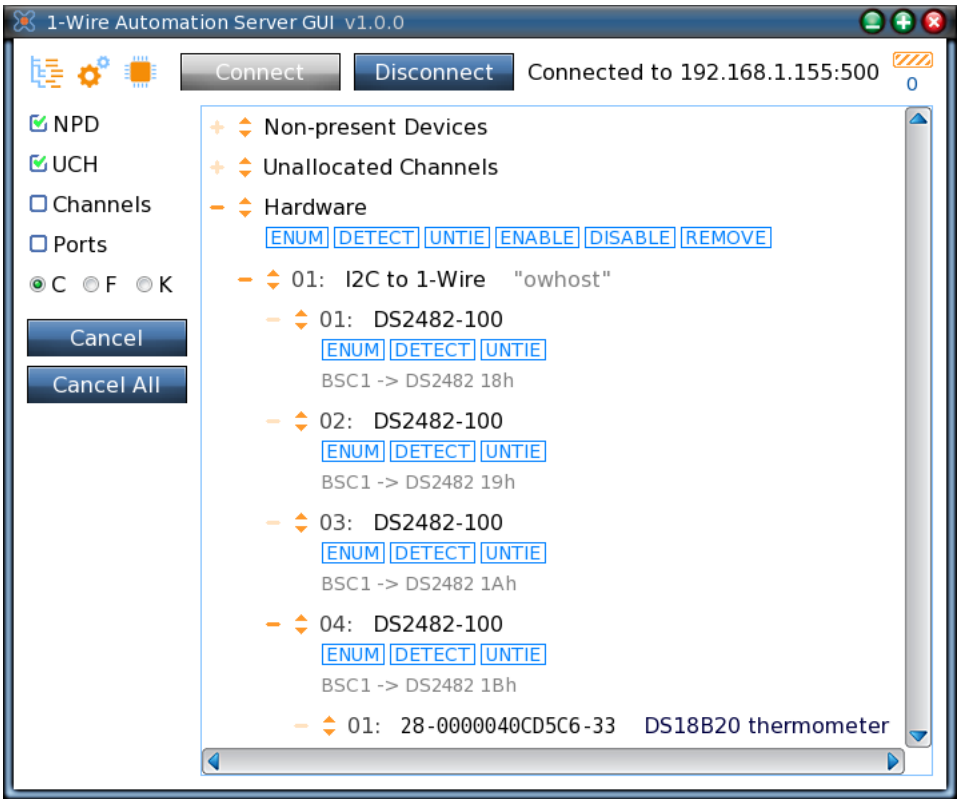
## Raspberry Pi

If you're using a Raspberry Pi as the controlling SBC, the server offers a detection procedure for figuring out the interface to use on your Raspberry Pi:

```
adapter "owhost" add bscdetect ds2482 18h ds2482 19h ds2482 1Ah ds2482 1Bh
```

The actual interface depends on the revision of the Raspberry Pi and whether or not the i2c-dev driver is loaded.

If no i2c-dev driver is present, the server uses direct I/O to communicate with the 1-Wire controller on the 1-Wire Host. The device path of each controller contains a BSC0 or BSC1 element:




It's recommended to activate the i2c-dev driver. In doing so, software other than the 1-Wire server is able to safely access the on-board I/O expander and I2C slaves to are connected to the extension connectors.

## *owfs*

The 1-Wire Host can be used with **owfs**, the 1-Wire File System. This software package is available from the following website:

http://www.owfs.org/

The **owfs** software includes programs that expose the 1-Wire hardware in a variety of ways to the system:

- **owfs**: Creates a file system in a specified mount directory. This program requires software package **libfuse**.
- **owhttpd**: Sets up a web server.

- **owftpd**: Sets up an FTP server.
- **owserver**: A server that allows multiple client programs to access the 1-Wire hardware.

These programs support a uniform command line syntax for specifying which 1-Wire adapters to detect and to expose. For the 1-Wire Host, the **--i2c** command line option is of importance.

Suppose you want to set up a web server that listens to port 80. Suppose the 1-Wire Host is connected to /dev/i2c-1 of the controlling SBC. Enter the following command as root in the **bin** directory of **owfs**:

```
# ./owhttpd -p 80 --i2c=/dev/i2c-1:0 --i2c=/dev/i2c-1:1 --i2c=/dev/i2c-1:2
--i2c=/dev/i2c-1:3
```

The **/dev/i2c-<n>:<i>** syntax denotes offset **<n>** from I2C address 0011000b on I2C bus of **<i>**. The mentioned command line syntax thus tells **owhttpd** to look for 1-Wire controllers at addresses 0011000b, 0011001b, 0011010b and 0011011b on the I2C bus. The type of 1-Wire controller doesn't need to be specified; the **owfs** software will distinguish between a DS2482-800 chip and a DS2482-100 chip.

Refer to the **owfs** documentation for more information.

# 6 Legal Information

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Official website: http://www.axiris.eu/