

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	±0.2°C typ ±0.4°C max
Humidity Range	0-100% RH (non condensing) 80% RH Max Operating
Humidity Accuracy	±2% 0-80% typ ±4% max
Light Sensor Range	0 - 5000 ppfd (umol/m2/s)
Light Accuracy	±10%
CO2 Range	400-40,000ppm (optional)
CO2 Accuracy	±50ppm + 3% 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



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KEEP THESE INSTRUCTIONS

REV 11/24

This product is intended for commercial use only.

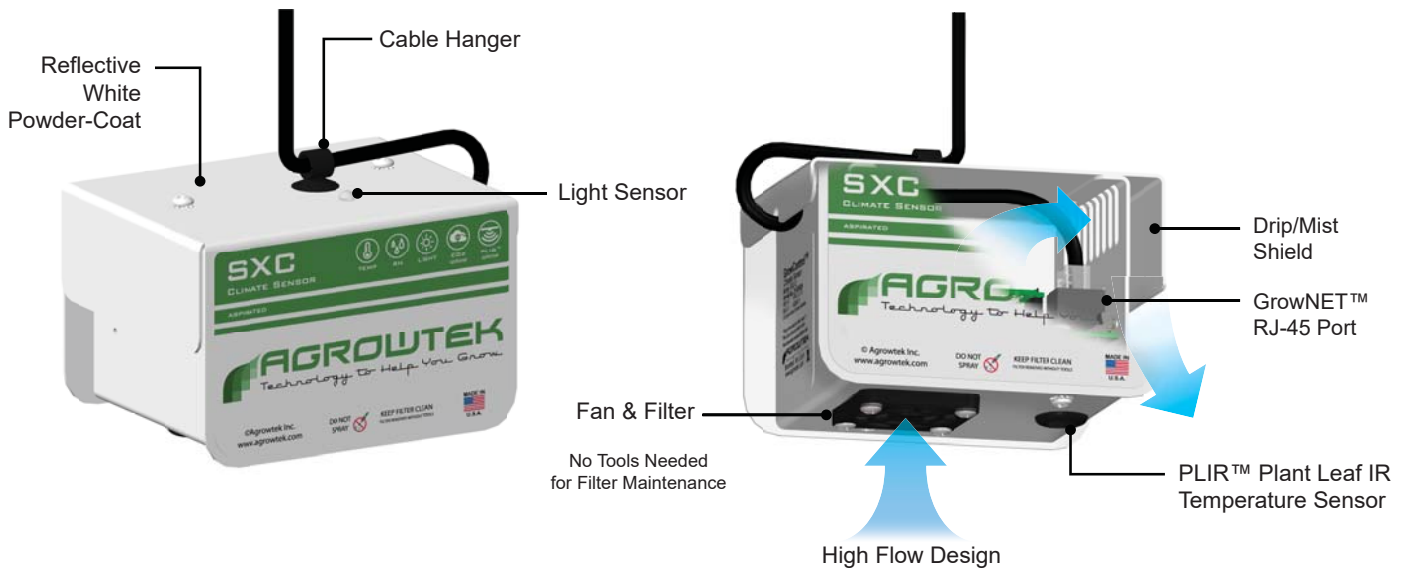
Features

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 provides 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 $\mu\text{mol}/\text{m}^2/\text{s}$ (ppfd) with ultra-low light sensitivity for detecting light leaks.

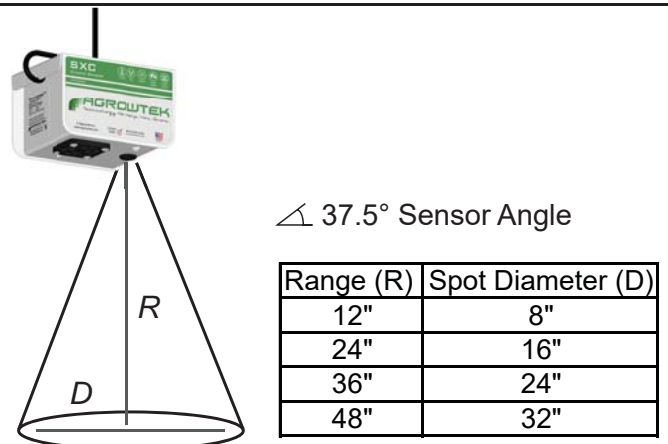
Sensor hangs above the crop canopy and connects to Agrowtek's GrowControl™ GCX Cultivation Controllers as part of a complete facility control solution. Compatible with third-party PLC's and building automation controls with a LX2 ModLINK™ for MODBUS RTU.



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.



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 damage, equipment failure and injury or death.

⚠ Always bag or remove sensors when spraying chemicals or fogging.

⚠ Do not spray the sensor with water or chemicals. Protect sensor from direct water exposure.

⚠ Do not locate the sensor near HVAC vents, humidifiers, misters, dehumidifiers, lighting equipment, etc.



⚠ 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 covering 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

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

Installation Instructions

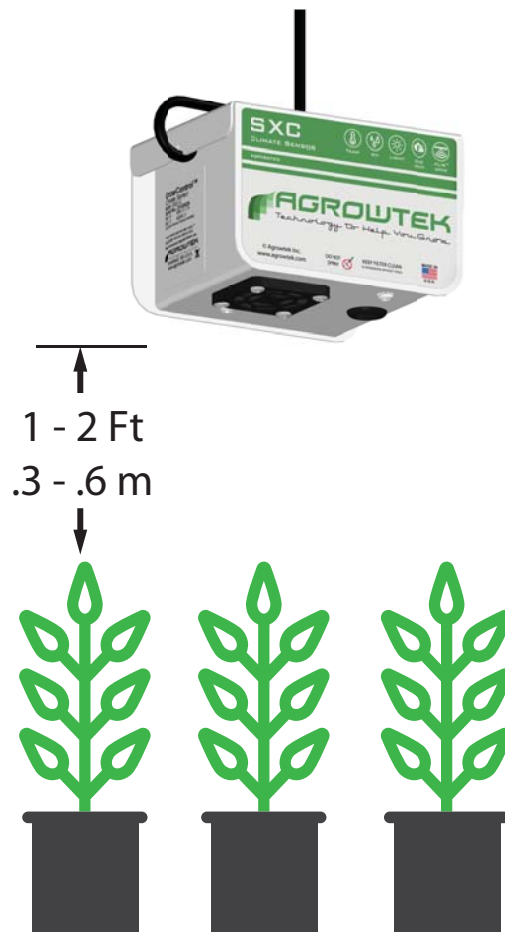
Installation Location Requirements:

- Air must adequately circulate to the sensor and be representative of the environment; avoid corners.
- Do not install near ventilation ducts, doorways, windows, directly under lights or hot equipment.
- Do not install near misters, 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. Do not install with RJ-45 port facing "up." Wall mounting slots are provided for installing against a vertical wall surface if hanging is not preferred.

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 and not above another heat source.



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

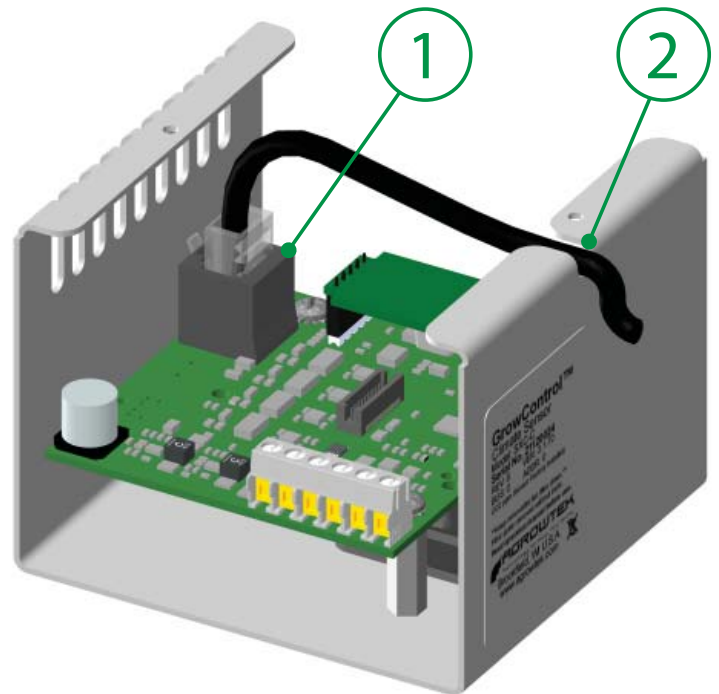
1. Connect the RJ-45 plug into the socket on the circuit board.

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.



Maintenance & Service

Sensors require periodic maintenance to ensure proper performance.

Cleaning

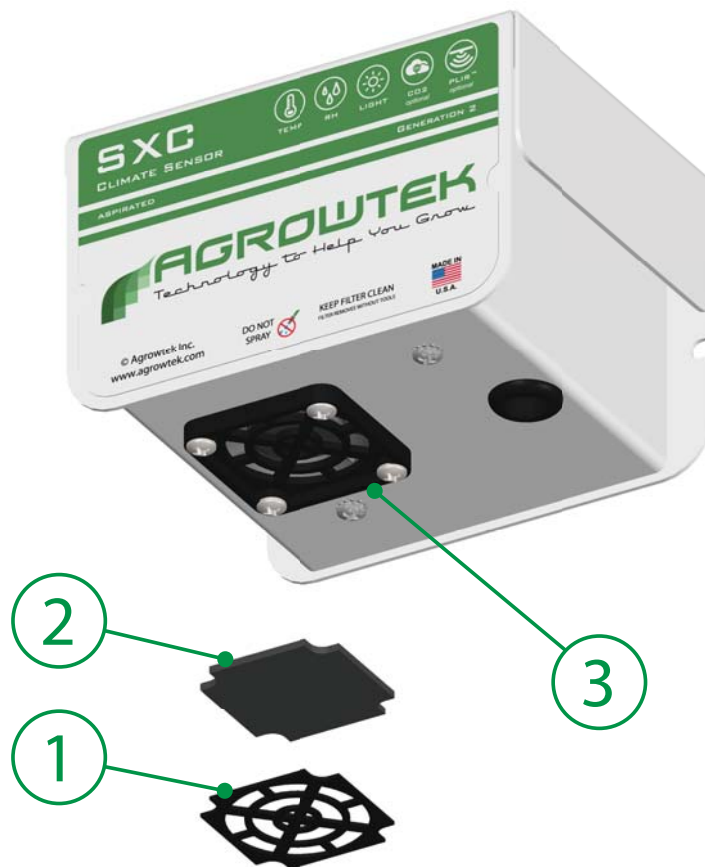
Exterior and label surfaces may be wiped with a damp cloth with mild dish detergent, then wiped dry. Avoid spraying the sensor with chemicals or water spray.

Fan Filter

The fan air filter should be periodically removed for cleaning.

It is NOT necessary to remove the fan.

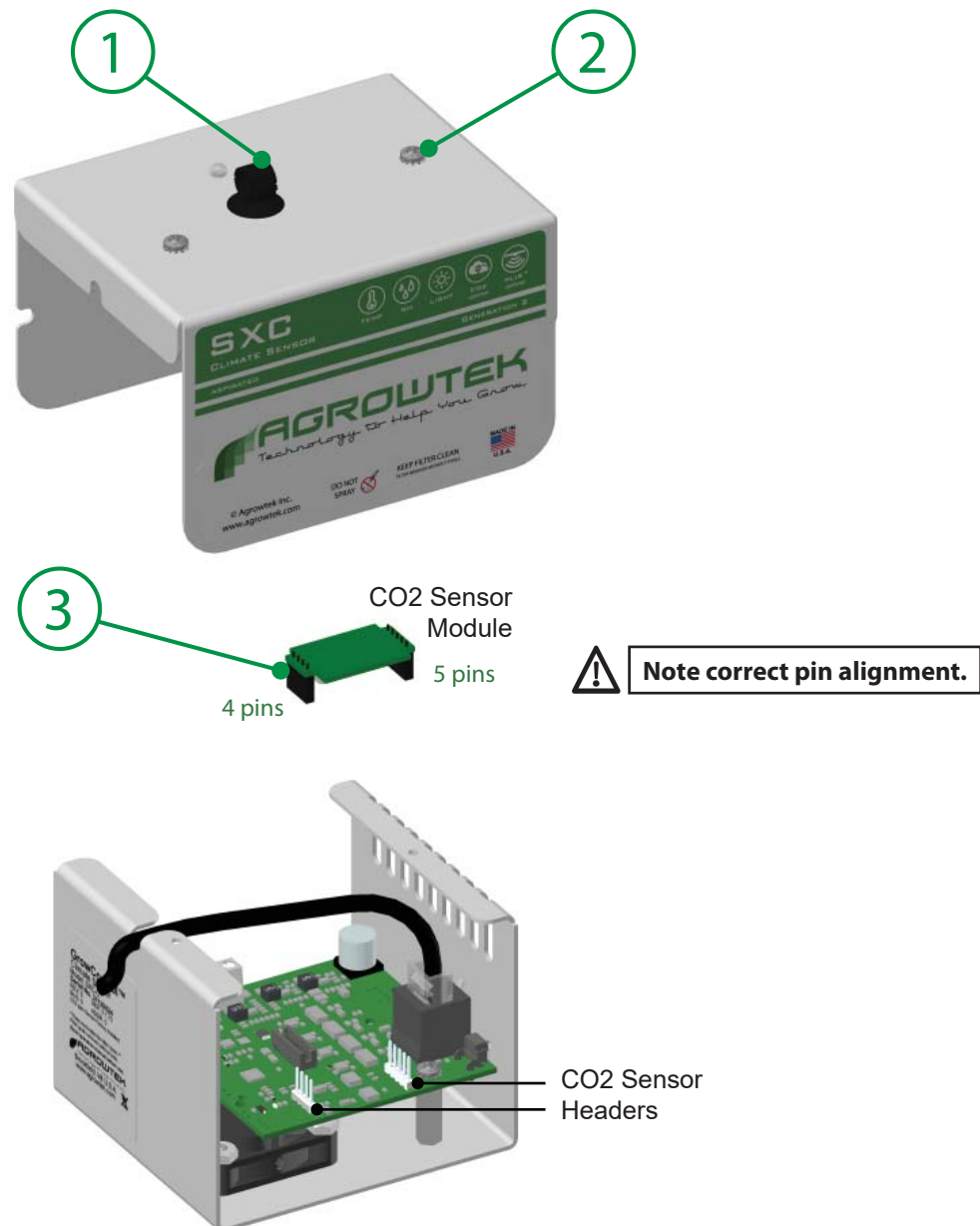
1. Pry the retaining grate (1) out of the base (3) using a small flat blade eye-glass screwdriver.
2. Remove the foam filter (2) and replace, or clean with mild dish detergent and water, then pat dry.
3. Check for proper fan operation while the filter is removed.
If fan is not spinning or is making noise,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



CO2 ppm Sensor Upgrade

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

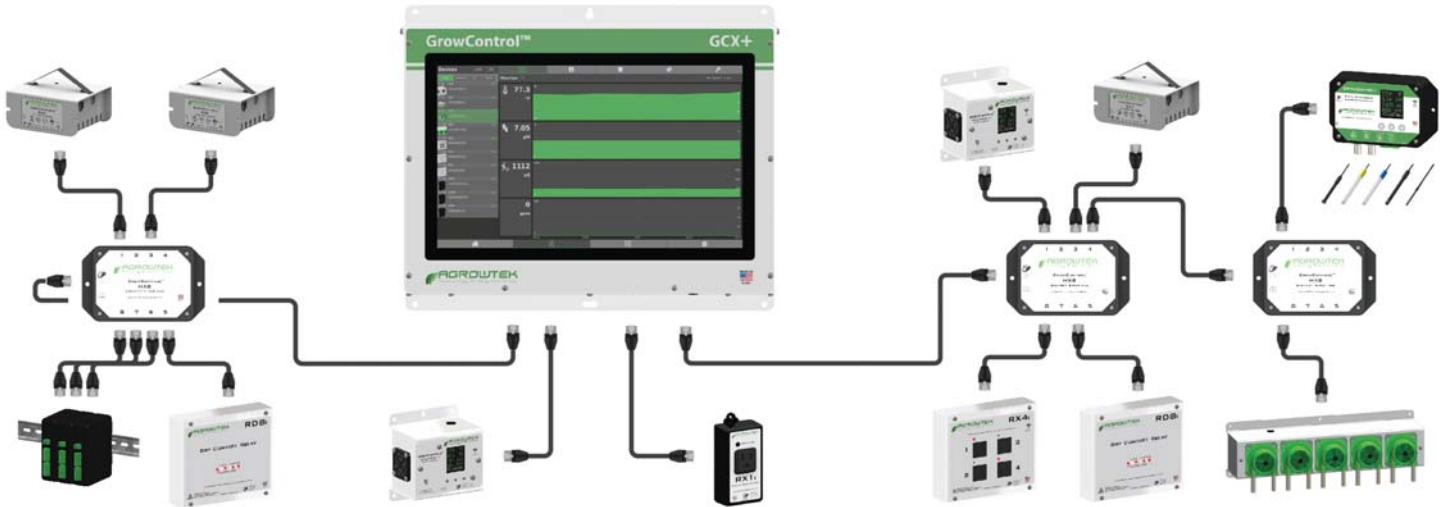
1. Disconnect cables from the sensor.
2. Remove the two cover screws (2) and lift off the cover.
3. Locate the CO2 headers on the circuit board.
4. Position and install the CO2 sensor module (3) ensuring the sensor is oriented correctly.
Note: One header is 4-pins and the other is 5-pins. *Installing 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.



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.

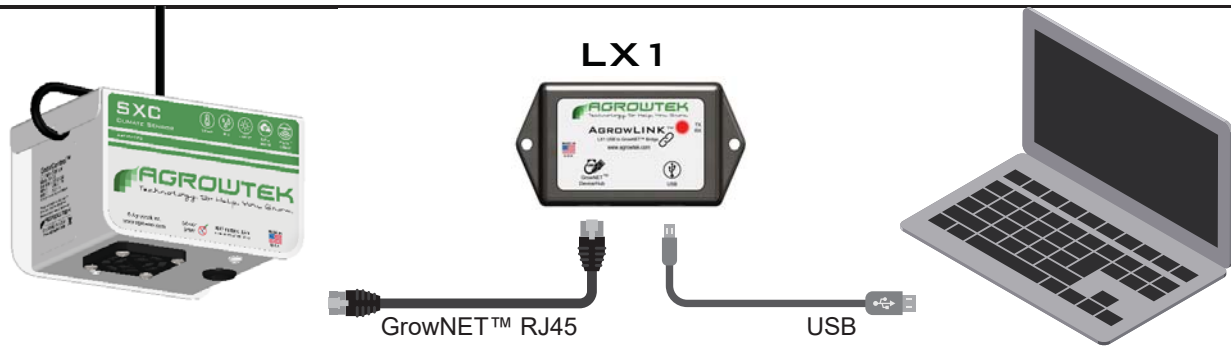
GrowNET™ Hubs

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 transceivers 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.

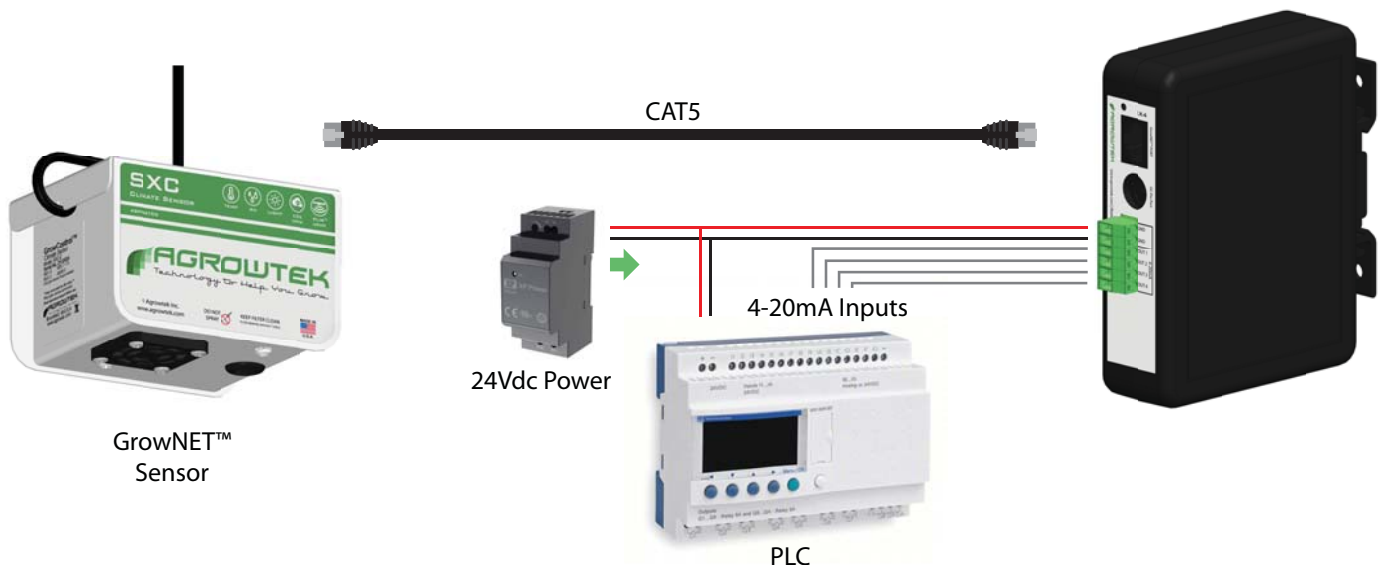
Visit www.agrowtek.com for free software applications.

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.



Connection to MODBUS RTU

RS-485

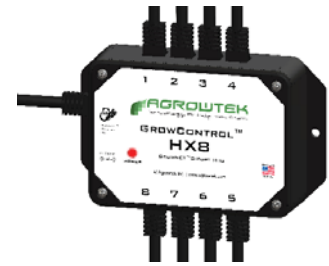
Use the LX2 ModLINK to connect MODBUS devices to the GrowNET™ port.



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.

The diagram shows the connection of an LX1 USB AgrowLINK and an LX2 ModLINK device. The LX1 is connected to a USB port. The LX2 is connected to a GrowNET Cross-Over Adapter, which is connected to a USB port. The LX2 is also connected to a 7-24 Vdc power source.

The screenshot shows the ModLINK Utility software interface. The interface includes fields for LX1 USB Link (Device, Device Address, COM Port) and ModLINK Settings (Slave Devices). The UART Settings section is expanded, showing Data Bits (9, 8, 7), Parity (None, Even, Odd), Stop Bits (One, Two), and Baud Rate (115200). A 'Set' button is visible.

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 - 1000 W/m2
4	CO2	x1	0 - 10,000 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 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 arithmetic 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."

Analog Calibration

Analog output calibration sends a positive or negative offset to the respective output channel's digital to analog converter (DAC.) The DAC has a resolution of 0.005mA/bit.

±1 calibration bit = ±0.005mA adjustment

For example: to shift the analog output up by 0.1mA, set the analog offset value to +20. (0.1 / 0.005 = 20)

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 *	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 - 1000 W/m2			40103
	CO2	0 - 10,000ppm			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 - 1000 W/m2			40205
	CO2	0 - 10,000ppm			40207
Calibration Input, Offset (Zero)	Temperature	See integer ranges above.	16 bit, signed	W	41101
	Humidity				41102
	Light				41103
	CO2				41104
Calibration Input, Analog Output	Temperature	-255 - 255 (bits)	16 bit, signed	W	41301
	Humidity				41302
	Light				41303
	CO2				41304

*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. *Not available on some sensor elements.*

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

Storage and Disposal

Storage

Store equipment in a clean, dry environment with ambient temperature between 10-50°C.

Disposal

This industrial 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 receipt. This warranty does not cover damages from abuse, accidental breakage, or units 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 for a return authorization. No returns will be accepted without a return authorization. Returns not purchased directly from Agrowtek Inc. must include proof of purchase date otherwise purchase date is considered date of manufacture. 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.