

CumulusMX on Raspberry Pi 3 – How To Guide

Introduction

CumulusMX is a software package written by Steve over at Sanday Weather – www.sandaysoft.com. This software allows us to connect our WeatherDuino Pro2 system to a network and enable a Web Interface to view our local weather information. It also allows us to connect to various weather sites around the Internet and setup a Personal Weather Station (PWS) and become part of the world-wide weather network.

I've put together the following 'How To Guide' as a starting place and a bit of guidance for someone completely new to Raspberry Pi and CumulusMX. This is not meant to be an ultimate CumulusMX guide, but rather a starting point and enough to get you up and running. During my own build process I was able to eventually find various pieces of information at different locations on the Internet, however I still had to piece it all together and work it out. I wasn't able to find a 'complete' guide or process which lead me from opening up a brand new Raspberry Pi to having it up running, and connected to my WeatherDuino system.

Even though I've been involved in the Information Technology industry for over twenty-five years, and have had formal training in SCO UNIX many years ago, I still had to search and search, and go through sessions of trial and error to get this all working on my Raspberry Pi. Out of the box, the Pi does absolutely nothing, and you have to first get your Pi running and then work out how to get CumulusMX installed and running. It certainly was a journey, but fear not, it is possible... And hopefully this guide will make your journey a little easier.

This document and the process outlined below aims to give someone with absolutely no exposure or experience with Raspberry Pi enough information to get a Raspberry Pi running Cumulus MX and communicating with your Weather Duino Pro2 system, which after all, is what we're all here for.

Overview

Once setup and running, CumulusMX will connect to your Weather Duino Pro2 weather station, and both log and display the data. In addition it will also upload your weather data to online services such as WeatherUnderground, allowing you to become part of the world-wide weather network.

And for me, the biggest advantage with this particular approach is that you don't require a dedicated Windows computer which needs to be running 24hrs a day, just to perform this task. Once setup and complete, you won't require a keyboard, mouse nor screen connected to your Raspberry Pi. Once setup, simply connect your Weather Duino and turn it on...

What Will You Need

To complete this process you will require a Raspberry Pi 2 or 3, a SD Card of at least 8Gb in size, a USB keyboard and mouse, and a suitable display for your Raspberry Pi. If you are using a Pi 2 you will also need a network cable and an Internet connection. If you are using a Pi 3 and have wireless Internet connection available we can use that option.

In the example below we are going to use a Raspberry Pi 3 with a 16Gb SD Memory Card and a wireless Internet connection. We have a USB wireless keyboard and mouse, and a HDMI 20" display connected to the Pi.

Power Supplies

The Raspberry Pi is powered via a micro USB connector, so you will need a suitable power supply. At this stage all we need to power is a USB keyboard and mouse, and the actual Raspberry Pi 3 with wireless adapter enabled and the onboard SD Card slot (read / write activities). This configuration will draw approximately 300mA – 400mA. I have read stories of people having stability issues with their Pi due to inadequate power supplies.

The safest option is to use the genuine Raspberry Pi power supply, however if you didn't order one you can use a good quality mobile phone charger / power supply. Ensure that you choose one with at least a 1A 5.1v output, or better still grab yourself one of the higher rated 2A or 2.5A USB power supplies that some of the Tablets use. If it is a reputable and trusted brand power supply, with a high power rating, you should be confident of a reliable experience with your Pi.

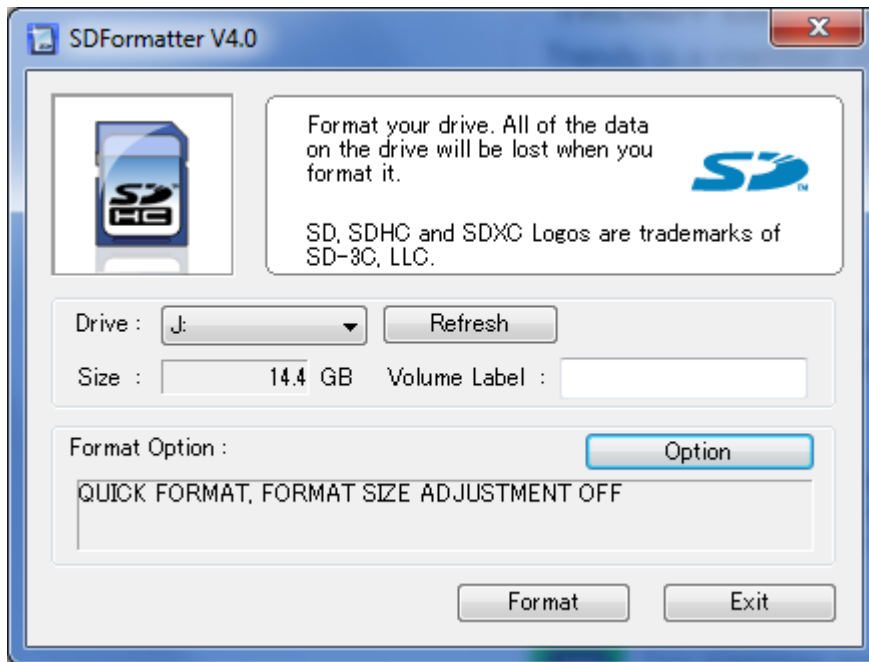
Choosing Your SD Card

When choosing your memory card, I suggest choosing a reputable and trusted brand card. We're looking for a reliable platform for our weather station and something that will both last and provide reliable service. I generally choose the SanDisk branded SD cards, and these days even the Ultra grade cards (up to 80MB/s) are only about \$15 - \$20 for a 16Gb card. I have read reports of some of the slower and no-name cards being a little unreliable in the Pi's, so probably best spending an extra couple of dollars here on your memory card. I used the standard SanDisk Class-4 (C4) cards and have had no problems, however I prefer to spend an extra few dollars and buy the faster Class-10 (C10) cards.

Format the SD Card

I found very quickly that the Raspbian Distro didn't like the 'Windows' format on my SD Card. The answer was to use a SD card format tool which will format the SD card in conformity with SD File System Specification issued by SDA (SD Association), so that the SD cards can exhibit their full performance.

Download a SD card formatting tool, such as SDFormatter from TRENDY Co. Refer to the following URL - http://www.trendy.co.jp/sd/en/p_formatter.html



The SDFormatter tool will format the card with a FAT32 file system, conforming to SD File System Specifications.

Download your Distro

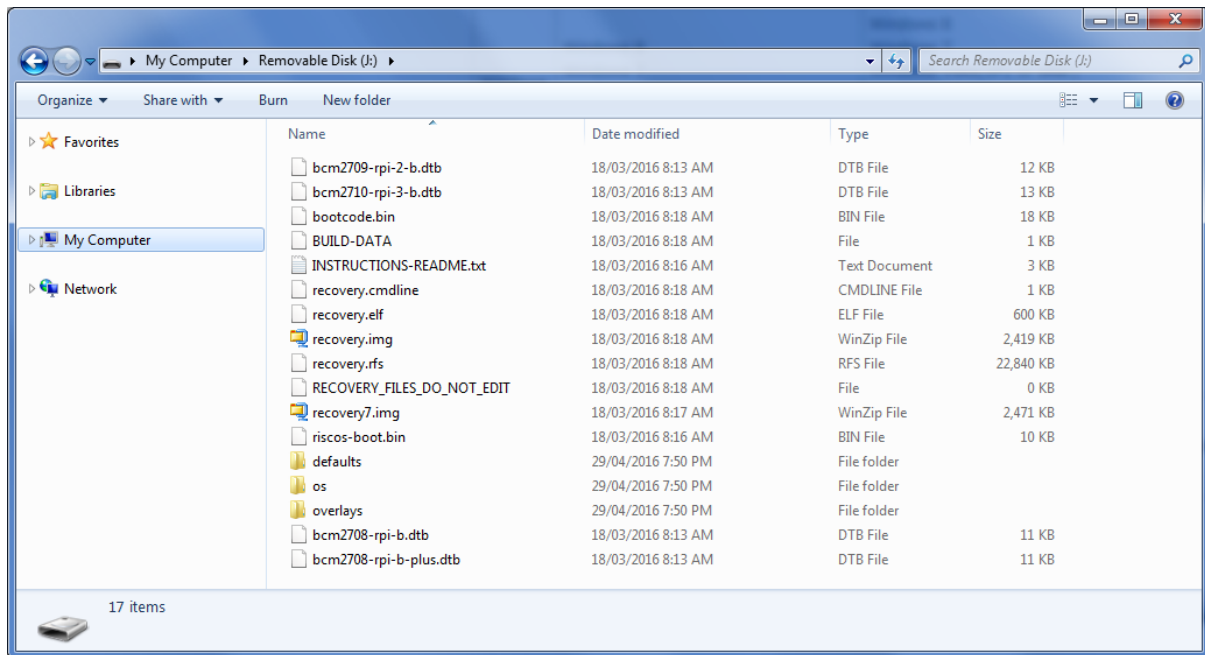
Next step is to download your Raspbian distribution (distro).for your Raspberry Pi. The NOOBS version is an installer which also contains the Raspbian operating system. Go to the following URL and download the NOOBS version (not the NOOBS Lite):

<https://www.raspberrypi.org/downloads/noobs/>

Copy the Distro to your SD Card

Once you have your Raspbian Distro downloaded, expand the contents of the ZIP file to a new folder on your Windows computer. Then copy the entire contents of that folder to the root of your SD Card.

The root of the SD Card should look similar to the following screenshot:



Don't forget to 'Eject' your SD Card before you remove it from your USB port, and then insert it into your Raspberry Pi (with power turned off). To do this, right click on the drive letter in Window Explorer and click on "Eject".

Build the Raspbian Image

Connect a USB keyboard and mouse to your Pi, and a HDMI monitor or display. Once the SD Card is inserted into your Raspberry Pi, proceed with power on and boot the Pi. You should see the Raspbian image boot, the partition may be resized, and then you should be presented with the initial NOOBS setup screen.

Select the Raspbian OS option, and select your Language and Keyboard at the bottom of the screen. If you have a Pi 3, there is no need to worry about Wifi Networks at the moment. Click on the "Install" icon and your image build will begin.

The build process will take about 10 or 15 minutes to complete, following which you should see a Installation Successful message. At this stage click the "Ok" button to reboot your Pi and start the initial configuration.

Update the Raspbian Distro

```
sudo apt-get-update
```

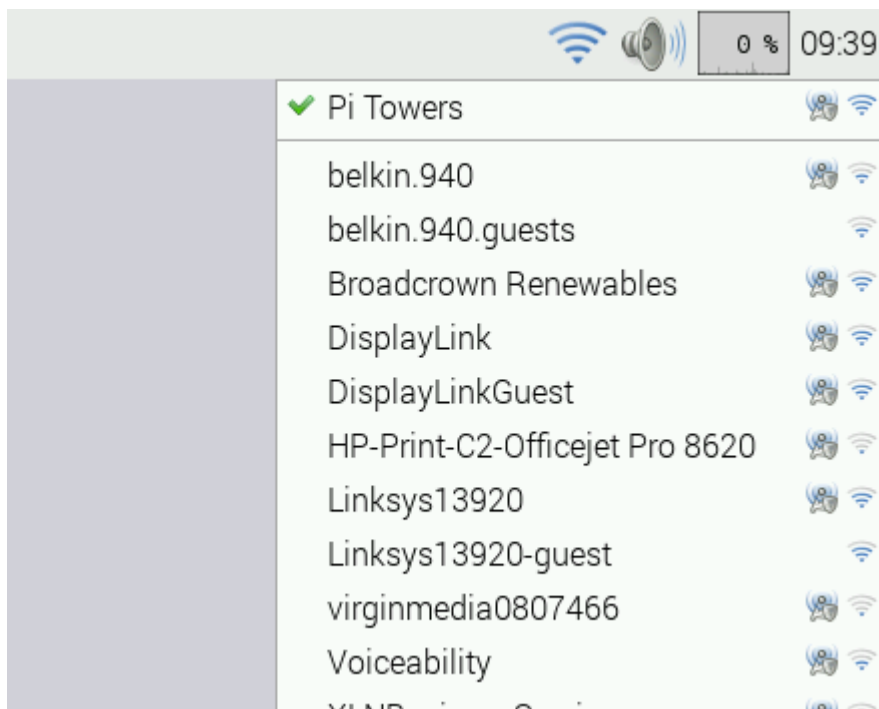
```
sudo apt-get-upgade
```

Raspbian Initial Configuration – RASPI-CONFIG and WiFi

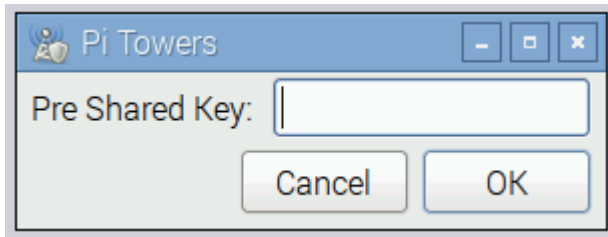
When your Pi boots for the very first time, if all has gone well you will be presented with an X- Windows screen.



The first step we want to complete is establishing a network connection to the Internet. If you are planning to use an Ethernet connection (wired) then connect your blue Ethernet cable and wait for an IP address to be allocated from your router. If you are planning to use a wireless connection, click on the Network Icon up on the toolbar, and select your Wireless network name from the list.



Enter the pre-shared wireless security key when prompted. Either way, wired or wireless, you should now have established an Internet connection to your Pi.



For this exercise our primary goal is CumulusMX, and for this guide we are going to use the bash Shell as our primary console and interface. Turning off the X-Window GUI, which is pretty resource-heavy will save us both memory and CPU performance, and at the end of the day it is not required to run CumulusMX.

Click on the Menu button and Accessories, and choose the Terminal option. This will launch a bash Shell, which looks like a Command Shell on a windows PC. Launch into the Raspian Configuration tool with:

```
sudo raspi-config
```

Choose option - '3 Boot Options'

And then choose option - 'B2 Console Autologin'

When the Pi boots we want the network interface to initialise and obtains an IP address before completing and launching our CumulusMX.

Choose option - '4 Wait for Network at Boot'

And then choose - 'Slow Wait for network connection before completing boot'

While we are in raspi-config we should also set our localisation options for country, timezone, keyboard, and wireless network (if Pi3).

Choose option - '5 Internationalisation Options' and set according to your region and area.

Once the above settings have been completed, choose the 'Finish' option.

When prompted for a reboot, select 'Yes'.

Once your Pi reboots successfully, test your Internet connection:

```
sudo ping 8.8.8.8
```

Downloading CumulusMX

The CumulusMX software is actually a bash script from Sandaysoft. Bring up the Sandaysoft forum at the following URL, and register a new account and username. You need to be a registered user to download the CumulusMX script.

<http://sandaysoft.com/forum/index.php>

Once you have setup your new username and it has been activated, go to the following URL to read about the Cumulus software and download the CulumusMX script:

<http://sandaysoft.com/forum/viewtopic.php?f=27&t=12908>

Look at the bottom of Steve's very first post and you will see the download link for the latest Cumulus distribution ZIP file. This URI is kept up to date and this will always be the latest version.

Don't forget to Donate to Sandaysoft and make a Paypal payment to support Steve and this great piece of software.

Installing Mono

The Mono package is platform for running and developing applications based on the ECMA/ISO Standards. This package facilitates the execution of Mono or Microsoft .NET applications, and is required for CumulusMX on Raspbian.

```
sudo apt-get update
sudo apt-get install mono-complete
```

Installing CumulusMX

Now we need to install the CumulusMX software onto the Pi which is nothing more than copying it across into a new folder. For the purpose of this exercise, we'll simply use a USB key to move the software. On your Windows computer create a new folder on your USB memory key, called something like CumulusMX. Open the downloaded CumulusMX ZIP file and extract all files and folders to the CumulusMX folder on your USB memory key.

When the copy to the USB key is finished 'Eject' the drive before removing it from the USB port. Simply right click on the drive in Windows Explorer and select the 'Eject' option. This will ensure any writing caching is flushed and finished and the key is safe for removal.

Insert the USB key into your Pi and mount the drive:

```
sudo mkdir /media/usb
sudo chown -R pi:pi /media/usb
sudo mount /dev/sda1 /media/usb -o uid=pi,gid=pi
```

Ensure that you are currently in your Pi home folder by typing:

```
cd ~
```

Create a new folder under your home drive for Cumulus and change context into the new folder:

```
sudo mkdir CumulusMX
cd CumulusMX
```

Copy the Cumulus software off the USB key:

```
sudo cp -a /media/usb/CumulusMX/* /home/pi/CumulusMX
```

Startup CumulusMX

```
cd ~/CumulusMX
sudo mono CumulusMX.exe
```

CumulusMX Configuration

Once you have successfully started the CumulusMX software as outlined above, we'll connect to the CumulusMX web-interface and set the application options that we need for communication with our WeatherDuino weather station:

```
ifconfig
```

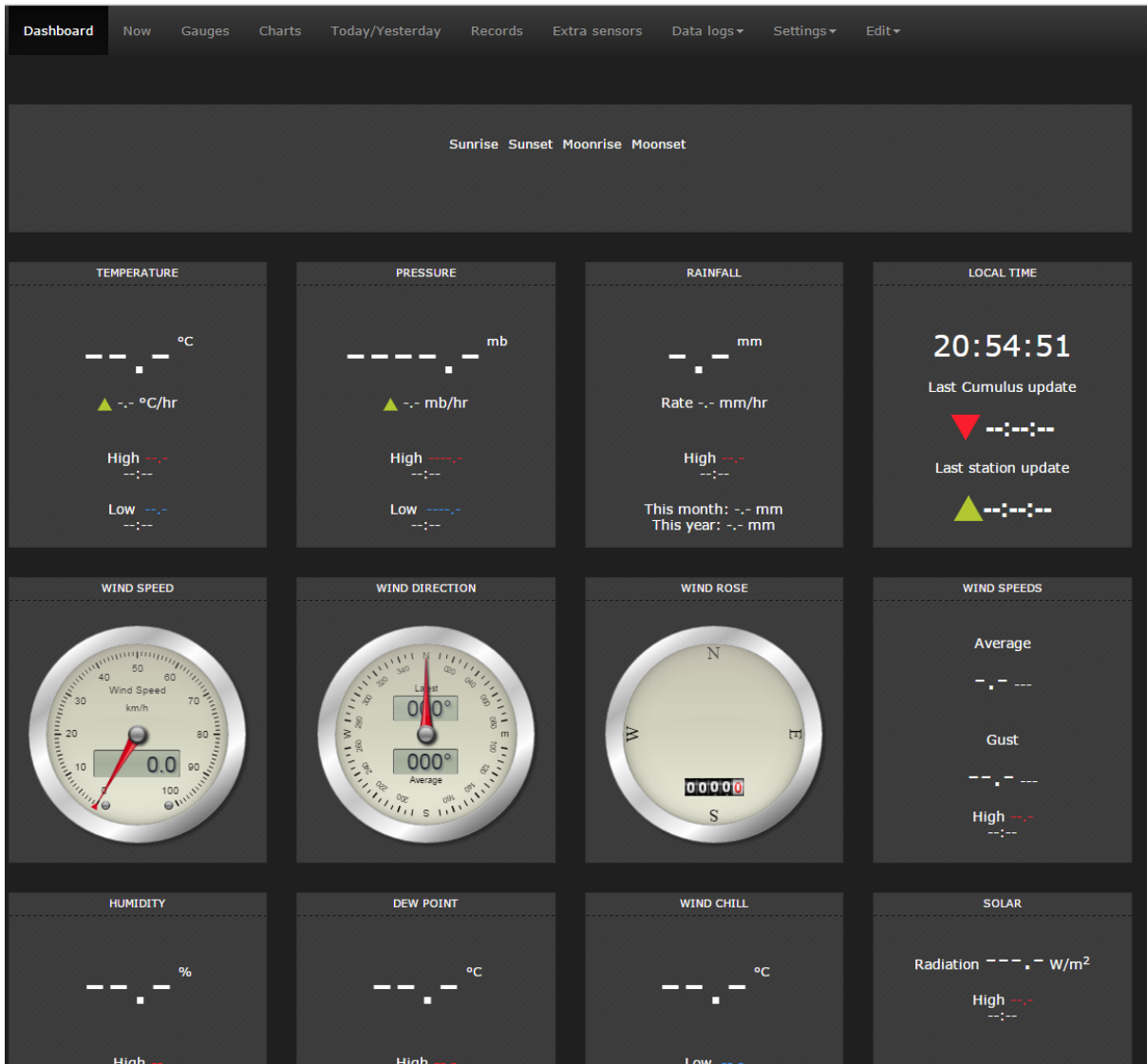
Look for your interface ('eth0' if you are using the onboard Network Adapter or 'wlan0' if you are using the wireless interface) and you will see your IP Address:

```
wlan0  Link encap:Ethernet HWaddr b8:27:eb:cb:ab:8c
       inet addr:192.168.1.10 Bcast:192.168.1.255 Mask:255.255.255.0
       inet6 addr: fe80::ba27:ebaf:fe8c/64 Scope:Link
       UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
       RX packets:93642 errors:0 dropped:2114 overruns:0 frame:0
       TX packets:61563 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:1000
       RX bytes:68308260 (65.1 MiB) TX bytes:6721584 (6.4 MiB)
```

Now startup your favourite Internet Web Browser on your Windows PC and connect to the IP address of your Pi, at port 8998 (default)



<http://192.168.1.10:8998>

All going well, you should see the CumulusMX dashboard:




Click on the 'settings' option on the toolbar at the top of the screen, and select 'Station Settings':

Station settings

Click on  to expand a section. Click on  to collapse the section again. Click the 'Save' button to save the settings.

Station type

Units

 Don't change units after you have chosen them for the first time!

Wind

Pressure

Temperature

Rain

Davis connection

Type Serial TCP/IP

TCP/IP settings

IP address

TCP port

Disconnect period

Enter the following settings:

Station Type: Vantage Pro2

Serial port name: `/dev/ttyUSB0`

Location Latitude, Longitude and altitude (Mr. Google should find this information for you)

Options \ Use bearing zero when calm = ON

Options \ Calculate dew point

Options \ Calculate wind chill

Options \ Synchronise station clock

Options \ Cumulus pressure trend names

Options \ VP 1-min barameter update

Options \Ignor La Crosse clock

Options \Extra Sensors

Now scroll to the bottom of the page and click the 'SAVE' option.

Click on the 'settings' option on the toolbar at the top of the screen, and select 'Calibration Settings', and then click on Offsets:

Dashboard Now Gauges Charts Today/Yesterday Records Extra sensors Data logs Settings Edit

Calibration settings

Click on to expand a section. Click on to collapse the section again.

Offsets

Pressure

Outdoor temperature

Indoor temperature

Outdoor humidity

Wind direction

UV

Wet bulb

Multipliers

Spike removal

Save

Enter your offsets here:

Windspeed = 0.448

Wind Gust = 0.448

Temperature = 1.0

Humidity = 1.0

NOTE Rainfall - The multiplier to specify here depends on the type of rain gauge used and on the value of each bucket tip. As example for a Davis rain gauge (0.2mm per tip), the multiplier should be 1.000. On my rain gauge I had to use 1.500. Suggest enter 1.000 as a starting point, and then do some careful and slow testing with a known quantity of water. Ideally, you want to drip the water through slowly, to do your test with accuracy.

The formula for the Rainfall multiplier is :
Multiplier = (mm per tip) / 0.2

Rainfall = 1.000

UV = 1.0

Wet bulb = 1.0

Now scroll to the bottom of the page and click the 'SAVE' option.

WeatherDuino Connection

At this point we will shutdown the Raspberry Pi and connect the WeatherDuino for initial testing.

Type CTRL -C to terminate the CumulusMX software
`sudo halt -h`

Once you see "System Halted" you can turn off your Pi and connect your WeatherDuino to one of the USB ports on your Raspberry Pi. Connect power and wait for your Pi to start backup.

Once started, startup the CumulusMX software

```
cd ~/CumulusMX  
sudo mono CumulusMX.exe
```

Now connect to your CumulusMX again with your web browser:

<http://192.168.1.10:8998>

All going well, you should now have a connection with your Weather Duino and you should start to see sensor values.