SENSIT

by ▶CROWCON

OPERATION & CONFIGURATION* GUIDE
READ AND UNDERSTAND INSTRUCTIONS BEFORE

CONTENTS

RAMP SENSOR OVERVIEW & SPECIFICATIONS

GENERAL

OVERVIEW	PARAMETER
Weight	Base unit: 7.5 lbs
Dimensions	Fully assembled without anemometer or antenna[1] D x W x H (5" x 10" x 12")
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	3-15 days battery backup[2]
Operating Temp	-20°C to 50°C
Data Outputs	• Digital wired output (3.3V TTL - USB) • Wireless (3G Cellular Included)3 • Optional analytics on server4 • SD card data backup5

NOTES:

1. The anemometer is to be mounted separate to a pole. Could be same pole as sensor.

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

3. Requires SIM card and suitable data plan on AT&T or T-Mobile

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 after inserting an SD card, power down the sensor and turn back on.

SENSORS

OVERVIEW	PARAMETER
CO Detection Range	100 ppb – 25 ppm
CO Accuracy	+/- 100 ppb min or 20%
NO Detection Range	20 ppb – 25 ppm
NO Accuracy	+/- 20 ppb min or 20%
NO_2 Detection Range	20 ppb – 25 ppm
NO_2 Accuracy	+/- 20 ppb min or 20%
O_3 Detection Range	20 ppb – 25 ppm
O_3 Accuracy	+/- 40 ppb min or 50%
CO, NO, NO_2, O_3 Response Times	60-90 seconds [1]
CO, NO, NO_2, O_3 Detection Method	Electrochemical
CO_2 Detection Threshold	100-2000 ppm[2]
CO_2 Accuracy	+/- 200 ppm min or 20%
CO_2 Response Time	15-30 seconds
CO_2 Detection Method	NDIR Optical
PM2.5 Detection Threshold	1 - 1000 µg /m^3
PM2.5 Accuracy	+/- 10 µg /m^3 min or 50%
PM2.5 Response Time	15-30 seconds
PM2.5 Detection Method	Laser Scattering
Periodic Maintenance	Periodic cleaning of sensor openings of dust, zero point calibration, and single point calibration. User replacement of sensors is easily performed as needed.
Additional Included Sensors	Additional sensors can be added (external ports)[3]

NOTES:

1. If the unit has been off for an extended period of time, it will take approximately 12-24 hours for the electrochemical sensors to stabilize completely.

2. There are additional CO_2 sensors available with identical form factors if higher concentrations (e.g. 10,000 ppm) are determined to be necessary.

3. The anemometer that is designed to work with the RAMP is the Davis Vantage Pro 2 Anemometer (https://www.davisinstruments.com/product/anemometer-for-vantage-pro2-vantage-pro/)

SENSOR EXTERIOR FEATURES (FRONT EXTERIOR)

Front View

Top Side

Antenna

Left Side

Right Side

Bottom Side

SENSOR EXTERIOR FEATURES (BACK SIDE EXTERIOR)

Back Side

Antenna

Mounting
Holes

SENSOR EXTERIOR FEATURES (LEFT SIDE EXTERIOR)

Left View

Antenna

Power Switch

Power/USB

USB/Power
Port

SENSOR EXTERIOR FEATURES (RIGHT SIDE EXTERIOR)

Right View

Auxiliary Device Ports

Port 2

Port 4

Port 1

Port 3

Vent for PM2.5 Sensor

Port 1
Anemometer

Antenna

SENSOR EXTERIOR FEATURES (BOTTOM EXTERIOR)

CO_2 Sensor

PM2.5 Sensor
(Vent Not Shown)

Electrochemical Sensors

NOTE: Do not obstruct sensor openings. User must install sensor enclosure with sensor openings facing downward to avoid water and debris accumulation.

SENSOR FEATURES (FRONT INTERIOR)
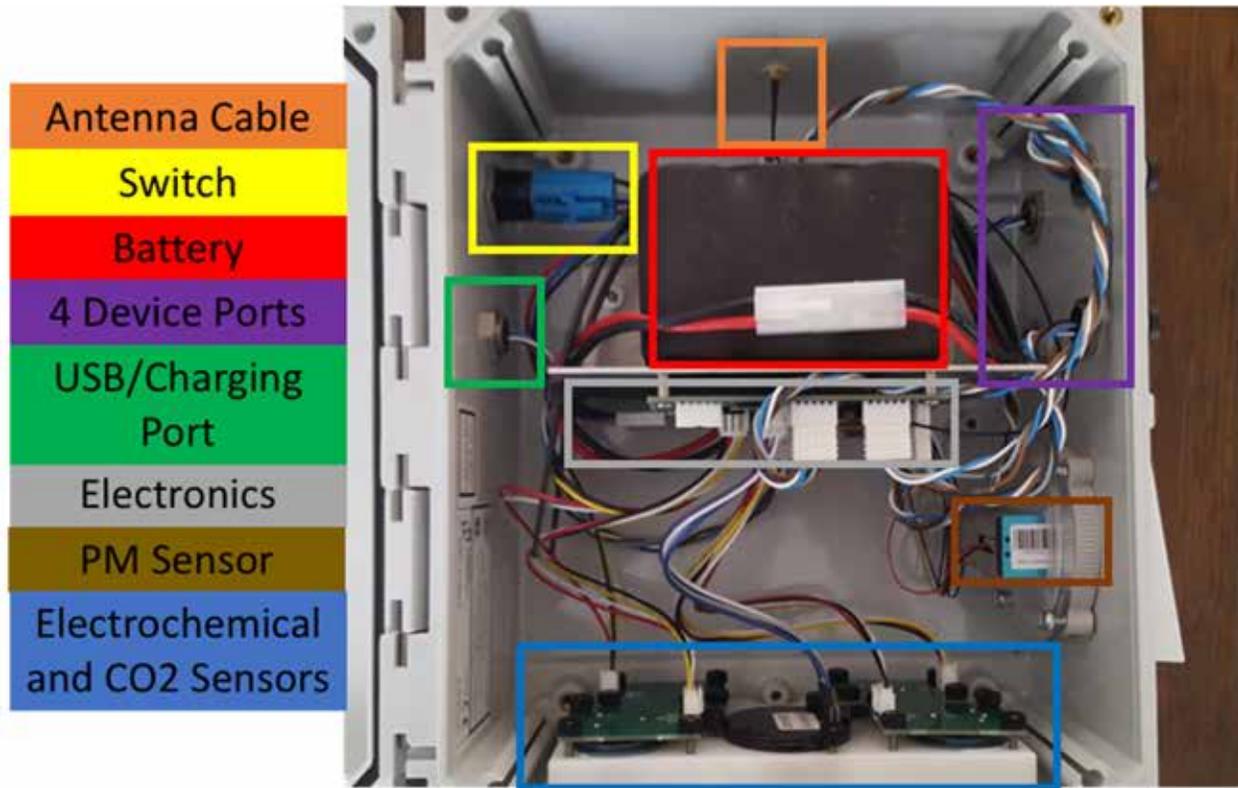
QUICK START DEPLOYMENT GUIDE

It is recommend 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).

1. 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.

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

3. Enter into USB mode from startup or from configuration menu. Verify the sensor outputs are reasonable or trending toward reasonable values keeping in mind the stabilization time for the electrochemical sensors. The output format is shown below:

HEADING	DESCRIPTION	UNITS/FORMAT
DATE	Local Date and Time	MM/DD/YY HH:MM:SS (24H)
CO	CO	PPB
NO/SO2[1]	NO/SO_2	PPB
NO2	NO_2	PPB
O3	O_3	PPB
CO2	CO_2	PPM
T	Temperature	°C
RH	Relative Humidity	%

PM1	PM1.0	$\mu g / m^3$
PM2.5	PM2.5	$\mu g / m^3$
PM10	PM10	$\mu g / m^3$
Port 1 [2]	External Module	Appears only if attached
Port 2 [2]	External Module	Appears only if attached
Port 3 [2]	External Module	Appears only if attached
Port 4 [2]	External Module	Appears only if attached
WD	Wind Dir	Degrees from North
WS	Wind Speed	Mph
BATT	Battery Voltage	Volts (4.2 - 3.4V)
CHRG	Charging Current	mA
RUN	Run Current	mA
SD	SD Status	(1 – OK, 0 – refer to STAT)
RAW	Raw sensor signals	$CO, NO/SO_2, NO_2, O_3$
STAT	System Information	*See Below*

4. The heading 'STAT' contains diagnostic information detailed below:

STAT = HEX1, HEX2, HEX3, (EXTENDED INFO)

HEX1 BIT	DESCRIPTION
0	SD Init Status (0 – Init Failure, 1 – Init Success)
1	SD Card Presence (0 – Not Installed, 1 – Installed)
2	SD Write Status (0 – No Error, 1 – Write Error)
3	Temp Flag (1 – Normal, 0 – Low Temp)
4	Charge Status (0 – Charge On, 1 – Charge Off)
5	CO2 Connection Status (0 – Not Installed, 1 – Installed)
6	PTR 1 Connection Status (0 – Not Installed, 1 – Installed)
7	Always Zero

HEX2 BIT	DESCRIPTION
0	CO Read Error (0 – OK, 1 – Error)
1	NO/SO2 Read Error (0 – OK, 1 – Error)
2	NO2 Read Error (0 – OK, 1 – Error)
3	O3 Read Error (0 – OK, 1 – Error)
4	Port 1 Connection Status (0 – Not Installed, 1 – Installed)
5	Port 2 Connection Status (0 – Not Installed, 1 – Installed)
6	Port 3 Connection Status (0 – Not Installed, 1 – Installed)
7	Port 4 Connection Status (0 – Not Installed, 1 – Installed)

HEX3 BIT	DESCRIPTION
0	Port 1 Power Status (0 – Power Off, 1 – Power On)
1	Port 2 Power Status (0 – Power Off, 1 – Power On)
2	Port 3 Power Status (0 – Power Off, 1 – Power On)
3	Port 4 Power Status (0 – Power Off, 1 – Power On)
4	Port 1 Fault Status (0 – No Fault, 1 – Fault)
5	Port 2 Fault Status (0 – No Fault, 1 – Fault)
6	Port 3 Fault Status (0 – No Fault, 1 – Fault)
7	Port 4 Fault Status (0 – No Fault, 1 – Fault)

5. If operating with a weather station, orient the weather sensor such that it is pointing North. Failure to do this will result in arbitrary wind direction.

6. 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 RAMP, then install a power adapter or a solar panel for long term deployment applications.

NOTES:

1. Position 2 is designated for either an NO or SO2 electrochemical sensor

2. The Heading for the ports will be specific to the device that is connected not 'Port #'

USB COMMUNICATION & CONFIGURATION MODE (SENSOR)

The RAMP sensors 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:
- Sensor
- USB data cable
- Computer with a serial port terminal software program (e.g. CoolTerm)

SENSOR QUICKSTART INSTRUCTIONS

1. Connect the USB cable to the RAMP and computer and establish the communication link in the terminal software.

2. Turn on power switch and observe initialization process. After initializing the microcontroller and printing RAMP information, the system will system will prompt the user to: "Enter Configuration Mode? (YES)" or "Enter Calibration (USB) Mode? (CAL)"

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
CONFIG	Common settings	Root Menu
DISPLAY	Prints device settings	Root Menu
LOG	Allows user to save message	Root Menu
SYSTEM	System settings	Root Menu
APN	Cellular Data APN	Config Menu
FILTER ECHEM	Filter Settings	Config Menu
PM	PM Device Settings	Config Menu
IDNUM	Device ID Number	Config Menu
INTERVAL	Output Interval	Config Menu
RATIO	Points Between Cell Post	Config Menu
SERVER	Server Address for Cell	Config Menu
TIME	System Time	Config Menu
AUTORANGE	Automatic ADC Selection	System Menu
AUTOTIME	Automatic Cell Time Sync	System Menu
DEBUG	Enable verbose USB Output	System Menu
DEFAULT	Reset all settings	System Menu
ECHEM	Sensor Parameters	System Menu
ECHEMPARAM	Display echem parameters	System Menu
OFFSET	Offset and slope settings	System Menu
OFFSETPARAM	Display offset/slope	System Menu
GSM	GSM Test and Info	System Menu
SIGNAL	Cell signal acquire and test	System Menu
USB	Toggle remote/local mode	System Menu
WIND	Wind sensor settings	System Menu

NOTE: With the exception of DEBUG option, all changes made within menu are stored in NVRAM and will be retained on power cycling

4. Calibration mode allows the user to observe a continuous sensor output as well as calibrate the zero and slope of the following sensors: CO, NO, NO2, O3,CO2, PM2.5 reading. Calibration mode is temporary and will be lost upon a system power cycle. To enter calibration mode type Cal at the prompt.

   • To set new zero level expose the sensor to zero air and type the following: CO:zero, NO:zero, NO2:zero, O3:zero, CO2:zero, or PM25:zero

   • To calibrate the sensor to a known level of target gas replace 'zero' with the actual ppb reading for CO, the actual ppm reading for CO2, or the µg /m3 reading for PM2.5

   (e.g. CO:10000 would calibrate to 10000 ppb CO, CO2:1500 would calibrate 1500 ppm CO2, or PM25:20 would calibrate 20 µg /m3)

   NOTE: Please allow 1-2 outputs for the sensor reading to update.

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.
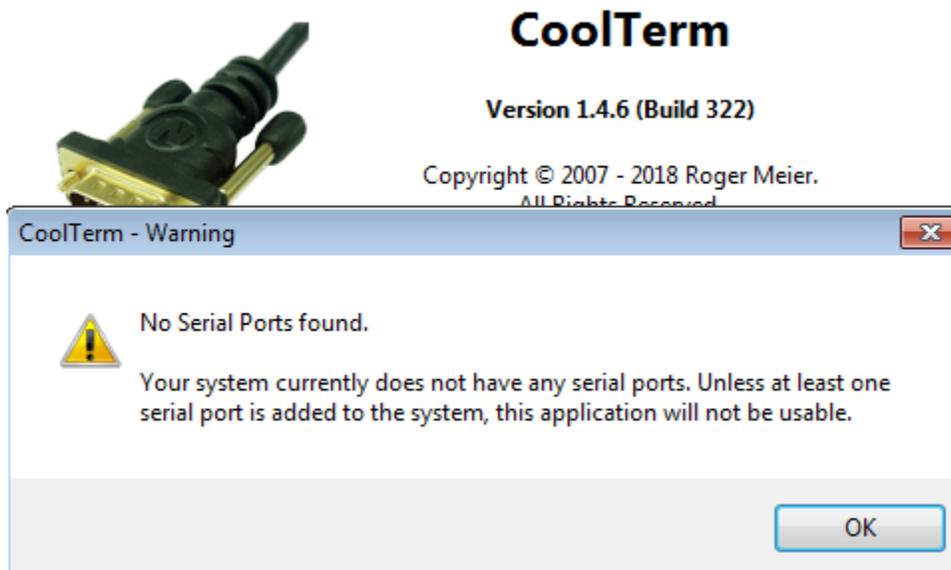
3. Click 'Options' as shown below

   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.
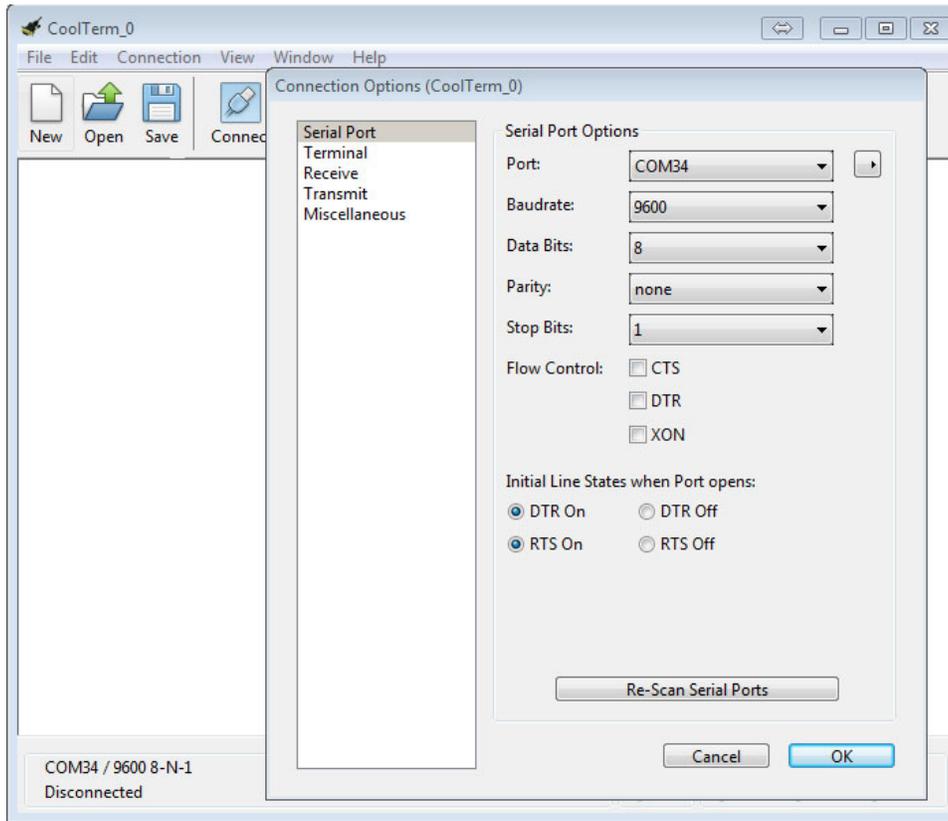
b. Select 'Terminal' options from list of available options and select 'Line Mode' as shown below. Line mode adds a text entry bar at the bottom of the screen that is useful for sending commands to the connected sensor.
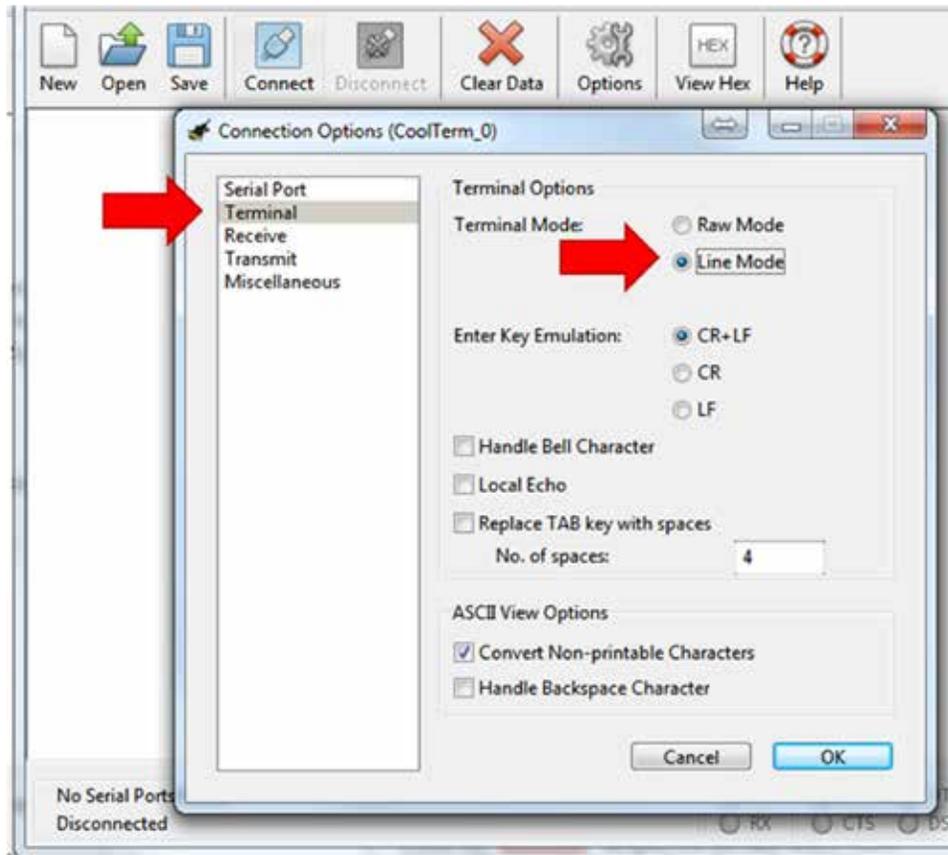
c. Select 'Receive' options from list of available options and check "Ignore Receive Signal Errors". Selecting this option reduces the possibility of the serial connection closing upon a received serial error such as connecting or disconnecting the cable or power cycling the unit.
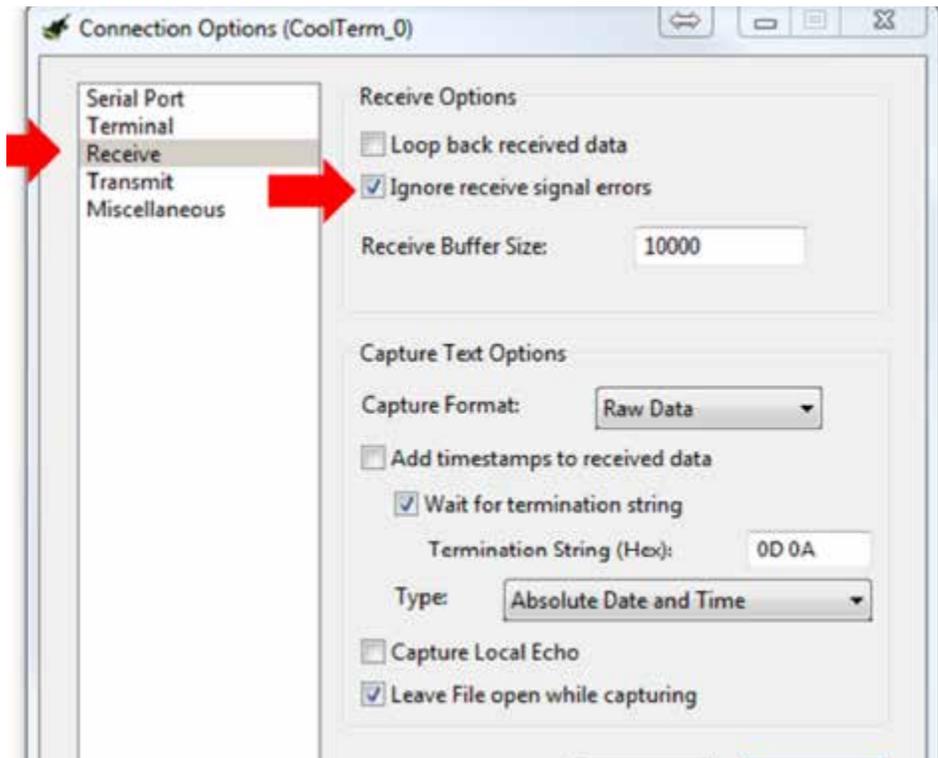
4. To avoid having to configure the terminal every time you open it, you have 2 options to save the configuration as shown in Figure 4.

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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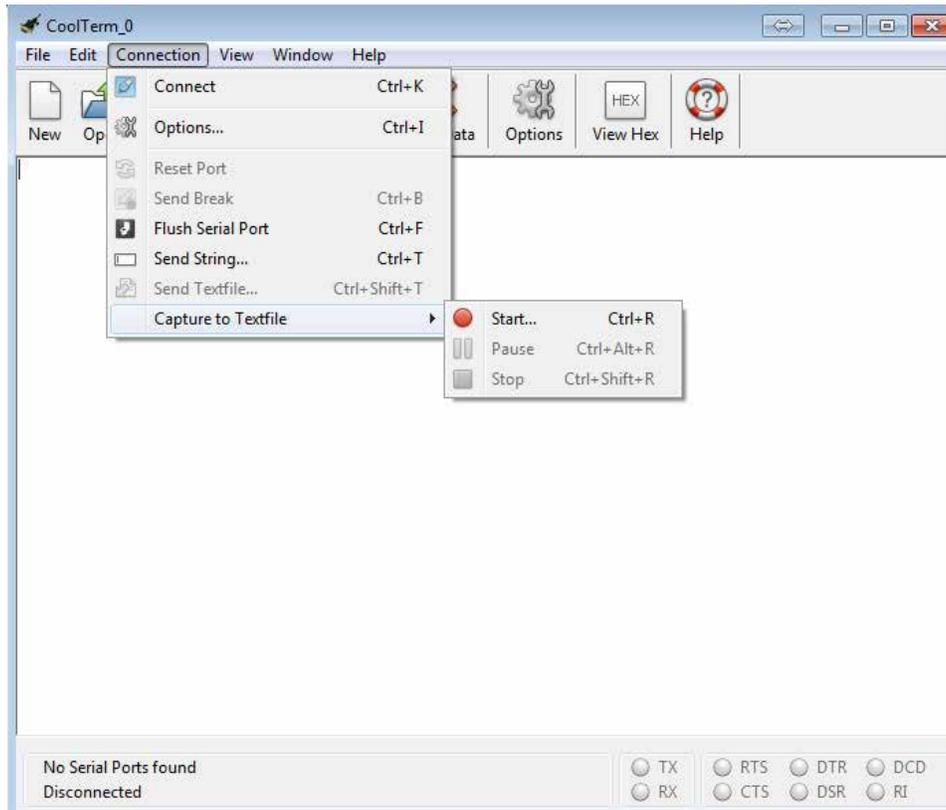
WARRANTY

Your **SENSIT® RAMP** is warranted to be free from defects in materials and workmanship for a period of two years 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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MADE IN THE USA
WITH GLOBALLY SOURCED COMPONENTS

SENSIT® RAMP **Operation Manual**
& Configuration Guide
Part Number: 750-00084
Revision October 1, 2018

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