SPECTO TECHNOLOGY

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# Auto-Meteo Sensor and Hub

## User Manual

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# 1 Introduction

Automated Motorized Total Stations (AMTS) use an optical laser sensor to monitor position. This reading method is particularly susceptible to interference from the refractive index of the air the laser is passing through. If the atmospheric conditions can be measured, the refractive index can be calculated and applied to correct the measurements.

To assist with correcting AMTS measurements, Specto Technology developed the Auto-Meteo, a simple, effective, atmospheric sensor and datalogger that can be easily integrated with an AMTS. The Auto-Meteo measures the meteorological parameters (temperature, barometric pressure, and relative humidity) needed to do real-time atmospheric corrections to automated survey data.

The Auto-Meteo was designed to take advantage of the usually empty ethernet port on the same modem used to control an Automated Total Station. The simple design and small size allow the Auto-Meteo to be integrated in to any AMTS installation with little to no modification of the typical install means and methods.

# 2 Overview of Operation

The Auto-Meteo is designed for quick deployment in the field with minimum requirement on time, tools and skill as illustrated by the work flow below:

- **Before you go to site:**
  a. Configure your modem for the Auto-Meteo.
  b. Take note of the Auto-Meteo's serial number and the Static IP Address of the modem

- **When you are in the field:**
  a. Install sensor
  b. Connect Hub to the Power Over Ethernet Injector
  c. Connect the POE injector to the Modem
  d. Power up the POE
  e. Confirm Auto-Meteo is online by opening the browser on your phone and navigating to xxx.xxx.xxx.xxx:8080 (where xxx.xxx.xxx.xxx is your modems static IP address)

- **After returning from site:**
  a. Connect Specto Technology to complete the data flow into GeoExplorer
  b. Start monitoring

# 3 Auto-Meteo Sensor Hub

The Auto-Meteo sensor hub consists of an atmospheric sensor and an ethernet enabled measurement hub to communicate with over a cellular modem.

**Sensor and Hub:**

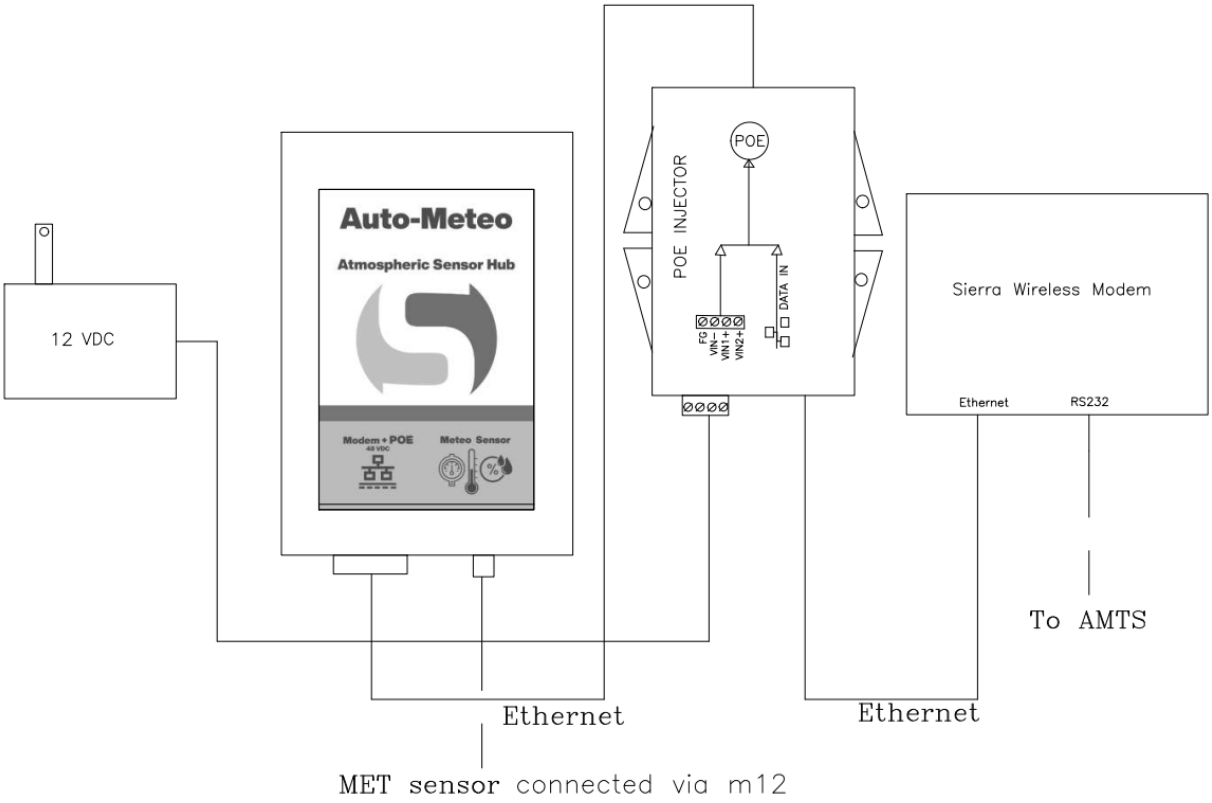
| | |
|---|---|
| Met Sensor | Measures relative humidity, barometric pressure, and temperature. Sealed for outdoor use. The sensor is hardwired into the hub and comes with a 4-meter cable. |
| Ethernet Hub | The hub transmits measurements of relative humidity, barometric pressure, and temperature over ethernet. Powered by Power Over Ethernet (POE) |

**Accessories:**

| | |
|---|---|
| POE Injector | The POE injector provides power and data connection to the Auto-Meteo and a data connection to the modem. |
| POE Power Supply | A 120VAC to 48VDC power supply provides power to the POE injector and Auto-Meteo. |
| Ethernet Cable | An ethernet cable is included to connect the POE injector to the Meteo |

## 3.1 Wiring details for the Auto-Meteo and POE injector:

| POE Injector Port | Auto-Meteo Port | Modem Port | Power Supply |
|---|---|---|---|
| VIN- | | | 12V - |
| VIN1+ | - | - | 12V + |
| POE | POE + Modem | - | - |
| DATA IN | - | Ethernet | - |
| - | Meteo Sensor M12 | - | - |



# 4 Requirements

The Auto-Meteo requires the following hardware and software:

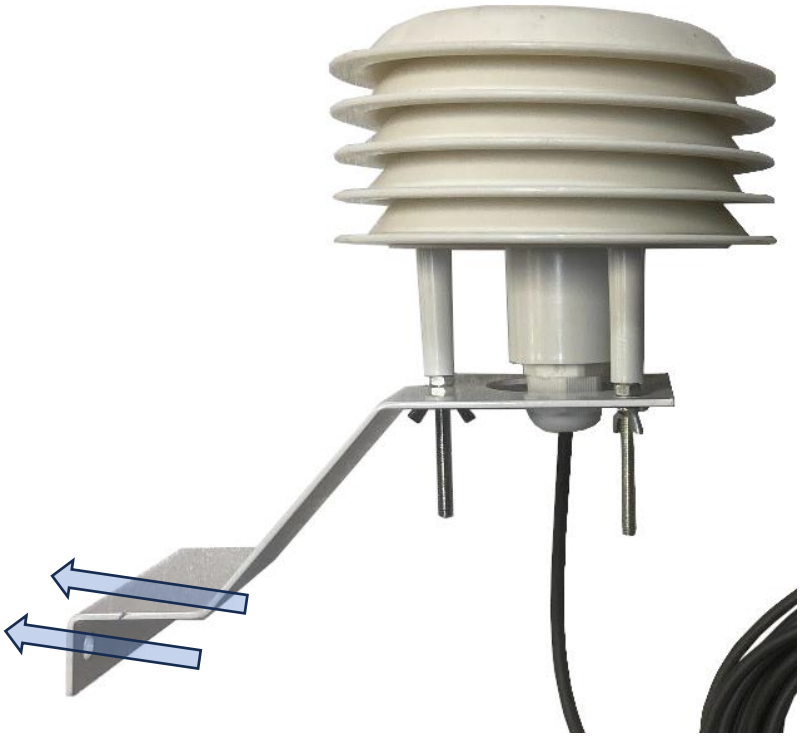
- A cellular modem with a Public Static IP address, such as the Sierra Wireless RV50x or RV50 Airlink modem (Available from Specto Technology)
- Mains 120VAC power or 48VDC power supply
- CAT5 or CAT6 Ethernet cable
- Atmosphere data hosting software subscription (Available from Specto Technology)
- For AMTS use: GeoExplorer software subscription (Available from Specto Technology)

# 5 Installing the Auto-Meteo

The sensor hub and POE injector should be installed in an enclosure or otherwise out of the elements. Four mounting holes on the hub can be used to mount it on an electrical panel. The POE injector has two mounting holes that can be used the same way. If your enclosure has an opening large enough to pass the sensor connector to pass through (if not see section 4.1 Alternate Sensor Connection), simply mount the hub first and pass the sensor cable into to your enclosure and connect to the hub.

The Auto-Meteo Sensor should be placed in the same environment as your Automated Total Station (AMTS). Installing the sensor as close to your AMTS as possible and either shaded or unshaded if your AMTS is shaded or unshaded (see section 5.2 Sensor Positioning General Guidelines). The sensor is mounted inside a radiation shield to protect it from direct sunlight. The radiation shield has two mounting holes on hits mounting backet. Bolt, screw, or even cable tie the radiation bracket in place with the shields facing up as shown below.

Once everything has been mounted; connect the hub to the Meteo port on the POE injector, connect the modem port to the ethernet port on your Modem, and finally plug the power supply in.



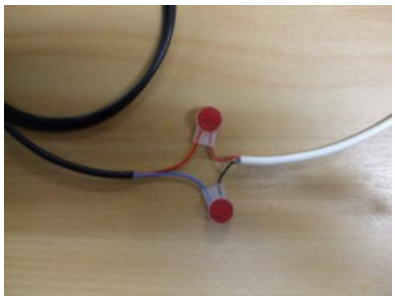
## 5.1 Alternate Sensor Connection

If the sensor cable needs to be passed though a cable gland, a cable splice can be performed.

1. Cut the cable with at least 18 inches before the hub. Always make sure there is plenty of cable on both sides of the connection to work with when splicing.
2. Pass the cut end from the sensor through the gland
3. Strip back both ends of the wire
4. Splice the two wires back together matching all four colors on each end.
5. It is extremely important to ensure that no moisture can get into the cable join between the cable and sensor cable. If moisture enters the cable join, the join will rust over time and will cause the signal from the sensor to stop being registered. Water can in some cases travel up the cable core into the logger or the sensor and damage the internal circuitry.

6. The "3M ScotchLok UY2 Insulation Displacement Wire Connectors" and crimper are recommended for splicing the signal cables together.

Crimping Pliers



As an alternative to splicing cable, water resistant connectors may be provided upon request.

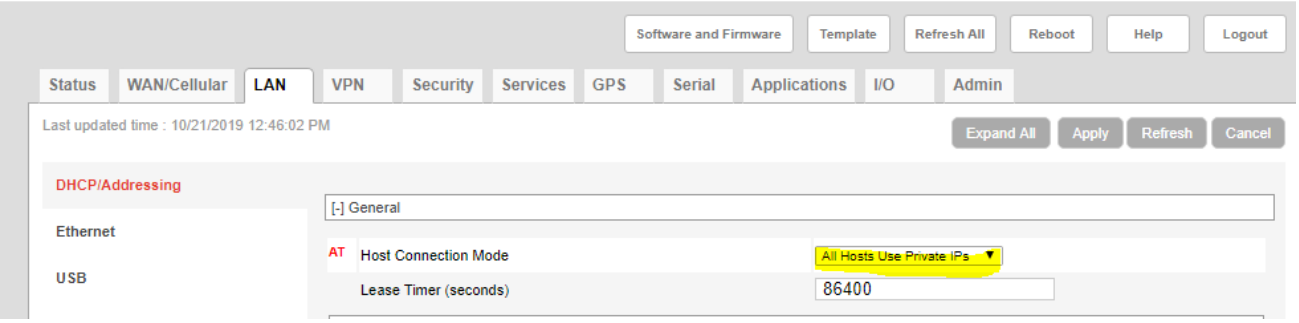
## 5.2 Sensor Positioning General Guidelines

- Install the sensor in the same environment as the AMTS
- The sensor and AMTS should be open air to each other
- If the AMTS is in shade, install the sensor in similar shade
- If the AMTS is in bright sun exposure, install the sensor with bright sun exposure
- Do not install the sensor somewhere where water might pool up and submerge the sensor. The sensor is sealed to protect against damage from submersion but the atmospheric data will be meaningless while the sensor is submerged.

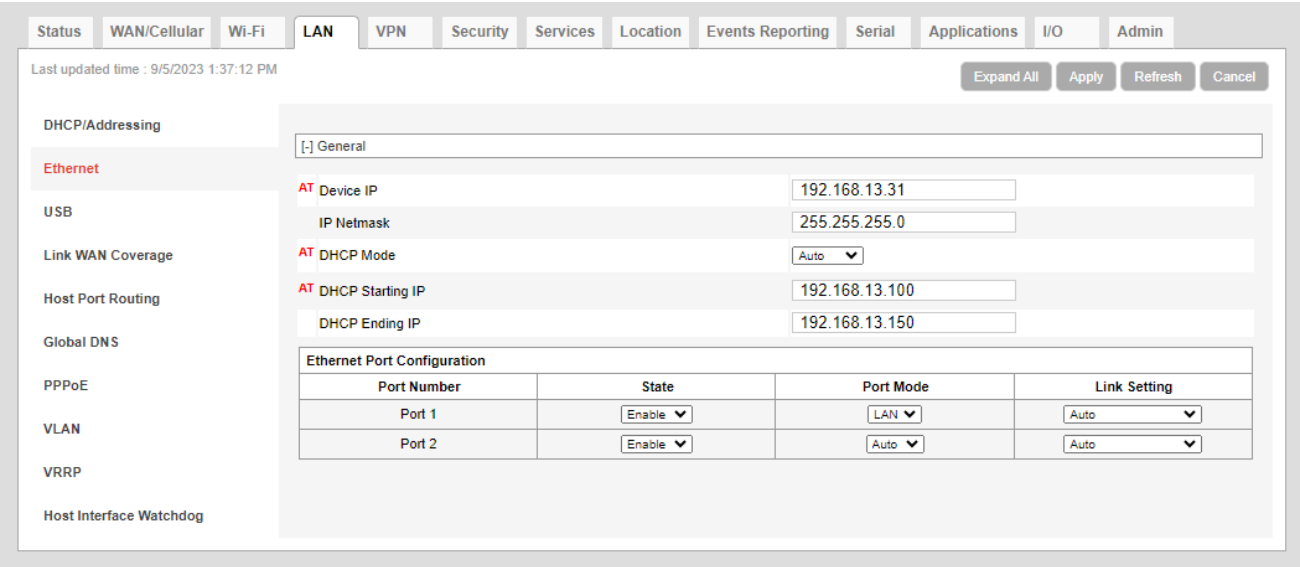
# 6 Configuring the Modem

Any modem with a Static IP Address, Ethernet port, and software enabled port forwarding can be used with the Auto-Meteo. For use with a Sierra Wireless Airlink Modem please follow these steps:

1. Connect to AceManager by opening your browser to xxx.xxx.xxx.xxx:9191(where xxx.xxx.xxx.xxx is your modems static IP address)
2. Login using user “Admin” and your password (the default on older models is 12345, on newer models a unique password is printed on the back label of the modem)
3. [For Firmware 4.9 or older only] On the LAN tab confirm the DHCP/Addressing > General > Host Connection Mode is set to “All Hosts use private Ips(on newer modems this setting is always on, so this step can be skipped)




4. On the LAN tab confirm the Ethernet > General > Ethernet Port is set to “Enable” and DHCP Mode is set to “Auto”.



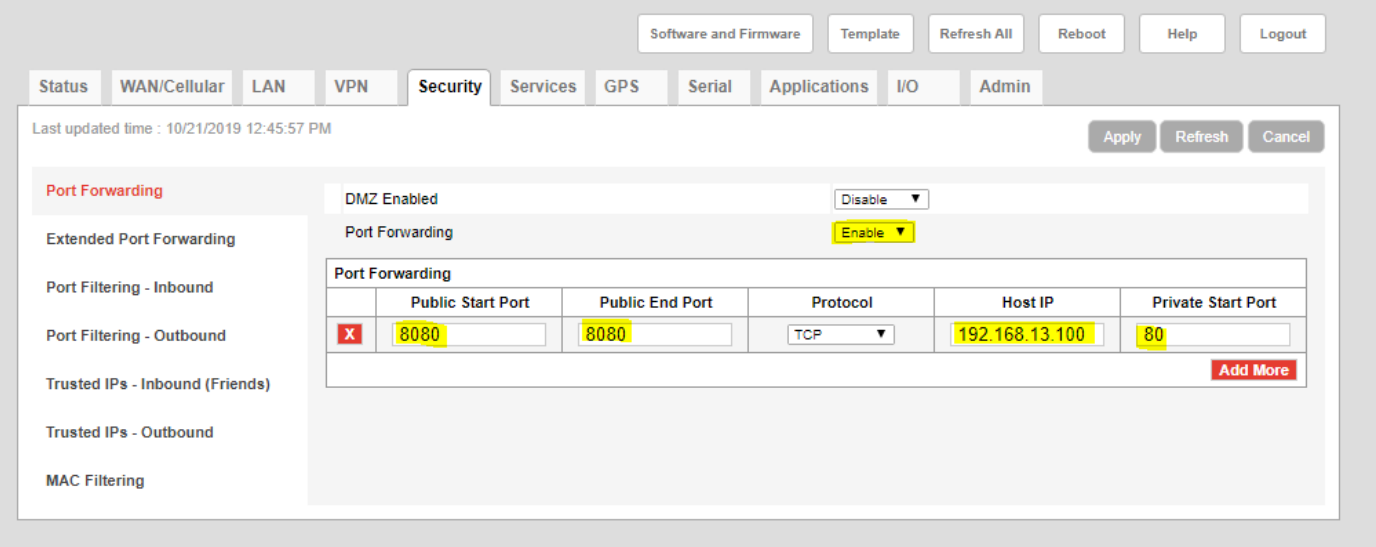

NOTE: If you have different settings under the Device, Starting or Ending IPs above make note of the “Starting IP” value for use in Step 5d.

5. Last on the Security Tab set the following:
    a. Port Forwarding – “Enable”
    b. Public Start Port – “8080”

c. Public End Port – “8080”

d. Host IP – “192.168.13.100” (or whatever the value was from Step 4)

e. Private Start Port – “80”




## 6.1 Confirming Auto-Meteo Connectivity

When the power supply is plugged in and connected to the Meteo by the Ethernet cable the power indicator light on the Auto-Meteo should turn on.

Confirm Auto-Meteo is online by opening the browser on your phone and navigating to xxx.xxx.xxx.xxx:8080 (where xxx.xxx.xxx.xxx is your modems static IP address). If this page loads, your Auto-Meteo is working.

# 7 GeoExplorer Client Setup

To setup the data connection into GeoExplorer please email support@spectotechnology.com and provide the IP address of the modem, the sensor serial number, and the name of the GeoExplorer project you wish to add your weather station to.

To add your AutoMeteo to GeoX you can follow along with our video guide or read the transcript below:

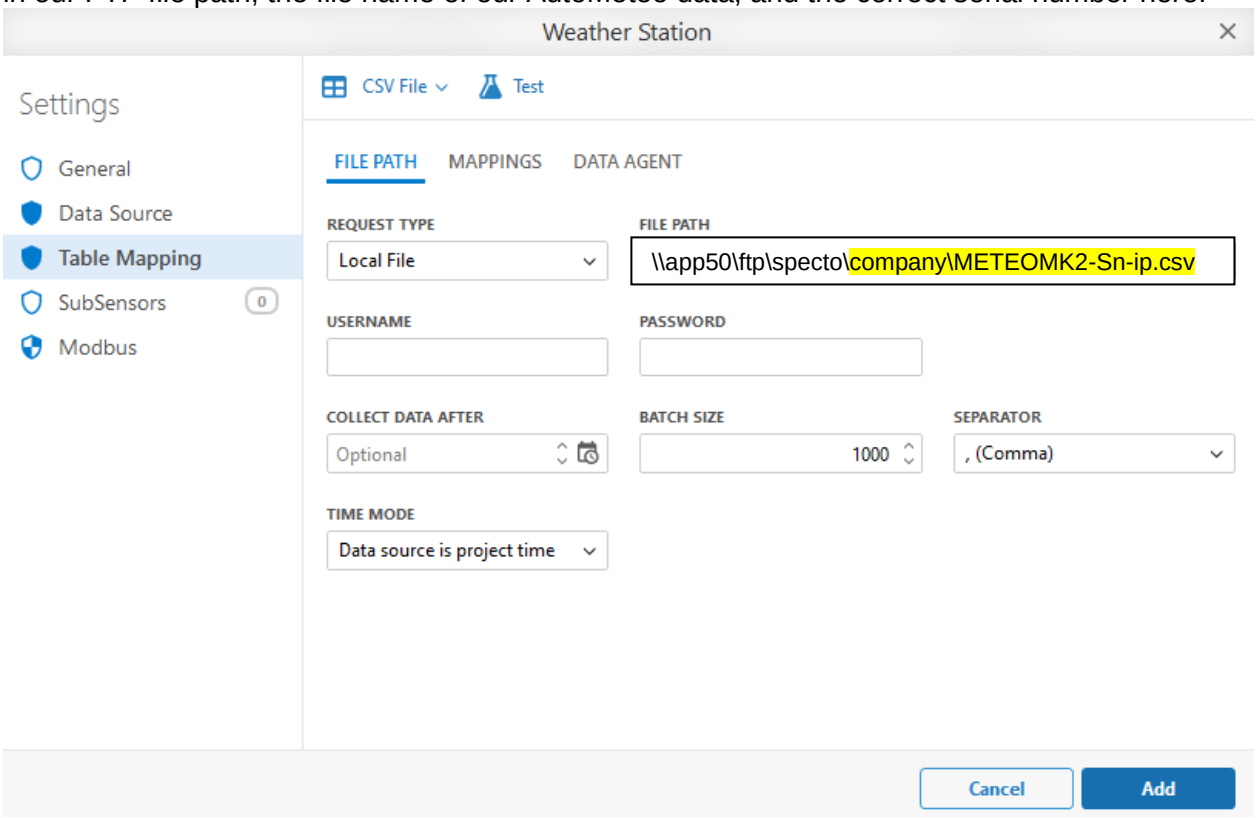
YouTube Link: https://youtu.be/ldqFjhH3aPk

1. First thing to do is to navigate to weather stations.

2. Go to systems and search for Weather. Go to Weather Stations. Click Add and give it a name.

3. Next, go to add Data Source. Choose Table – Sensor. Choose a data storage interval of 60 minutes and a data query interval of 5 minutes.

4. Go to Table Mapping. Scroll down to the CSV File. We're going to choose a local file which is actually going to be an address on the local server that is accessible via FTP. So, what we're going to do is put in our FTP file path, the file name of our AutoMeteo data, and the correct serial number here.

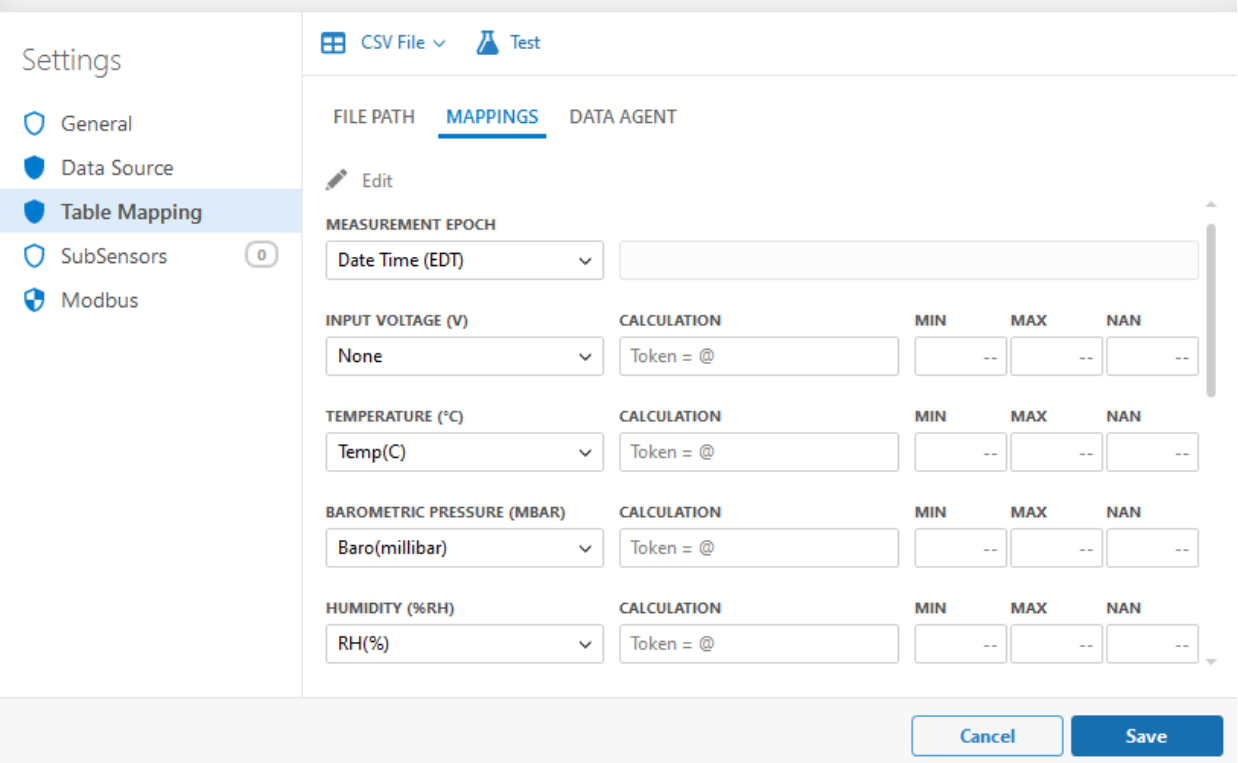


5. Then, make sure to choose the appropriate time mode – Project Time.

6. Then go to Mappings and click Edit. Now, we're going to tell it what each column in the file that we're looking at is. Measurement EPOCH is going to be column with the date time.
    a. Input voltage is going to be nothing because there's no input voltage.
    b. Temperature is going to be the column with the temperature (this is showing you a sample of what's in your actual file).

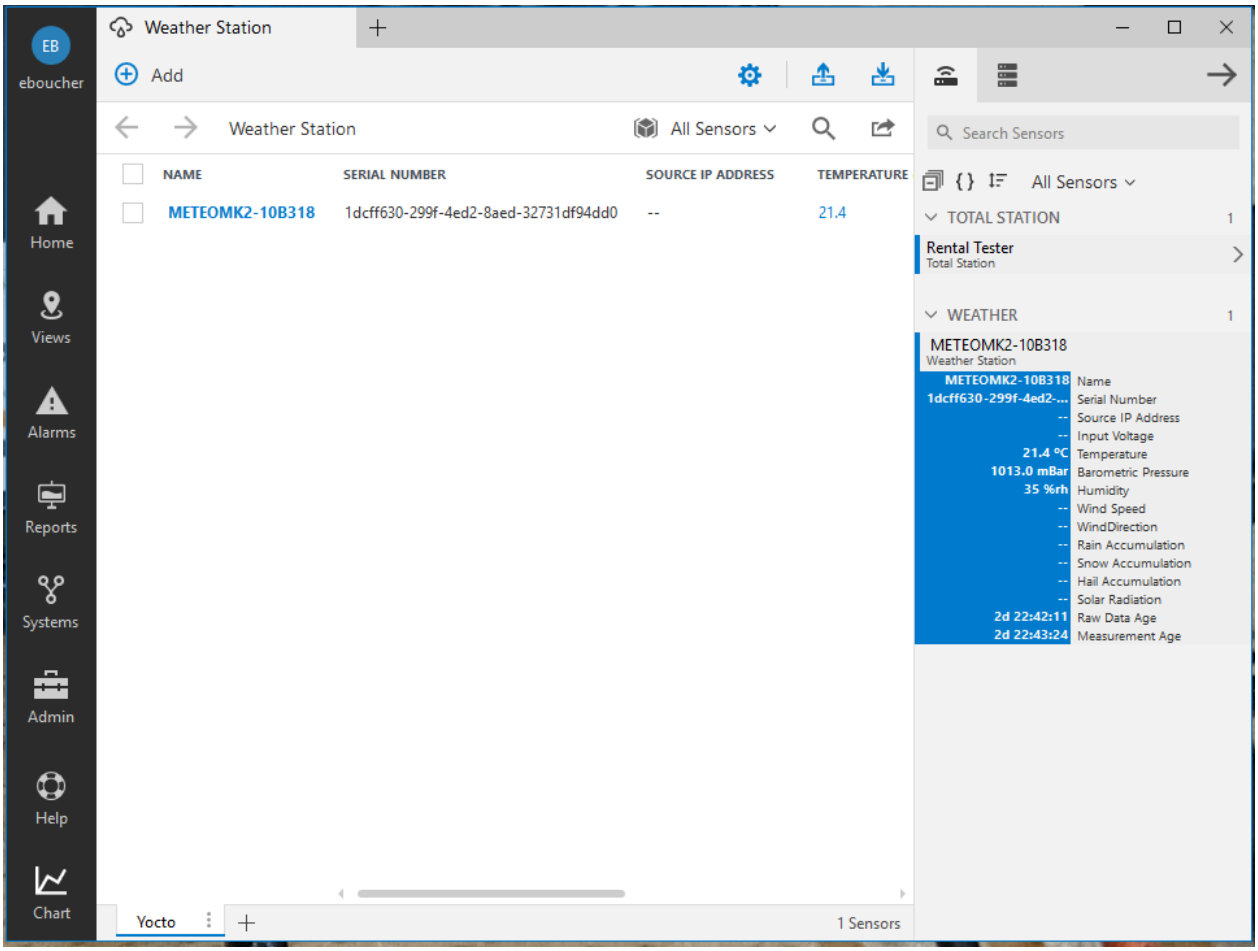
    c. Then, the last one is going to be our humidity.

    If we're using an AutoMeteo, we just have those first three to deal with - temperature, pressure and humidity.




7. Go ahead and hit Add. That's all there is to it.

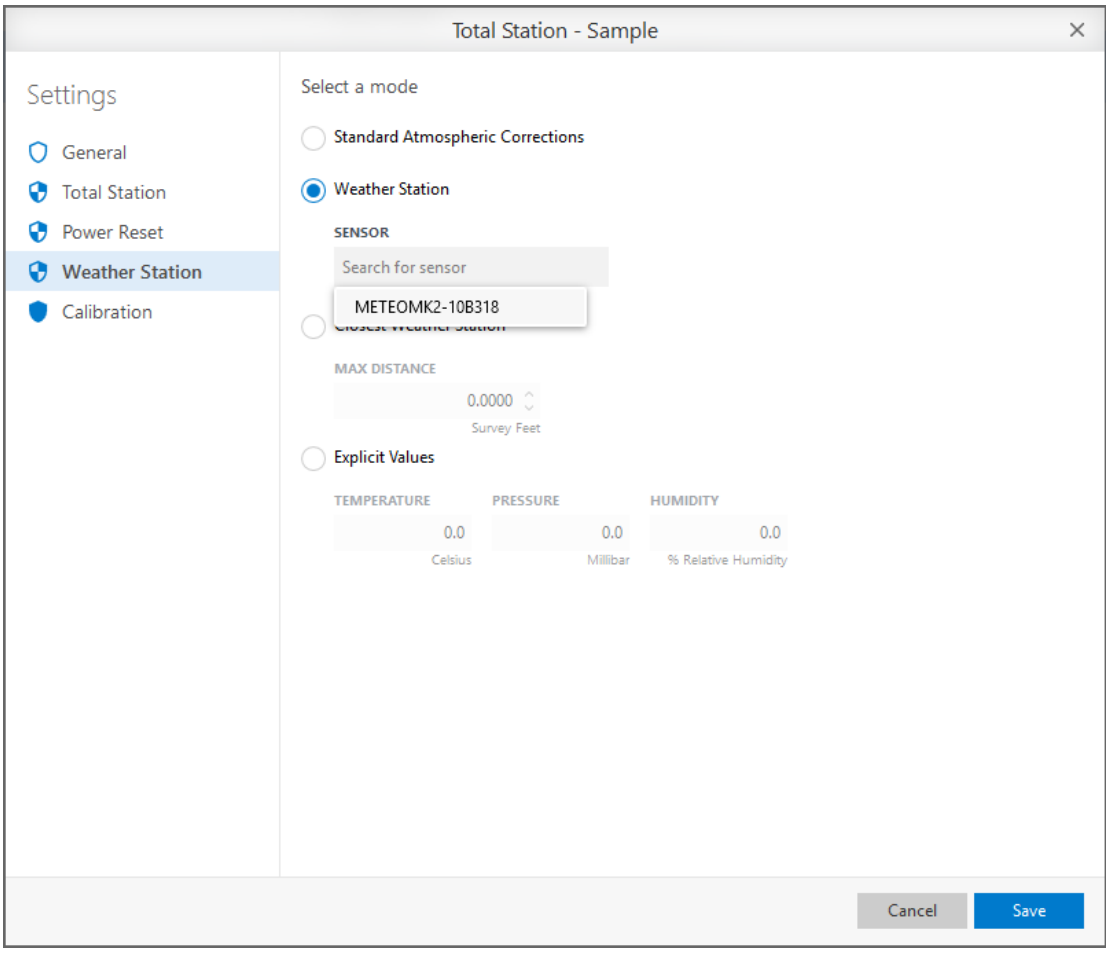
Specto Technology and Navstar will add the Auto-Meteo sensor to your project. It will appear under the Weather Stations section of the Systems Menu




Once the weather station is in your project you can add it to any of the Total Stations on that project to perform atmospheric corrections. To do this follow these steps:

1. Click on the Settings of a live Total Station you wish to add the weather sensor to.
2. Click on the Weather Station menu tab on the left.

3. Where it says Select a mode, click Weather Station and select your sensor from the dropdown menu




Your Total Station will now use the atmospheric conditions to perform a scale correction to the measured slope distances every time GeoExplorer runs a calibration.

You can view these values from the Calibrations menu where it says Atmospheric Correction Scale.

# 8 Specifications

**Sensor**
- Accuracy (Rel. Humidity): 1.5%
- Accuracy (Baro. Pressure rel): 0.01mbar
- Accuracy (Temperature): 0.2°C

**Ethernet Hub**
- Network Connection: Fast-Ethernet

**Electrical**
- Power Input: 10-36VDC
- Power Method:  POE (Power over Ethernet)
- Current Draw: 14mA @ 48V
- Max current (Cont.): 2A
- IEC protection class: Class III
- RoHS compliance: RoHS III (2011/65/UE+2015/863)

**Dimmensions**
- Hub: 4.33" 2.87" 1.85"(LWH)
- Sensor: 6”Diameter x 4.5”Height