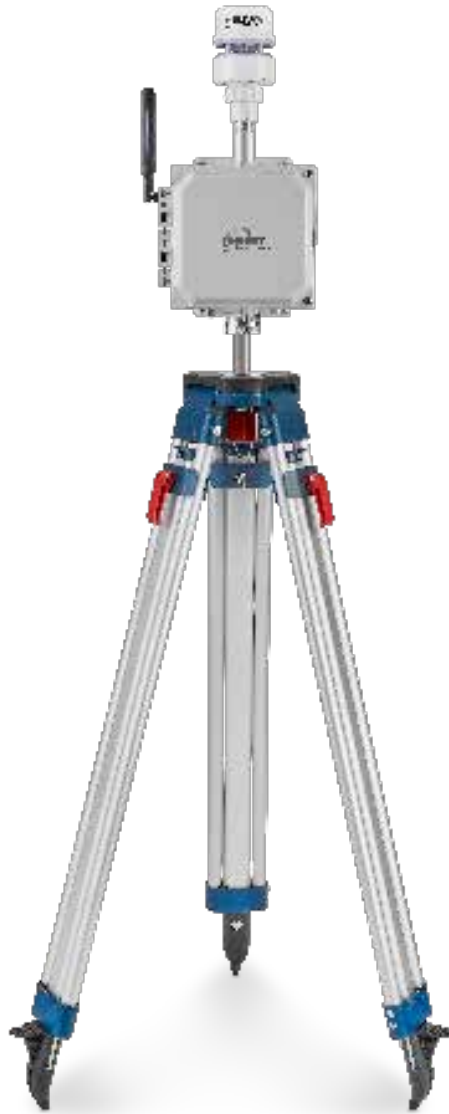# SENSITSPOD

by CROWCON

OPERATION & CONFIGURATION GUIDE

READ AND UNDERSTAND INSTRUCTIONS BEFORE USE.

SENSIT
by CROWCON

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CONTENTS

SPOD SENSOR OVERVIEW

GENERAL

OVERVIEW	PARAMETER
Weight	Base Unit: 6.75 lbs
Dimensions	Fully assembled with anemometer & antenna D x W x H (6" x 8" x 16")
Mounting	Attached mounting flanges
Voltage Requirements	18V – 24V DC Charging (wired adapter or solar panel)
Current Requirements	2A max current draw when charging
Operating Runtime	3-5 days battery backup [1]
Operating Temp	-10°C to 50°C [2]
Data Outputs	- Digital wired output (3.3V TTL - USB) - Wireless (4G IoT Cellular Included) [2] - Optional analytics on server [4] - SD card data backup [5]

NOTES:

1. Battery backup time depends on run mode and frequency of transmission.

2. Limited by lithium iron phosphate charging temperature. Lower temperature operation will require external or internal heating to maintain sufficient battery temperature for charge acceptance. Contact the manufacturer for more information.

3. Requires SIM card and suitable data plan on AT&T or T-mobile. Verizon service is pending

4. Cloud based analytics can be developed with additional contract

5. When removing SD card to obtain data, it is recommended to power off the sensor box prior to reinserting the SD card to avoid possible errors. If the system stops responding or any SD errors are observed after inserting an SD card, power down the sensor and turn back on.

SENSORS

OVERVIEW	PARAMETER
Default PID Detection Range	10 ppb – 2 ppm1
Default PID Lamp Energy	10.6 eV2
Target PID Accuracy	+/- 20 ppb min or 10%3,4
Response Time	5-10 seconds5,6
Expected Lamp Life	1 year+

NOTES:

1. VOC range reference to isobutylene. Additional PID sensors available with identical form factors if higher concentrations are necessary.

2. Additional PID sensors available with identical form factors if different lamp energies are required.

3. Factory calibration conducted with 1ppm isobutylene and ultra zero air. This value is a target and cannot be guaranteed for all environments.

4. PID Sensors are sensitive to high amounts of humidity and may rail at the upper output if humidity is excessive. The SPOD contains an internal sensor heater to minimize humidity interference.

5. If the unit has been off for an extended period of time, it could take several minutes to an hour for the PID readings to drop to normal operating conditions depending on storage conditions. This stabilization may temporarily interfere with VOC detection.

6. Exposure to very high levels of VOCs may saturate the detector for several minutes to an hour

CELLULAR SPECIFICATIONS

OVERVIEW	PARAMETER
Network Technology	4G/2G[1]
Carrier	AT&T and T-mobile[2]
Transport Layer	TCP
Internet Layer	IP
Application Layer	HTTP and MQTT
Data Transfer Method	HTTP POST or MQTT Topics
HTTP Content Type	application/x-www-form-urlencoded
HTTP Body Field Identifiers	&ID, &MODULE, &STAT, &DATA
MQTT Content Type	JSON
MQTT Tags	"deviceId", "time", "iodb"
Post Location	Adjustable in Menu
APN	Adjustable in Menu
TLS/SSL	HTTPS and MQTTS with server authentication[3]

NOTES:

1. 4G CAT M1 and NB-IoT

2. Modem is pending Verizon certification

3. Client authentication possible with additional development

SENSOR EXTERIOR FEATURES (FRONT EXTERIOR)

Anemometer

Cellular Antenna

Power Switch

Power/USB Port

Auxiliary Port

PID Assembly
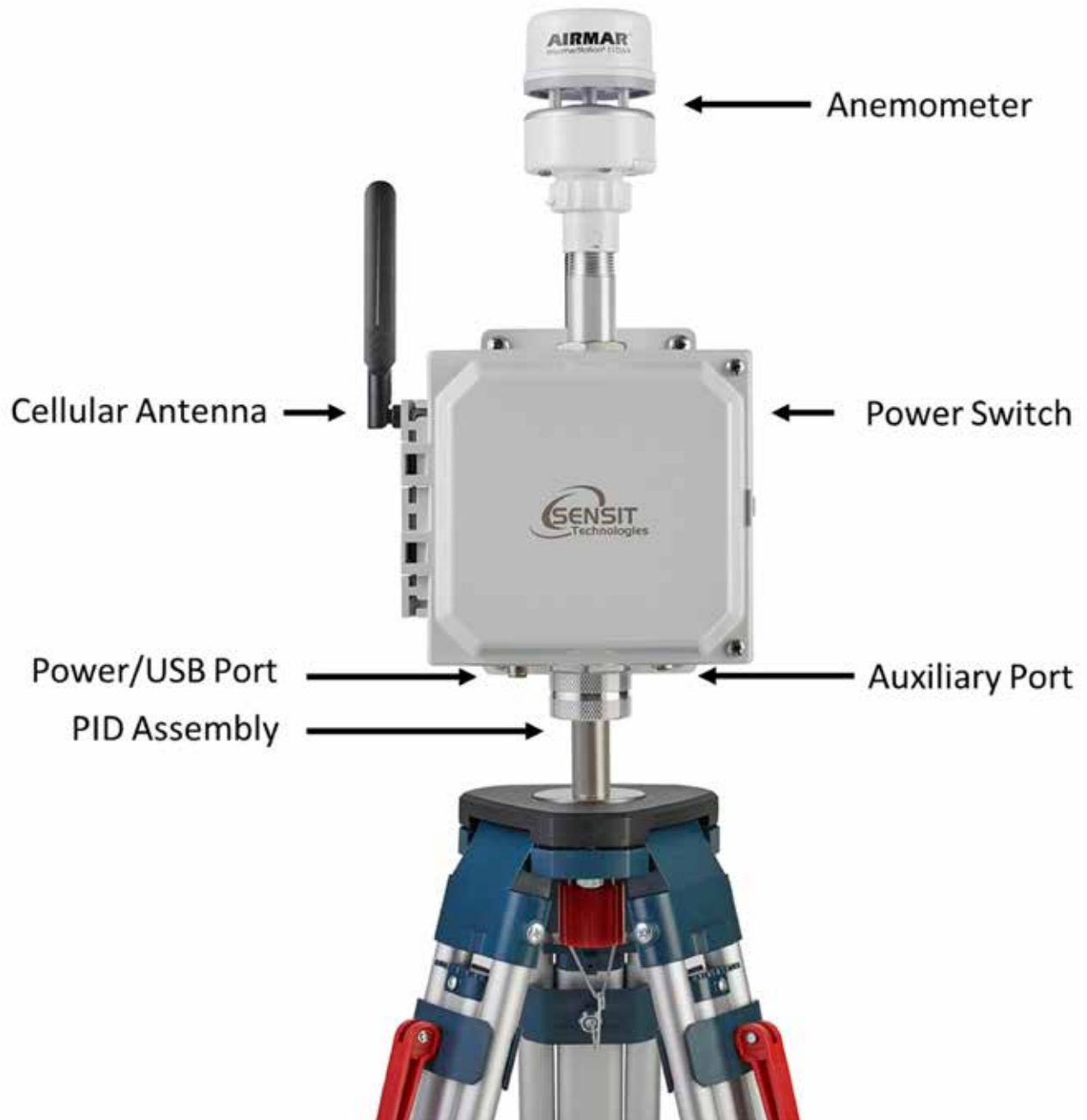
SENSOR INTERIOR FEATURES (FRONT INTERIOR)
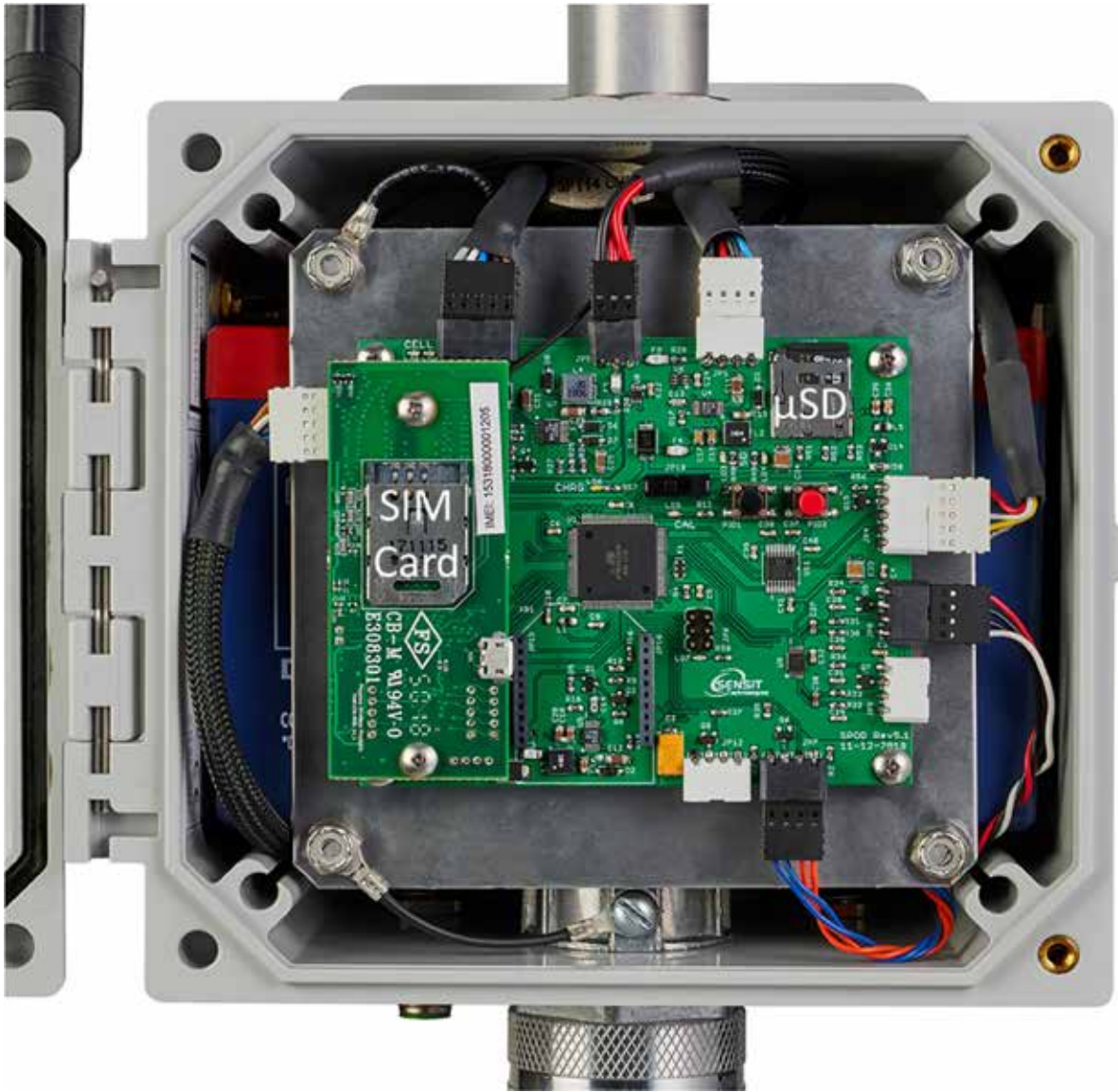
SENSOR INTERIOR LED INDICATION
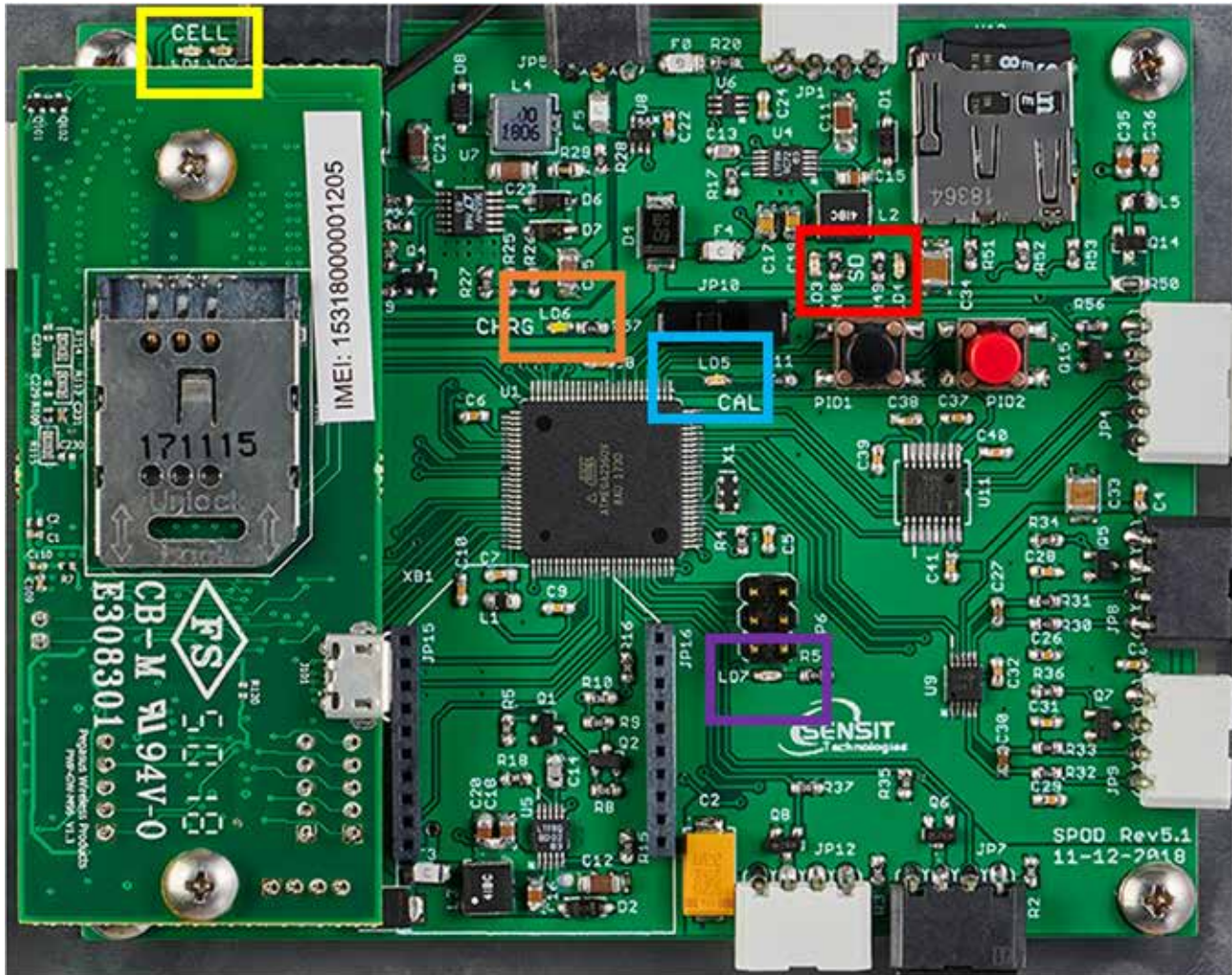
| Cellular Status | Charging Status | Calibration Mode | Sensor Status | SD Card Status |

Cellular Status: Red LED if failure, Green LED if successful

Charging Status: Green LED if Charging

Calibration Mode: Solid/Flashing Blue LED in Calibration

Sensor Status: Red LED if initialization failure (PID or Weather Station)

SD Card Status: Red LED if failure, Green LED if successful

QUICK START DEPLOYMENT GUIDE (USB CABLE & COMPUTER)

It is recommended to use a computer and the supplied USB cable when setting up the sensor unit to verify the operation of the sensors, system output, and cellular data connectivity (if applicable). If no cable and computer are available, please see the next page.

Unpack the sensor unit and check for any physical damage or obstructions at the sensor openings. Open enclosure cover and check for any loose or damaged components. Make sure all wires are securely fastened as shown in the internal sensor view on page 7.

1. Hook up sample controller if applicable to the auxiliary port of the SPOD using the provided 5 pin cable.

2. Hook up USB cable sensor and initialize terminal connection. Power on unit and verify that the SD card was detected and initialized.

3. Verify the sensor outputs are reasonable or trending toward reasonable values keeping in mind the stabilization time for sensors that have been powered off or exposed to high VOC concentrations. Additionally, it may take up to 30 seconds for the ultrasonic anemometer to report valid environmental data. For information on USB headings and field identification, please see page 12.

4. When installing orient the weather sensor such that it is pointing North. Failure to do this will result in arbitrary wind direction. The North direction is indicated with a notch on the ultrasonic anemometer base. See page 15 for anemometer instructions. Never rotate the anemometer from the top or severe damage will occur.

5. After verifying functionality remove the USB cable. If planning to run in USB mode, install a power adapter or a solar panel for long term deployment applications. Otherwise, power cycle the SPOD, then install a power adapter or a solar panel for long term deployment applications.

QUICK START DEPLOYMENT GUIDE (NO COMPUTER)

Unpack the sensor unit and check for any physical damage or obstructions at the sensor openings. Open enclosure cover and check for any loose or damaged components. Make sure all wires are securely fastened as shown in the internal sensor view on page 7 and refer to the LEDs indicated on page 8.

1. Hook up sample controller if using to the auxiliary port of the SPOD using the provide 5 pin cable.

2. Power on unit. The illuminated switch should turn on. If the switch does not illuminate, inspect all wiring connections and charge battery.

3. Verify that the SD card was detected and initialized with the SD status LEDs

4. Verify the absence of sensor errors with sensor status LED:

    NORMAL STARTUP: LED solid for 5-10 seconds, brief off period followed by "Normal Flash (see below)"
    SD CARD ABSENT OR ERROR: 250 msec on/250 msec off (e.g. rapid blink on and off) after the solid LED after pushing power button
    HARDWARE ERROR: The following flash patterns are indicated for 1 minute following startup. This blink pattern is repeated every 6 seconds and is mirrored on sensor status led inside SPOD housing.

    1 blink = PID Lamp 1 > 10000 hours

    2 blink = PID Sensor 1 Voltage Error

    3 blink = PID Lamp 2 > 10000 hours (Only for Dual Sensor Design)

    4 blink = PID Sensor 2 Voltage Error (Only for Dual Sensor Design)

    5 blink = Ultrasonic Anemometer Error 6 blink = Canister Communication Error (expected canister controller but wasn't found)

5. If HTTP or MQTT protocol is selected verify successful initialization after startup with Cellular status. If cellular connection fails, there will be diagnostic code in the beginning. These codes will be repeated on the cellular status led inside the enclosure. If PERIODIC protocol is used wait for required amount of time before cellular post.

    1 blink = General Error, Host Address Error

    2 blink = Communication Error

    3 blink = SIM card error (missing/not valid)

    4 blink = Cellular Registration Error

    5 blink = Data Connection Error

    6 blink = No response from server

    7 blink = MQTT authentication error

6. If power is hooked up, wait for 1 minute after power up to verify the charging status LED is illuminated. Please note that if the battery is completely full the charging status LED will not illuminate.

7. When installing orient the weather sensor such that it is pointing North. Failure to do this will result in arbitrary wind direction. The North direction is indicated with a notch on the ultrasonic anemometer base. See page 15 for anemometer instructions. Never rotate the anemometer from the top or severe damage will occur.

8. After initialization is complete the illuminated switch will display the "Normal Flash" (During Operation): Double blink every ~1 second.

NOTE: Flash pattern during cellular post is more erratic and is associated with different times to send commands and receive response. If flash pattern looks different and you are concerned, I'd recommend giving the sensor 30-60 seconds and see if the double blink starts again after the cellular post finishes.

USB OUTPUT HEADINGS AND DESCRIPTION

USB HEADING	DESCRIPTION	UNITS/FORMAT
SPOD	Serial Number	1000-63535
DATE	Local Date and Time	MM/DD/YY HH:MM:SS (24H)
PID1	Field 1, Sensor 1 VOC	PPB
	Field 2, Sensor 1 Raw	mV
PID2[1]	Field 1, Sensor 2 VOC	PPB
	Field 2, Sensor 2 Raw	mV
T	Temperature	°C
RH	Relative Humidity	%
P	Pressure	mBar
WS	Wind Speed	mph
WD	Wind Direction	Degrees
TC	Field 1, Sensor 1 Temp	Arb Units
	Field 2, Heater 1 Output	0 = Off, 255 = Fully On
	Field 3, Sensor 1 Setpoint	Arb Units
	Field 4, Sensor 2 Temp[1]	Arb Units
	Field 5, Heater 2 Output[1]	0 = Off, 255 = Fully On
	Field 5, Heater 2 Setpoint[1]	Arb Units
BATT	Battery Voltage	Volt
CHRG	Charging Current	mA
RUN	Operating Current	mA
TRIG	Field 1, Port Status	*See Below For All Fields*
	Field 2, Trigger Flag	
	Field 3, Active Flag	
	Field 4, Sample Flag	
LAT[2]	GPS Latitude	Degrees
LON[2]	GPS Longitude	Degrees

NOTES:

1. The control circuit board is designed to support a second sensor. Additional parameters will show up in the output if a dual sensor unit is configured by the factory.

2. GPS is not enabled on all units. Please contact Sensit to enable GPS.

FIELD 1 (PORT STATUS)

BIT NUMBER	DESCRIPTION
7 (MSB)	Port 4: Collected = 1, Not Collected = 0
6	Port 3: Collected = 1, Not Collected = 0
5	Port 2: Collected = 1, Not Collected = 0
4	Port 1: Collected = 1, Not Collected = 0
3	Port 4: Installed = 1, Not Installed = 0
2	Port 3: Installed = 1, Not Installed = 0
1	Port 2: Installed = 1, Not Installed = 0
0	(LSB) Port 1: Installed = 1, Not Installed = 0

FIELD 2 (TRIGGER STATUS)

BIT NUMBER	DESCRIPTION
7 (MSB)	Not Used
6	Not Used
5	Not Used
4	Wind Only Trigger
3	Combo, High Wind Speed
2	Combo, Med Wind Speed
1	Combo, Low Wind Speed
0 (LSB)	Threshold Trigger

FIELD 3 (ACTIVE PORT)

BIT NUMBER	DESCRIPTION
7 (MSB)	Not Used
6	Not Used
5	Not Used
4	Not Used
3	Port 4: On = 1, Off = 0
2	Port 3: On = 1, Off = 0
1	Port 2: On = 1, Off = 0
0 (LSB)	Port 1: On = 1, Off = 0

FIELD 4 (EVENT STATUS)

BIT NUMBER	DESCRIPTION
7 (MSB)	Event 4: Complete = 1, Not Complete = 0
6	Event 3: Complete = 1, Not Complete = 0
5	Event 2: Complete = 1, Not Complete = 0
4	Event 1: Complete = 1, Not Complete = 0
3	Event 4: Started = 1, Not Started = 0
2	Event 3: Started = 1, Not Started = 0
1	Event 2: Started = 1, Not Started = 0
0 (LSB)	Event 1: Started = 1, Not Started = 0

15 ULTRASONIC ANEMOMETER MOUNTING INSTRUCTIONS

INSTALLING (FIGURE 3)

CAUTION: The reflector plate and the waterproof film found in the wind channel of the WeatherStation Instrument are essential to its operation. Be careful not to scratch the plate, puncture the film, or damage them in any way.

CAUTION: The WeatherStation Instrument must be installed upright and vertical, not tilted to one side. It must be level and plumb. If the WeatherStation Instrument is tilted from the horizontal plane, it may introduce errors in the compass and wind readings.

CAUTION: To accurately measure the wind direction and heacing, the alignment notch on the WeatherStation Instrument must be pointed correctly.
- Moving vehicle/boat-The alignment notch must point forward and be parallel to the centerline of the vehicle/boat.
- Stationary surface-It is recommended that the alignment notch point toward true north

CAUTION: Tighten or align the WeatherStation Instrument by grasping the lower housing below the reflector plate. Hand tighten only.
- Do not rotate the cap. Turning It may sever internal connections and void the warranty.
- 1 lOWXS, 150WXRS, 150WXS-Oo not grasp the solar-radiation shield. The louvers may break.

CAUTION: If you use a thread lock, use Teflon pipe-thread tape. Do not use a liquid thread lock as it may weaken the plastic, causing it to swell and crack.
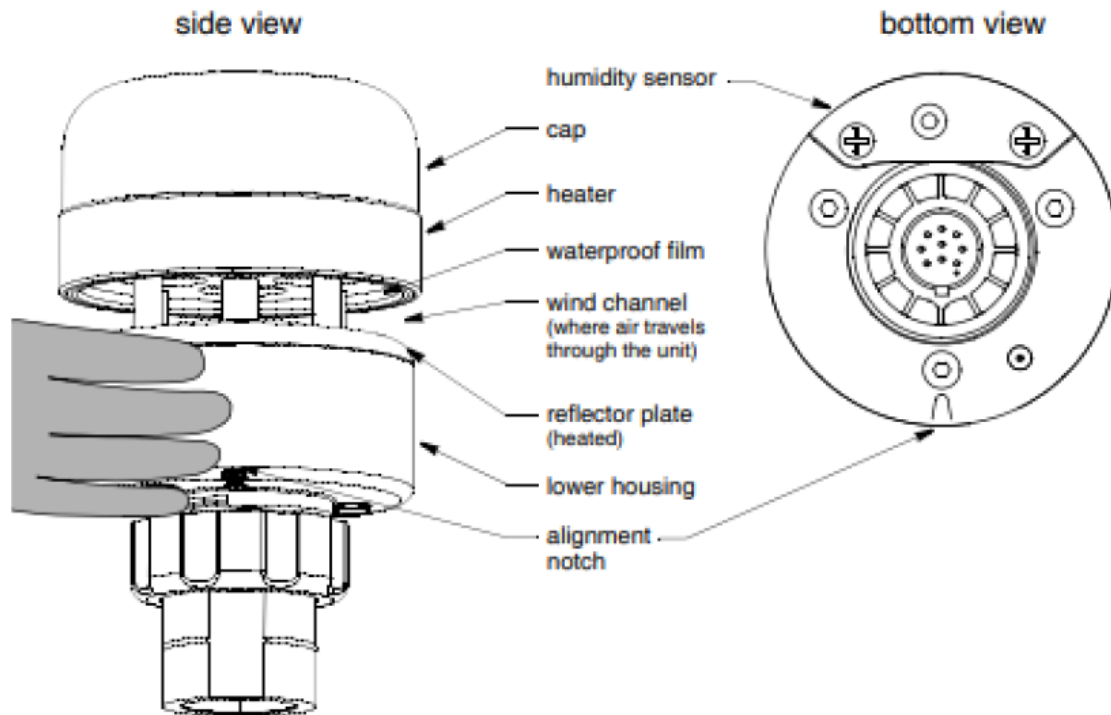

Figure 3. WeatherStation Instrument with heater (120/220WXH shown)
Copyright © 2008 - 2018 Airmar Technology Corp.

TRIPOD SETUP AND INSTALLATION (OPTIONAL)

1. Remove protective rubber feet if installing outdoors

2. Install pole on tripod. Pole mounting attachment may differ from image below.

3. Set leg height of tripod and spread legs with a minimum of 30° from perpendicular

4. For added stability in high wind or long-term deployments place sandbags against all legs and step in feet down into the soil.

Catch tab with
bag to hold down

5. Use the shorter ¼" long screw to attach pole mount to back of SPOD

6. Use the longer 1 ¼" long screw + nut to tighten on pole

7. Tighten sufficiently to prevent rotation

8. Place SPOD as far up as possible on pole to avoid blocking anemometer

    NOTE: The images below are used for reference. SPOD appearance will differ slightly from image below.
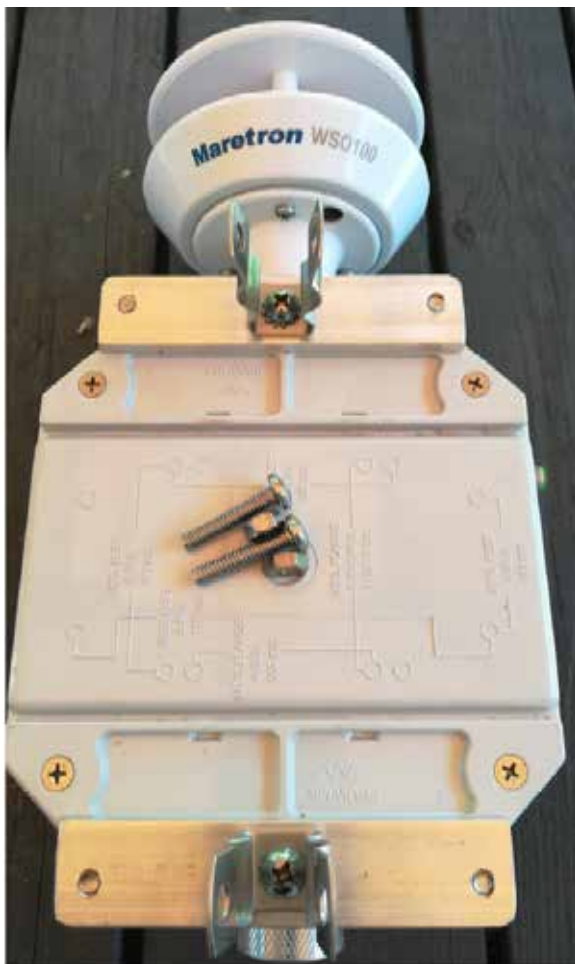
SOLAR PANEL SETUP AND INSTALLATION (OPTIONAL)

1. Lift up on side with 2 knobs to unfold panel

2. Fold down angular supports on both sides and remove 2 knobs on bottom
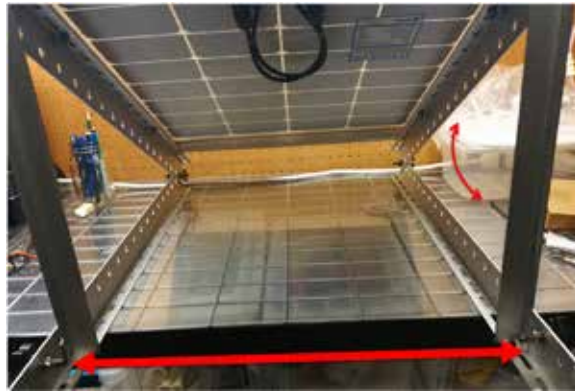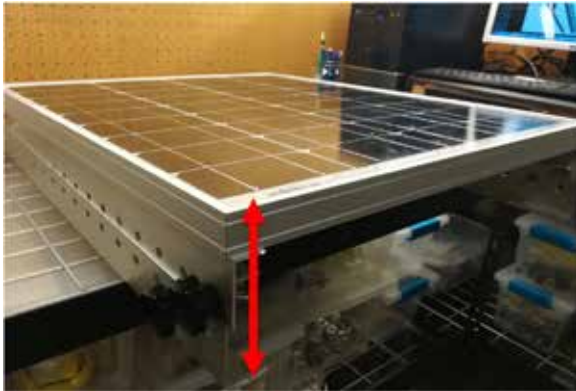
3. Reattach knobs vertical angular supports on both sides (flat washer, lock washer, wing nut)
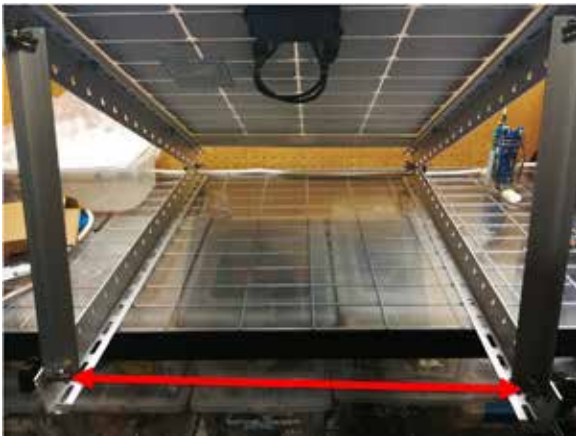
4. Place solar panel on ground and fasten to ground or add ballast if possible (recommended to avoid wind damage and theft)

5. Avoid shadowing on panel as much as possible as this will drastically reduce panel output power and efficiency

6. Route cable to SPOD unit

7. Plug cable into SPOD "Power/USB" connection

8. Power on SPOD unit

NOTE: Alternative solar mounts and solar panel extension cables can be purchased from Sensit. Please contact Sensit for more information if your application requires an alternative solar mounting setup.

CANISTER VALVE CONTROLLER INSTALLATION (OPTIONAL)

The SPOD Canister Valve Controller (CVC) allows the independent or concurrent actuation of up to 4 latching solenoid valves.

Canister Valve Controller

1. To use the canister valve controller, hook the valve controller power and TTL comm port up to the auxiliary port of the SPOD.

2. Hook any valves and pressure sensors up to the valve/pressure ports.

3. Power on SPOD and configure sampler as described in the USB configuration settings. Please note that when enabling sampling for the first time, the user must power cycle before attempting to configure the sampler parameters.
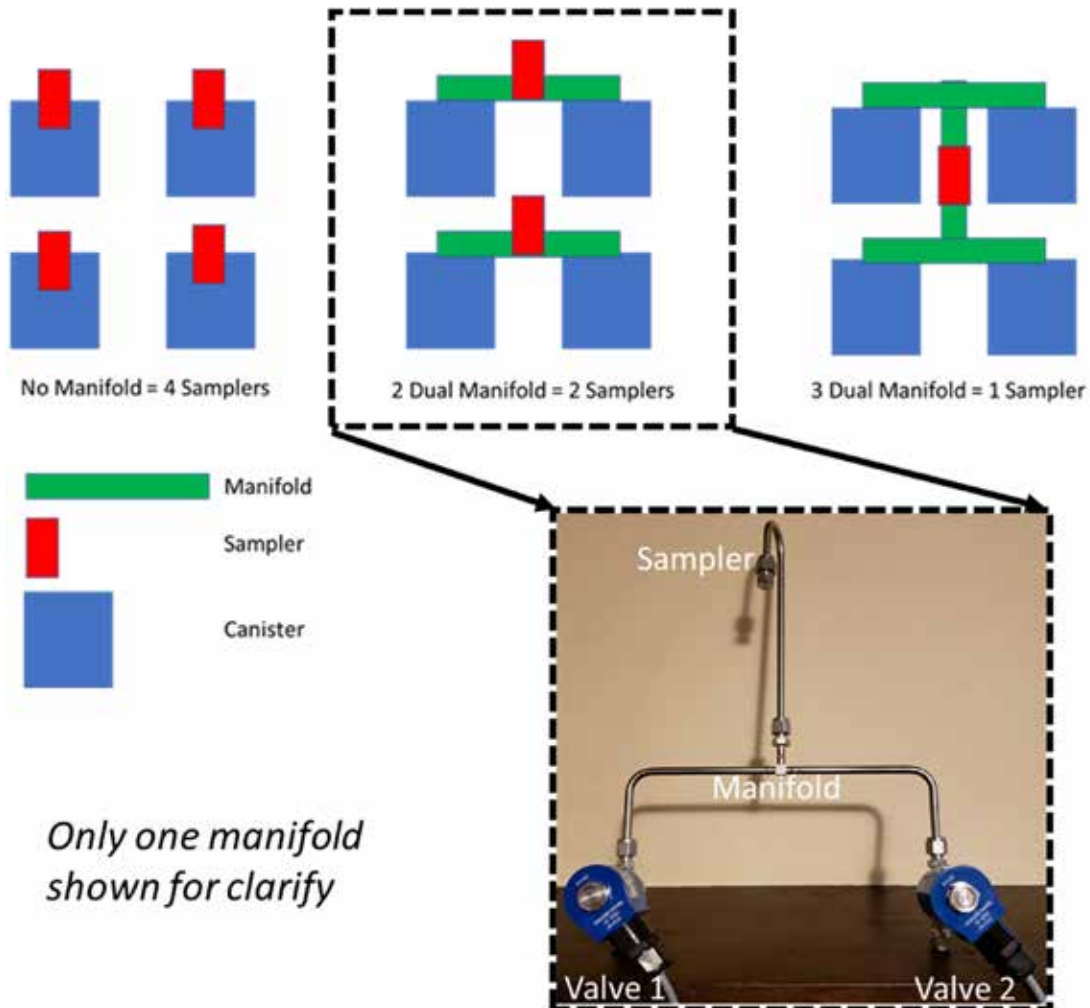

4. The canister valve controller features 4 status indicators for the ports. The color indicates the status.

LED COLOR	DESCRIPTION
BLUE	Not Enabled
GREEN	Enabled and Not Collected
RED	Enabled and Collected
RED-GREEN-BLUE	Currently Collecting Sample

5. The canister valve controller features 4 local buttons for control and testing. The button behavior will depend on the status of port. When the button is pushed, the LED begins to flash RED-GREEN-RED-GREEN. Continue to hold the button until the status LED shows BLUE. Release button and change will occur.

CANISTER STATUS	ACTION
(B) NOT ENABLED	No Action
(G) ENABLED AND NOT COLLECTED	Open Valve
(R) ENABLED AND COLLECTED	Reset Collection Status (Swap Canister)
(RGB) CURRENTLY COLLECTING	Close Valve

6. The configuration of the canister valve hardware is up to the operator. Example setups are discussed here. The CVC can be used with up to 4 cans. The canisters can be connected with manifolds to share a single sampler. This is especially useful when using expensive time integrated samplers. The manifold dead space is negligible when using a 6L can and larger but becomes significant for smaller can sizes.

No Manifold = 4 Samplers

2 Dual Manifold = 2 Samplers

3 Dual Manifold = 1 Sampler

Manifold

Sampler

Canister

Only one manifold shown for clarify

Sampler

Manifold

Valve 1

Valve 2

7. The connection to the canister is shown here both with and without a pressure sensor and no manifold. The inlet of the valve should be the high pressure (atmosphere) side and the outlet of the valve should be the low pressure (vacuum) side of the valve.

Without Pressure Sensor

With Pressure Sensor

8. After hooking everything up, test the valves and pressure sensors described in the USB configuration guide. After testing is complete, be sure to close all the valves and open the manual canister valve. The valves have been leak tested at the factory but final leak testing is the responsibility of the customer.

USB COMMUNICATION & CONFIGURATION MODE (SENSOR)

The SPOD units allow for the reconfiguration of several parameters pertaining to the operation of system. Adjustment of these parameters is only accessible for a short period of time after powering on the sensor (~10s). These parameters are stored in non-volatile memory and are retained during subsequent power cycling. Documentation of these parameters is listed below.

REQUIRED COMPONENTS:
- SPOD Unit
- USB data cable
- Computer with a serial port terminal software program (e.g. CoolTerm)

SENSOR QUICKSTART INSTRUCTIONS
1. Connect the USB cable to the SPOD and computer and establish the communication link in the terminal software.

2. Turn on power switch and observe initialization process. After initializing the micro-controller and printing SPOD information, the system will system will prompt the user to: "Enter Configuration Mode? (YES)"

3. Configuration mode allows access to configuration settings and system settings. To enter configuration mode type Yes at the prompt and hit enter. The menus are all text-based and easy to follow. The following list contains all the adjustable within the menu:

MENU ITEM	DESCRIPTION	LOCATION
Cellular	Common setting	Root Menu
Default	System Default Settings	Root Menu
Display	Prints Current Settings	Root Menu
GPS	GPS Settings	Root Menu
Heat	Sensor Heater Settings	Root Menu
Baseline	Sensor Offset Setting	Root Menu
Output	Sensor Output Behavior	Root Menu
Power	Power Settings	Root Menu
PID	PID Sensor Setting	Root Menu
Sample	Sample Collection Setting	Root Menu
Time	Time Settings	Root Menu
Trigger	Sample Trigger Settings	Root Menu
Exit	Exit Menu	Root Menu

DETAILED ROOT MENU INFORMATION

CELLULAR: Contains all settings associated with the cellular modem. This is required for communication with any online servers.

DEFAULT: Resets all options to the factory default. Not recommended without consulting Sensit.

DISPLAY: Displays all current settings in the terminal window. An example print out is shown below. Please not that system settings may differ from device to device depending on the application.

System DATE,08/09/19 11:57:06
Sensor ID: SPOD00100
Battery Voltage: 13.74
Power Source: AC Power
Output Mode: Streaming
Communication Mode: Cellular
Network Selection: Automatic
Cellular Protocol: MQTT v3.1.1 with TLS
Publish Topic: "devices/SPOD00100/messages/events/"
Subscribe Topic:
Output Data Rate: 10
Cellular Output Ratio: 120
Server Address: sensit-test-hub.azure-devices.net
Access Point Name: zipitwireless.com.attz
GPS Mode: Interval
Sensor Heater: Enabled
Temp Set: 15
Dew Point Control: Disabled
Humidity Threshold: 80
Temp Set: 15
PID1 Offset Value (ppb): 0.00
Sample Trigger Value (ppb): 500
Trigger Average Time (sec): 10
Sample Collection Time (sec): 30

GPS: "ENABLE" or "DISABLE" the GPS. Depending on the cellular data protocol and output mode, the user may be presented with additional options. If cellular output is disabled or if PERIODIC protocol is selected the GPS mode will default to SINGLE (see below). If cellular output is enabled **and** MQTT or HTTP protocol are enabled the user can select between the following GPS settings:

"CONSTANT": GPS is always on and fixing position (Highest power draw)
"INTERVAL": GPS turns on at and interval determined by "RATIO"x"ODR"
"SINGLE": GPS turns on at power up and remains off until system is reset

HEAT: Adjust "CONSTANT" or "HUMID" heat settings. The "CONSTANT" setting means that the sensor heater is on at all times if enabled. The "HUMID" setting means that the sensor heater is on only if humidity exceeds a predefined threshold. If either option is enabled the user will be prompted to adjust the heater setpoints and for the "HUMID" option the user will be prompted to adjust the humidity set point. Both options could be enabled simultaneously to produce different heater setpoints depending on the humidity level. "CONSTANT" heat is enabled by default at 15°C above ambient.

BASELINE: "MANUAL" adjustment of the PID sensor baseline up or down by a constant value or enable "AUTOMATIC" baseline adjustment to track baseline downward as sensor ages.

OUTPUT: This menu contains settings that modify the output characteristics of the sensor.

POWER: Select "SOLAR" and "AC" power. If "SOLAR" is selected the unit will try to charge the batteries whenever power is present. If "AC" is selected the system will maintain the battery voltage in the middle of its range to extend battery life. It is very important that "SOLAR" is selected for remote power application.

PID: Allows the user to manually "SET" the number of PID operating hours, "REPLACE" a sensor and reset the hour

counter or define the "ERROR" threshold in mV for a sensor error.

SAMPLE: Control the behavior of the auxiliary port. The port is configured to supply power to a sample collection system if trigger conditions are met.

TIME: Set the system date and time. If cellular is available and automatic date and time is enabled, this will happen automatically when the device connects. Note that the initial data may have the wrong date and time until the clock adjusts.

TRIGGER: Define the required environmental conditions to trigger sample collection.

EXIT: Leave the root menu and starts system operation

DETAILED CELLULAR MENU INFORMATION

MENU ITEM	DESCRIPTION	LOCATION
APN	Carrier APN Setting	Cellular Menu
Credentials	MQTT Username and Password	Cellular Menu
Host	Server Location Address	Cellular Menu
Network	Cellular Network Configuration	Cellular Menu
Protocol	Data Transfer Protocol	Cellular Menu
Ratio	Number of Samples to Buffer	Cellular Menu
Signal	Apply settings and check signal	Cellular Menu
TLS	Activate TLS, Load Server Cert	Cellular Menu
Topics	MQTT Topics	Cellular Menu
Exit	Exit Cellular Menu	Cellular Menu

APN: Set the required APN for data access on the installed sim card. Please note that the APN text entry might be case sensitive for your network provider.

CREDENTIALS: Set the require USERNAME and PASSWORD require for MQTT data access. This menu will prompt the user to type "USERPASS" or "AZUREHUB". To manually configure username and password type "USERPASS". If using Azure IoT hub, type "AZUREHUB" to send SAS token. The SPOD will parse the relevant connection parameters from the SAS token. The SAS token must have the following parameters to be accepted:

SharedAccessSignature sr=<HOSTNAME>%2Fdevices%2F<DEVICEID> &sig=<URI of the resource being accessed, HASH > &se=<Token Expiry Time, Epoch Time>

HOST: Set the server address to send the data to. The target server must be configured to accept the data.

NETWORK: Define network behavior of the cellular module. AUTO mode is enabled by default and under most circumstances will work well. If required it is possible to force the modem to only look for "CAT M1", "GLOBAL", "NB IoT", or "2G" service instead of scanning for all network options. It is required to run "SIGNAL" option after adjusting network settings. Contact Sensit for more information and do not make changes to this parameter unless directed.

PROTOCOL: Set the cellular data communication protocol to the following options:

- **"HTTP"**: Transfers data using HTTP Post protocol constantly at interval determined by the output data rate (ODR)

- **"MQTT"**: Transfers data using MQTT publish constantly at interval determined by the output data rate (ODR)
- **"PERIODIC"**: Buffers data according to the "RATIO" setting at the output data rate. After the required number of samples has been collected the modem will turn on, post all data, and then turn off. The interval of cellular cycles is determined by "ODR" x "RATIO"

RATIO: Set the number of required samples between cellular cycles for the "PERIODIC" cellular protocol. This value also influences GPS signal acquisition interval for certain modes. See information of GPS for more info.

SIGNAL: Acquire cellular signal strength and network registration status. This option also programs the modem with any changes to the NETWORK mode. After 10-15 seconds the serial terminal should display "CSQ: X,Y CREG Status: Z". A description of X,Y, and Z follow below.

- **X**: (0-31,99) defines the signal strength
- **Y**: (0-7, 99) defines the data error rate
- **Z**: (0-5) defines the network registration status

X VALUE		
CSQ	DBM	MEANING
0	<-113	Absolutely no Signal
1	-111	Very Weak Signal
2-10	-109 to -93	Weak Signal
10-20	-81 to -73	Moderate Signal
21-30	-71 to -53	Strong Signal
31	>-51	Very Strong Signal
99	?	Unknown/Not Detected

Y VALUE	MEANING
0-3	Reliable Data Link 4-5
4-5	Occasional Dropped Posts
6-7	Unreliable Data Link
99	Unknown/Not Detected

Z VALUE	MEANING
0	Not registered, Not Searching
1	Registered Successfully
2	Not registered, Searching
3	Registration Denied
4	Unknown Status
5	Registered Successfully, Roaming

TLS: Enable or disable TLS encryption for HTTPS or MQTTS. For TLS authentication the user must load a root certificate file for the server on the microSD card. The certificate file **must** be named "CACERT.CER". If TLS is enabled the terminal should display:

TLS Eanbled...Waiting to Load Cert
Deleting Old Files
Loading New Cert From SD
Cert File Found
+QFUPL: 1311,3f41

OK

Please note that the values after "+QFUPL" are different for different certificate files. The first number is the number of bytes and the second number is a checksum. The same cert file should always generate the same number of bytes and checksum. If errors are observed verify that the certificate file is loaded on the microSD card and properly named.

TOPICS: Set the publish and subscribe topic used for MQTT cellular protocol.

EXIT: Leave the cellular configuration menu and enter the root menu

DETAILED OUTPUT MENU INFORMATION

MENU ITEM	DESCRIPTION	LOCATION
Mode	Output Mode Settings	Output Menu
ODR	Data Rate Setting	Output Menu
POLL	Output When Polled (any char)	Output Menu
STREAM	Output Continuously	Output Menu
EXIT	Exit Output Menu	Output Menu

MODE: Sets the communication mode of the SPOD. The following options are possible:

"Cellular": Sends data with cellular modem at ODR and USB/Power port at 1Hz "USB": Sends data with USB/Power Port at 1Hz "XBEE": Sends data with XBEE (optional) at ODR and USB/Power port at 1Hz

ODR: Sets the output data rate of the cellular modem or XBEE wireless device. The USB port will always show data output at 1Hz

POLL: Disable streaming over USB/Port and XBEE. SPOD will return data when receiving any character from control device.

STREAM: Continuous USB and XBEE data output at 1Hz.

EXIT: Leave the output configuration menu and enter the root menu

DETAILED SAMPLE MENU INFORMATION

MENU ITEM	DESCRIPTION	LOCATION
SAMPCONFIG	Configure Sampler	Sample Menu
SAMPDELAY	Sample Delay Time	Sample Menu
SAMPRESET	Reset Sampler Status	Sample Menu
SAMPTEST	Manually Test Sampler	Sample Menu
SAMPTIME	Sample Acquisition Time	Sample Menu
SAMETYPE	Type of Sampler	Sample Menu
EXIT	Exit Sample Menu	Sample Menu

SAMPCONFIG: **WARNING, this will erase sample configuration and will need to go through programming the following steps.** System will prompt for all canister locations. (e.g. 123 or 1,2,3 or Port 1 Port 2 Port 3, it doesn't matter). It will show the ports that have been selected and will next prompt the user to define sampling events up to the number of canisters present. Please note a single event could be to trigger a single canister or it could be to trigger multiple canisters. Type the canister(s) you want to trigger first and continue until all canisters have been accounted for. **NOTE**, you must program events or no sampling can take place.

SAMPDELAY: This option is used to program a delay after startup where events are ignored. This is helpful if sensor has been shut down or was exposed to high VOC concentrations. This will let the sensor stabilize before triggering any samples. This will also allow bump tests after powering up and will avoid unintentional sample acquisition.

SAMPRESET: This option is used to reset a canister status after changing the canister. The user will be prompted to type the port number that requires a reset. (e.g. 123 or 1,2,3 or Port 1 Port 2 Port 3, it doesn't matter).

SAMPTEST: This option is used to verify communication with the valve controller and test valves opening and closing. Recommended prior to any deployment. The system will prompt the user to type "'P#:1' to Open Valve 'P#:0' to Close Valve 'TEST#:1' for Pressure On 'TEST#:0' for Pressure Off (#=1,2,3,4) or EXIT" For example to manually open Port 1 the user would type "P1:1" and to manually close Port 1, the user would type "P1:0". If a pressure sensor is installed the user can test using the "TEST" command to output the pressure in PSI similar to the port test command.

SAMPTIME: Sets the duration of the sample grab. Adjustable between 1-100,000 seconds. This is adjustable for every single port location. This could be due to different canister sizes or sample flow rates.

SAMPTYPE: This option defines the type of sampling, "DIRECT, NONE, PRESSURE, or TIME". "DIRECT" would be a non-latching valve hooked directly up to the auxiliary port. This requires a 12V valve and is switched with a 3.3V digital output. Valve must be isolated from SPOD. "NONE" is no sampler hooked up. This should be selected if not using a sampler to avoid and initialization error upon startup. "PRESSURE" is configured to allow the valve controller to hook up a pressure sensor to monitor canister pressure and stop sampling at a predefined threshold (-2.5 PSI) and is only relevant for deployments with pressure sensors. For pressure sampling, the SAMPTIME setting becomes a timeout value and the sampling will cease if the timeout is reached. "TIME" is sampling for a given amount of time as defined by SAMPTIME.

EXIT: Leave the sample configuration menu and enter the root menu.

DETAILED TIME MENU INFORMATION

MENU ITEM	DESCRIPTION	LOCATION
AUTOTIME	Enable/Disable Autotime	Time Menu
TIMEZONE	Select LOCAL or UTC Timezone	Time Menu
SET	Set Date and Time	Time Menu

AUTOTIME: Autotime sync uses the network time provided by the cellular module if available. For some cellular network SIM card combinations, the provided time can be incorrect and should be disabled to avoid time errors.

TIMEZONE: "LOCAL" or "UTC" The time can be reported as local time according to the location of the device or UTC time.

SET: Allows user to manually set date and time. The indicated format must be followed exactly with no exceptions and all numbers must be padded with 0's as required. The specified format is:

MM/DD/YY HH:MM:SS (e.g. 01/01/20 00:00:01)

DETAILED TRIGGER MENU INFORMATION

MENU ITEM	DESCRIPTION	LOCATION
TRIGCONFIG	Configure Trigger Settings	Trigger Menu
TRIGTYPE	Set Trigger Type	Trigger Menu
EXIT	Exit Trigger Menu	Trigger Menu

TRIGTYPE: This option allows the user to define the type of trigger that is used to initiate a sampling event. The most basic trigger is the "THRESHOLD" option which will trigger on a set PPB level for a set time. The "WIND" option triggers using wind direction and wind speed only. The "COMBO" option uses both Wind Direction/Speed and PPB level. Lastly the QUADRANT option (Must have 4 independent canisters. Samples designated canister for North, East, South, and West). Your units are configured for "THRESHOLD" per the bid requirement.

TRIGCONFIG: Settings for the given "TRIGTYPE". For THRESHOLD it is ppb value and the time above the threshold. For WIND it is the minimum wind speed and direction range. For COMBO there are 3 Ranges for the combination trigger "LOW", "MED", "HIGH". Every wind speed range can have different direction ranges and concentration thresholds and all ranges must be programmed. Carefully follow the prompts.

EXIT: Leave the trigger menu and enter the main menu.

SENSOR MAINTENANCE AND CALIBRATION

PERIODIC MAINTENANCE: The SPOD is a low maintenance device and is designed to operate remotely with no user intervention. Occasional inspections for damage and cleanliness are recommended to maintain optimum performance.

SENSOR CALIBRATION: Depending on application requirements and environmental conditions, periodic calibrations may be required to maintain target accuracy. Contact Sensit for ordering calibration gases, calibration hardware, and calibration instructions.

SENSOR REPLACEMENT: The PID sensor assembly is designed to be field replaceable. Sensit recommends factory service when replacing the sensor to ensure overall sensor performance. Contact Sensit for more information.

HARDWARE AND SOFTWARE INSTALLATION GUIDE

1. Download drivers for FTDI Serial Adapter and install drivers

   http://www.ftdichip.com/Drivers/VCP.htm

2. Open serial terminal program of your choice. CoolTerm is recommended and instructions for using CoolTerm are found below. CoolTerm is available for Windows, Mac, and Linux. CoolTerm can be downloaded for free from here: http://freeware.the-meiers.org/
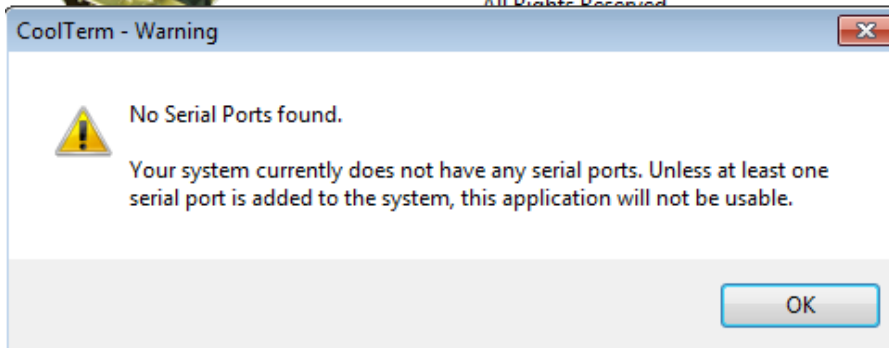
   1. Extract 'Software_CoolTerm' to the directory of your choosing. To avoid certain permissions issues do not extract into "Program Files". It is recommended to extract to the desktop if possible.

   2. Open the 'CoolTerm' application. You may receive an error indicating that no serial ports are found depending on what is hooked up to the computer. Click okay to continue.

**CoolTerm**

Version 1.4.6 (Build 322)

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CoolTerm - Warning

⚠ No Serial Ports found.

Your system currently does not have any serial ports. Unless at least one serial port is added to the system, this application will not be usable.

OK

3. Click 'Options' as shown below

   a. 'Serial Port' options should open by default. If not, select Serial Port options from the list of available options as shown below. All default options should be correct but please verify. Click on 'Port' dropdown list and make note of any available ports. Plug in the USB cable and wait for hardware installation to finish. Click "Re-Scan Serial Ports". The newly added port is the USB cable. Select this port.
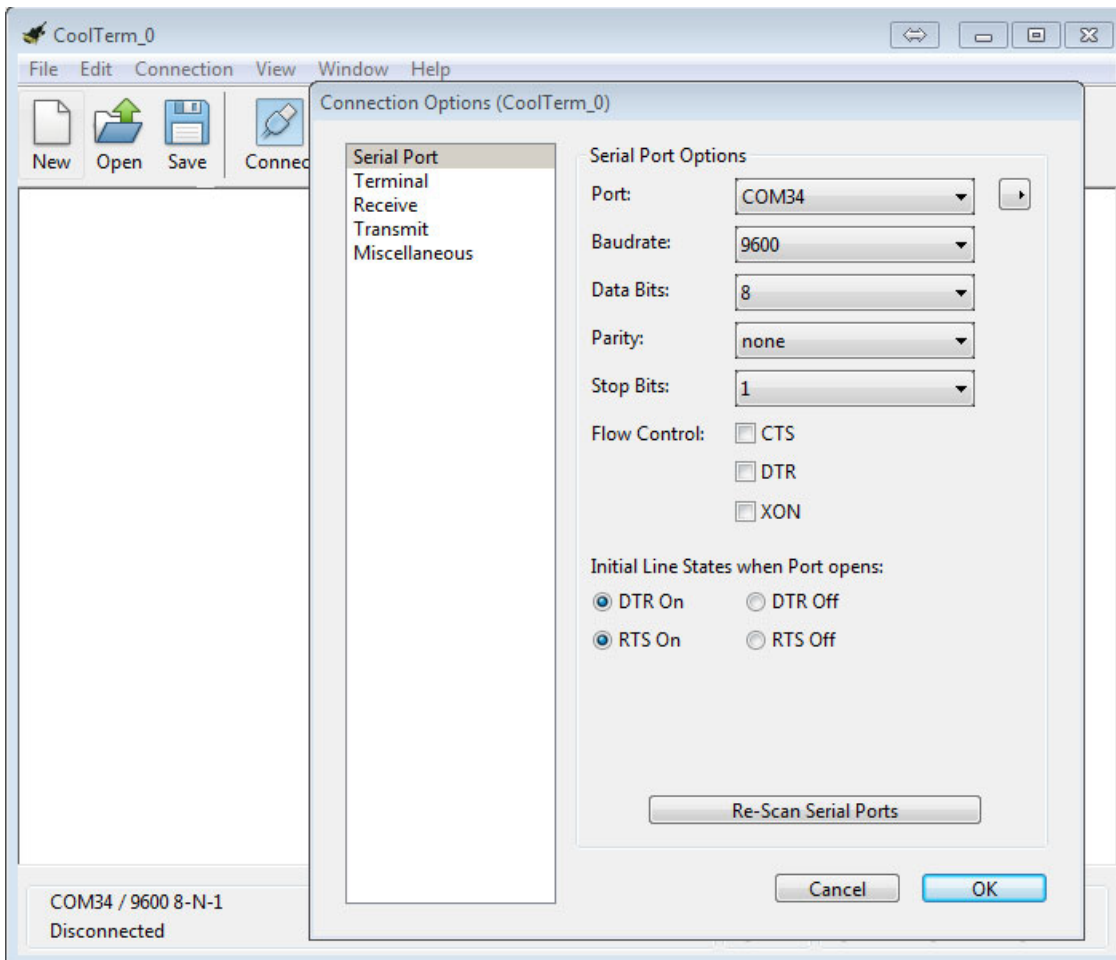
b. Select 'Terminal' options from list of available options and select 'Line Mode' as shown below. Line mode adds a text entry bar at the bottom of the screen that is useful for sending commands to the connected sensor.
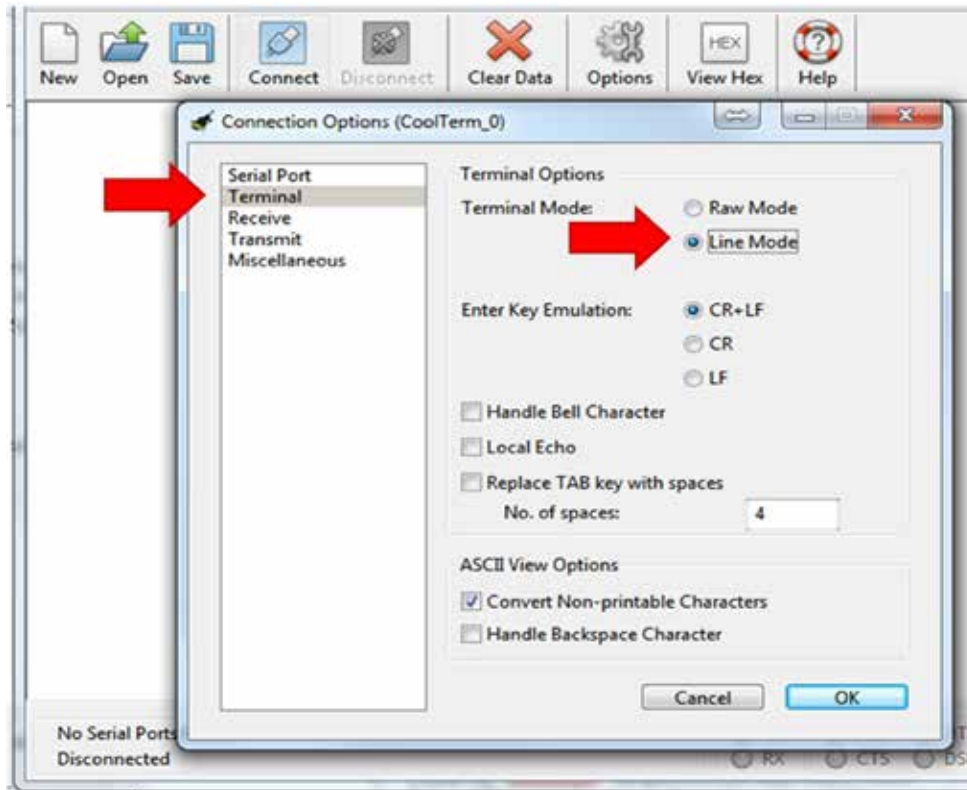

c. Select 'Receive' options from list of available options and check "Ignore Receive Signal Errors". Selecting this option reduces the possibility of the serial connection closing upon a received serial error such as connecting or disconnecting the cable or power cycling the unit.
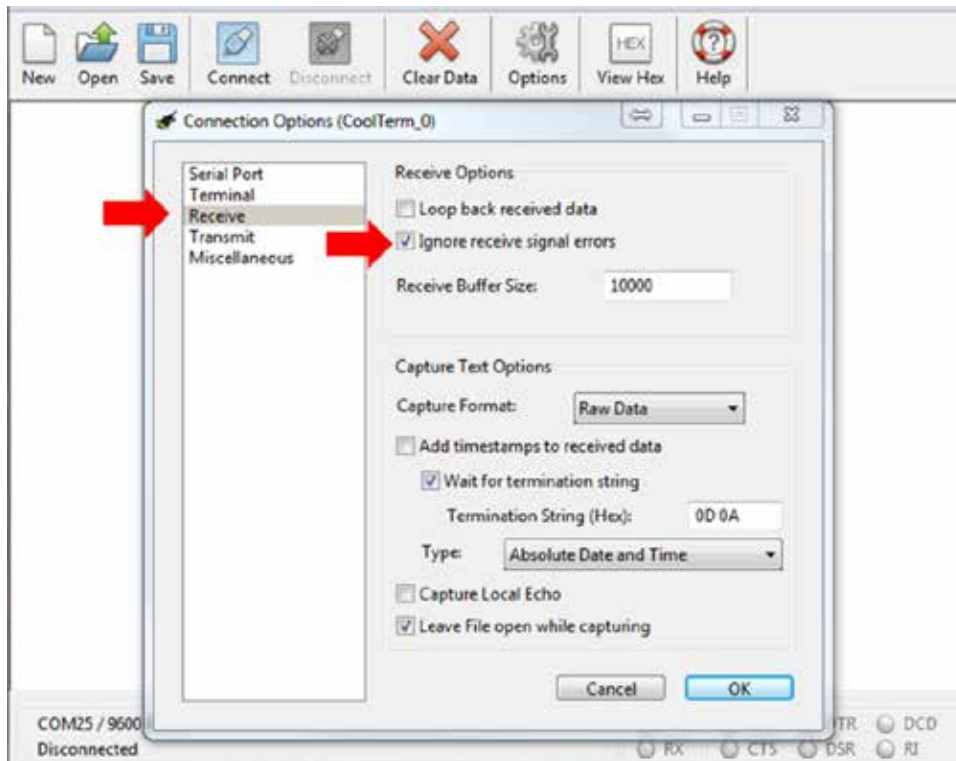
4. To avoid having to configure the terminal every time you open it, you have 2 options to save the configuration as shown in Figure 4.

   a. Click "Save As" and save the connection settings as a file that you can share or store on the computer

   b. Click "Save As Default" to change these settings to the default settings when starting the program. If you are running off the CD this option will give you an error as there is no default file.
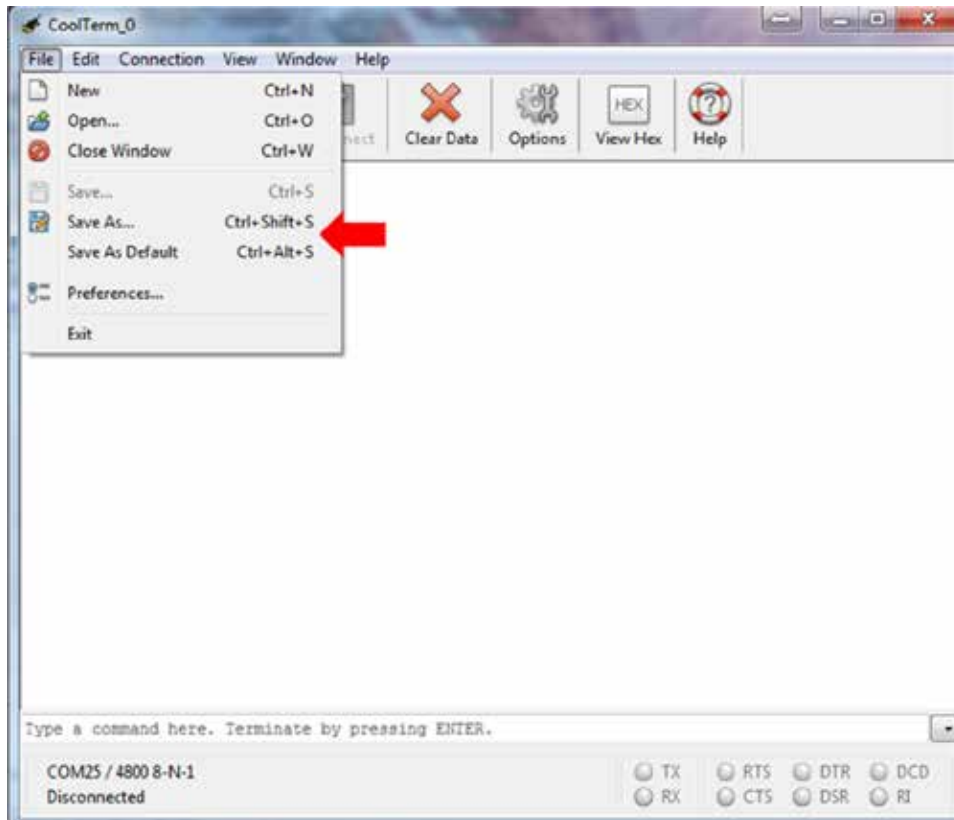
5. Coolterm can be configured to record all data received over serial. This will be useful for evaluation purposes.

   a. To start a capture go to 'Connection' dropdown menu ➔ Capture to Textfile➔ Start or hit Ctrl-R (⌘-R). Enter a file name and click save.

   b. To stop the capture navigate back to the menu entry and click stop or hit Ctrl-Shift-R (⌘-Shift-R)
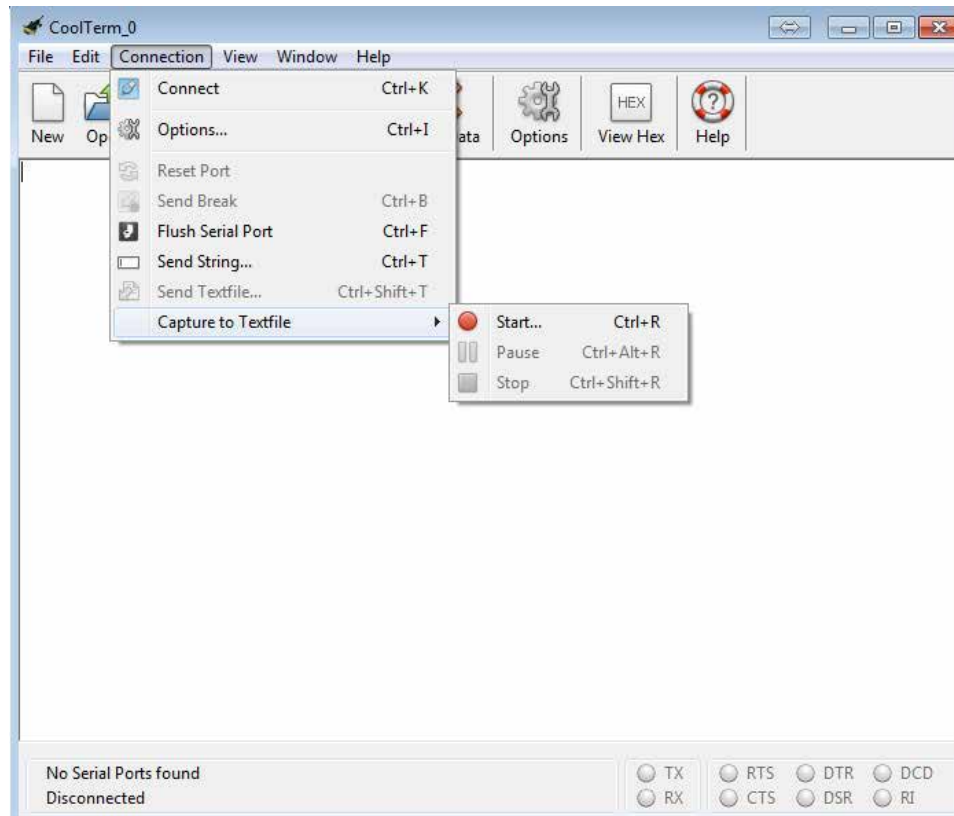
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WARRANTY

Your **SENSIT® SPOD** is warranted to be free from defects in materials and workmanship for a period of one year after purchase. If within the warranty period the instrument should become inoperative from such defects the instrument will be repaired or replaced at our option. This warranty covers normal use and does not cover damage which occurs in shipment or failure which results from alteration, tampering, accident, misuse, abuse, neglect or improper maintenance. Proof of purchase may be required before warranty is rendered. Units out of warranty will be repaired for a service charge. Internal repair or maintenance must be performed by a Sensit Technologies authorized technician. Violation will void the warranty. Units must be returned postpaid, insured and to the attention of the service department for warranty or repair.

This warranty gives you specific legal rights and you may have other rights which vary from state to state.

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WITH GLOBALLY SOURCED COMPONENTS

SENSIT

by CROWCON