Climate Sensor & Data Logger

Specifications

Power, GrowNET/MODBUS	24Vdc 1.5W average, 2.5W peak
Power, Analog/4-20mA	24Vdc ~5W
Max Cable Distance	1000 ft
Aspirator	6cfm Fan with Foam Filter
Temperature Range	-20 - 60°C (0 - 140°F)
Temperature Accuracy	±1°C typ ±2°C max
Humidity Range	0 - 100% RH (non condensing) 80% RH Max Operating
Humidity Accuracy	±3% 20-80%
Light Sensor Range	0 - 5000 ppfd (umol/m2/s)
Light Accuracy	±10%
CO2 Range	0 - 40,000ppm (optional)
CO2 Accuracy	±50ppm + 5% of reading
PLIR™ Temperature Range	-40 - 85°C (-40 - 185°F) (optional)
PLIR™ Accuracy	±0.3°C typical
PLIR™ Measurement Angle	37.5° Cone
Protocols Supported	GrowNET™ or MODBUS RTU

Modbus

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KEEP THESE INSTRUCTIONS

This product is intended for commercial use only.

REV 04/26

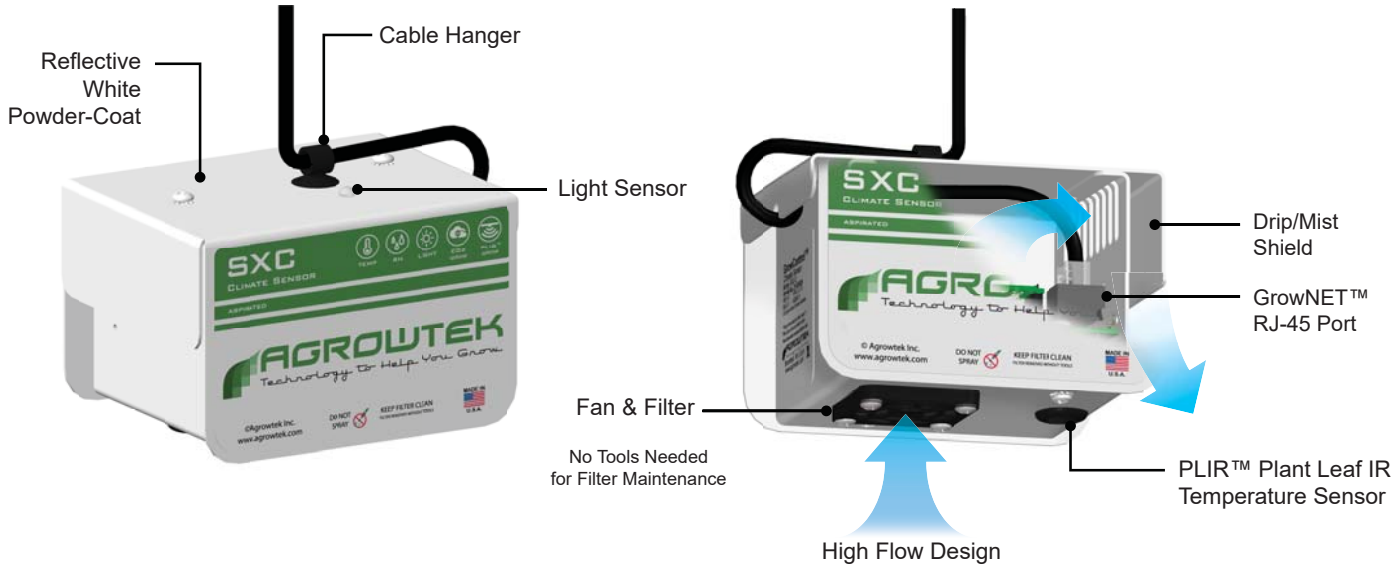
Features

GrowControl™ SXC is a precision agricultural climate sensor featuring temperature, humidity, and ambient light sensors standard. Optional CO2 ppm sensor allows accurate readings up to 40,000 ppm. Optional PLIR™ downward-looking plant-leaf infrared sensor privdes real-time leaf temperatures for VPD measurements.

Compact sensor array features an improved enclosure design for enhanced durability and performance. Fan aspirated for continuous accuracy and protected with a no-tool servicable air filter.

Digital temperature/humidity chip offers high stability and accuracy with specialized filters to protect the sensor element from dew and dust. Integrated light sensor delivers readings in umol/m2/s (ppfd) with ultra-low light sensitivity for detecting light leaks.

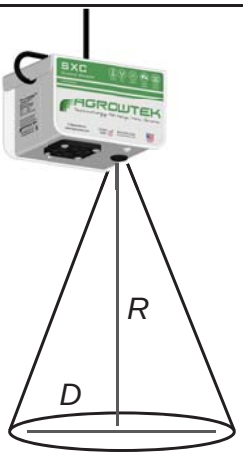
Sensor hangs above the crop canopy and connects to Agrowtek's GrowControl™ GCX Cultivation Controllers as part of a complete facility control solution. Compatible with third-party PLC's and building automation controls with a LX2 ModLINK™ for MODBUS RTU.



PLIR™ Plant Leaf IR Sensor

Units equipped with a PLIR™ sensor should consider the measurement spot size when hanging the sensor above the plant canopy.

The spot size will increase with greater distance to the plant canopy and will be reduced as the canopy grows closer to the sensor unit.



∠ 37.5° Sensor Angle

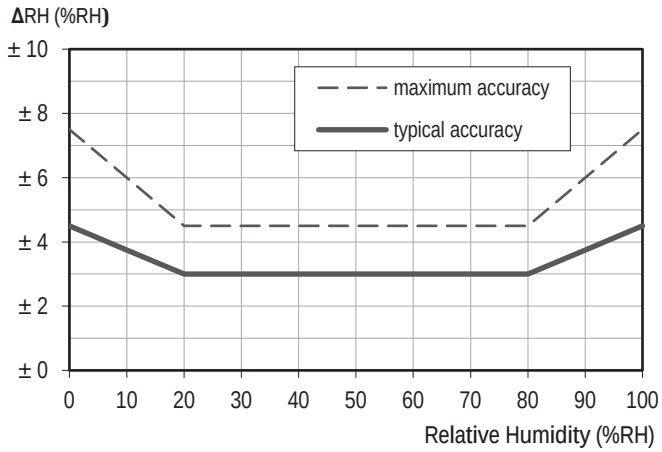
Range (R)	Spot Diameter (D)
12"	8"
24"	16"
36"	24"
48"	32"

Sensor Performance

SXC environment sensors are manufactured with precision digital temperature/humidity sensor chips.

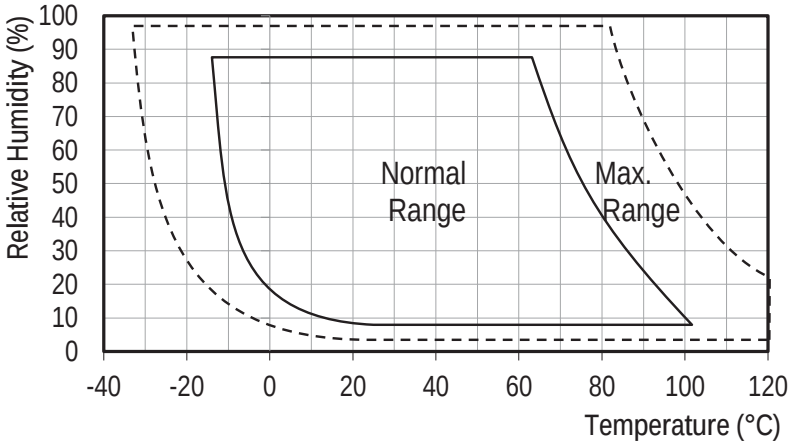
Sensors feature unique protections from condensation for extended sensor life and resistance to high humidity.

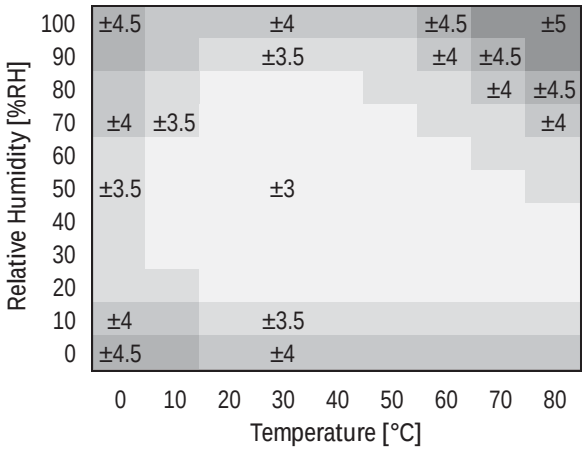
Humidity Sensor Tolerance



Normal Operating Range

The sensor is stable within recommended Normal Range – see below. Long term exposure to conditions outside Normal Range, especially at humidity >80 %RH, may temporarily offset the RH signal (+3 %RH after 60 h). After return into the Normal Range it will slowly return towards calibration state by itself. Prolonged exposure to extreme conditions may accelerate ageing.





Typical relative humidity accuracy at ranges other than 25°C

Warnings & Notices

SXC environment sensors are precision electronic instruments which require attention and care to maintain their accuracy and reliability. Failure to install and operate the equipment properly can cause damange, equipment failure and injury or death.

⚠ READ & UNDERSTAND ENTIRE MANUAL PRIOR TO INSTALLATION OR OPERATION.
Failure to read, understand and comply with warnings and installation requirements may result in property damage, personal injury or death.

⚠ WARNING
Do not use a power supply other than the intended or included power supply. Do not exceed the maximum ratings on the product serial label or specifications listed in this manual. Any power supply with energy levels exceeding the specifications must be current limited or fused to prevent overcurrent to the device.

⚠ NOTICE
Do not spray the sensor with water or chemicals. Protect sensor from direct water exposure. Always cover sensor openings when spraying chemicals or fogging.

⚠ NOTICE
Do not locate the sensor near HVAC vents, humidifiers, or dehumidifiers, lighting equipment, etc. This will cause the sensor to over react and short-cycle hvac equipment.

⚠ NOTICE
GrowNET™ ports use standard RJ-45 connections but are NOT compatible the Ethernet network equipment. *Do not connect GrowNET™ ports to Ethernet ports or network switch gear or equipment damage may result.*

⚠ DIELECTRIC GREASE
Dielectric grease is recommended on RJ-45 GrowNET™ connections when used in humid environments. Place a small amount of grease onto the RJ-45 plug contacts before inserting into the GrowNET™ port.
- Loctite LB 8423
- Dupont Molykote 4/5
- CRC 05105 Di-Electric Grease
- Super Lube 91016 Silicone Dielectric Grease
- Other Silicone or Lithium based insulating grease

⚠ WARNING
Do not drill or cut into the enclosure. Damage to the product from metallic debris or impact from the tool may result.

⚠ WARNING
This product may contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Installation Instructions

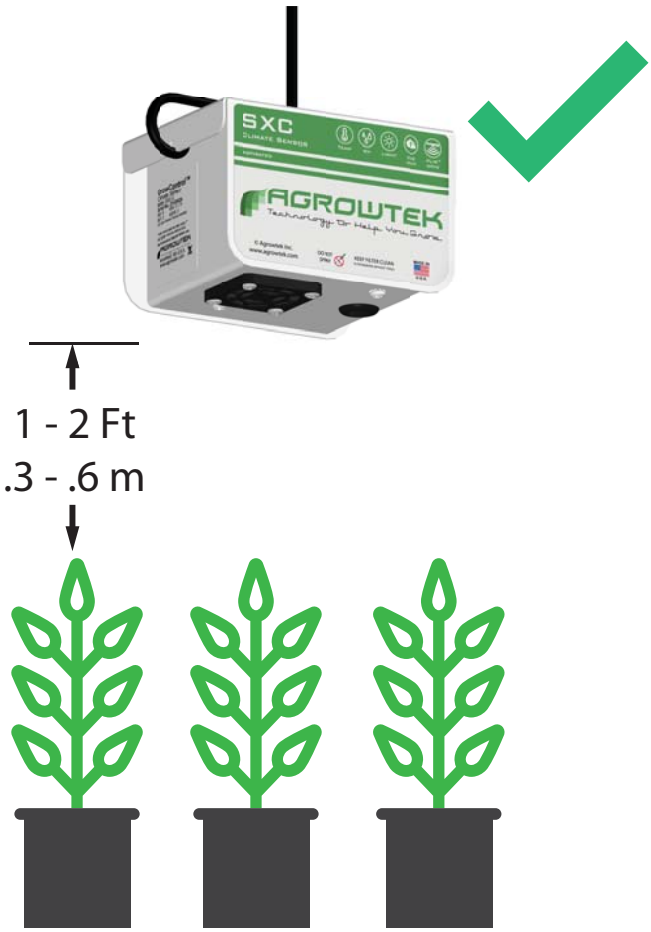
Installation Location Requirements:

- Air must adquately circulated to the sensor and be representative of the environment; avoid corners.
- Do not install near ventilation ducts, doorways, windows, direclty under lights or hot equipment.
- Do not install near mistsers, humidifiers, sprayers or open rain.
- Hang above the canopy approximately 1-2 ft. (0.3-0.6m) using the communication cable.

A cable clamp is installed in the cover for conveniently suspending the sensor from the sensor cable in the middle of the environment. The sensor cable loops back up into the enclosure forming a condensate loop to drip off any water traveling down the cable. The cable is connected inside of the enclosure to protect the connector.

Note the location of the light sensor (top.) Sensor must be installed with the light sensor facing up and the fan facing down to prevent potential water damage from drips and running along the cable. Wall mounting slots are provided for installing against a vertical wall surface if hanging is not preferred (orientation rules must still be observed.)

If equipped, the PLIR™ infrared sensor is located on the bottom (fan) side and should be directed toward the plant canopy. Ensure the sensor is located directly above plants (not the floor) to ensure accurate readings.



⚠ **WARNING:** Do NOT hang sensor in the incorrect orientation or damage to sensor may occurr from water ingress.

Cable Connection

The sensor cable is a standard CAT5 or CAT6 cable with RJ-45 crimp connector on the end using the standard 568B wiring order. The cable plugs into an RJ-45 jack inside of the sensor enclosure. It is necessary to remove the cover to connect the sensor cable.

Sensor Cable Installation

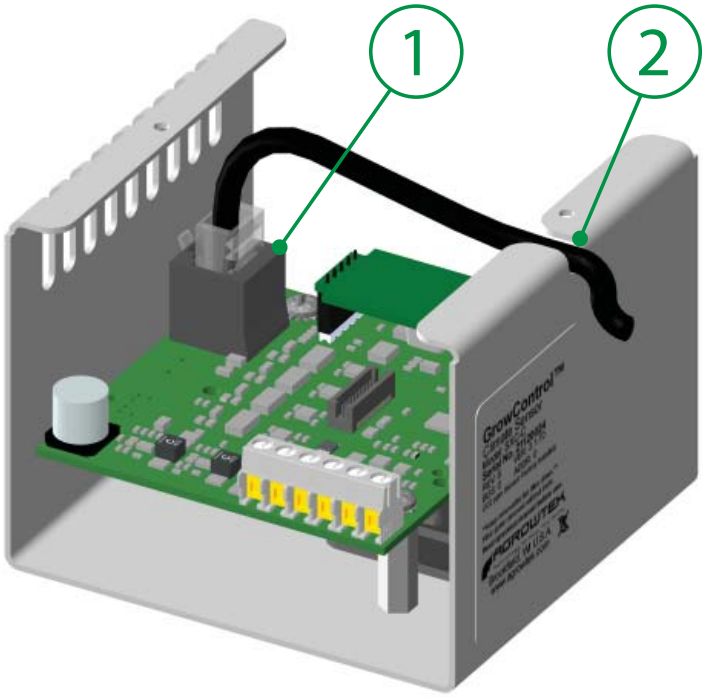
1. Connect the RJ-45 plug into the socket on the circuit board.

Note dielectric grease is recommended for extended protection.

2. Route the cable through the cable slot.

Install the cover.

Note the cover can not be installed backwards due to the offset hole locations. If the screw holes do not align, rotate the cover 180°.



3. Route the cable back up over the sensor cover and install it through the cable hanger clamp. Snap the clamp closed and ensure it is secure.

4. Check the sensor for level. Depending on the stiffness of the cable, it may be necessary to add a slight 'kink' to the cable after the clamp to level the sensor.

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Maintenance & Service

Sensors require periodic maintenance to ensure proper performance.

Cleaning

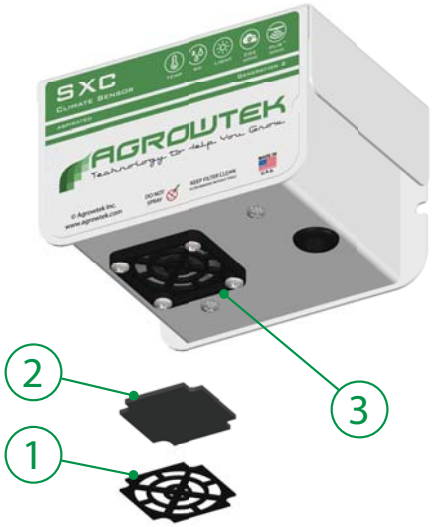
Exterior and label surfaces may be wiped with a damp cloth wish mild dish detergent, then wiped dry. Avoid spraying the sensor with chemicals or water spray.

Fan Filter

The fan air filter should be periodically removed for cleaning.

It is NOT necessary to remove the fan.

1. Pry the retaining grate (1) out of the base (3) using a small flat blade eye-glass screwdriver.
2. Remove the foam filter (2) and replace, or clean with mild dish detergent and water, then pat dry.
3. Check for proper fan operation while the filter is removed.
   If fan is not spinning or is making noise, replace the fan.
4. Re-install the foam filter (2) and grate (1) into the base (3) gently snapping the grate back into place.



Reset Button

Devices retain their "device address" in memory. If a device will not recognize it may have a conflicting address with another device that is in use.

Reset the device by holding the reset button in for three seconds while the device is plugged in. The status LED will flash three times to indicate it has reset.

The reset button is located behind a pin-hole in the enclosure and will require a paper-clip or similar tool to depress.

CO2 ppm Sensor Upgrade

The SXC sensor may be upgrade to sense and control CO2 ppm with a precision NDIR type CO2 sensor.

1. Disconnect cables from the sensor.

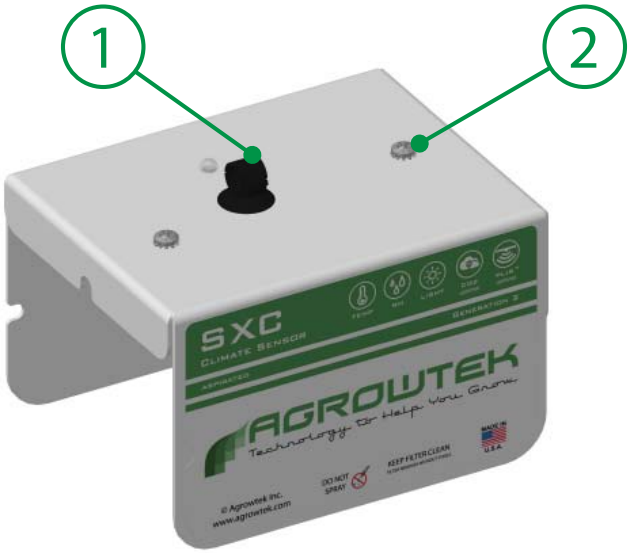
2. Remove the two cover screws (2) and lift off the cover.

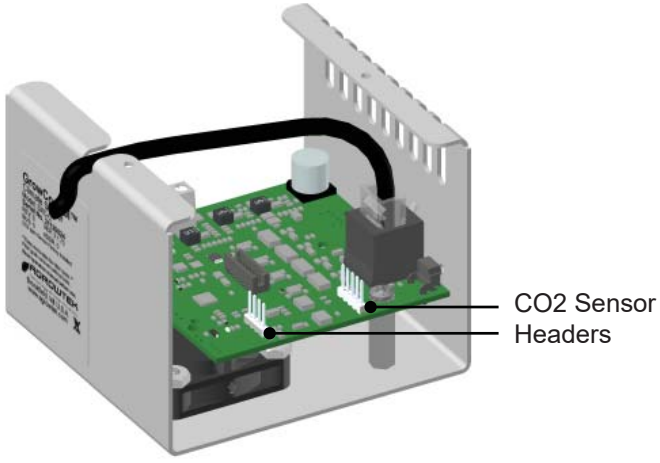
3. Locate the CO2 headers on the circuit board.

4. Position and install the CO2 sensor module (3) ensuring the sensor is oriented correctly.
Note: One header is 4-pins and the other is 5-pins. *Installing the sensor backwards will damage the module.*

5. Re-install the top cover and re-connect cables.

6. Check to ensure the CO2 reading is now working.





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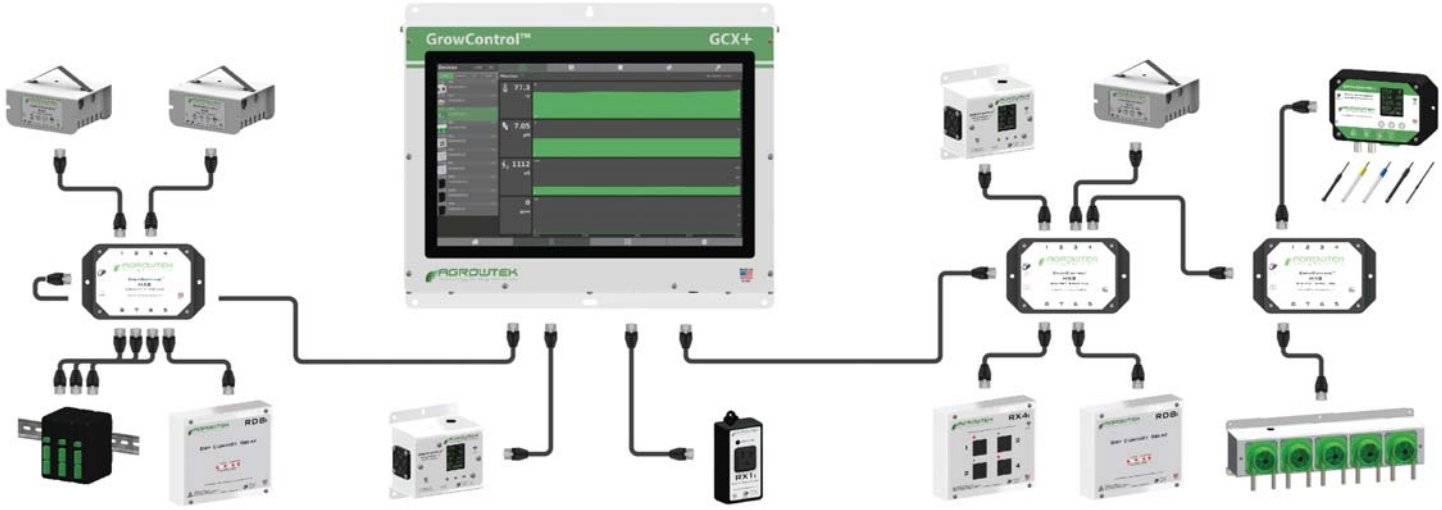
Connection to GrowControl™ GCX

All GrowNET™ devices are connected using standard CAT5 Ethernet cable with RJ-45 connections.

Devices can be connected directly to the GrowNET™ ports on the bottom of the controller, or through HX8 GrowNET™ hubs. It is typical to simplify cabling by locating hubs centrally in hall ways and rooms allowing single runs from an 8-port device hub back to a central hub or back to the controller.



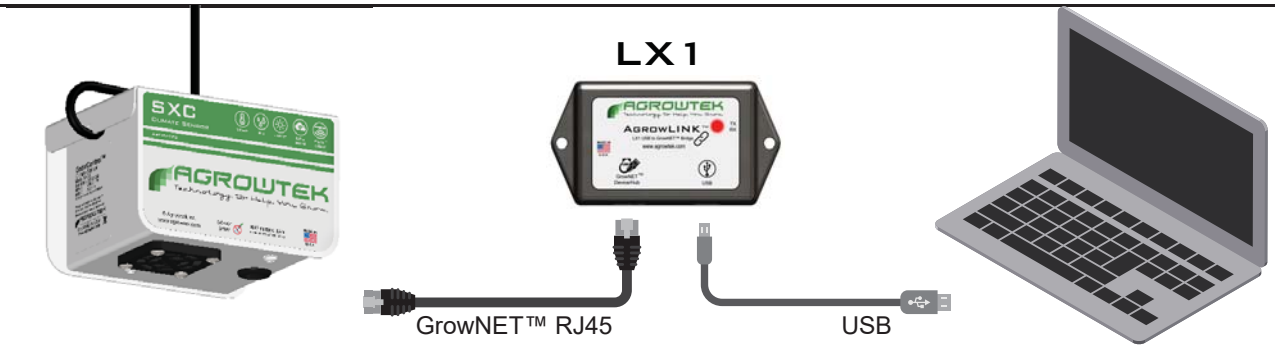
Refer to the GCX controller manual for details on adding the device to the system.

GrowNET™ Hubs

HX8 GrowNET ™ hubs expand a single port into eight more ports. Hubs can be daisy-chained to form a network of up to 100 devices per GrowNET™ bus. Individually buffered port transcievers provide excellent signal integrity and extended communication strength and range.

Hubs provide up to 1A of power for operating sensors and most relays directly over the CAT5 cable. A DC jack on the hub provides 24Vdc power to the ports from the included wall power supply. A terminal block power option is also available.

Connection to USB AgrowLINK



LX1 USB AgrowLINK connects Agrowtek's devices to a computer's USB port for:

- Testing
- Firmware Updates
- Calibration
- Configuration

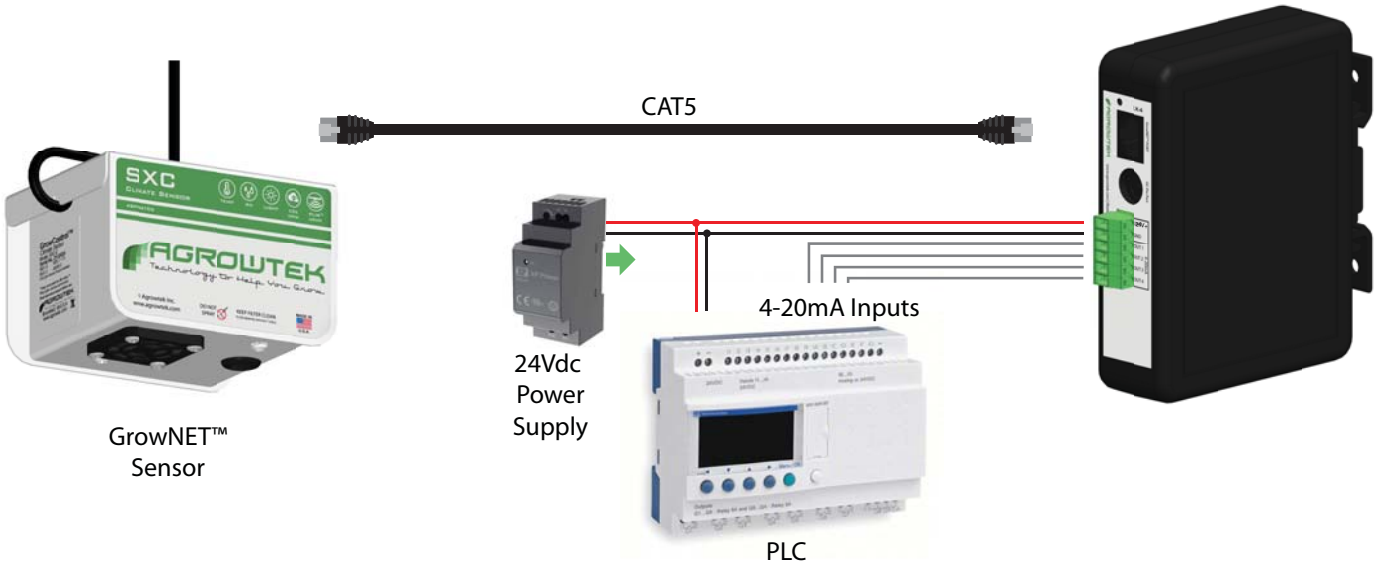
Note: the SXC sensor can not be fully operated from the LX1; the sensor requires 24Vdc for the fan, PLIR and CO2 sensors to operate.

Visit www.agrowtek.com for free software applications.
Standard FTDI drivers automatically install in Windows. See software manual for more information.

Connection to 4-20mA Outputs

Converting sensors to current output requires the LX4 4-20mA Analog Module.

The LX4 module will convert any Agrowtek GrowNET™ sensor device into an analog output signal for 4-20mA PLC inputs. The LX4 features four channels of output for sensors with up to four values. Simply plug into the Agrowtek device and the LX4 will begin transmitting sensor data. See LX4 manual for more detail.



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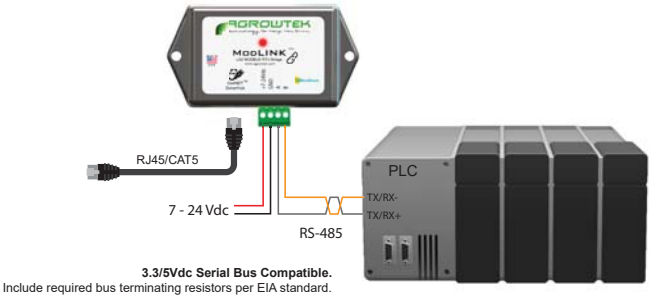
Connection to MODBUS RTU

RS-485

Use the LX2 ModLINK to connect MODBUS devices to the GrowNET™ port.



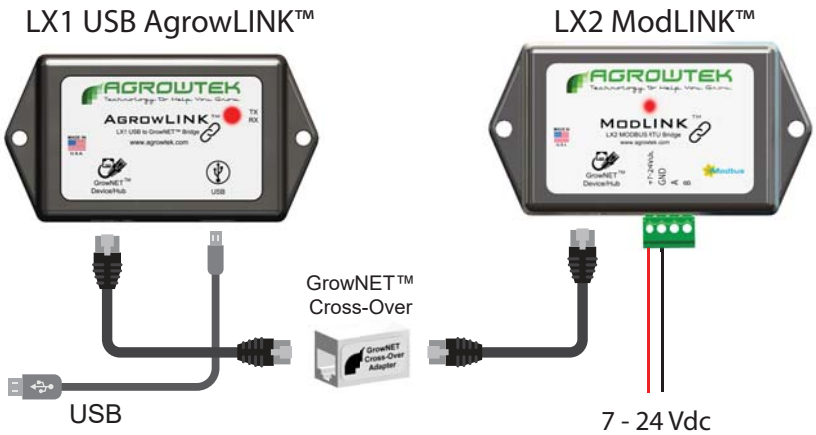
3.3/5Vdc Serial Bus Compatible.
Include required bus terminating resistors per EIA standard.

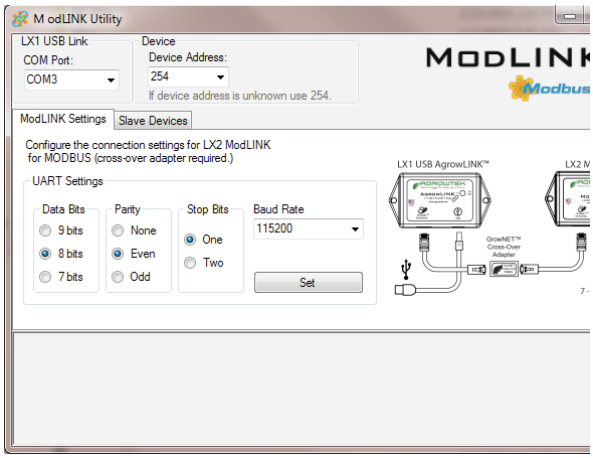
HX8 GrowNET ™ hubs are compatible with LX2 ModLINK™ and MODBUS. Connect multiple devices to a single LX2 and benefit from the superior buffered communication of the HX8 hub.

Serial Speed & Format

The default serial data format for the LX2 ModLINK interface is: **19,200 baud, 8-N-1**.

Alternate speeds and formats between 9,600 - 115,200 baud may be configured with the free AgrowLINK PC utility using a LX1 USB AgrowLINK and the cross-over adapter supplied with the LX2 ModLINK.





See MODBUS manual for more information.

MODBUS Manual

Supported Commands

0x03 Read Multiple Registers
0x06 Write Single Register

A request to use a function that is not available will return an illegal function exception.

Register Types

Data registers are 16 bits wide with addresses using the standard MODICON protocol. Floating point values use the standard IEEE 32-bit format occupying two contiguous 16 bit registers. ASCII values are stored with two characters (bytes) per register in hexadecimal format.

Sensor Value Registers

Sensor values are available in integer or floating point formats depending on the register requested (see map.)

Sensor #	Type	Integer Scale	Range
1	Temperature	x100	-2000 - 6000 (-20 - 60°C) / -400 - 14000 (-4 - 140°F)
2	Humidity	x10	0 - 1000 (0 - 100%)
3	Light	x1	0 - 5000 umol/m2/s
4	CO2	x1	0 - 40,000 ppm

For example: an integer temperature value of 2417 is equal to a temperature reading of 24.17°C.

The value "9999" is representative of a failed sensor (with the exception of CO2 which will read 0.)

Toggle Units Register

Sensors with alternate units may toggle the units using the "toggle units" register. To toggle the units, send the sensor channel number to to the toggle register. *This register is write-only.*

For example: to toggle between °F and °C, send a "1" to register 1002.

Calibration Registers

Calibration registers are 16-bit signed integers for the purpose of calibrating the sensor values or analog output channels. Calibration may be achieved by writing the desired calibrated value to the associated register. Writing to the calibration registers automatically invokes the calibration routine for that register.

Offset Calibration
Offset, or zero calibration, is an arithmatic positive or negative correction to the sensor reading and is the only type of sensor calibration available on climate/environmental sensors.

To perform a sensor offset calibration, simply write the corrected sensor value to the offset calibration register (taking into account the integer scale as shown above.)

For example: to set the temperature to a calibrated value of 25°C, write the value "2500."

MODBUS Holding Registers

Parameter	Description	Range	Type	Access	Address
Address	Device Slave Address	1 - 247	8 bit	R/W	40001
Serial#	Device Serial Number	ASCII	8 char	R	40004
DOM	Date of Manufacture	ASCII	8 char	R	40008
HW Version	Hardware Version	ASCII	8 char	R	40012
FW Version	Firmware Version	ASCII	8 char	R	40016
Toggle Units	Toggle sensor units	1 - 4	16 bit, unsigned	W	41002
Heater Power	RH Sensor Heater	0 - 16 (1)	16 bit, unsigned	W	41003
Sensor Reading, Integer	Temperature	-2000 - 6000 (-20 - 60°C)	16 bit, signed	R	40101
	Humidity	0 - 1000 (0 - 100%)			40102
	Light	0 - 5000 umol/m2/s			40103
	CO2	0 - 40,000ppm			40104
	PLIR™ IR Temperature	-4000 - 8500 (-40 - 85°C)			40105
	Wind Speed	0 -125 mph			40105
	Wind Direction	0 - 359 Degrees			40106
Sensor Reading, Float	Temperature	-20.00- 60.00 °C	32 bit, floating pt	R	40201
	Humidity	0 - 100.0 %			40203
	Light	0 - 5000 umol/m2/s			40205
	CO2	0 - 40,000ppm			40207
	PLIR™ IR Temperature	-4000 - 8500 (-40 - 85°C)			40209
Calibration Input, Offset (Zero)	Temperature	See INTEGER ranges above.	16 bit, signed	W	41101
	Humidity				41102
	Light				41103
	CO2 (2)				41104
	PLIR™ IR Temperature				41105
Reset to Factory Calib.	Clear Calibration	Write "1" to clear calibration.	16 bit, unsigned	W	41401

A request to read or write a register that is not available will return an illegal address error (0x02).

Notes:

1) Sensor heater power will reset to default (0) on a power cycle. Use sensor heater to test the temperature/RH sensor, drive off condensation or recondition the RH sensor element from saturation. Use full power (16) for 24 hours to bake the sensor. *Internal algorithm operates heater as needed to maintain RH sensor stability.*

2) CO2 calibration can only be performed at 400ppm (outdoor air) and no other values will be accepted.

Troubleshooting

Problem	Solution
Sensor is "Offline" or not reading on the control system.	Check if the fan is operating by listening or removing the filter and observing for rotation. If the fan is not operating, the PCB may not be receiving power. Check the power supply of the controller or hub that the sensor is plugged into. Check the RJ-45 connection for damage. Test the RJ-45 cable with a tester tool. If connected to an HX8 hub, ensure the hub's LED is illuminated to indicate it has power. Try an alternate hub port to ensure there is not a problem with the hub port. Try an alternate RJ-45 cable to ensure there is not a problem with the cable. Check the RJ-45 jack on the sensor; ensure there is no corrosion or missing pins.
Sensor is reporting incorrect or inaccurate values.	Ensure the sensor fan is operating and the filter is clean. See Fan Filter section for removal instructions. Reset the sensor to factory calibration and check the readings again. Ensure the sensor is not located in an area of undue influence such as below a light or near an air duct. See the sensor calibration app note for more details on checking a sensor's calibration.
CO2 is not providing a reading.	Check to see if the sensor has the CO2 option installed. The serial number label should indicate "CO2 sensor factory installed." Open the sensor cover and check that the CO2 sensor module is installed on the PCB. Ensure the module is fully seated and installed in the correct orientation. If the module is installed but not reporting, exchange the module with a known working module to test if the module has failed. Replace the CO2 module if necessary.

Storage and Disposal

Storage
Store equipment in a clean, dry environment with ambient temperature between10-50°C.

Disposal
This indsutrial control equipment may contain traces of lead or other metals and environmental contaminants and must not be discarded as unsorted municipal waste, but must be collected separately for the purpose of treatment, recovery and environmentally sound disposal. Wash hands after handling internal components or PCB's.

Warranty

Agrowtek Inc. warrants that all manufactured products are, to the best of its knowledge, free of defective material and workmanship and warrants this product for one (1) year from the date of purchase. This warranty is extended to the original purchaser from the date of purchase. Returns not purchased directly from Agrowtek Inc. must include proof of purchase date otherwise purchase date is considered as date of manufacture. This warranty does not cover damages from abuse, accidental breakage, or items that have been modified, altered, or installed in a manner other than that which is specified in the installation instructions. This warranty is applicable only to products that have been properly stored, installed, and maintained per the installation and operation manual and used for their intended purpose. This limited warranty does not cover products installed in or operated under unusual conditions or environments including, but not limited to, excessive humidity or extreme temperature conditions outside of the specified limits. Agrowtek Inc. must be contacted prior to return shipment of any returns for a return authorization. No returns will be accepted without a return authorization. Customer is responsible for return shipment to Agrowtek Inc. for warranty service. Return authorization number(s) must be printed on the outside of the box or the return may be rejected and returned to the sender. Agrowtek Inc. is not responsible for supplying replacement products or parts in advance of return(s) for warranty claim. The products which have been claimed and comply with the aforementioned restrictions shall be replaced or repaired at the sole discretion of the Agrowtek Inc. at no charge. This warranty is provided in lieu of all other warranty provisions, express or implied. It is including but not limited to any implied warranty of fitness or merchantability for a particular purpose and is limited to the Warranty Period. In no event or circumstance shall Agrowtek Inc. be liable to any third party or the claimant for damages in excess of the price paid for the product, or for any loss of use, inconvenience, commercial loss, loss of time, lost profits or savings or any other incidental, consequential or special damages arising out of the use of, or inability to use, the product. This disclaimer is made to the fullest extent allowed by law or regulation and is specifically made to specify that the liability of Agrowtek Inc. under this limited warranty, or any claimed extension thereof, shall be to replace or repair the Product or refund the price paid for the Product.