Australian Meteorological Association Inc

Monana

THE OFFICIAL PUBLICATION OF THE AUSTRALIAN METEOROLOGICAL ASSOCIATION INC

Welcome!

March 2020 Edition

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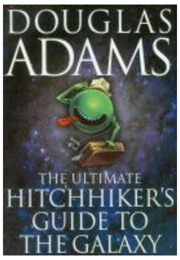
Welcome to the first Personal Weather Station (PWS) orientated edition of the ***Monana*** magazine. This edition of the Monana is being distributed to members and those people who have previously registered on Eventbrite to attend a meeting. Subsequent editions will be for members only and will only be available electronically.



For members without an interest in personal weather stations, take comfort from one of *The Hitchhiker's Guide to the Galaxy*'s most famous quotes "**DON'T PANIC**!" because the regular edition of Monana is still being published. Members who have no interest in the PWS edition can ask to be removed from its email list by dropping Mark an email requesting removal.

For those that are interested, there are some interesting developments in the personal weather station field with ultrasonic wind measurement starting to appear, along with the impact disdrometer making an appearance to start replacing the more traditional tipping bucket (or tipping spoon) rain gauges, to allow better of detection of the start and intensity distribution of rain events. If you have never heard of an "disdrometer", you probably didn't attend the AMetA presentation on Rain Gauges, but fortunately you can follow the link above and view the presentation.

Other personal weather station sensors that are becoming increasingly common are the air particle counting **air quality sensors**. The summer bushfires saw unprecedented bad air quality in some areas and increased interest in people knowing more about air quality. In an exciting development, the South Australian Environmental Protection Authority (EPA) has expressed an interest in possibly obtaining air quality readings from AMetA members who have air quality sensors. The current Coronavirus pandemic has brought any further exploration of this topic to a standstill, but once this situation improves, it is expected that this opportunity will be further explored. So, sit tight, keep yourself safe and keep up to date with what is going on in the background of the AMetA through the Monana monthly magazine. For members whose weather stations do not support air quality sensors, the AMetA is starting to develop its own sensor.

If you would like to contribute to the Monana magazine (in either its regular or PWS editions), please email your article to monana@ameta.org.au in plain text (plus images), Word or Publisher. Don't worry if you think that your composition, spelling and grammar aren't the greatest, it is your projects, activities and/or anecdotes that are important. If composition and grammatical perfection were required nothing I write would ever be published. ☺

The next PWS Edition of the Monana magazine is due to be published on the 22nd May 2020. Please submit all items for publication by the 15th May 2020 to:

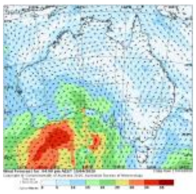
monana@ameta.org.au

Already in the next edition:

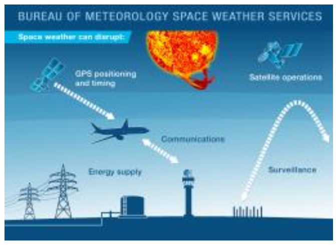
- Data Analysis Using SQL (Part 1)
- Errors and Inaccuracies
- Using a Sky Camera

A Bit About the Australian Meteorological Association

Some people reading this edition will probably not know much about the Australian Meteorological Association (AMetA), so here some background about the organisation. The AMetA was established in 1969 under the direction of John 'Doc' Hogan, the then Regional Director of the Bureau of Meteorology (BOM). Because people sometimes ask, his nick-name was not because he was a medical doctor, but because he was always the first to help administer first-aid when he was young.



One of the primary reasons for creating the AMetA was to open up communication between the Bureau of Meteorology and the community. Meetings and publications served as a means of making members aware of advancements in meteorological understanding and how these advancements impacted on local services. Over the past half-century, the development of electronic communications via the Internet have lessened the need for the distribution of basic weather information.

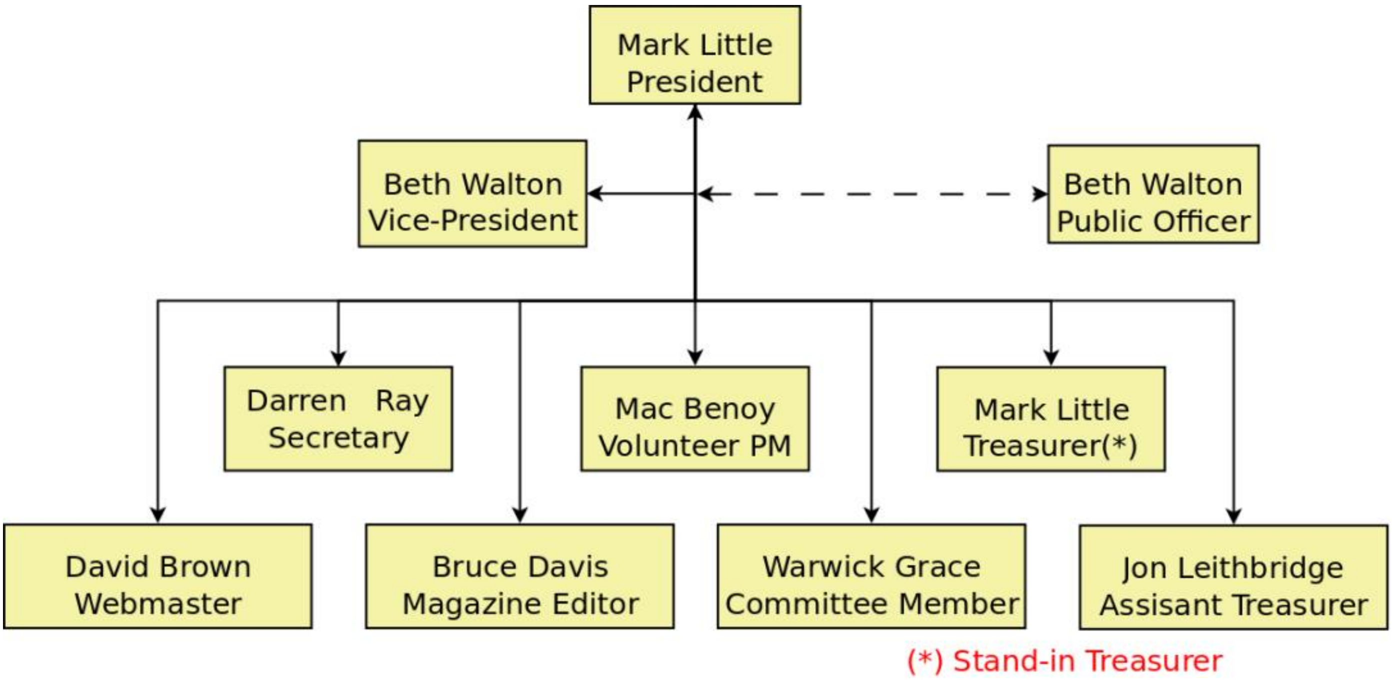


The BOM website is overflowing with all sorts of information about atmospheric weather and space weather, so the emphasis of the AMetA has shifted from just sharing weather details with the public to sharing how that information is used in activities such as agriculture, aviation, defence and ordinary community living. It has also been conducting a decade long campaign to digitise old weather observations and feeding that data into the world meteorological pool of historic information that is invaluable for testing computer weather modelling development.

The AMetA is also moving into more STEM (Science, Technology, Engineering and Mathematics) orientated activity as personal weather stations increase in sophistication and decrease in price. Who would have thought a few decades ago that hundreds of thousands of personal weather stations would be uploading data to both government and commercial weather organisations across the world or that complex sensors such as air particle measurement sensors, with performance suitable for inclusion in research studies, would be available for about $50 to $60?

Even though the original objective of ensuring that the public has access to weather information has essentially passed to the Internet, the AMetA is still strongly supported by the BOM, both in respect to its monthly meetings and its volunteer Citizen Science projects.

Want to know who is on the committee? The the chart below tells all, except what on earth is a "Volunteer PM". Well, that is the Project Manager for the Volunteer Projects that digitise the historical paper meteorological records.



As with any volunteer organisation, the AMetA is always looking for volunteers to be on the Committee. At the moment, we are looking for an honorary Treasurer to look after its financial affairs. Because the AMetA is a small group with limited resources, this is not an overly complex task, but given the current social-isolation, it is one that will move at a snail's pace. A great place to gently ease into your climb to being a world renowned CFO (Chief Financial Officer). ☺

Atmospheric Particle Measurements

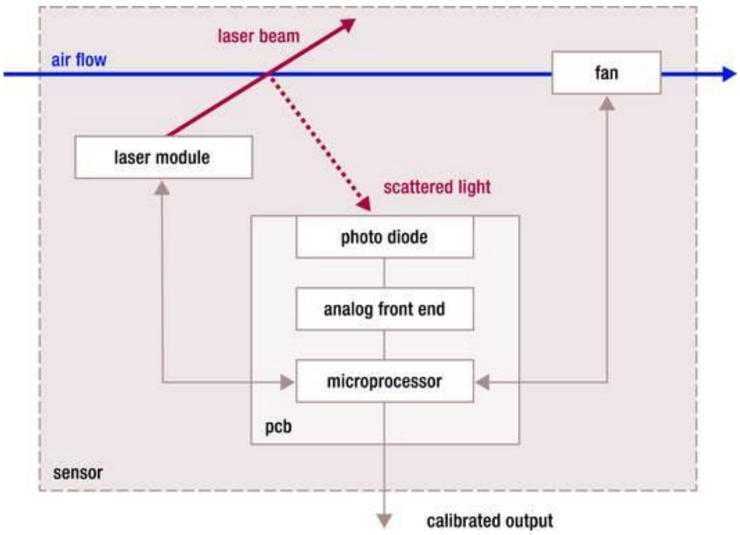
Atmospheric Particles have been very newsworthy in recent times when the bushfires caused air pollution in Sydney that caused it to be rated as the city with the world's worst air pollution at almost 30 times safe levels (an air quality index reading of 2334 compared to a good reading which is less than 67).

So, what is an air quality index reading actually reading? It measures the number of particles in the air of a particular size range in a cubic metre of air (among other pollutants). The most common particles sizes measured are the $PM_{2.5}$ and the PM_{10} size particles. The PM_{10} counts particulate matter (solids or liquids suspended in the atmosphere) that is 10 micrometres or less in diameter in a cubic metre of air, and the $PM_{2.5}$ counts the particulate matter that is 2.5 micrometres in diameter or less in a cubic metre of air. As a result, the PM_{10} particle count should be expected to be larger than the $PM_{2.5}$ count if measured at the same time and place.

The reason these particles are significant is that they make up a large proportion of the dust that can be drawn deep down into the lungs. Larger particles tend to be trapped by the nose, mouth and throat. The measurement is all about the size of the particles, not their chemical composition. This means that not all particles of the same size will ultimately have the same effect on the body. In addition to the measuring particle sizes, air quality can also include the measurement of noxious gases, including gasses like ozone, nitrogen dioxide, sulphur dioxide, and carbon monoxide.

In Australia, the monitoring of air quality is a state responsibility with the Environmental Protection Authority (EPA) conducting monitoring in South Australia. From their website, there appear to be about a dozen monitoring sites around the state with eight (8) in Adelaide, two (2) in Whyalla, one (1) in Port Augusta and one (1) in Port Pirie. However, it would seem that (at the time I looked) three (3) of the stations were not working. From the ones that were working, seven (7) reported the air quality as "Very Good" and two (2) as "Good".

The question now is how the particles in the atmosphere get counted? Take a sample of the atmosphere and blow it past a point at a defined rate and count the number of particles that go by. It's (sort of) that simple. The only problem is how to count particles that are less than 2.5 micrometres in diameter. This is done using a laser beam shining across the air flow as shown in the picture (from Sensirion). When a particle passes through the laser beam, it scatters light and a detector at right angles to the laser beam picks up light scattered from the particle and uses signal processing to derive information about the particles such as mass and the number of particles detected.



Such detectors are becoming more common and a sensor that can be controlled by a small Arduino computer can be obtained for about $40. My HP2550 weather station can read up to four (4) remote WH41 PM2.5 air quality sensors which cost less than $60 and come in a weatherproof box and powered by a solar panel. The WH41 has no displays, so it must be connected to another device to get its readings.

I intend to use my commercial air quality sensor as a means to (roughly) calibrate the air quality sensors modules that I will control using an Arduino. While this will not necessarily be cheaper than buying a WH41, it will not need a compatible weather station to read the air quality readings.

As was stated on the front page, the Environmental Protection Authority (EPA) in South Australia is interested in broadening their coverage by obtaining readings from members of the AMetA who have sensors that measure atmospheric particles, but this is currently delayed because of the Coronavirus.

In the meantime, the Particle Measurement Sensor project is still being developed by the AMetA that will allow members to measure the particles at 1 µm, 2.5 µm and 10 µm. Please let Mark know if you are interested in the air quality sensor development program.

A Review of the WH51 Soil Moisture Sensor

The WH51 soil moisture sensor (about $20) is designed to measure the moisture content in the soil. To get it to make a measurement is simply a matter of installing one AA battery in its offset battery holder and gently pushing the sensor into the ground where the measurement is to be made.

One of the disadvantages of this device is that it does not come with a display that shows you the moisture reading. The moisture sensors sends out a short radio burst every 70 seconds that holds the moisture reading. There are a number of devices available that can receive that burst of 433MHz radio and display the moisture reading, such as the HP2550 weather station reviewed in the previous edition of Monana.

Unlike many other weather sensors, this device uses indirect measurement to find the moisture in the soil. The moisture in the soil changes the capacitance of the black sensor head and that change in capacitance is used to calculate the amount of moisture in the soil.

As received, the sensor is calibrated against a typical soil type so that you will see a moisture reading when you put the sensor in the ground. However, not all soil types have the same composition, texture and water holding capacity. This means that for different types of soil, the capacitance reading at 0% soil moisture and at 100% soil moisture can vary from place to place. Because of these variations, the direct reading of capacitance by the moisture sensors can vary significantly. To compensate for this the HP2550 weather station I'm using provides a means to calibrate the sensor for the soil type. It does this by allowing you to read the direct measurement taken by the sensor, and set it to the equivalent moisture percentage.

It is easy to get 100% soil moisture capacity by wetting the soil. As soon as the liquid water has disappeared, it is probably around 100% moisture capacity (its not quite that simple, but you get the picture). Getting 0% is a bit harder, except if we have another massive heat wave, but if you are serious, you can use a sample of soil heated in the oven to get rid of all the moisture.

An alternative to the capacitive sensor is a resistance sensor that inserts two conductive electrodes into the soil and measures the resistance between them. The more moisture, the more ions will be available to conduct the electricity, resulting in a lower resistance. The problem with this method is that the current flow will attack the electrodes because of electrolysis. If this method is to be used, the voltage should only be applied when a measurement is taken, and ideally, the polarity of the voltage across the probes should be periodically reversed to limit the erosion. For the home user, the capacitive sensor represents the better option.

So, how do they work in practice? Well, that depends on where you want to use it. I first tested the two units I bought in an elevated garden bed (old concrete wash tubs) near the back patio of my house. By the time I had walked back from installing them, the weather station had picked up their signal and showed readings that were within 1% of each other. I then saturated the soil around the sensors and read the soil moisture. They were not reading near 100%, even though the soil was nearly liquid —a bit of calibration required, but no real problems.

The problem came when I tried to use the sensors in the ground a little further away from the house. The weather station ceased reading the sensors. This was due to the low power of the transmitters in the sensors and the low mounting locations (at ground level). However, not to be beaten so easily, I wrapped a piece of wire around the sensor and tied the other end to a broom stick. Success! The weather station showed the reading immediately, even about 20 metres from the weather station. Leaving the broom stick wedged under the branch of the lemon tree isn't a permanent answer, but attaching the wire to the upright of a wooden trellis in the garden bed does provide a way to mount the antenna without the dog knocking it over, or the wife complaining about the waste of a good broom.

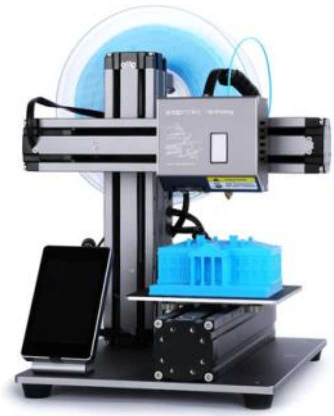
Simplify Weather Station Building with a 3D Printer

In an introductory talk about building/upgrading weather stations, I indicated that the electronics and the computer programming are not especially difficult because we can draw on the experience of some really smart people all over the world, courtesy of the Internet. In fact, the most difficult part of the process is what, on the face of it, seems to the easiest bit.

How hard can it be? After all, anyone can walk into, or go online to, Jaycar, Altronics or many other hobby electronics shop and find a wide range of IP65 or IP67 boxes for less than $20. These boxes can give your equipment protection from dust and rain as is required in many cases.

It is only when you take off the lid that the problem usually becomes obvious. Firstly the interior shape tends to be a bit odd, and secondly, the mounting points in the box don't tend to match anything that you are likely to build, especially those with grooves on the side walls to hold a PCB (Printed Circuit Board).

Drilling mounting holes through the wall of the case tends to defeat the IP65/IP67 rating of the box, so that is often not a good idea. The next thing that usually springs to mind is to glue posts to the bottom of the inside of the case and mount your project on them. It is a little later as you are doing up the screws that you realise that normal glues do not adhere strongly to the smooth surface of the box. Next comes an attempt to roughen the surface of the box with some sand paper to get more grip, but again only to find that the normal epoxy glue still doesn't bond well. In desperation, you can melt groves into the case so that the epoxy can get a stronger 3D bonding surface, but it is an ugly look and can be a problem if you want to use the box for another project later on.



Many of the annoying mounting problems can be solved with the use of a 3D printer to make a mounting frame for the hardware of your project. Recently, I got a bit of money together and was able to purchase a small Snapmaker 3-in-1 3D printer that provide a laser etcher, a CNC miller and a 3D printer. In this article, I will concentrate on the 3D printer configuration.

There are many designs available that you can load into your 3D printer to make all manner of things from a miniature Yoda to a surgical mask (if your printer is big enough and mine isn't). The problem for custom projects is how to make you own design and use that design to print the object you need.

There are many tools that you can use to do this. I was already using the Computer Aided Design (CAD) tool TurboCAD Deluxe for 2D drawings, so it was the logical tool for me to use for this article. However a common tool to use is the free hobby edition of AutoDesk Fusion 360, which is a very powerful on-line tool. Although they have different commands, the concepts involved are quite similar.

To start making a mounting plate for a project in a box, the first thing that you will need (apart from the components that you wish to mount) is a digital micrometer which can be had from hobby shops like Jaycar or sometimes even from supermarkets like Aldi for between $10 and $50. The second thing that will come in very handy is a digital camera—the reason why will become obvious later.

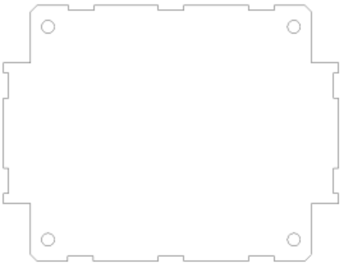
For this example, we will be using a box similar to the Jaycar HB6217 115x90x55 IP65 enclosure with mounting flange. The box will contain a Plantower PMS5003 Particle Concentration Sensor, BMP180 Pressure Sensor, +5V Regulator Board and a DIY MORE Nano Strong.

Since the enclosure is one that can be used for a variety of projects, the first thing to do is to make a basic mounting plate that fits into the base of the enclosure. This is where the micrometer and the camera come in.

Remove the lid of your enclosure and take a picture from directly above the enclosure. Then select a couple of points near the top of the enclosure and measure them as accurately as possible with your micrometer. Do this a few times to be sure and write it down, since these measurements will affect every other dimension in your drawing. Just remember that the bottom of the enclose will seem small than the top even if the top and bottom are the same size because of parallax error.

Inside your CAD tool, draw a series of lines that match the distances that you measured from the physical box. When you have dome that, load the photo of the enclosure and scale and move the drawing until the photo lines up with the lines that you have drawn.

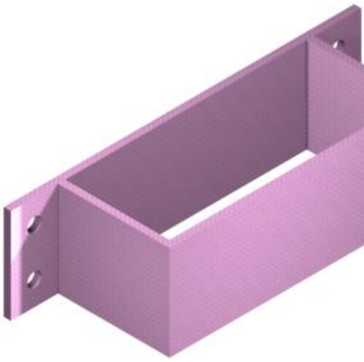
It is now a matter of drawing lines to match the outline, holes and other features that you want to capture. If you have set up the initial lines you measured and accurately drew over the image of the enclosure, you will have an accurate drawing of the base of the enclosure. If you look back at the photo you will see that the notches are simplified as there was no point in making gaps for the tiny rails on the walls. After setting the thickness of the plate, it is now time to check the 3D image of the mounting plate that is about to be laid down by the printer. The image on the left shows the result of a fast print.



Once that base plate has been printed and checked in the box, it is time to modify the design to include the specific mountings needed for the air quality monitor project.

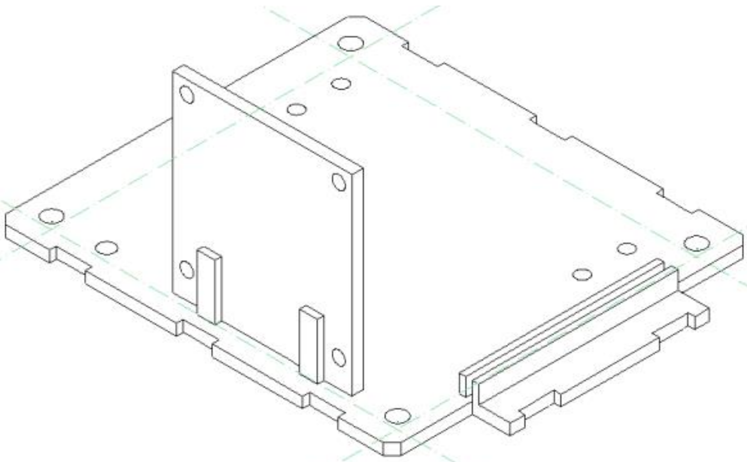
The Plantower Air Quality Sensor is the largest item to be mounted, and because it needs access to the atmosphere, it must be mounted so that its front is facing a wall of the box which will need a hole cut in it. It is possible to add a bracket to hold the printer directly to the base plate, that would require the printing of an unsupported span that has the possibility of sagging during printing. Because of this, it was decided to print a separate bracket so that there would be no unsupported surfaces that may require bracing during printing.

As you can see from the model, the bracket is printed on its side so the long spans are printed sitting on the ground and supported during the entire printing process. To attach it to the base plate, two mounting holes are provided in the flanges on either side. Once this model has been completed, it is rotated 90° so that the flanges are horizontal and them placed on the base plate model. The holes in this bracket are then used to locate position of the holes on the plate, ensuring a perfect fit.



Because the air quality sensor is relatively large, there is no longer space in the box to mount the Arduino horizontally, even though the Arduino clone is much smaller than the standard Arduino UNO. There is, however, enough space to mount the Arduino vertically on the base plate and still allow the lid to be placed on top of the box.

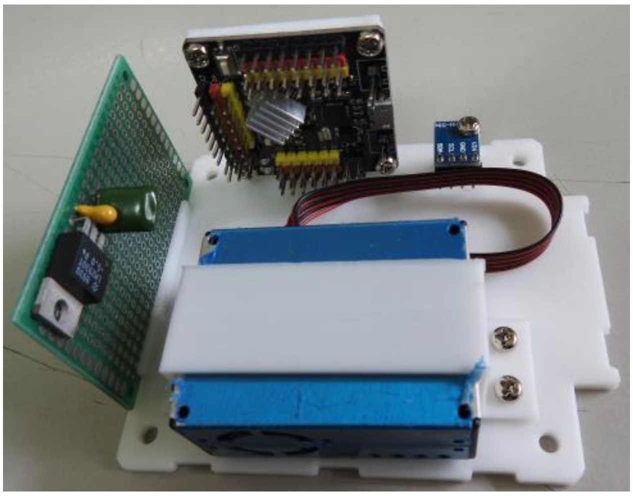
Out comes the trusty micrometer to measure the size of the circuit board and the location of the mounting holes. Because the mounting plate is vertical, there is not need to consider making a separate bracket like the one used for the sensor. It is 3D printed with the base. However, what needs to be considered is that this vertical plate is over 40 mm higher with a circuit board hanging off it, but it is only 2mm thick. This makes it easy to snap off the vertical plate at the base. To reduce the risk of this happening, two pillars are added to the back of the vertical plate as shown in the model.

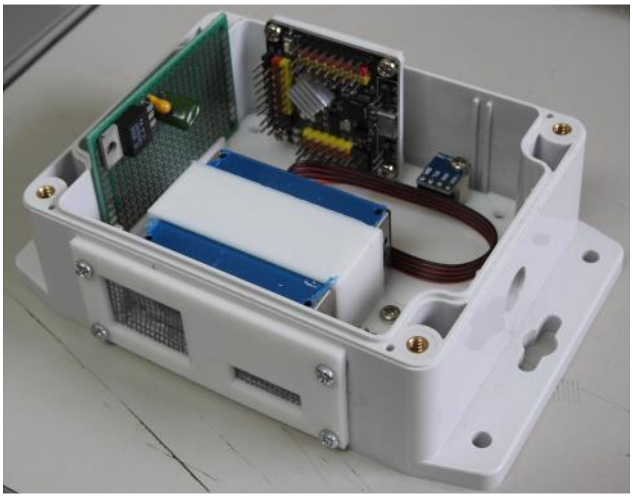


On the right hand side of the model, there are two low horizontal walls. These walls are spaced to provide a way to mount the +5V regulator board without the need for any mounting screws by providing a pressure fit. This was done by accurately measuring the thickness of the circuit board and spacing the walls accordingly. To finish off the design, a hole was added on the right hand corner to mount the pressure sensor.

After the two items have been printed, it is time to put it all together. The Arduino clone is mounted to the vertical plate using M3 screws. The size of the holes was selected so that the screws could be screwed directly into the plastic which is soft enough to be tapped by the screw as it is put in.

Next the air quality sensor is placed in its mounting bracket and screwed to the base plate. The diameter of the holes was





again selected so that the M3 screws could be screwed directly into the plastic.

The pressure sensor (top right on base plate) is mounted on a small metal pillar to give it some clearance from the base plate and the circuit board in pushed into place between the two small walls. Once this has been done, it is time to confirm that the whole thing will fit into the enclosure with the lid on.

You may recall that the air quality sensor had to be open to the atmosphere, so a hole needed to be cut through the case. The problem with such a hole is that it invites insects to enter and build nests, so the holes were covered with fly screen and a small plate printed and screwed to the case to hold the mesh in place.

Printing the three pieces of hardware uses about $1 of plastic, so ignoring the cost of the printer, it is a fairly cheap way to make solid mountings,

Now for the non-so-good news. The plastic commonly used for home 3D printing (PLA) starts to soften around 51°C. This means that it is not suitable for applications where it will be exposed to the summer sun for long periods. Being a bioplastic PLA is bio-degradable which is good in one sense, but that also makes it unsuitable for prolonged outside exposure. The 3D printing plastics shrink when they cool after printing. This is minimal for PLA, but must be taken into account if you want to use a more permanent plastic like ABS plastic (which is also more expensive).

Home 3D printers are not fast. On the fastest print setting, the three items illustrated in this article will take well over three hours in total to print. This can be rather annoying if you find a mistake and have to reprint. If I'm doing a new design, I tend to stop the printing as soon as I can to check critical dimensions, rather than let it run to completion and find the error then.

If the problems with the actual printing haven't scared you off, you will need to learn about Computer Aided Design (CAD) software to be able to make your own designs. If you don't have a 3D printer, you would normally be able to join a Maker centre of some kind to get access to 3D printers, but the COVID-19 pandemic has put that option on-hold for now.

I have been asked whether I thought it was worth buying a 3D printer. When I was being driven mad trying to come to grips with 3D CAD programs, setting up the printer and having failed prints because the air-conditioner was blowing on the printer, it would have been a hard question to answer, but now I have the hang of the basics, I'm definitely glad that I bought the printer.

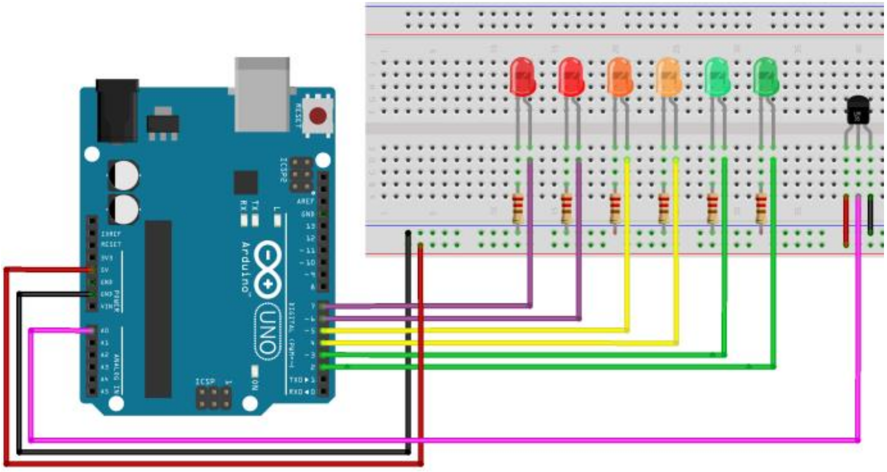
Meteorological Terms We Might Not Know

Actinometer	The general name for any instrument used to measure the intensity of radiant energy, particularly that of the sun. There are various types of actinometer depending on what they are measuring.
Blue Jets	Weakly luminous upward propagating discharges, blue in colour, emanating from the tops of thunderstorms.
Barometry	The study of the measurement of atmospheric pressure, with particular reference to ascertaining and correcting the errors of the different types of barometer.
Ceilometer	An automatic, active, remote-sensing instrument for detecting clouds and measuring their base height.
Deterministic	Governed by and predictable in terms of definite laws, such as dynamic equations.
Field Capacity	The amount of water left in the saturated soil allowed to drain by gravity for 24 hours.
Geostrophic Wind	The geostrophic wind is directed along the isobars with the low pressure to the right (Southern Hemisphere).

An Introduction to Using the Arduino

The Arduino is a small, inexpensive computer platform based on open-source hardware and software. Arduino boards are able to read inputs such as the press of a button, or the voltage from a sensor such as a thermometer or a gas detector. It is able to output signals that can be used to turn on a light, operate a relay to turn a sprinkler on or off, or to show a message on your computer or its own display. Over the years Arduino has been used in thousands of projects, from simple prototypes to complex scientific instruments.

To quote the foundation that looks after the Arduino, “Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community. ” The PWS Group will use the Arduino to control a wide variety of sensors that read meteorological parameters such temperature, relative humidity, pressure, air quality and lightning.



Initially, the group will focus on making prototypes of various meteorological instruments using the Arduino and inexpensive sensors.

To maker it easy for the complete novice to become involved, all hardware connections will be illustrated using the *Fritzing* tool. It even draws a circuit of the design.

By using the outputs of this tool, even a person with no electronics knowledge can wire up a circuit and use it. The Fritzing tool can also be used to build and upload the software to the Arduino (see below for an example of the code for the thermometer).

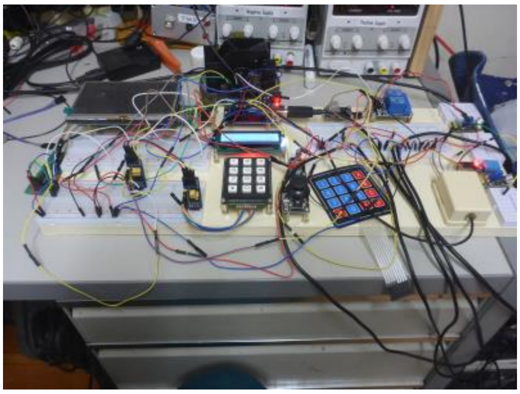
```
float temperature;                               // Store Temperature
int sensor_pin        = 0;                       // Pin connected to Thermometer
int start_temperature = 20;                      // Starting Temperature

// Setup the Arduino
void setup()
{
  // Set these pins to Outputs to Control the LEDS
  for ( int i = 2; i < 7; i++ )
  {
    pinMode( i, OUTPUT );
  }
}

// Repeat this Section of Code Forever
void loop()
{
  // Read the Temperature from the Sensor and Convert voltage reading to Celsius
  temperature = analogRead( sensor_pin ) * 0.488;

  // Select Each LED in turn
  for ( int i = 2; i < 7; i++ )
  {
    // Check if the temperature is greater than 20 degrees + 2 degrees * LED pin number
    // If higher turn on LED, otherwise, turn it off
    if ( temperature > ( ( i * 2 ) + start_temperature ) )
    {
      digitalWrite( i, HIGH );
    }
    else
    {
      digitalWrite( i, LOW );
    }
}
```

While novices usually think that the electronics and the software are the hardest part about building your own instruments, this is often not the case, because you usually find hardware and software examples on the Internet.

Even the complete novice can easily make simple software to read a sensor, but the AMetA will assist members with designs and software that will allow the readings to be stored in a database for analysis, and/or uploaded to multiple weather siters like WOW and the Weather Underground.

The most complex part is often finding and modifying a suitable box to mount the equipment, especially if it mounted outside and has to survive in the rain while still getting enough air flow to be in a representation sample of the atmosphere.

Although the Arduino is inexpensive, it is capable of controlling multiple sensors. The photo below left shows the prototype of a setup using multiple sensors. It uses the same type of construction shown in the diagram on the last page, just with a lot more wires.



While the breadboard (as it is called) proved that the system worked, it was hardly usable in real life.

The photograph below right shows a later prototype using old bits and pieces which is not as cumbersome to use.

Testing showed that the keypad and display weren't really needed, so a smaller box and a small version of the Arduino were used in a second prototype.

This box is waterproof, but connectors weren't. The connectors need to be waterproofed after the cables to the sensors. are connected.

Once the prototype Arduino was completed, it was time to make the a sensor prototype or two. The first is a set of ground thermometers. There sensors are set to measure the temperature at ground level, 10cm , 20cm deep, 50 cm deep and 100 cm deep. As you can see from the photo below, the construction is very simple. The temperature sensors are spaced out and taped in place. They are then put into a piece of irrigation pipe so it can be sunk into the ground to the correct depth easily.

Since the temperature sensors are waterproof and the irrigation pipe can be sealed to prevent water leaks, it is possible to make a copy of the sensor below, add some weight at one end and some flotation at the other and drop it in your swimming pool. If you hate cold water as much as I do, there now need by no nasty surprises when you dive in the pool and find that under that warm layer on the top, it is freezing cold.

If you are looking to save some water in the garden, it is best not to water until the soil dries, but not too much. Adding the next simple sensor can do that for you. The box to the side contains two sensors. The black spike pointing to the left is pushed into the ground and used to measure the amount of moisture in the soil. The small panel attached to the side is a small panel that is used to detect rain drops, dew, or the water from a hose. This will detect rain long before the tipping bucket in the rain gauge tips and gives an indication that it is raining.

When the panel is mounted on the box which sits on the ground, it is probably too low as it may get soil on the panel if the water splashes heavily, but this is acceptable for the prototype.

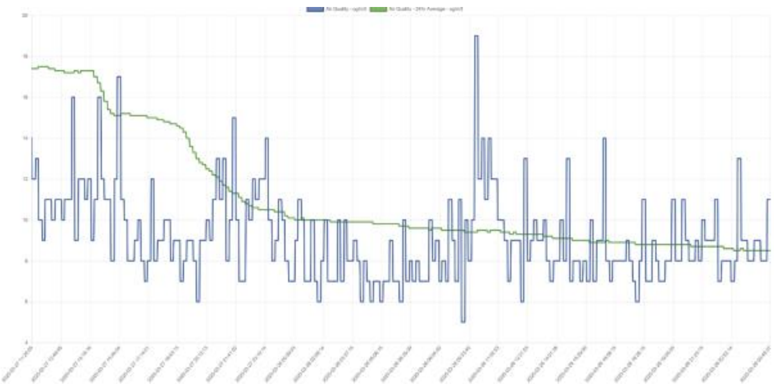
The Way Forward For The AMetA PWS Group

Due to the Coronavirus pandemic, it is banned/unwise for Clubs and Associations to have physical meetings. For many, the solution is to simply go into complete hibernation. The AMetA has taken a different tack. It is seeking to make sure that it does not forget its members, and hopes that its members will not forget it.

Although the PWS group is unable to physically meet to plan and build projects, the AMetA intends to make its activities available on-line so that members have access to the latest information and software being developed to “Understand, Interpret and Extend” their weather stations.

It was originally planned to have all information and software immediately available to the public on the Internet, but since all meetings have been cancelled, it now seems unfair to expect that some people will pay a membership fee for the same access to information that will be provided free to others.

As a result, new hardware and software will be developed inside password protected directories, only available to financial members. The information will eventually be released publicly, but updates and extensions will not be immediately available to the public. If you are interested in what is currently publicly available, this link will take you there.



For members, there will be two projects running. The first is the development of the air quality monitoring. This project will involve monitoring member’s air quality sensors (see graph to left or on-line) and investigating how to upload that data to the EPA (if required).

The other part of this project will be developing the hardware for a custom air quality sensor (refer to the 3D printing article for more information) and the software to upload the readings so that they can be used with the readings from the commercial sensors.

The other project, suitable for members with limited electronics and/or computer programming experience, will involve making hardware and software for custom sensors (refer to the Arduino article for an example of two of those sensors). If you are interested in the hardware and software that this project will be based on, have a look at this link. If you want to look at a more nuts and bolts level, this link will take you down to a more detailed view of the hardware and the software sources.

Members who want to become involved should email Mark indicating interest. Non-members who would like to be involved will need to first become members. This is simply a matter of applying for membership using the instructions on the AMetA website.

These are difficult times, but it is possible that the enforced social isolation may be just the opportunity that you need to get involved in some projects that you can do at home with just your computer and a few components that you can order on-line. If you prefer, it is possible to just develop software to use and display the readings that are being recorded by the weather stations and sensors to the database. Alternatively, you can get involved by writing documentation for these projects using a simple text editor and some free software. You can stay safe and get involved at the same time, so don’t let this opportunity pass you by!!