

BC24 Weather Assembly and Operations Manual

August 2018

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Revisions

None

Introduction

The BC24 Weather Kit is a flexible full weather station kit that requires no soldering to complete. It has the following sensors:

- Wind Speed
- Wind Direction
- Rain Bucket
- Inside Temperature
- Inside Humidity
- Outside Temperature
- Outside Humidity
- Barometric Pressure

And more coming in expansion kits!

Please check the product page on switchdoc.com for the latest information.

Want a Box for Outside Use?

Check out our clear top enclosure for the BC24 Weather Kit on our Store:

<https://shop.switchdoc.com/products/weather-proof-enclosure-for-bc24-weather>

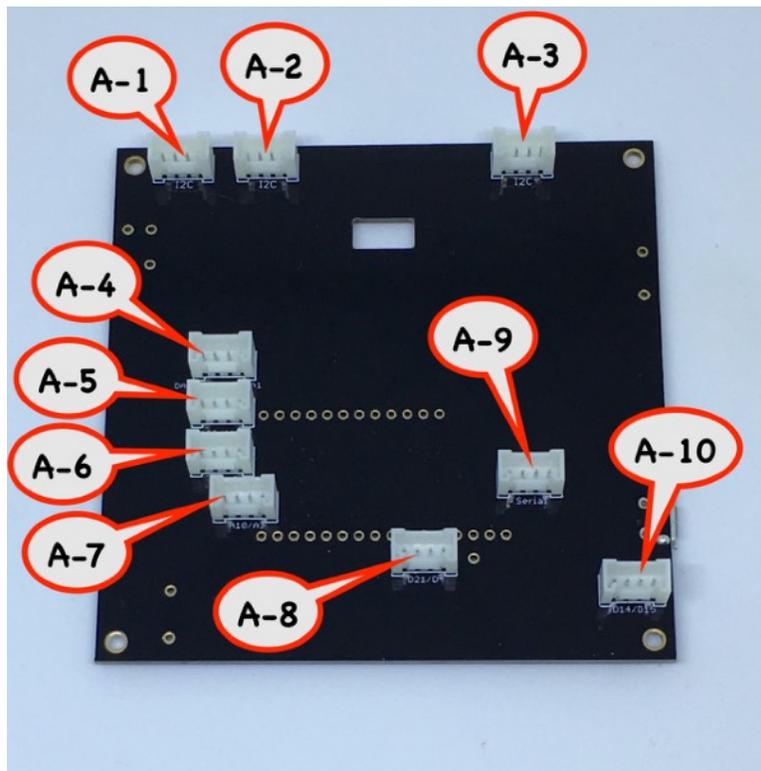
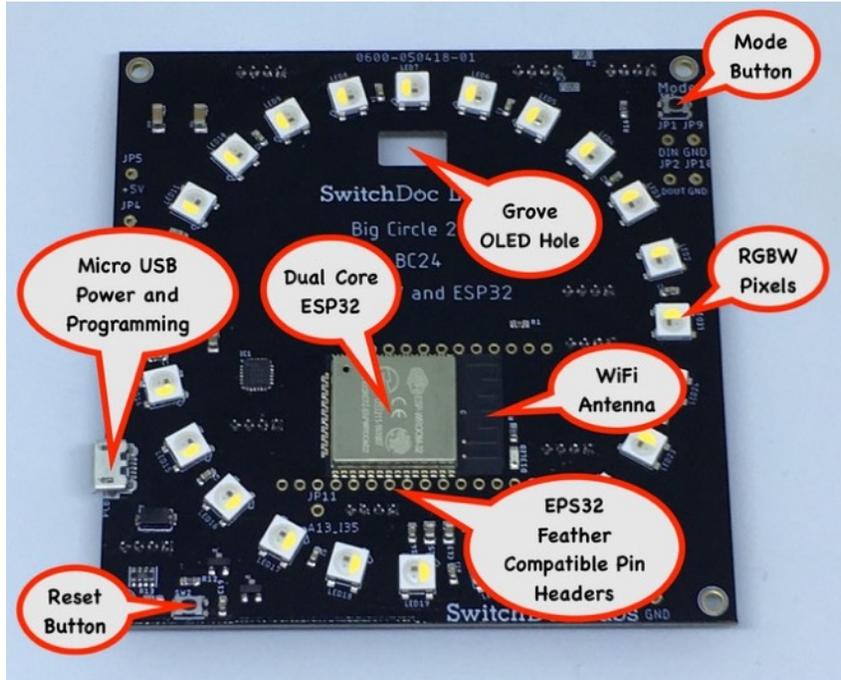
What are Grove Connectors?

Read our Grove Connector tutorial at:

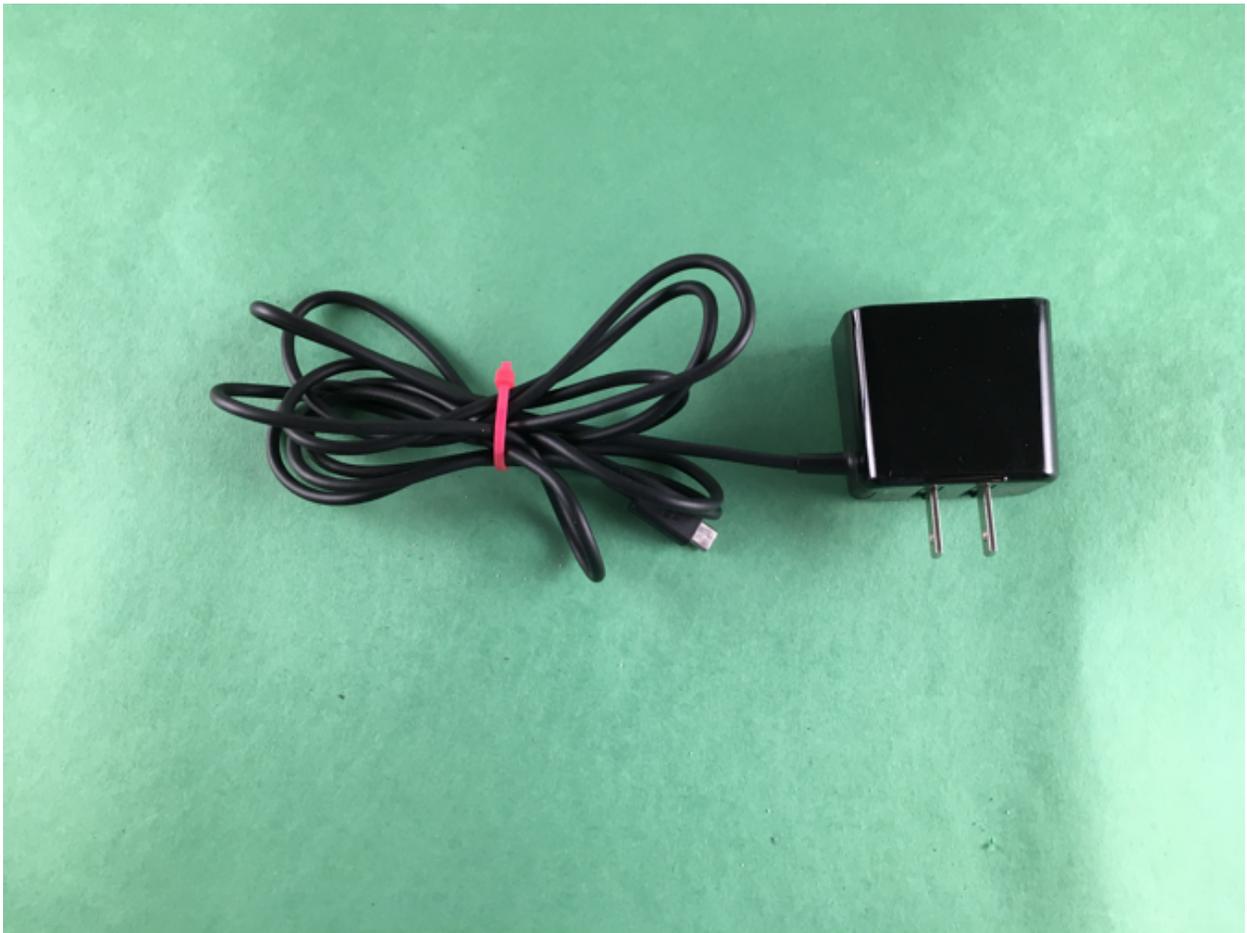
<http://www.switchdoc.com/2016/02/tutorial-intro-to-grove-connectors-for-arduinoraspberry-pi-projects/>

Part List and Identification

A - BC24



B - Micro USB Power Supply



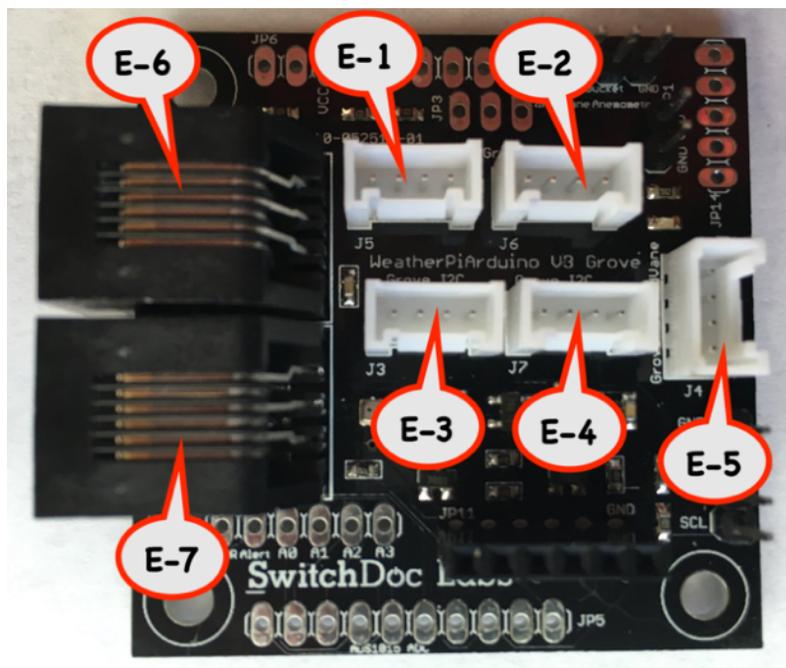
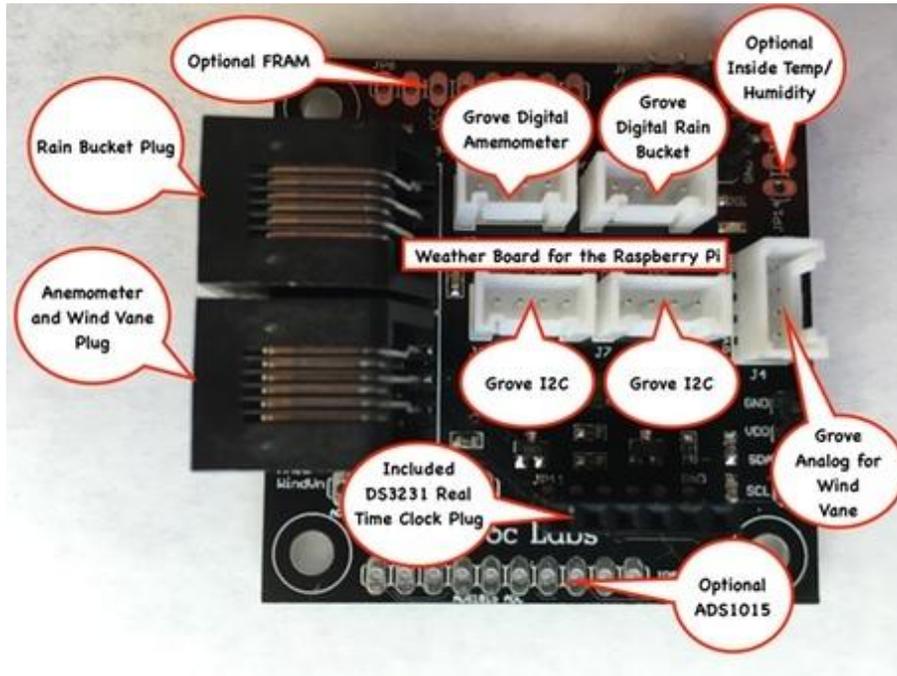
C - AM2315 Outdoor Temperature and Humidity Sensor



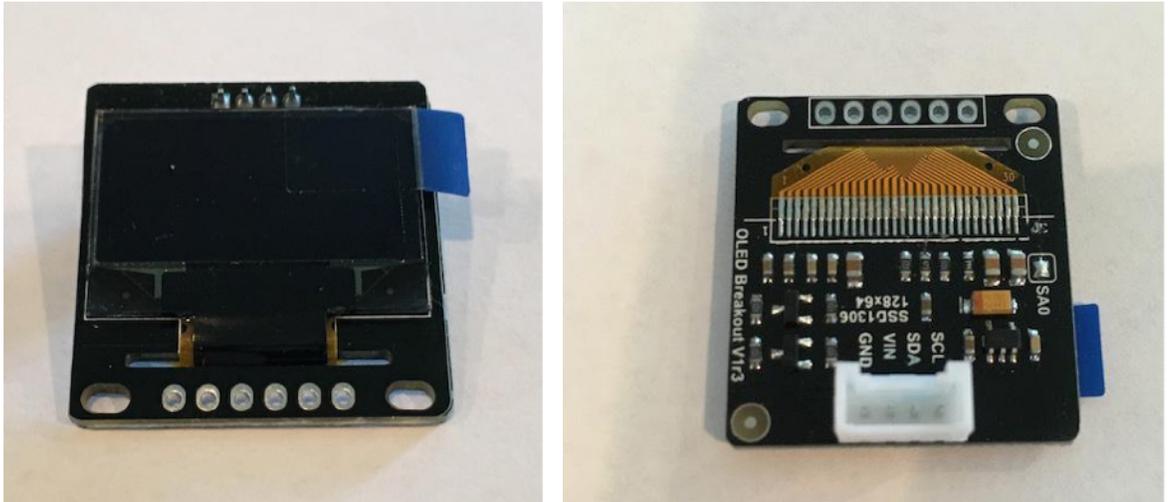
D - HDC1080 Indoor Temperature and Humidity Sensor



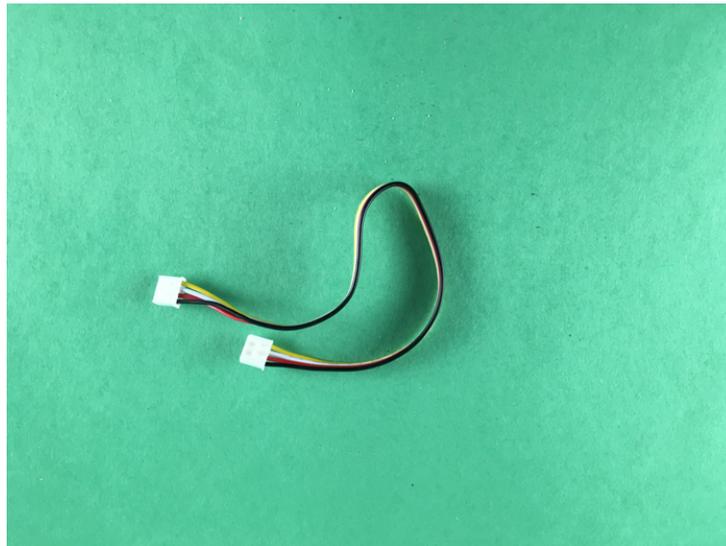
E - WeatherBoard w/Barometric Pressure and WeatherRack Interface



F - Grove OLED Display

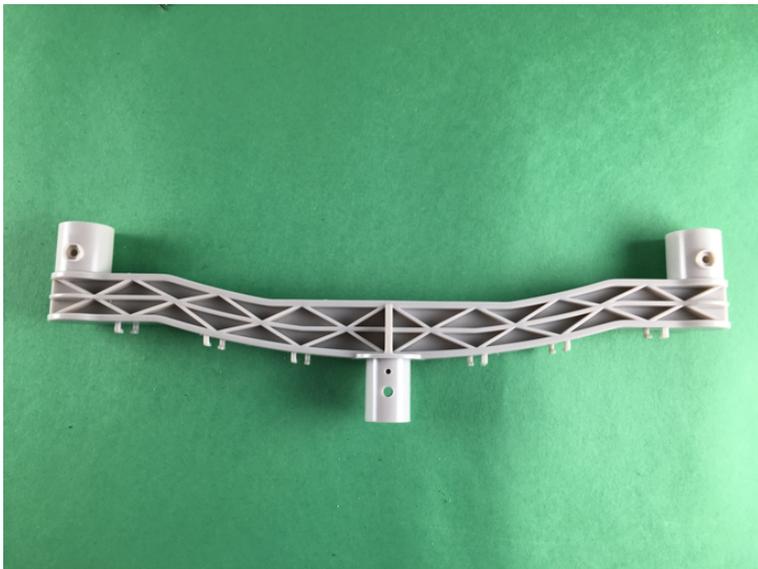


G - 6 Grove Cables





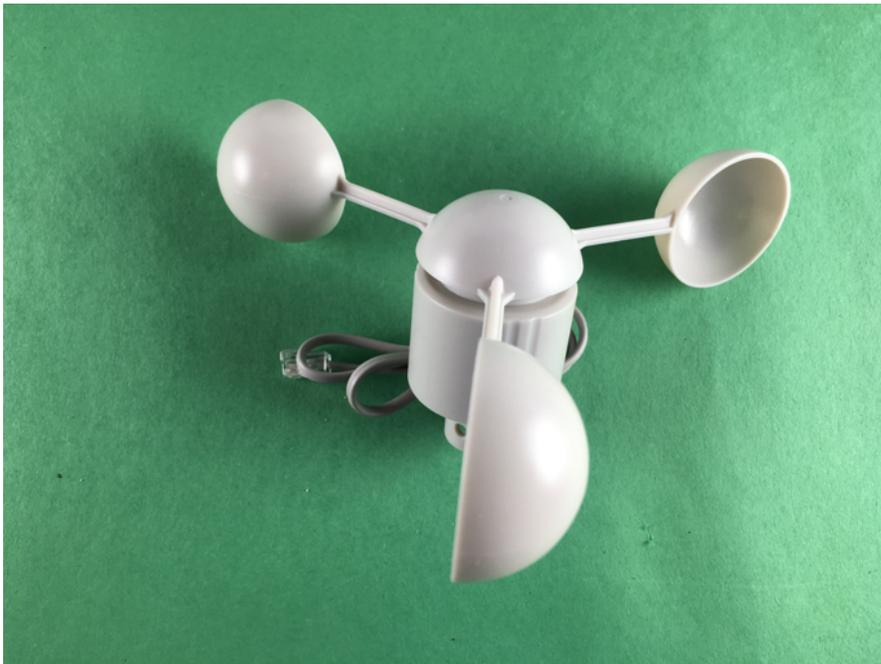
H - Wind Direction Wind Vane



I - Bracket for Anemometer and Wind Vane



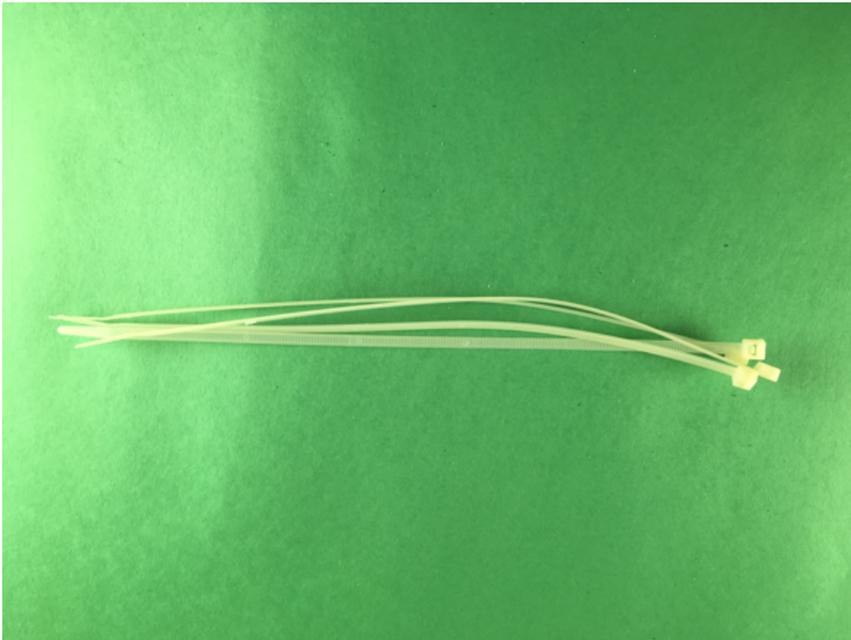
J - Rain Bucket



K - Wind Speed Anemometer



L - Rain Gauge Mounting Assembly



M - Wire Ties



N - Metal Mounting Mast for Weather Instruments



O - Mounting Brackets for Metal Mast

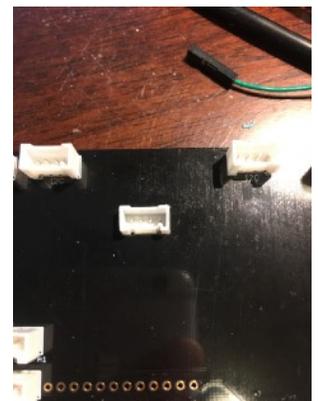
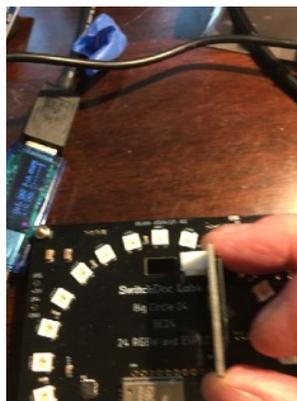


P - Screws for Mounting Weather Instruments to Brackets. Contains two small self tapping screws and three screws with bolts

Step By Step Assembly of the BC24 Weather Kit

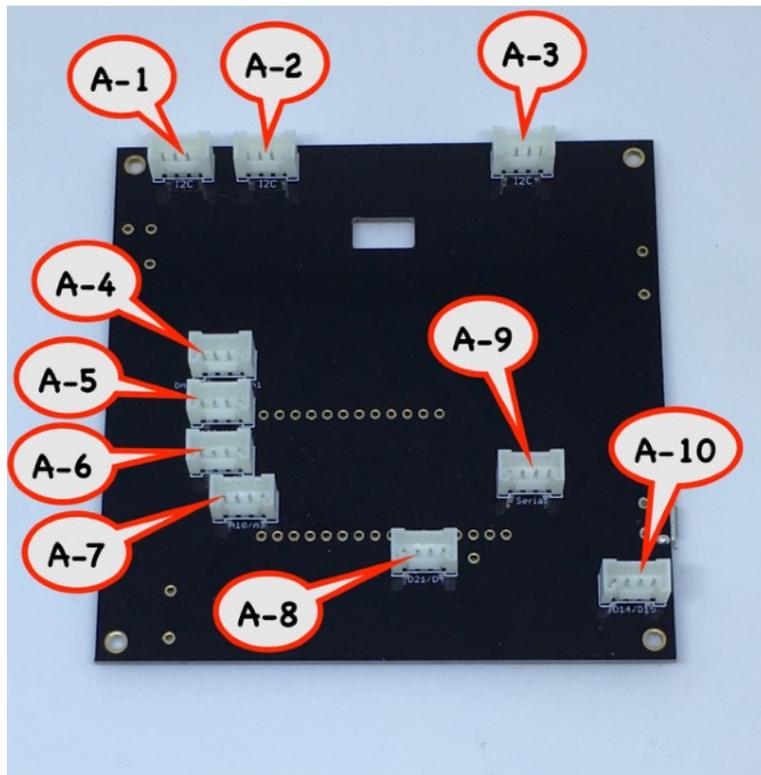
Step 1) Familiarize yourself with all of the parts A-P above.

Step 2) Take **Part A-BC24** and **Part F-Grove OLED Display** and gently push the Grove Connector of **Part F-Grove OLED Display** through the Hold in the top middle of **Part A - BC24**.

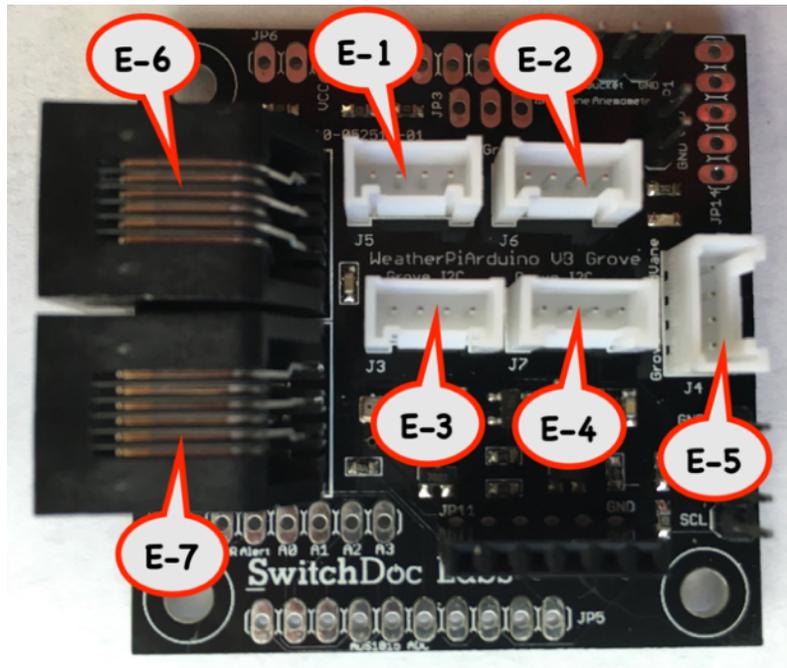


Step 3) Turn **Part A-BC24** over so the Grove Connectors are facing up.

Step 4) Take a **Part G-Grove Cable** and Plug it into the **Part F-Grove OLED Display** Grove Connector that is protruding through the Hole in **Part A-BC24**. If the buckle on the Grove Cable gets in the way, clip off the buckle with a wire cutter. Connect the other end into **PartA-BC24 Connector A-1**.



Step 5) Take a **Part G-Grove Cable** and plug it into **Part A-BC24 Connector A-2**. Take the other end of the **Part G-Grove Cable** and plug it into **Part E-Weather Board Connector E-3**.



Step 6) Take the Grove Connector from the **Part C-AM2315 Outdoor Temperature and Humidity Sensor** and Plug it into **Part E-Weather Board Connector E-4**.

Step 7) Take a **Part G-Grove Cable** and plug it into **Part A-BC24 Connector A-3**. Take the other end of the **Part G-Grove Cable** and plug it into **Part D-HDC1080 Indoor Temperature and Humidity Sensor Grove Connector**.

Step 8) Take a **Part G-Grove Cable** and plug it into **Part A-BC24 Connector A-6**. Take the other end of the **Part G-Grove Cable** and Plug it into **Part E-Weather Board Connector E-5**.

Step 9) Take a **Part G-Grove Cable** and plug it into **Part A-BC24 Connector A-10**. Take the other end of the **Part G-Grove Cable** and Plug it into **Part E-Weather Board Connector E-2**.

Step 10) Take a **Part G-Grove Cable** and plug it into **Part A-BC24 Connector A-8**. Take the other end of the **Part G-Grove Cable** and Plug it into **Part E-Weather Board Connector E-1**.

Your assembly of the BC24 Weather Station Kit Electronics is complete. Now we proceed to the assembly of the Weather Rack and the final two connections to Part E-Weather Board.

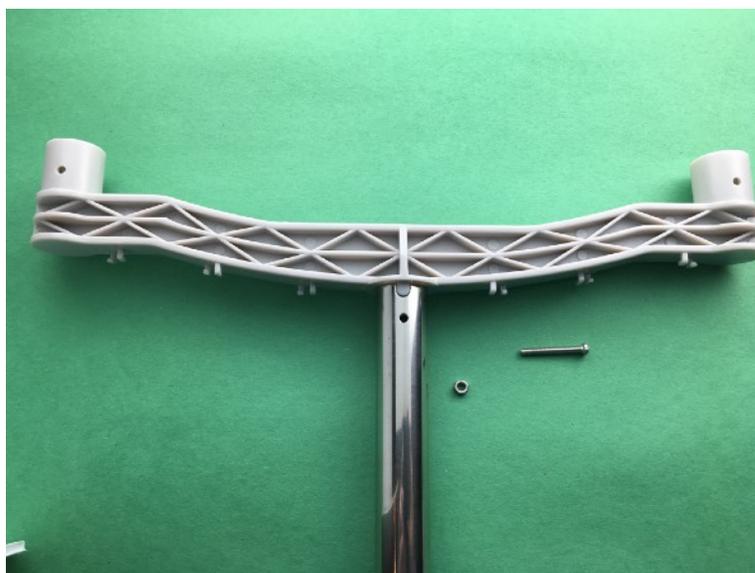
Step 11) Pick up the **Part N-Metal Mounting Mast** with the mounting holes drilled in the top of the mast.



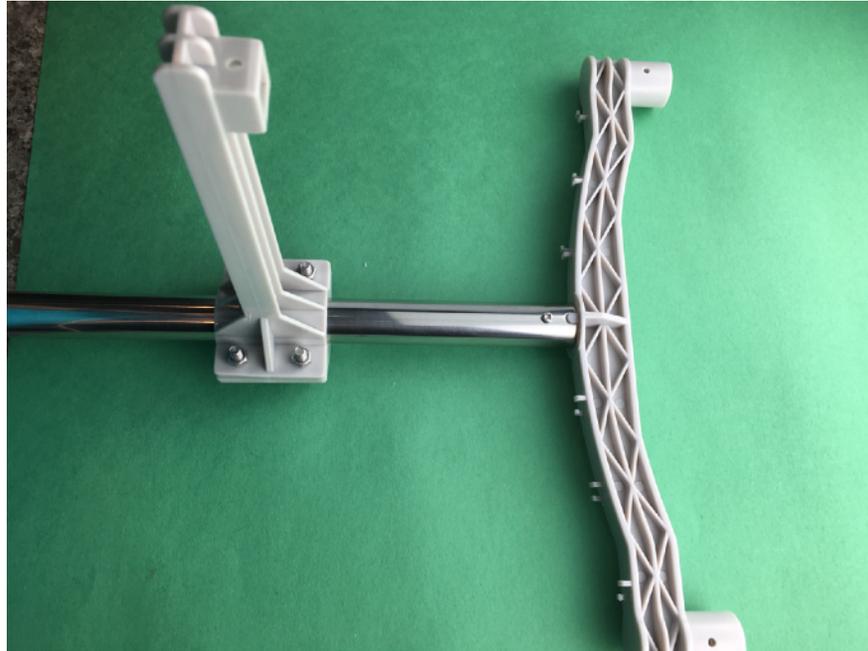
Step 12) Place the Bracket for the **Part I-Wind Vane and Anemometer** into the **Part N-Mounting Mast** from Step 11. Note the Mounting tab in the bracket and Key in the Mounting Mast and make sure they are aligned.



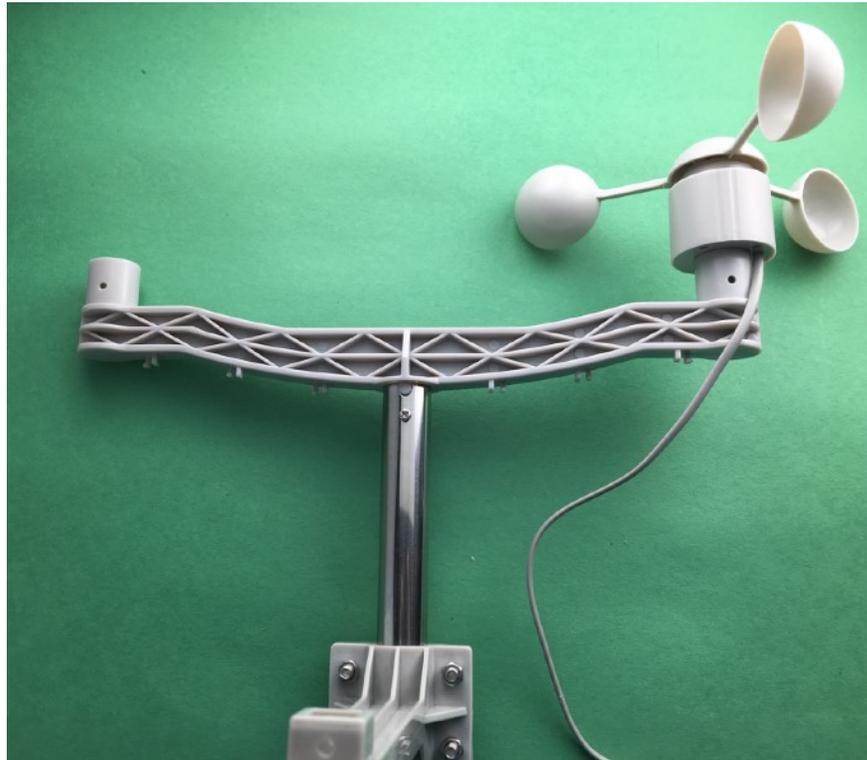
Step 13) Take a screw and bolt from **Part P-Screws for Mounting Weather Instruments to Brackets**, remove the bolt, slide the screw through the hole in the **Part N-Mounting Mast** from step and tighten the bolt to the Mast.



Step 14) Take the **Part L-Rain Gauge Mounting Assembly** and slide it on the **Part N-Mounting Mast** to about 5 inches from the top of the Mast as shown. Tighten the bolts to secure the Rain Gauge Mounting Assembly to the the Mounting Mast. Note that the Square Bracket points towards the top of the Mast.



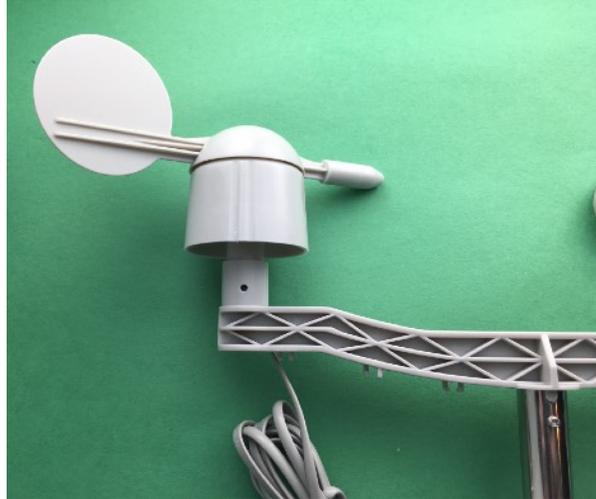
Step 15) Take the **Part K-Anemometer** and place it at the left end **Part I-Wind Vane and Anemometer Bracket**. Note the alignment tab on the Anemometer.



Step 16) Take a screw and bolt from **Part P-Screws for Mounting Weather Instruments to Brackets**, slide it into the **Part I-Wind Vane and Anemometer Bracket** under the **Part K-Anemometer** and tighten in place to secure the **Part K-Anemometer**.



Step 17) Take the **Part H-Wind Vane** and place it on the other end of the **Part I-Anemometer and Wind Vane Bracket**. Note the alignment tab on the Wind Vane.



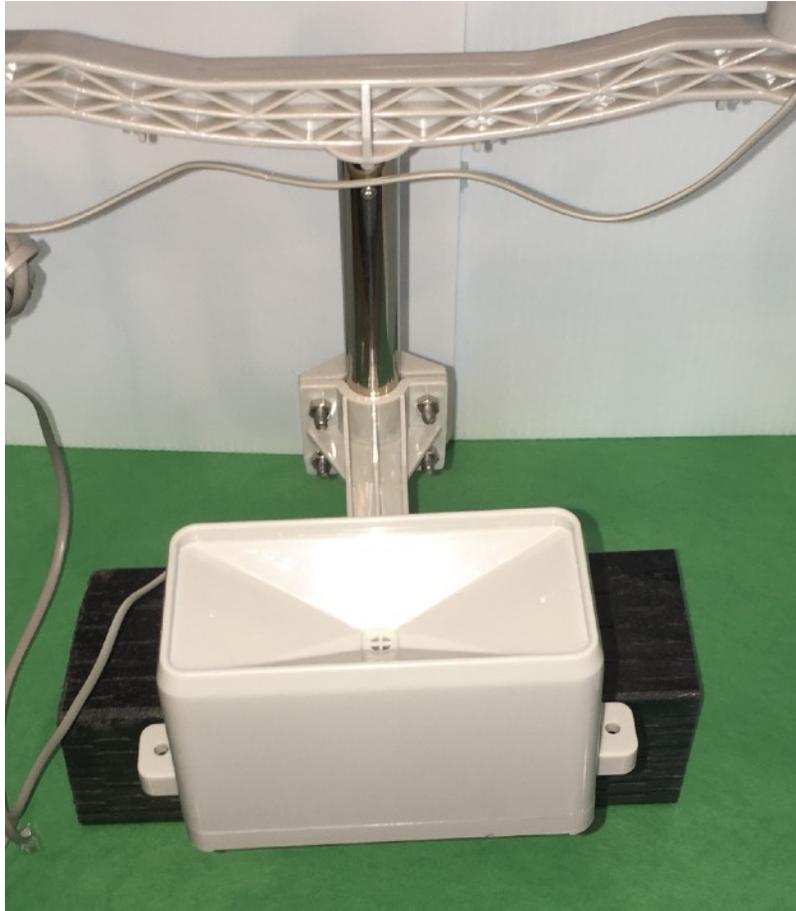
Step 18) Take a screw and bolt **Part P-Screws for Mounting Weather Instruments to Brackets**, slide it into the **Part H-Wind Vane** and **Part I-Anemometer and Wind Vane Bracket** under the **Part H-Wind Vane** and tighten in place to secure the Wind Vane.



Step 19) Take the RJ45 plug on the cable from the **Part K-Anemometer** and snap it into the bottom of the **Part H-Wind Vane**. The plug will only fit one way and it will snap into place.



Step 20) Take the **Part J-Rain Gauge** and place it on the **Part L-Rain Gauge Mounting Assembly** perpendicular to the **Part L-Rain Gauge Mounting Assembly** as shown.



Step 21) Take a self tapping screw from **Part P-Screws for Mounting Weather Instruments to Brackets** and screw it in the bottom of the **Part L-Rain Gauge Mounting Assembly** as shown to secure the **Part J-Rain Gauge**.



Step 22) - Push the second **Part N-Metal Mounting Mast for Weather Instruments** into the first **Part N-Metal Mounting Mast for Weather Instruments**.

Step 23) Stand the **Part N-Metal Mounting Mast for Weather Instruments** up and secure it with books, wood or bricks to keep it secure for testing.



Step 25) Plug the RJ54 Cable coming from the **Part J-Rain Gauge** into the Plug receptacle labeled **Part E-Weather Board Connector E-6**. Note that there are two Plug receptacles on the **Part E-Weather Board Connector**. One is labeled Rain Bucket and the other is labeled Anemometer/Wind Vane. If you plug them in the wrong position, nothing will be damaged, but the Weather sensors will not work until you plug them in correctly.

Step 26) Plug the RJ54 Cable coming from the **Part H-Wind Vane** into the the Plug receptacle on the **Part E-Weather Board Connector E-6**). One is labeled Rain Bucket and the other is labeled Anemometer/Wind Vane. If you plug them in the wrong position, nothing will be damaged, but the Weather sensors will not work until you plug them in correctly.

Step 27) Go back through and check all your wiring to make sure you have put things in the right slots. One of the big advantages of using Grove connectors in this kit is if you make a mistake, it just won't work, but no harm done!

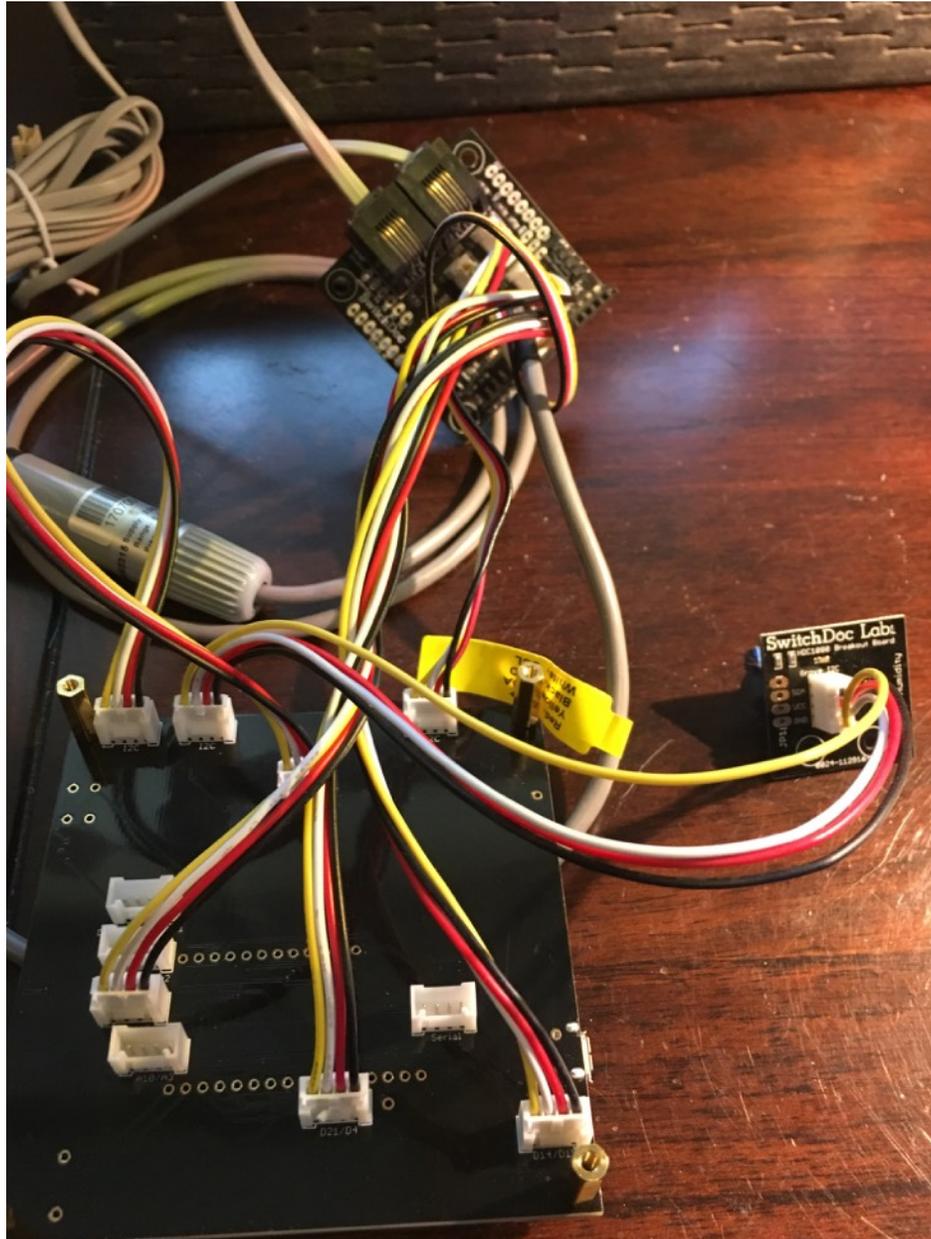
This completes the BC24 Weather Kit Assembly assembly.

Note that you have clamps and wire ties left over in the assembly process for the WeatherRack. You can use these to install the WeatherRack assembly outdoors and use the wire ties to secure the cables from the WeatherRack to the Computer Assembly.

Next we will power up BC24 Weather, test our sensors and then hook it up to your local area network.

Wired Pictures of the BC24 Weather Kit

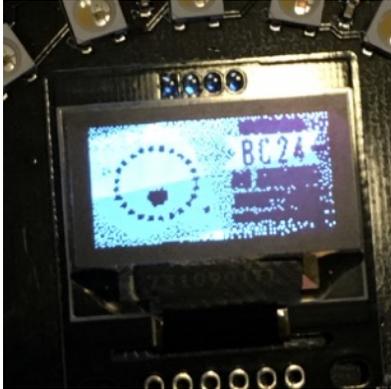
These pictures are from a fully functional BC24 Weather Kit and are for additional visual information.





Initial Testing

Plug in your Micro USB Power Supply and watch the BC24 OLED screen. You should see the next three screens in sequence:



Now the BC24 Weather is in WiFi acquisition mode which is described in the next section.

Setting Up Your WiFi

WiFi Connection Sequence - Provisioning

The BC24 Weather has three methods for getting an IP from your Wireless Access Point.

These are:

- SmartConfig
- WPS Button on AP
- Local AP on ESP32 (192.168.4.1)

Note: This was developed for the BC24 ESP32 Based 24 RGBW Pixel LED Board

SmartConfig

This method uses the TI method of provisioning "SmartConfig" was invented by TI. You can refer to it here:

<https://community.particle.io/t/smart-config-the-missing-manual-now-available/442>

In order to do SmartConfig, you need a smartphone or tablet (Android or iOS) that connected to WiFi network (which you want ESP32 to connect to) and installed a special application. On this application, you just supply the ssid and password of WiFi network so that the application can use, encode them and then broadcast (via UDP) encoded ssid and password (under packet format) over the air. When this software is being run, the ESP32 (with the SmartConfig software loaded) will capture these packets, decode back ssid and password and use them to connect to Wifi network.

After connecting to WiFi, the ESP32 will use mDNS to multicast a message to the application to notify that it has successfully connected to WiFi.

The source code of special application is supplied by Espressif. You can download at:

<https://github.com/EspressifApp/EsptouchForAndroid>

<https://github.com/EspressifApp/EsptouchForIOS>

This application is also available on App Store. You can use it to test SmartConfig feature.

- For Android, this application is available under name "IOT_Espressif" or another application "ESP8266 SmartConfig" (this is for ESP8266 but you can use it for ESP32):

<https://play.google.com/store/apps/details?id=com.cmmakerclub.iot.esptouch>

<https://play.google.com/store/apps/details?id=com.espressif.iot>

- For iOS, this application is available under name "Espressif Esptouch":

<https://itunes.apple.com/us/app/espressif-esptouch/id1071176700?mt=8>

There is also another app on the iOS Appstore, search on "SmartConfig"

Color sequence

Default Time: 15 seconds to hit Smart Config on app, 30 seconds timeout on response

- Three White Lights
- Three Red on failure
- Three Green on success

WPS Button on AP

Wi-Fi Protected Setup (WPS; originally, Wi-Fi Simple Config) is a network security standard to create a secure wireless home network.

Introduced in 2006, the goal of the protocol is to allow home users who know little of wireless security and may be intimidated by the available security options to set up Wi-Fi Protected Access, as well as making it easy to add new devices to an existing network without entering long passphrases.

This library will wait 60 seconds (in the example) for the WPS packets to be received by the ESP32.

A major security flaw was revealed in December 2011 that affects wireless routers with the WPS PIN feature, which most recent models have enabled by default.

This software does not use the PIN feature.

Color sequence

Default Time: 30 seconds timeout if no WPS button sent from AP

- Three White Lights
- Two White Lights during search
- Two Red Lights on failure
- Two Green on success

Local AP (192.168.4.1)

For the third provisioning method, the ESP32 is set up as an access point (192.168.4.1) - look at your list of WiFi APs on your computer when it is running. A small web server is started that will allow you to select the AP that you want the ESP32 to connect to and then you can enter the password for the access point. It runs for 60 seconds by default.

Color sequence

Default Time: 60 seconds timeout if No completed Webform returned

- One Blink of single White Light
- One Blinking White Light during AP page active
- One Red Light on failure
- One Green on success

Remember that all of these features may fail and have to be repeated. Nature of the beast.

Once Connected

Once the WiFi Connection has been made, the BC24 Weather software will show a similar screen to this (the color of the LEDs will vary as to what has been happening on the BC24):



The BC24 remembers your last connection.

Resetting the BC24 Weather to Default Values

To reset the BC24, hold down the mode button while hitting the reset button. This will clear the WiFi credentials as well as reset other values to default. See the Advanced Programming Manual.

What Does my BC24 Software Do?

There are a number of options available. The below table is a summary. Go to the Advanced Programming Manual to see how to use your browser to control BC24 Weather.

Mode Commands Available

Below is a list of the mode commands in the BC24 Weather Software

Mode	Value	Description	Status
BC24_WEATHER_MODE_OUTSIDE_TEMPERATURE	0	Shows Outside Temperature	Implemented

Mode	Value	Description	Status
BC24_WEATHER_MODE_WINDSPEED_DIRECTION	1	Shows Current Windspeed and Wind Direction	Implemented
BC24_WEATHER_MODE_OUTSIDE_HUMIDITY	2	Shows Outside Humidity	Implemented
BC24_WEATHER_MODE_INSIDE_TEMPERATURE	3	Shows Inside Temperature	Implemented
BC24_WEATHER_MODE_INSIDE_HUMIDITY	4	Shows Inside Humidity	Implemented
BC24_WEATHER_MODE_BP_TREND	5	Show Current Barometric Trend	Not Implemented
BC24_WEATHER_MODE_LIGHTNING	6	Shows Lighting Status and Events	Not Implemented
BC24_WEATHER_MODE_AIRQUALITY	7	Shows Current Air Quality	Not Implemented
BC24_WEATHER_MODE_NO_ROTATE_BLANK	20	Blank all BC24 LEDs	Implemented
BC24_WEATHER_MODE_NO_ROTATE_RAINBOW	21	Displays Rainbow of various colors	Implemented
BC24_WEATHER_MODE_NO_ROTATE_DOWJONES	22	Displays Current State of the Dow Jones Average	Not Implemented
BC24_WEATHER_MODE_NO_ROTATE_FIRE	23	Displays Fire LEDs - Looks great behind paper or reflection	Implemented
BC24_WEATHER_MODE_NO_ROTATE_CLOCK	24	Displays 12 hour clock from BC24 Weather Time	Implemented

Mode	Value	Description	Status
BC24_WEATHER_MODE_NON_IMPLEMENTED	100	Indicates a non-implemented feature to the BC24 Weather Software	Implemented

How to Program Your BC24 Weather

The BC24 ESP32 comes programmed with the released version of the software when the BC24 boards are programmed. On Boot up of BC24 Weather you can see the version of software as well as you can get it from the REST commands (See Using the REST Interface later in this manual).



Download the Arduino IDE 1.8.5 (or higher) to start from arduino.cc

Installation of the IDE

See the Tutorial on:

<http://www.switchdoc.com/2018/07/tutorial-arduino-ide-esp32-bc24/>

Download The Software

Download and Install the software below in your Arduino IDE. If you don't know how to do this read one of the many tutorials on how to copy sketches into the Arduino IDE for your machine type.

https://github.com/switchdooclabs/SDL_ESP32_BC24_WEATHER

NOTE: There is much more information about programming the BC24 Weather in the BC24 Weather Advanced Programming Manual

Using the REST Interface built into BC24 Weather

See the BC24 Weather Advanced Programming Manual

Settings for Alexa and BC24 Weather

Not Released Yet

Settings for WXLink / Solar WXLink

Not Released Yet

Settings for BC24 Weather Solar Power Extender Kit

Not Released Yet

Settings for BC24 Weather ThunderBoard Lightning Detector Extender Kit

Not Released Yet

Setting up the BC24 Weather Twitter Interface

Not Released Yet

Setting up the BC24 Weather CWOP Interface

Not Released Yet

Setting up the BC24 Weather WeatherUnderground Interface

See the BC24 Weather WeatherUnderground Manual