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AGROWTEK VXi Digital Irrigation Valve Controller Instruction Manual

Contents

AGROWTEK VXi Digital Irrigation Valve Controller

The AGROWtEK VX series digital interface modules are designed to connect Agrowtek's intelligent controllers to devices in your growing environment. The VX8i and VX12i models feature eight discrete DC FET outputs for directly driving 15Vdc/24Vac irrigation valves and other DC devices. The VX12i model also features four analog inputs for the connection of SXL optical liquid sensors and other third-party analog sensors for integration. The FET outputs connect to DC-signaled devices such as relays/contactors, solenoid valves, and PWM-driven devices such as motor speed controllers or lighting dimming inputs.

Specifications

- **Input Power:** 1A@15Vdc
- **Max Switching Current:** 1A per point / 1A combined
- **Max Switching Voltage:** 24Vdc
- **Outputs:** 8 Sourcing FETS
- **Output Status Indicators:** Red LEDs
- **PWM on Outputs:** 6 Channels, 1kHz, 10-90%
- **Inputs:** 4 Analog Channels, 0-5Vdc / 0-20mA, 12-Bit Jumper Selectable
- **Analog Sensor Power:** 500mA @ 5Vdc
- **Enclosure Knock-Outs:** (2) dia. 7/8 TYPE 12K NEMA
- **Enclosure Rating:** 1-second GrowNETTM, MODBUS
- **Minimum Cycle Time Interface:** GrowNETTM, MODBUS

Usage Instructions

The AGROWtEK VX series digital irrigation valve controller can be used to connect Agrowtek's intelligent controllers to devices in your growing environment. The VX8i and VX12i models feature eight discrete DC FET outputs for directly driving 15Vdc/24Vac irrigation valves and other DC devices. The VX12i model also features four analog inputs for the connection of SXL optical liquid sensors and other third-party analog sensors for integration. The FET outputs connect to DC signaled devices such as relays/contactors, solenoid valves, and PWM-driven devices such as motor speed controllers or lighting dimming inputs.

Installation Instructions

1. Mount the enclosure in a suitable location using the provided mounting brackets.
2. Connect the power supply to the input terminals of the controller.
3. Connect the output terminals of the controller to the irrigation valves or other DC devices that you wish to control.
4. Connect any analog or discrete sensors to the appropriate input terminals on the VX12i model.
5. Route wires neatly and securely, and use wire ties to prevent damage to wires or the controller.

Output Connections
The AGROWtEK VX series digital irrigation valve controller features eight heavy-duty transistor outputs with transient and flyback protection designed to connect to the DC contactor and relay coils for electrical panel control. Each transistor output is rated at 1A pilot duty (2A max total per unit) and will switch the supplied voltage out to the terminals. Heavy-duty FET transistors offer robustness and reliability with ultra-low heating. The first six (6) transistor outputs may be operated in a 1kHz square-wave PWM (pulse width modulation) duty frequency between 10% and 90%. This allows integration with most lighting dimming controls and fan speed controls. Duty values below 10% will be output as 0%. Duty values above 90% will be output as 100%.

Input Connections
The AGROWtEK VX12i model features four analog inputs that are provided for the connection of various analog 5Vdc third-party sensors, or discrete sensors. Inputs are rated 0-5Vdc (or 0-20mA if the current jumper is installed for the channel) and are 12-bit (4096 steps.) Inputs may be used for discrete or analog-type sensors. A 5Vdc 500mA power supply is included on board for powering analog sensors or providing a signaling voltage for discrete or dry-contact sensors. Typical Discrete Sensors include SXL Optical Liquid Detection Sensors, Float Switches, Door/Window Switches, and Flow Switches. Typical Analog Sensors include Moisture, Pressure, Temperature, and other sensors.

Specifications

Input Power	1A@15Vdc
Max Switching Current	1A per point / 1A combined
Max Switching Voltage	24Vdc
Outputs	8 Sourcing FETS
Output Status Indicators	Red LEDs
PWM on Outputs	6 Channels, 1kHz 10-90%
Inputs	4 Analog Channels
Analog Input Type	0-5Vdc _ / 0-20mA, 12-Bit Jumper Selectable
Analog Sensor Power	500mA @ 5Vdc
Enclosure Knock-Outs	(2) dia. 7/8"
Enclosure Rating	TYPE 12K NEMA
Minimum Cycle Time	1 second
Interface	GrowNET™, MODBUS

Introduction

GrowControl VX series digital interface modules connect Agrowtek's intelligent controllers to devices in your growing environment. VX8i and VX12i modules feature eight discrete DC FET outputs for directly driving 15Vdc/24Vac irrigation valves and other Dc devices. VX12i models also feature four analog inputs. Analog inputs allow the connection of SXL optical liquid sensors and other third-party analog sensors for integration. FET outputs connect to DC-signaled devices such as relays/contactors, and solenoid valves, and to PWM-driven devices such as motor speed controllers or lighting dimming inputs.

Inputs (VX12i only)
Four analog inputs are provided for the connection of various analog 5Vdc third-party sensors, or discrete sensors. Inputs are rated 0-5Vdc (or 0-20mA if the current jumper is installed for the channel) and are 12 bit (4096 steps.) Inputs may be used for discrete or analog-type sensors. A 5Vdc 500mA power supply is included on board for powering analog sensors or providing a signaling voltage for discrete or dry-contact sensors.

| Typical Discrete Sensors	Typical Analog Sensors
SXL Optical Liquid Detection Sensors	Moisture
Float Switches	Pressure
Door/Window Switches	Temperature
Flow Switches	Other

Outputs
Eight heavy-duty transistor outputs with transient and flyback protection are designed to connect to DC contactor and relay coils for electrical panel control. Each transistor output is rated at 1A pilot duty (2A max total per unit) and will switch the supplied voltage out to the terminals. Heavy-duty FET transistors offer robustness and reliability with ultra low heating.

Pulse Width Modulation (PWM)
The first six (6) transistor outputs may be operated in a 1kHz square-wave PWM (pulse width modulation) duty

frquency between 10% and 90%. This allows integration with most lighting dimming controls and fan speed controls.

Duty values below 10% will be output as 0%. Duty values above 90% will be output as 100%.

$$DUTY\ CYCLE\ \% = \frac{ON\ TIME}{OFF\ TIME} \times 100$$
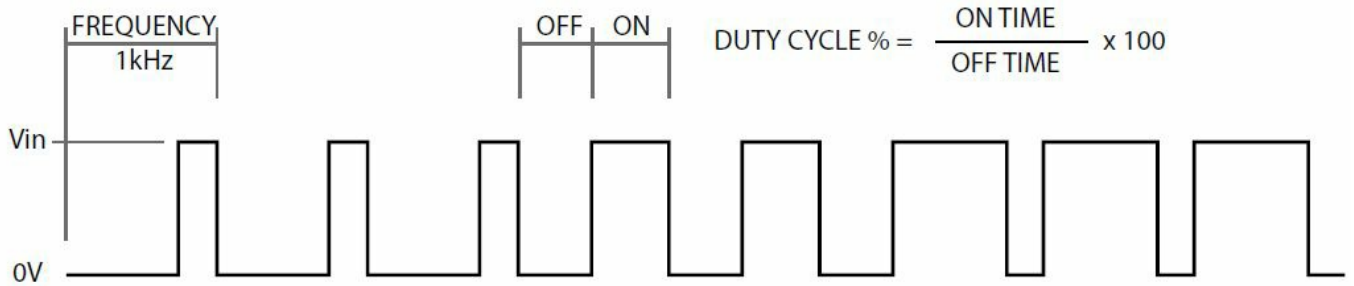
Component Locations

Remove the cover by loosening the two bottom screws and removing the top two screws. Tilt the cover back to clear the light pipes and then remove the cover. The PCB has several connection and configuration options as described:
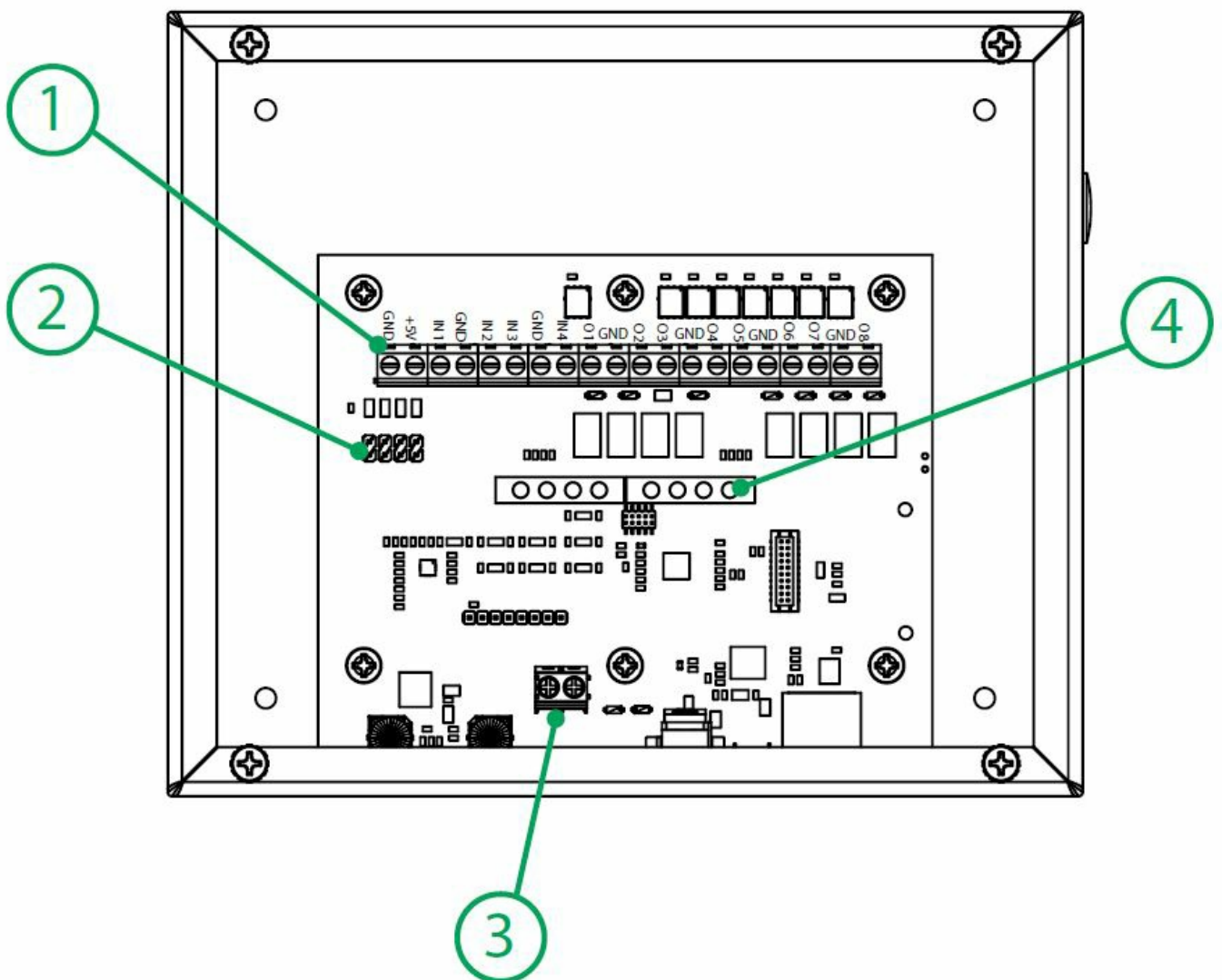
1. **I/O Screw Terminal Block**

   Make connections to analog sensor inputs and transistor outputs.

2. **Input Jumper Select Block**

   Set input channels to the current mode (0-20mA) instead of voltage (VX12i only)

3. **Power Input Terminals**

   Optional input power terminals for hard wire applications.

4. **LED Light Pipes**

Indicators for each of the eight (8) outputs; red when on. Pipes protrude through front panel openings.

Installation Instructions
DANGER Electrocution Hazard
Disconnected all power sources before servicing or wiring. For continued protection against electric shock ensure the enclo-sure is properly grounded at the marked chassis ground terminal. Install all electrical equipment and wiring in accordance with national and local electric codes. For indoor use in dry locations only (0-80% RH non-condensing.) Replace serviceable parts only with those recommended by Agrowtek Inc.
DANGER Risque d'électrocution
Débranchez toutes les sources d'alimentation avant l'entretien ou le câblage. Pour une protection continue contre les chocs électriques assurer l'enceinte est correctement reliée à la borne de terre du châssis marquée. Installez tous les équipements électriques et le câblage conformément aux codes électriques nationaux et locaux. Pour une utilisation en intérieur dans des endroits secs seulement (0-80% RH sans condensation.) Remplacer les pièces réparable seulement avec ceux recommandés par Agrowtek Inc.

Notes:

1. Install with the connections facing down to reduce the risk of water permeating the enclosures.
2. For indoor installation only. The enclosures are not waterproof.
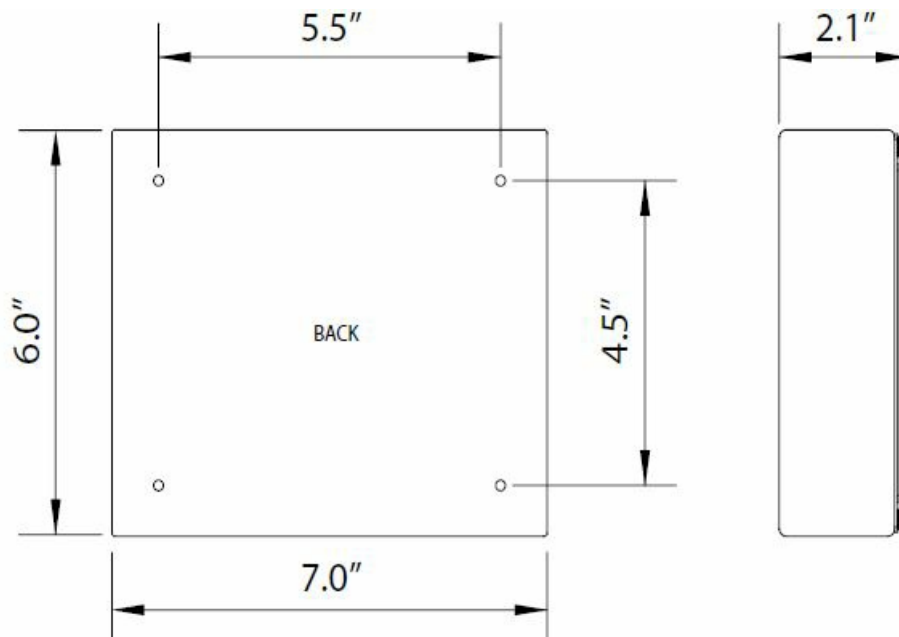3. Do not place the sensor in direct sunlight.

Mounting the Enclosure
The intelligent interface module is to be securely installed on a vertical wall surface using the four mounting holes provided in the rear of the enclosure.

1. Remove the front cover panel using caution not to damage the LED light pipes.
2. Locate the relay box and mark the mounting hole locations or use the dimensions below.
3. Pre-drill and install anchors if necessary. Keep dust and debris away from the circuit board.

Ensure all dust and contaminants have been blown out of the enclosure. Hardware is not provided. Drywall screws are recommended.
Do NOT: drill holes into the enclosure or enlarge holes. Metal chips from drills can cause short circuits on the PCB.

Power Connections

Input Power: 15 Vdc, 1A is required to operate the unit which may be supplied via:

- **a)** the 2.1/5.5mm DC barrel jack and standard power supply, or
- **b)** the V-in terminal block on the circuit board (for industrial/DIN rail power supplies.)

Standard 7/8" diameter knock-outs are provided on either side for 1/2" EMT conduit fittings.

Maximum 1A power supply current! An input power protection fuse of 1A is required to prevent damage to the unit from overloading.

Wire Routing

Recommended wire routing for low noise and electrical interference is shown in the diagram below. Route sensor and input wires on the left side of the unit and route output wires on the right side of the unit, keeping the sensor wiring and output wiring separated.
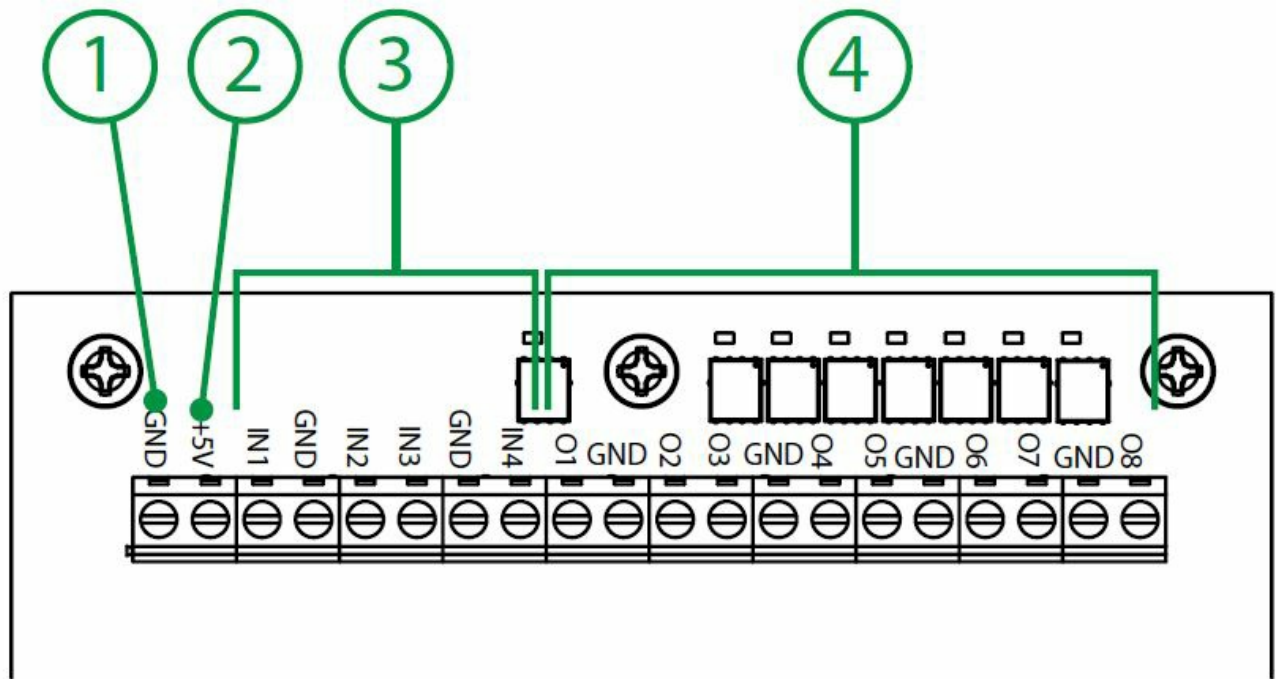

1. Input Wiring
2. Output Wiring

I/O Terminals

DANGER! Risk of injury, short circuit, or equipment damage; disconnect all power before wiring or service. Terminals are provided for connecting to the inputs, outputs, and 5V DC power supply.

- **Terminal Specifications:**

- **Acceptable Wire Size:** 26-14 AWG
- **Tightening Torque:** 0.35-0.40 Nm

1. **GND (VX12i only)**

   DC Ground (V-) terminals, all terminals marked GND are common.

2. **+5V (VX12i only)**

   A 5V DC 500mA power supply is provided for powering discrete and analog 5V sensors that connect to the 0-5V dc input terminals.

3. **Inputs (VX12i only)**

   There are four (4) 12-bit analog input terminals for measuring 0-5Vdc or 0-20mA/4-20mA signals.

4. **Outputs**

   There are eight (8) transistor outputs for driving solenoids, relays, contactors, etc. with a DC voltage. Six (6) of the outputs can be configured for PWM control between 10-90% for motor speed control, light dimming, etc.

Output Connections, Irrigation Valves
Standard irrigation valves can be connected directly to the DC outputs when the unit is operated with the included 15 Vdc power supply. Up to eight valves can be connected and up to four valves can be operated simultaneously.
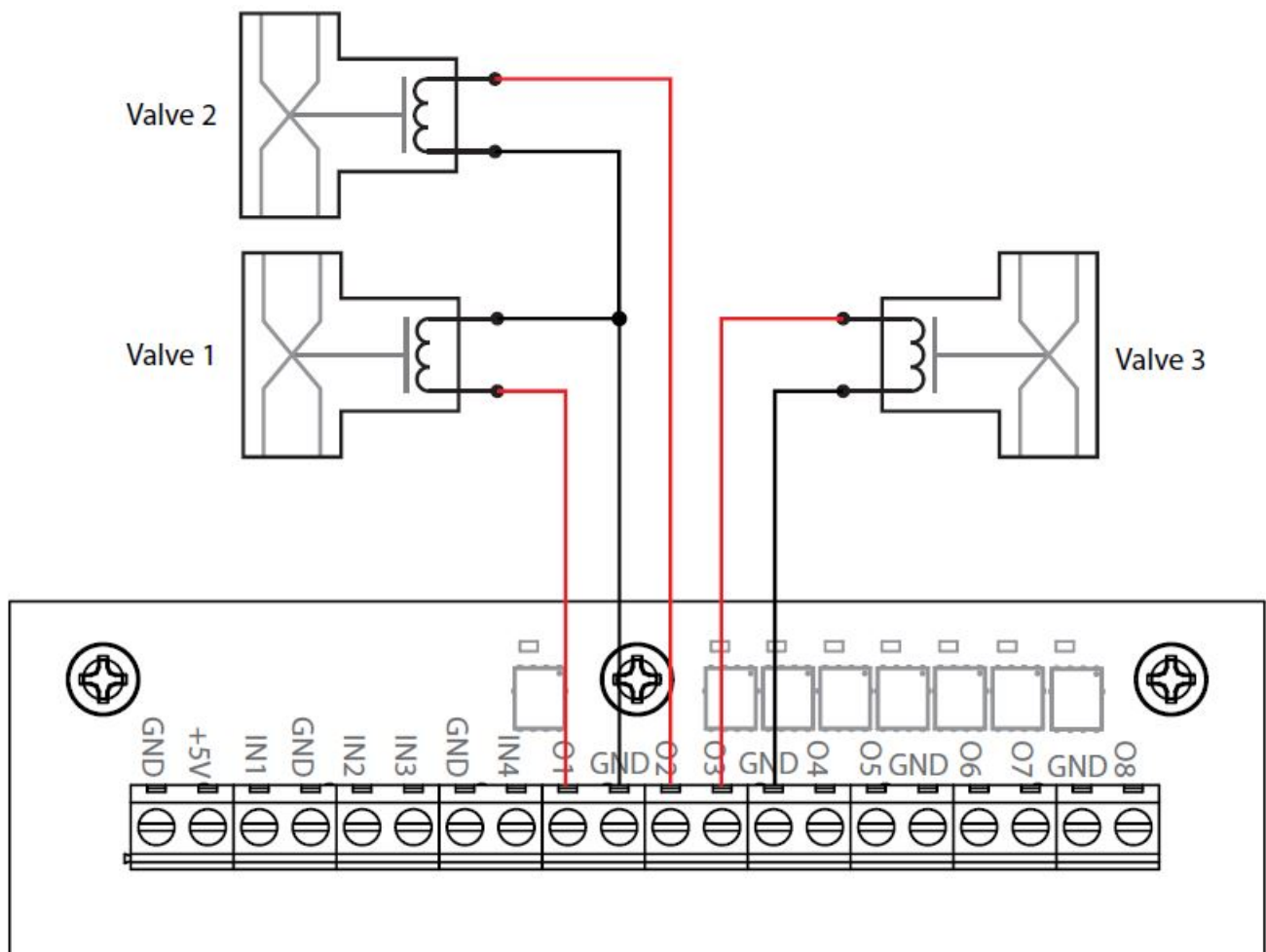
Output Connections, Other Devices

High-current FET (transistor) outputs control DC loads and switch the voltage that is supplied to the unit. The default power supply is 24Vdc. Lower voltage may be supplied to the board (down to 6Vdc) depending on the requirements of the devices being driven.

① Dimmable Ballast or VFD Controller (PWM Input)

② Relay or Contactor (DC Coil)
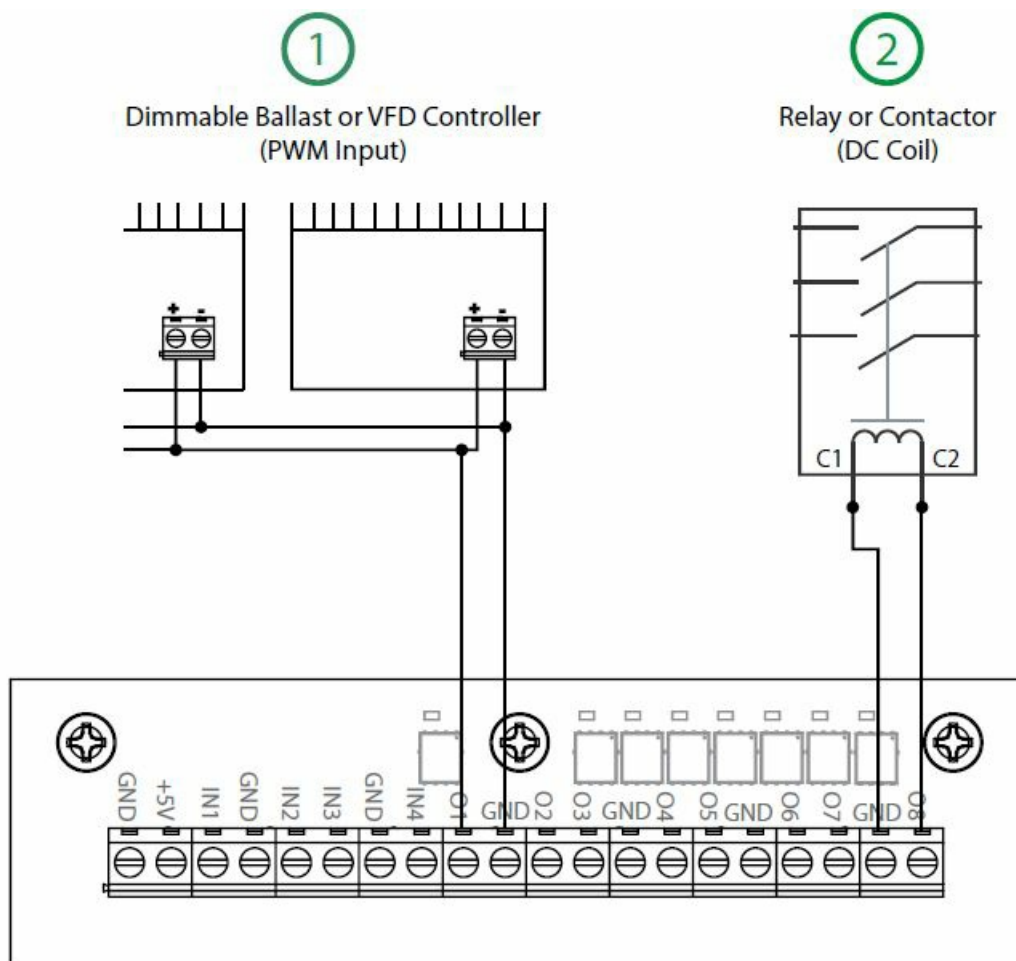
1. **Dimmable Ballasts & VFD Motor Controllers**

   Ballasts and VFD controllers that accept a 1kHz PWM signal may be controlled by the first six (6) output channels for variable speed motor control or variable intensity lighting control. Each of the six channels operates at 1kHz but may be set to 0, 10-90%, and 100% duty independently.

   - **Note:** A low-pass filter may be constructed to convert PWM to an analog voltage. Consult the light manufac-turer to determine if PWM signals are accepted, or for advice on analog filter construction.

2. **Relays & Contactors**

   DC-powered relays, contactors and SSRs may be driven directly by the outputs. Each output is protected for flyback and surge and is capable of up to 1A continuous current (1A max combined current.)
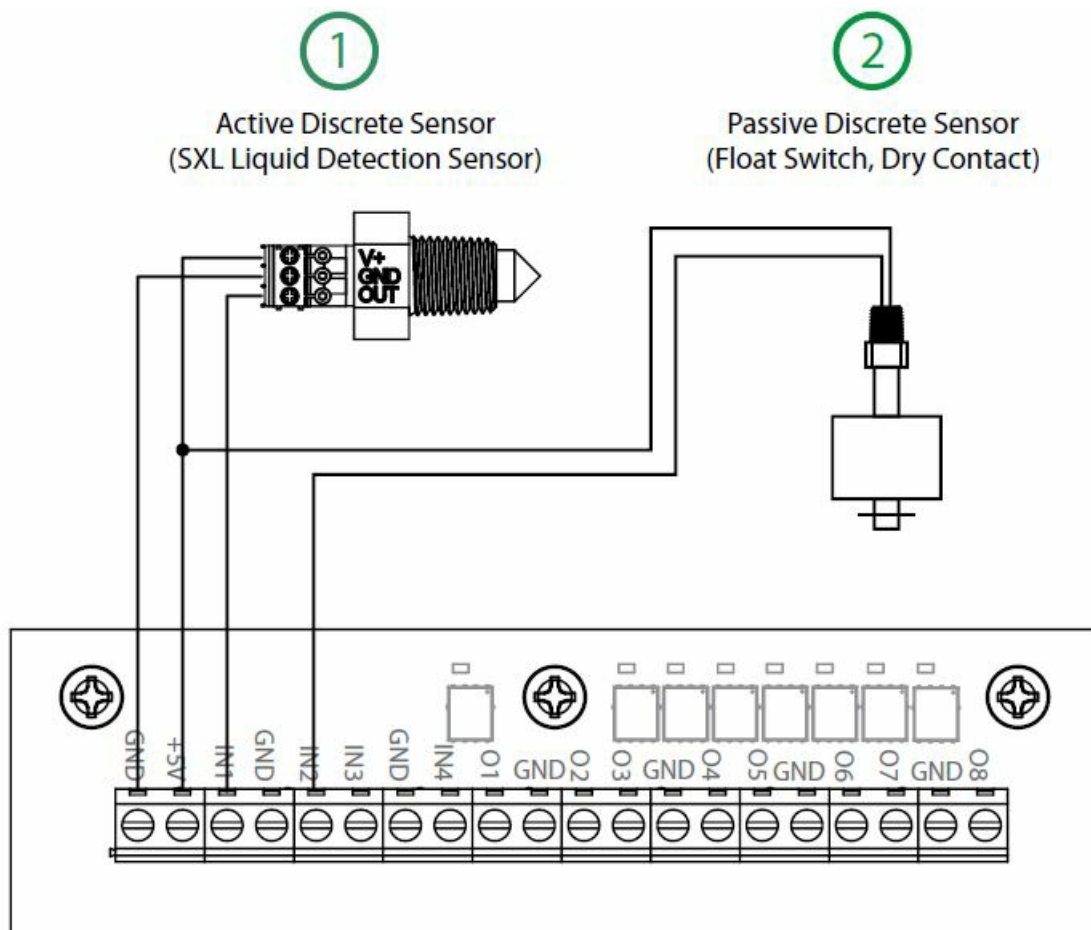
Input Connections, Discrete Sensors (VX12i)
Discrete-type sensors offer only an indication of "true" or "false" and no information in between. Typical examples include liquid presence detection sensors, manual and proximity switches, door and window switches, etc.
Passive Sensors
Passive sensors are simple, typically mechanical sensors that manipulate a physical switch (dry contact) to close a circuit. Passive sensors do not have any electronics on board and simply pass through the signal voltage when the condition is true. Passive sensors only require two wires; the signal voltage and the sensor output.
Active Sensors
Active sensors have electronics on board and require both a power and ground wire to operate the sensor, plus a third wire to carry the output signal of the sensor.

1. **Active Sensor**

   Requires three wires; V+, GND, and signal output.

2. **Passive Sensor**

   Requires two wires; V+ and signal output.

Input Connections, Analog Sensors (VX12i)
Analog sensors offer a "variable" value such as temperature, pressure, etc. The device's analog inputs are 12-bit and offer 4096 steps of resolution (1.22mV or 0.005mA.) Each input has a default range in the "Voltage" mode of 0-5Vdc, or if set with a jumper to a "Current" mode, a 0-20mA range.
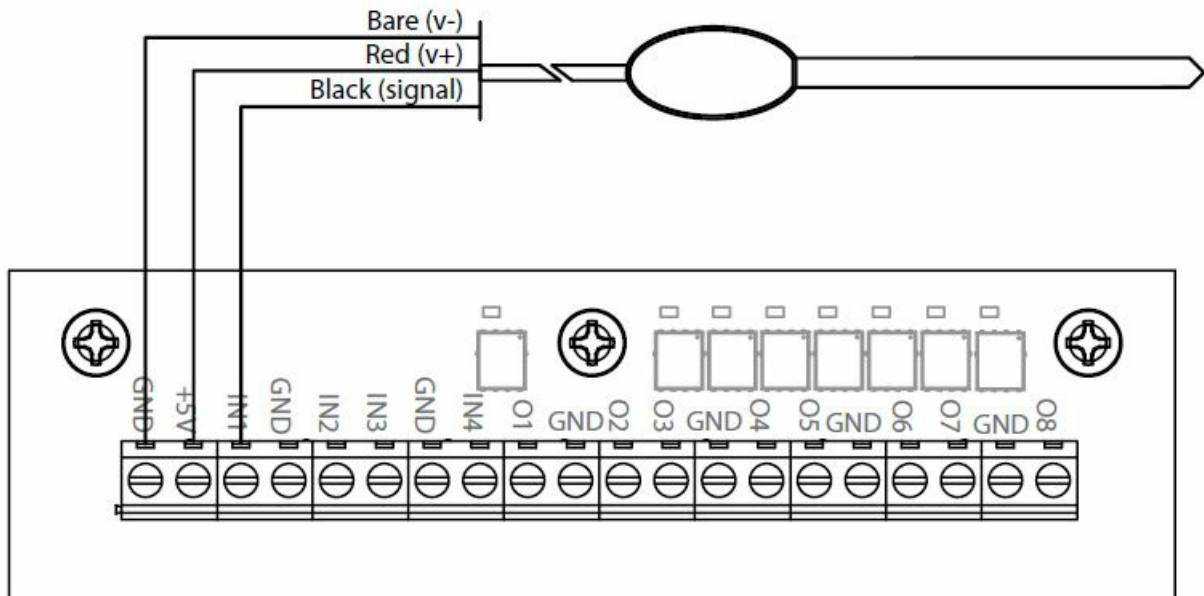**Voltage Mode**
Standard mode for 0-5Vdc analog sensors or discrete type sensors.
Current Mode
Mode for 0-20mA or 4-20mA type industrial analog sensors.
Note: Jumpers must be installed on the PCB for mA mode.

Analog Sensor (Moisture Probe)

Bare (v-)
Red (v+)
Black (signal)

Connection to GrowControl™ Cultivation Controllers

All GrowNET™ devices are connected using standard CAT5 Ethernet cables 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.
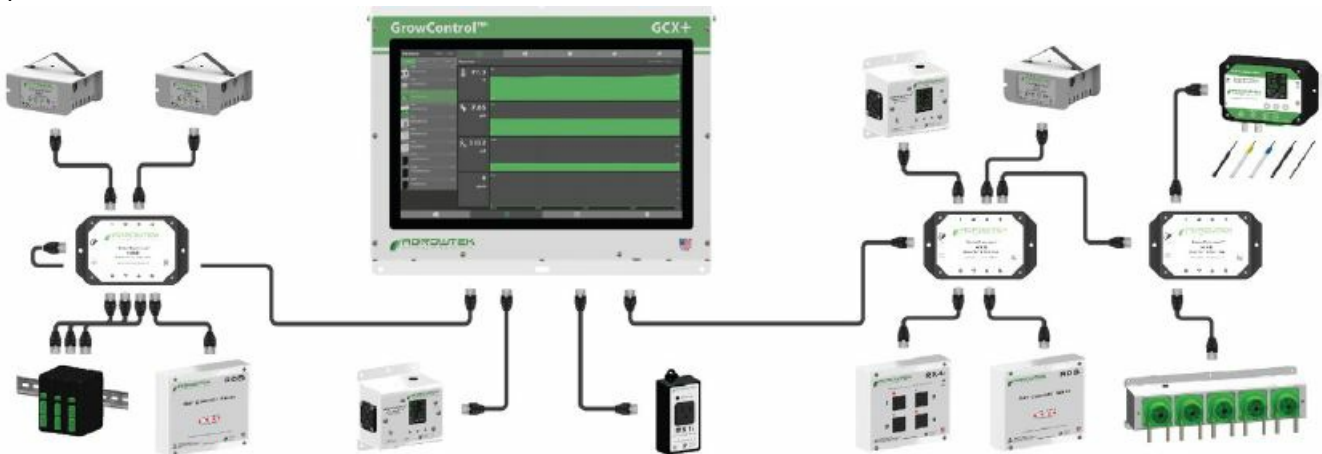
Refer to the GCX controller manual for details on adding the device to the system.

GrowNET™ Hub

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.

Installation Notes

NOTICE: GrowNET™ ports use standard RJ-45 connections but are NOT compatible with the Ethernet network equipment. Do not connect GrowNET™ ports to Ethernet ports or network switch gear.
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. Non-conductive grease is designed to prevent corrosion from moisture in electrical connectors.

- Loctite LB 8423
- Dupont Molykote 4/5
- CRC 05105 Di-Electric Grease
- Super Lube 91016 Silicone Dielectric Grease
- Other Silicone or Lithium based insulating greases

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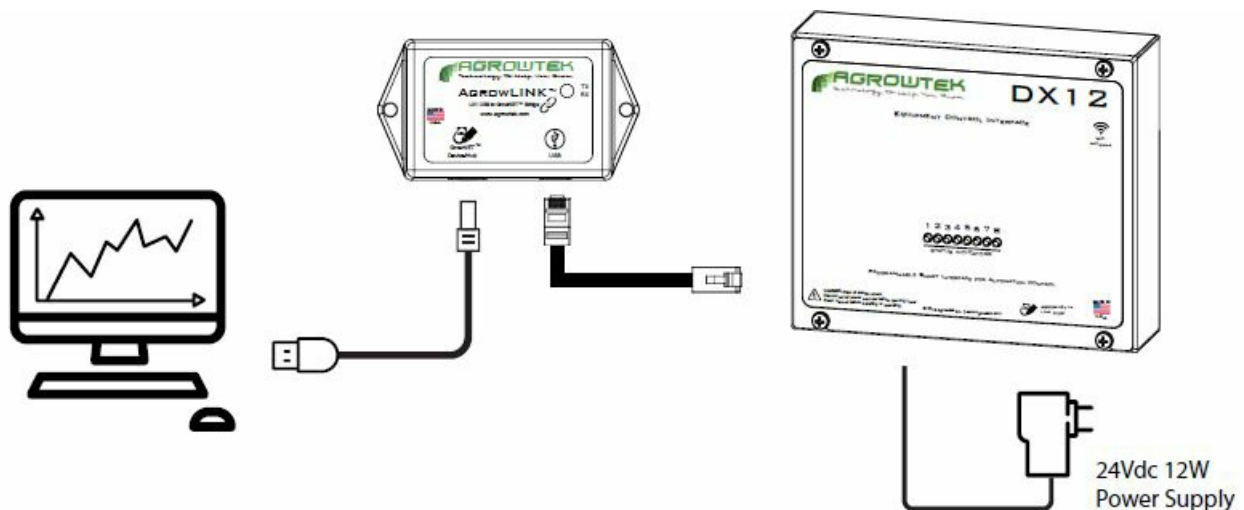
LX1 USB AgrowLINK connects Agrowtek's devices to a computer's USB port for:

- Firmware Updates
- Manual Operation
- API Based Control
- More

Agrowtek's intelligent relays may be connected to the LX1 USB AgrowLINK for firmware updates, communication protocol configuration, addressing, and manual operation. Standard drivers automatically install in Windows for the LX1 USB AgrowLINK. GrowNET API is available for custom software applications.

MODBUS RTU

RS-485: Use the LX2 ModLINK to connect MODBUS devices to the GrowNET™ port.
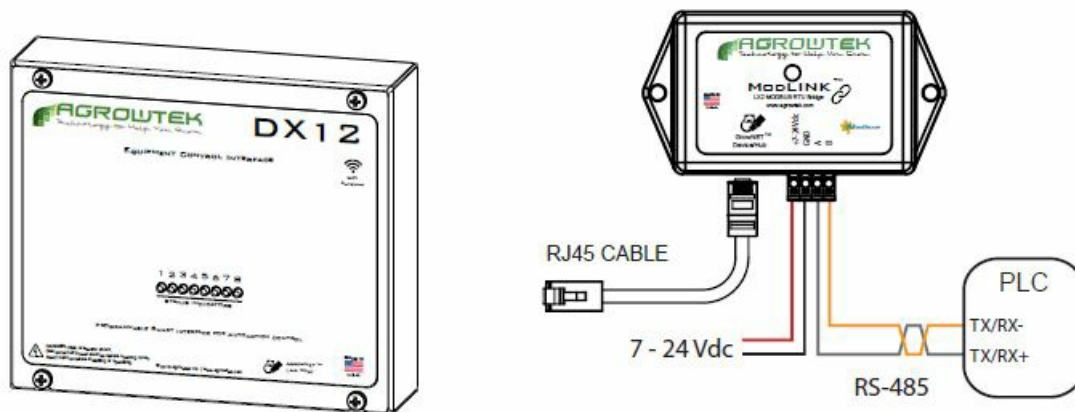
Serial Speed & Format

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.
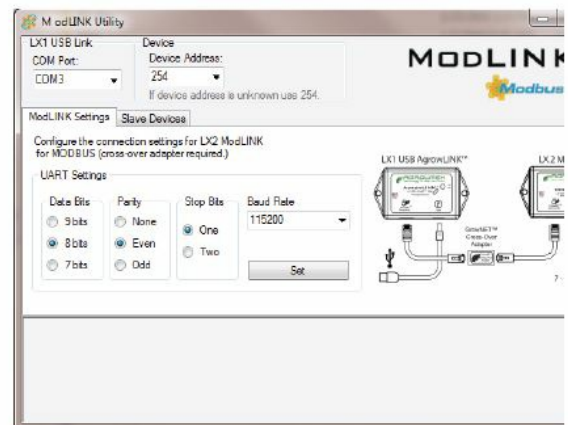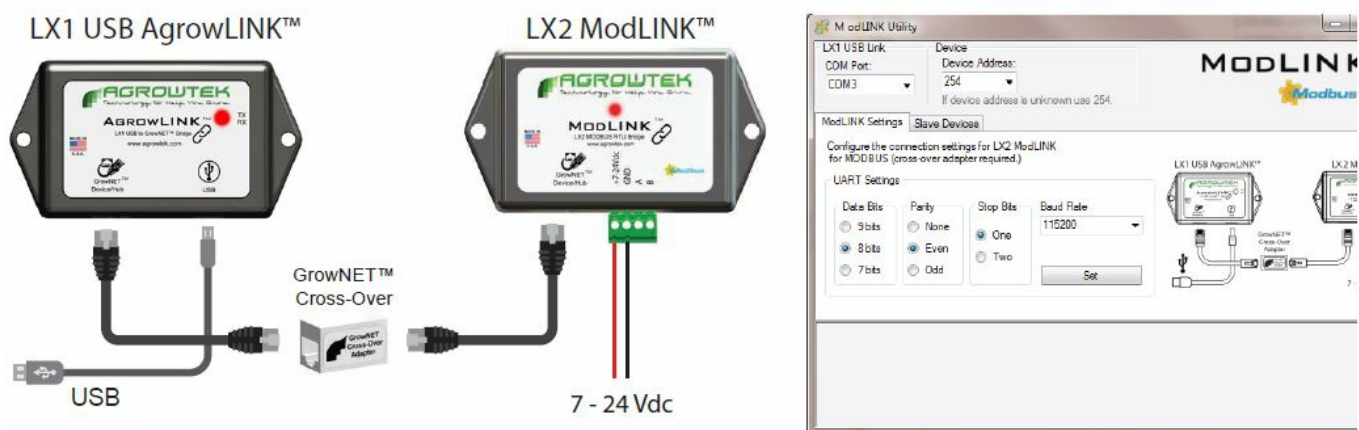
See the MODBUS manual for more information.

- MODBUS Manual

Supported Commands

- 0x01 Read Coils
- 0x03 Read Multiple Registers
- 0x05 Write Single Coil
- 0x06 Write Single Register
- 0x15 Write Multiple Coils
- A request to use a function that is not available will return an illegal function error (0x01).

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. Coil registers are single-bit values that control and indicate the status of a relay; 1 = on, 0 = off.

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
Analog Input Value, Integer	Input 1	Signed Int	16 bit, signed	R	40101
	Input 2				40102
	Input 3				40103
	Input 4				40104
Analog Input Value, Floating Point	Input 1	Floating Point	32 bit, float	R	40201
	Input 2				40203
	Input 3				40205
	Input 4				40207
PWM Output, Duty Cycle %	Output 1	0, 10-90, 100	16 bit, signed	R/W	40301
	Output 2				40302
	Output 3				40303
	Output 4				40304
	Output 5				40305
	Output 6				40306

Timeout (seconds)	Turn off outputs if no communication	0 – 32767	16 bit, unsigned	R/W	41001
Output Closure Count, Discrete	Output 1	Unsigned Int	32 bit, unsigned	R	49001
	Output 2				49003
	Output 3				49005
	Output 4				49007
	Output 5				49009
	Output 6				49011
	Output 7				49013
	Output 8				49015

MODBUS Coil Registers

Parameter	Access	Address
Relay 1	R/W	1
Relay 2	R/W	2
Relay 3	R/W	3
Relay 4	R/W	4
Relay 5	R/W	5
Relay 6	R/W	6
Relay 7	R/W	7
Relay 8	R/W	8

A request to read or write coils/registers that are not available will return an illegal address error (0x02.)

Technical Information

Troubleshooting

Outputs are not activating, no power LED on PCB Ensure the input power has 12-24Vdc and is correctly wired for polarity. A dimly lit red LED should illuminate when the circuit board has power.

Maintenance & Service

Exterior Cleaning

The exterior may be wiped with a damp cloth with mild dish detergent, then wiped dry. Disconnect power before cleaning the enclosure to prevent electrical shock.

Storage and Disposal

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

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 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. Agrowtek Inc. must be contacted prior to return shipment for a return authorization. No returns will be accepted without a return authorization. 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, high humidity or high-temperature conditions. The products which have been claimed and comply with the afore-mentioned restrictions shall be replaced or repaired at the sole discretion of Agrowtek Inc. at no charge. This warranty is provided in lieu of all other warranty provisions, express or implied. It is including but is 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.

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Documents / Resources

AGROWTEK VXi Digital Irrigation Valve Controller [pdf] Instruction Manual
VXi Digital Irrigation Valve Controller, VXi, Digital Irrigation Valve Controller, Irrigation Valve Controller, Valve Controller, Controller

References

- 🌱 **Agrowtek Inc. :: Grow Controls for Greenhouses, Hydroponics & Indoor Growing**