

How to Guide: DS18B20 Thermometer

The DS18B20 Thermometer is a digital thermometer that uses a “One Wire” interface for collecting data from the Beaglebone. Unlike an analog input where you the device like a potentiometer and calibrate it, you will need to configure and install a driver for this device. There are some guides for using the temperature sensor with the BeagleBone, but none of the guides explain how to use different pins, nor troubleshooting steps.

We used a waterproof thermometer, which has the wires already colour coated for us. To aid in easy removal, we soldered on female connectors to the wires, so they could be slipped on/off the Zen Cape.

The labelling is as follows:

VCC (3 or 5V)

GND

Digital Signal

You will need a circuit where the VCC and Signal wire are linked together by a 4.7K Ohm resistor. We found that there were less issues when wired that way.

The VCC line will connect with SYS_5V which is either pin 7 or 8 on Header P8.

The signal line will connect with the GPIO pin of your choice

The ground wire will connect to either pin 0, 1 from P8 or P9.

Clone, compile, and install device tree drivers.

On your BeagleBone, clone Robert C. Nelson's overlay repository (you may need to install git first)

```
git clone https://github.com/beagleboard/bb.org-overlays
```

Edit `src/arm/BB-W1-P9.12-00A0.dts` in your favourite text editor

You will need to refer to

<https://www.cs.sfu.ca/CourseCentral/433/bfraser/other/BareMetalDocs/BeagleboneBlackP8HeaderTable.pdf>

Or

<https://www.cs.sfu.ca/CourseCentral/433/bfraser/other/BareMetalDocs/BeagleboneBlackP9HeaderTable.pdf>

Rename `part-number = "BB-W1-P9.12"` to `BB-W1-P8.11` so that we know it is on Header P8, Pin 11.

Change `exclusive-use = "P9.12"` to `"P8.11"`

Change `BONE_P9_12` to `BONE_P8_11`

Change `gpios = <&gpio1 28 GPIO_ACTIVE_HIGH>;` to
`gpios = <&gpio1 13 GPIO_ACTIVE_HIGH>;`

Referring to the `mode7` column in the Header Table, for the `gpio#` and the index of it.

Save the file as `BB-W1-P8.11-00A0.dts`, and then `./install.sh` in the root of the repository.

Copy the file to `/etc/firmware/`

```
echo BB-W1-P8.11 > $SLOTS
```

`P8.11` might be different, depending on which pin you've set the thermometer to. The device should now be visible to access

Access the temperature value

This should be trivial, but a number of issues could occur, most of which we could not exactly triage. However, our steps were mostly stable enough to read the temperature.

```
cd /sys/bus/w1/devices
```

```
root@gshieh-beagle:/sys/bus/w1/devices# ls
28-800000046fa3 w1_bus_master1
```

`28-800000046fa3` is the serial number of your thermometer.

You can read the temperature value as follows:

```
root@gshieh-beagle:/sys/bus/w1/devices# cat 28-800000046fa3/w1_slave
88 01 ff ff 7f ff ff ff 4e : crc=4e YES
88 01 ff ff 7f ff ff ff 4e t=24500
```

The `t=24500` shows that the current temperature reading is 24.500 degrees celsius. There is no clean way to read this temperature value, other than using `fscanf`, or using a regex. We used the following regex to parse the file: `t=(\\d*)`

Troubleshooting

- However, you may have a reading where the CRC check is a NO.
- Temperature is either 0, or 85000
- Loose wiring may cause similar values to appear when you call `ls`

```
root@gshieh-beagle:/sys/bus/w1/devices# ls
28-800000046fa3 28-a00000046fa3 28-b00000046fa3 w1_bus_master1
```

Our fix was to secure the wiring by soldering, but also to install a resistor as recommended above. For some reason, these issues were more apparent when we used the P8 header. Also check if you are cat-ing the correct `w1_slave`. If there are multiple devices appearing, that suggests that the wiring is incorrect or is loose.

Credits

We based most of our steps from this guide

<http://www.bonebrews.com/temperature-monitoring-with-the-ds18b20-on-a-beaglebone-black/>

However, no amount of searching helped us source our issues.