



GrowControl™ GCX

Cultivation Control Systems





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KEEP THESE INSTRUCTIONS

REV 08/22

Overview

GrowControl[™] GCX Cultivation Control Systems can manage nearly every aspect of a facility's environment and water management with extensive and intuitive programming capabilities. Sensors and inputs are monitored, control logic is executed, and output devices are operated. Alarm conditions can be set to notify users of a fault or problem condition by email or text message, and data logs are stored on the system that can be exported by email or USB.

GrowNET™ Devices

A large variety of 'GrowNET^{™'} plug-and-play peripherals are available to sense and control the environment including:

- Environment Sensors (temperature, humidity, light, co2, etc.)
- Hydroponics Sensors (pH, conductivity, ORP, etc.)
- Peristaltic Dosing Pumps
- Control Relays
- DIN Rail I/O Modules

GrowNET[™] devices connect using standard CAT5 Ethernet cable and RJ-45 connections. HX8 GrowNET[™] Hubs expand one GrowNET[™] port into eight more ports. HX8 hubs provide power to the devices from the hub ports, further simplifying installation. *Recommended maximum cable length is 1000ft*.



Standard Control Functions

- Clock Timers
- On/Off Delay Timers
- Cycle Timers
- Thermostats
- Humidistats
- Photostats/Light Dimming Controls
- CO2 Injection/Exhaust

- Motor Position Controls (Vents/Shades/Curtains)
- Irrigation Stage Timers
- Tank Level (Refill) Control
- Nutrient & pH Dosing
- Sensor Averaging
- Math
- Logic

Physical Features

GrowControl[™] GCX controllers are high performance Linux based systems with industrial flash hard drive for security and reliability. High performance quad-core processor with passive cooling technology means the system runs smooth and silent. High definition tempered glass touch screen offers brilliant resolution and excellent touch response.



GCX

GCX+

Display Size	10.1″	15.6″
Display Resolution	1024x800	1920x1080
Max. GrowNET™ Devices	100	200
Number of GrowNET [™] Ports	8	16

Connections



1. Conduit Knock-Out

- 2. Power Input Jack
- 3. USB Slave Port
- 4. USB Host Ports
- 5. GrowNET[™] Ports
- 6. Ethernet

GCX+ Only

7. GrowNET[™] Ports

Knock-out for hard-wired DC power input connection. Barrel jack connection for DC power input. Slave port for boot loader; loading system firmware image from USB host. USB Ports for WIFI, memory sticks, and other USB accessories (4 ports.) 8-port, 100 device GrowNET[™] bus 0 (RJ-45.) 10/100 Ethernet for Internet connection

8-port, 100 device GrowNET[™] bus 1.

Dimensions, GCX



Dimensions, GCX+



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

Warnings & Precautions

INSTALL IN ACCORDANCE with all national and local plumbing and electrical codes. The GCX system operates on low-voltage with NRTL LISTED limited energy power supplies. Run all low-voltage signal cables separate from high-voltage cabling and conduits.

\triangle danger: electrocution hazard

Disconnect power before maintenance or service on the system or system components to prevent equipment damage or electrical shock. Use caution when servicing plumbing to drain the system off away from electrical components and connections. Connect the system and components to GFCI fault protected energy sources to reduce risk of electric shock.

$m \Lambda$ indoor locations only

This system is designed for indoor mounting only and must be protected from weather and direct sunlight.

$m \Delta$ prevent over heating

Keep air space around the system cool and ventilated to prevent overheating of system components.

Site Requirements

Electrical

The GCX system requires one 120Vac electrical outlet (GFCI fault protected recommended.) GCX systems are provided with a 60 Watt power supply.

A hard-wire terminal block is available internally for connection to industrial power supplies. *Customer supplied power sources must be UL listed class-II / limited energy power supplies.*

Battery Back-up

A Battery Back-up system is recommended to maintain power in the event of power interruptions and to provide clean power to the control system. Any components connected to the GCX controller's GrowNET[™] ports will be powered by the controller (except dosing pumps and 120V outlet relays.)

Network

A Ethernet connection is recommended if available. WiFi is also available as an alternative to Ethernet.

Mounting the Controller

The system should be securely mounted on an indoor vertical surface.

Follow these tips for the best results:

- 1. Locate the controller in a dry location away from direct sunlight and other heat sources.
- 2. Mount the location at a height that is easy to view and operate from a standing position.
- 3. Ensure the area around the controller can be kept clear and accessible.
- 4. Avoid locating the controller next to heavy electrical loads and equipment.

Use the holes in the top and bottom mounting flanges to secure the controller to the surface. It is recommended to trace the holes and drill pilot holes. Use a level to ensure the system is mounted straight.

USE CAUTION when installing screws and mounting the unit. Impacting the screen with a drill or screw driver or dropping the unit will cause serious damage to the unit.

DO NOT OVER TIGHTEN screws; enclosure is made out of corrosion resistant aluminum which can be bent easily. Use minimal toque when installing screws. Plastic washers are recommended to prevent damage to the paint.

DO NOT DRILL HOLES into the enclosure of any product. Damage to the unit may result and will not be covered under warranty. Only use the knock-outs provided in the bottom panel if necessary.

Device Connections

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.

HX8 GrowNET [™] hubs can be daisy-chained to form a network of up to 100 devices per bus. 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.



\triangle 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 grease

GrowNET[™] ports use standard RJ-45 connections but are NOT compatible with Ethernet networks. *To prevent damage, do not connect GrowNET[™] ports to Ethernet ports or network switch gear.*

Addressing Devices

BEFORE YOU BEGIN INSTALLATION we recommend pre-addressing devices at the controller prior to mounting them in the final installation locations.

Each GrowNET[™] device on the GCX controller must be assigned an address number before the controller can begin talking to it. All devices come from the factory without an address assigned and must be assigned by the GCX controller when first installed.

GCX systems are equipped with either a single bus (GCX) or a dual bus (GCX+.) *Each bus is capable of supporting 100 device addresses (1-100.)*



IMPORTANT Each new device must be added one at a time. Do not connect multiple un-assigned devices at the same time or devices will recive duplicate addresses.

How to Assign a Device Address:

- 1. Use a regular straight cable and connect only one new device to the GCX system. *If this is a GCX+ system, connect the device to the bus that it will be located on when installed.*
- 2. Add the device using the 'Add Device' button on the device tab. See "Add a Device" in the Device Management section of this manual.
- 3. Disconnect the device and prepare it for installation in the final location. Mark the device in a discrete location with a non-permanent or temporary removable label if necessary.

4. Connect the next device to be assigned and repeat the process until all devices have been added to the device list on the GCX controller.

User Interface Introduction

The system is controlled by a 10.1" or 15.6" high resolution touch screen with easy to use graphical interface. The system uses familiar controls such as buttons, switches, check boxes, drop-down combo-boxes and text fields. Dynamic pop-up dialogs alert the user to faults or confirm important actions.

Swipe Gestures

Swipe Left/Right to change between tabs/pages. Swipe Up/Down to scroll on pages.

Help Pages

Most pages include a help dialog that can provide reference information right at the screen. *Press the "?" button on the page header to display the help dialog.*

Keyboard

The touch screen features a "pop-up" keyboard that will be displayed any time a text or numerical field is selected for editing.



Physical Keyboard & Mouse

If preferred, a physical USB keyboard and mouse can be connected to the GCX's USB ports.



Loader Screen

The Agrowtek Leaf logo appears while the system boots. Once the Linux operating system boots, the system loader screen appears which displays the status of the system memory, and searches for downloaded firmware updates, or for updates on USB memory. *See Firmware Updates for more information*.

\sim	FECTROLOGY TO H	UTEK
(1)	System Memory: OK	Capacity: 7 GB / Free: 2 GB
3	GCX System Loader Version 2.0.0 started. Checking for new firmware Firmware file found from download. Backing up old firmware file System firmware backed up successfully. Copying new firmware file System firmware update completed from download.	
4	RECOVERY	5

6

- 1. Memory Status System memory status, should read OK.
- 2. Memory Capacity Capacity and free space on the system memory.
- 3. Message Buffer Messages showing current actions of the loader.
- 4. System Recovery Opens the system recovery options dialog.
- 5. Skip Button The loader screen can be skipped if this button is pressed. Button can not be pressed if firmware is found and loaded.
- 6. Progress Bar Indicates the progress of the loader screen before starting the system.

System Recovery

The system recovery dialog is for 'emergency' recovery of a system if a firmware update or other problem is preventing the system from starting successfully. Several recovery tools are available including exporting system files, restoring defaults or the previous firmware version, and forcing an update from Agrowtek.

NOTE: Always export your system files (by email or USB) before restoring factory defaults. These files can aid in bug fixes and restoring your settings to your system.



- 1. USB Memory
- 2. System Files
- 3. Restore Backup
- Restores the backup file of the previous system firmware. Use this if a firmware update has caused a problem with your system. Buffer window for messages to display. Forces a download of the most current firmware from the Agrowtek se
- Messages
 Download
- 6. Restore Defaults
- 7. Exit

Forces a download of the most current firmware from the Agrowtek server. Deletes all user files (devices, controls, recipes, etc.) and restores to factory. Exits the recovery screen and attempts to boot the GCX system.

Drop-down menu to select which USB memory stick to use for file recovery.

Functions for exporting the system files for diagnostics via Email or USB.

Login Screen

User accounts with operator or administrator access can be configured on the system to restrict access to the system's interface. If "Require Login on Power-up" is checked, the system will boot with the login screen. Swipe the slider at the bottom of the screen to the right to continue.



1. Logo Area 2. Swipe Slider A custom logo can be displayed; see the "Files" page for more information. Slide the green dot from the left to the right then release.

1 2 3 4 COCH

If users are configured on the system, the login screen will appear:

1. User Name

2. Password

3. Login Button

4. Keyboard

Enter your user name by pressing on the text field to bring up the keyboard. Enter your password by pressing on the text field to bring up the keyboard. Once you have entered the correct user name and password, press LOGIN. The on-screen keyboard pops-up when ever a text field is selected.

Home

The home page displays a general information overview of the system. The left pane shows recent notifications from the system. The right pane shows a customizable report by control group/zone. Page between the different groups to quickly monitor the conditions and I/O status of devices in each group. Devices with active outputs are highlighted green and sensors in alarm condition are highlighted red for enhanced visibility.



1. Notifications

List of recent notifications from the system.

[CLEAR] will delete messages in the list but they remain in the event log.

- 2. Main Menu Bar Select between the four main page displays on the system (see below.)
- 3. Report Area Customizable reports by control group display the status of devices and control functions that are selected to be shown in the report.
- 4. Report Selection Select a group from the drop-down or use the arrow buttons to page through reports.5. Logout Button Press to log-out of the system and show the login screen.
- 6. Run/Stop Press to place entire system into Run or Stop mode. In Stop mode, no outputs activate.

Main Menu Bar

The main menu bar is located at the bottom of the display and is used to switch between the primary screen pages. The bar indicates which page is active by highlighting the icon green and darkening the background. Press the tabs to switch between the screen pages.



Devices Page

The devices page displays all of the relevant data pertaining to GrowNET[™] devices that are connected to the system, and manages all of their properties including reference names, alarm settings, calibration and manual operation / overrides.



- 1. Devices Menu Bar Change between the different pages in the devices screen.
- 2. Page Title Bar Displays the title of the current page. A help [?] button is located on most title bars.
- 3. Page Area Area to display the selected menu bar page; the device monitor page is shown.
- 4. Device List

The device list shows the name and status of each device. Select the device to monitor the device or edit the device properties.

Devices Menu Bar

The devices menu bar selects between the monitoring page and, alarms, calibration and other device properties pages. The bar indicates which page is active by highlighting the icon green and darkening the background. Press the tabs to switch between the screen pages.



Device List

The device list comprises a list of all of the GrowNET[™] devices that are connected to the GCX system. The device list can be organized by device type (sensor, I/O or pumps) or can show all devices (all.) This is also where devices are added to and removed from the system.

Each device in the list includes basic details about the device including the type with an icon, the reference name, communication status and address details. Scrolling through the list of a devices at a glance can identify any offline devices.

Selecting an device in the list will highlight it and populate the properties and data relative to the device on the device pages for viewing and editing.

	Devi	ices 🭸	H +	R R	3
	ALL	SENSORS	1/0	PUMPS	\sim
9		SXE Room 1 Climate		OK)	
	0/2 :	SXC Room 2 Climate		ок	
	0/3 9	SXH Tank 1 Hydro		ок	(5)
(7)	0/4	AD4		ок	-6
		Tank 1 Pumps			

- 1. Device Type
- 2. Add a Device
- 3. Delete a Device
- 4. Product Model
- 5. Device Status
- 6. Device Name
- 7. Device Address
- 8. Bus Number
- 9. Selected Device
- 10. Group Device

Select the type of devices to show in the list.

Press to open the "Add Device" dialog window and scan for new devices.

- Press to delete the currently selected device from the system.
- Product type/model number.
- Communication status of the device; see chart below.

Reference name assigned by the operator and used by the control functions. The GrowNET[™] device address.

- The GrowNET[™] bus number the device is on (100 devices per bus.)
- The selected device is highlighted in a transparent green.
 - Creates a new "grouped" or averaged device with the selected device as a base.

Input & Sensor Monitoring

Device monitor page provides the current readings of the sensor values and a graphical history for each sensor channel. The time since the last reading update is shown in the page title bar.

Additional data can be displayed by touching on a sensor reading group or a graph pane to open the enlarged graph window.



- 1. Reading Group
- 2. Sensor Reading
- 3. Sensor Icon
- 4. Sensor Units
- 5. Last Update
- 6. Location
- 7. Graph Options
- 8. Graph Pane Graph history pane showing 1440 points; touch a pane to enlarge the graph.

Amount of time since sensor readings were last updated.

Area grouping the sensor reading, units and icon.

Units the sensor reading is being displayed in.

X-Axis zoom in/out and graph display options.

Actual sensor reading value.

Icon to identify the sensor type.

9. X-Axis

Time axis of graph panes (all share the same time axis.) Enlarge graph for dates.

Control group that the device is associated with (see device info tab.)

Output & Pump Monitoring

The device monitor page provides the output status' and a graphical history for each output. The time since the last reading update is shown in the page title bar.

Additional data can be displayed by touching on a graph pane to open the enlarged graph window.





- 1. Graph Pane
- 2. Output Name
- Graph history pane showing 1440 points; touch a pane to enlarge the graph. Reference name for the output or pump. Manually set outputs/pumps Off/On, or set to AUTO for function control.
- 3. Manual/Auto Manually se
- 4. Output Status Graphic and info displaying the output status.

MX Motor Monitoring

The MX monitor page displays data relevant to the MX motor controller:

- Current MX controller position
- Forward/reverse output status
- Manual knob position
- Manual overrides
- History charts

The time since the last reading update is shown in the page title bar.

Additional data can be displayed by touching on a graph pane to open the enlarged graph window.



- 1. Position
- 2. Output Status
- 3. Knob Status
- 4. Manual/Auto
- Graphic and info displaying the output status; forward, reverse or off. Displays current position of the MX controller's manual override knob. Manually operate the MX controller, disable or enable automatic control. *Automatic or manual controls are not available if the knob position is not in "auto."* Graph history pane of the motor position.
- 5. Position Graph Graph h 6. Output Graph Graph h
 - out Graph Graph history pane of the motor outputs (forward, reverse.)

Current position reported by the MX controller.

The MX position is calibrated on the calibration page; see the calibration section.

Enlarged Graph Window

Historical graph data can be analyzed on-screen to review:

- Minimum and Maximum (High/Low) sensor readings
- Point data with 'cursor' selection
- Graph history

To open the graph window, touch on a graph pane in the monitor page of a device.

A maximum of 1440 points are shown on the graph pane.

Graph data is stored on the system in .csv format for export by USB or FTP; see the "Files" section of this manual.



- 1. Exit Button
- 2. Screen Capture
- 3. Date
- 4. Fwd/Back
- 5. Cursor Data
- 6. Cursor
- Press to close the graph window.
- Sends a screen capture of the graph window to the email/sms recipients. Beginning and end dates of the data on the chart.
- Page Forward/Backward buttons to move through histortical data.
- Data at the point shown by the cursor line when the chart area is touched.
- Touch on the graph display to show cursor data.

Graph Options

Graph options are shown at the top of the graph display in the Monitor view. Adjust the amount of data shown on the graph and how it is displayed to get the most optimal view of the information.



- 1. Zoom Out
- Show a larger time frame on the graph pane.
- 2. Zoom In Show a shorter time frame on the graph pane.
- 3. Zoom Default Set the default time frame (24 hours) on the graph pane.
- 4. Single Pane Show all graph data on a single, overlaid pane (sensors only.)
- 5. Multi Pane Show each grapg on a separate pane.
- 6. Chart Fill Enable or disable color fill under the chart line.
- 7. All Green Set all charts to default green color.
- 8. Multi Color Set sensor charts to multi-color.
- 9. Screen Capture Take a screen capture and send it to email/sms recipients.

Multi-Pane, Multi-Color

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	SAH									
1	7	200								
-745	W/m ²	0								
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(@ <u>`</u>	ppm -									2000
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Ø	19.1 2	0								18 9
4	1 9	4	er-su r							3
	L.O.	0								
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Single-Pane, Color Fill

Device Information

The device information page is where device names are managed and where devices can be configured for display in the report views on the home page.

Names

Device names and I/O names are used for more than just reference. Names are used when configuring control functions to assign sensors, outputs, inputs, pumps, etc. to the functions. If equipped with outputs or analog inputs, each channel can be named for reference.

Where Used

To determine which control functions are assigned to use a specific output, select the output from the dropdown menu and press the where-used search button. This can aid in troubleshooting if a device is operating in an unexpected fashion.

Device Location

To show the device in the home report view select a control group to associate it with, then check the box to show it in the report.

	- ^-	0	Û	+	¥	
	Device Info	rmation 👔				—(7)
	Device Name					\smile
\bigcirc	Dry Contact Relay	S				
\frown	Device Location					
(2)—	Room 1				•	
(3)	Show in Report					
$\overline{\bigcirc}$	Outputs					
(4)	Output 1	Q Output 1				
					,	
5						
6						
\bigcirc						

1. Device Name

Reference name for the GrowNET[™] device.

- 2. Device Location Reference the device to a control group to display the device in the home report.
- 3. Show in Report Select to show the device in the home report display.
- 4. Output Select Select an output (or input) to search "where used" or edit the name.
- 5. Where Used Search where this output is used in the control functions.
- 6. Channel Name7. Save ButtonOutput (or input) channel name; typically named for what is connected to the channel.When highlighted Green, there are changes that are not saved.
 - Press the Save button to save the changes to system memory.

Device Alerts

Devices which are capable of reporting alerts (sensor devices) can configure basic high and low level threshold alerts on the device alerts page. These alerts are recorded in the event log and can be emailed or sent by text message using the system email sender.

To configure an alarm:

- 1. Select the sensor type.
- 2. Turn on the high alert and/or low alert switch.
- 3. Enter the high and/or low alert values.
- 4. Check the **Enabled** box to enable the alert.

Alerts will only be sent once each time they are activated.



- 1. Sensor Channel
- 2. High Alert
- 3. Low Alert
- 5. Save Button

If sensor value meets or exceeds this value trigger a high-alert. If sensor value meets or falls below this value trigger a low-alert. 4. Enable Checkbox Check to enable the alerts for this sensor channel. When highlighted Green, there are changes that are not saved. Press the Save button to save the changes to system memory.

Select the sensor channel to configure the alert limits.

Device Calibration

Sensor devices, motor controllers and dosing pumps require occasional calibration to ensure their readings, positions and dosing volumes are accurate. If a device has features that can be calibrated, a calibration screen will be shown on the calibration page.

Sensor Calibration

A menu of available sensor types is displayed for the sensor unit that is selected. Select the sensor channel to calibrate and follow the prompts on the display.

Most calibration requires the user to simply enter the actual calibrated vale.

	-1-	i	()	e	۶	
	Calibration	?				
	Sensor	Current F	leading	Re	set	
\cup	Temperature	- 75.3	Ľ.	F	RESET TO FACTORY	-5
	Calibrate					
(2)—	Actual Value: 74	.0			CALIBRATE	(4)
$\tilde{\odot}$						
3		g and press the CALIBRA	TE button.			

1. Channel

Select the sensor channel to calibrate.

- 2. Calibration Value Follow the prompts and enter the calibration value.
- 3. Prompts Instructions to follow for calibration.
- 4. Calibrate Button Press once the calibration value has been entered to save the value.
- 5. Reset Button Restores factory sensor calibration values.

pH calibration uses pre-defined calibration solutions which are industry standard. *pH 4 & pH 7 solution are typically used for pH calibration*.

Sensor	Current Reading		Reset
рH	7.06	рН	RESET TO FACTORY
Calibrate			
CALIBRATE PH7			

Always begin with pH7 calibration and follow the prompts on the display.

Dosing Pump Calibration

Dosing pumps may vary from the factory calibrated flow rate if fluids are viscous or supply lines are long.

Operate the pump for 60 seconds and measure the output with a graduated cylinder. Enter the measured quantity as the calibration value (mL/min) to set the true flow of the dosing pump.



- 1. Channel
 - Select the sensor channel or pump head to calibrate.
- 2. Calibration Value Follow the prompts and enter the calibration value.
- 3. Prompts Instructions to follow for calibration.
- 4. Calibrate Button Press once the calibration value has been entered to save the value.
- 5. Reset Button Restores factory sensor calibration values.

MX Motor Position Calibration

In some cases it may be necessary to adjust the calibration of the MX controller's position to ensure it is accurate in the MX controller. There are two methods for calibrationg the MX controller position:

- Manually operate the MX controller until it reaches 0% (closed) and the motor stops at the working limit.
- Set the position to a known value using the device calibration page.

- /-	i	()	•	۶				
Calibration								
Current Position	Calibrate Posit	lon						
23 % 0	pen Actual Posit	ion: 0		CALIBRATE				
Enter the actual motor position and press the CALIBRATE button.								

Device Management

General management for GrowNET[™] devices is handled on the device management page including:

- Temporarily taking a device offline for service or maintenance
- Replacing a device
- Changing device display order
- Changing the device address
- Removing a device from the system
- Configuring data logging interval

	-1~	i	Ŷ	•	×
	Device Man	agement 💿			
\frown	Options				1
(1)	Device Out of	Service			
-	Management				
\square	H	$\uparrow \equiv \downarrow$	B	∕ →	
	FACTORY INFO	CHANGE ORDER	CHANGE ADDRESS	REPLACE OFFLINE	DE-COMISSION
_	Data Logging				
\bigcirc	Interval:	Log File Size:	DELETELOC		
9	1 • mir	15 209 KB	DELETE LOG		

- 1. Service Switch
- 2. Mgmt Buttons
- 3. Logging Options

Set a device "out-of-service" so the system does not poll it or show errors. Buttons to activate various management dialogs; see "setting up devices" section. Configure the logging interval and delete logs.

See the "Files" page for more advanced log management.

Management Buttons



Controls

Control "functions" are used to create control logic in order to operate equipment in a facility. Functions are arranged in work spaces known as "control groups." Control groups are often modeled after an environment zone, but they may also represent sub-zones or other logical groupings of controls.

Create and name control groups according to how you would like to group functions and show report displays. Note the system executes controls in the order of groups and functions within the groups. Groups and functions can be re-arranged to create the logical order required for proper operation. *See the "Programming" section for more information*.

O TIP:

Press and hold on the control icon's (3) name to drag the function to a different order in the workspace.



1. Workspace

Controls work space; shows control functions in the selected group.

2. Function Toolbar Toobar of available functions; press a button to add a new function to the workspace.

- 3. Workspace Toolbar Contains items specific to the work space including the day counter.
- 4. Function Icon Icon depicting the function type, status and name.

Press the function icon to open the function editor and configure the function.

- 5. Run/Pause Set the control group to run mode or pause (suspend).
- 6. Control Group Select the control group to view and edit in the workspace.
- 7. Rename Group Opens a dialog to rename the currently selected control group.
- 8. Add Group Opens a dialog to add a new control group to the system.
- 9. Move Group Opens a dialog to move the current group to a new position in the group list.
- 10. Remove Group Opens a dialog to delete the current group and all of it's controls from the system.
- 11. Day Count Displays the workspace count and opens a dialog to adjust the day counter.
- 12. Enable Report Show or hide this workspace from the home page report view.

Network Settings

The network page shows the status of Ethernet and WiFi connections as well as provides configuration for:

- WiFi scanning & connection
- MODBUS TCP/IP Command server
- VNC Remote access password

A network connection is required for:

- Email/SMS alerts
- Remote access/control
- Internet updates (also available by USB)

The system uses DHCP to obtain an IP address automatically from a newtwork DHCP server/router. If a static IP address is preferred, set a static IP address in the network router, or set the system to use STATIC IP and manually enter the IP address, subnet and gateway information.

If a network connection is detected, the controller's IP address will be displayed. Use the [INFO] button to get details about the network activity.

Network 7	
Ethernet IP Address VNC Remote Access	(3)
IP: 192.168.1.189 RESTART INFO VIEW CURRENT SESSIONS RESET SERVER KEYS O DHCP (Automatic) Static (Manual)	
IP Address: 192 168 1 189 Password: Password: Subnet Mask: 255 255 0 minimum length: 6 characters SET PASSWORD:	
WiFi (optional)	
No Network Connection RESTART INFO Network SSID: Port Number	6
Passphrase:	ections
DISCONNECT	
A II II O	

1. Ethernet	Status of Ethernet connection.
	The connection can be configured for DHCP (automatic) or STATIC (manual settings.)
2. WiFi	Status and configuration of wireless network connection (if equipped.)
	Use the SCAN button to find networks.
3. VNC Password	Change the default VNC remote access password (default = $gcxvnc$).
4. Server Keys	Resets the VNC server keys and challenge phrases.
	If excessive unathorized access attemptes are detected, the keys may be invalidated and require resetting.
5. TCP/IP Server	Enable or disable the TCP/IP command server for MODBUS integration.

Email Settings

An email account is required to send email or text message alerts from the system. Alerts can be sent to multiple email accounts or phone numbers.

Email alerts can be sent automatically for:

- System power-up
- User Login
- System Error / Alert

To configure email alerts, enter the email account settings to use for sending messages. Add at least one recipient and send a test message. Once a message is sent successfully and the settings are verified correct, general alerts can be enabled.

See "Email Configuration" section for more details and instructions on using Gmail.



- 1. Recipients
 - Manage recipients of emails from the system.
- If recipient is a mobile phone number, select the carrier of the phone service. 2. Text Carrier
- 3. Recipeint List List of message recipients; select a recipient to highlight it.
- 4. Delete Recipient Delete the highlighted recipient from the list.
- 5. Add Recipient
- Add the recipient listed in the Address field above. 6. Account Settings Configuration for the email account used by the system to send messages.
- 7. Test Button
- Send a test message to recipients using the email account configured. Select the alerts to be sent by the system to the recipients. 8. General Alerts
- 9. Alert Frequency Time delay between repeating the same alert message.

User Accounts

User accounts allow logged access to the system. When a user logs into the system, that information is recorded in the system log. Additionally, an alert can be sent out any time a user logs into the system.

There are two level of acces: administrator and operator. Administrator has full access to the system while operator does not have access to any of the settings on the system page.

NOTE: If the 'Require login on power-up' option is not checked, the system will automatically login with Administrator access on power-up even if users are configured on the system.



1. Manage Users

e Users Add and remove users from the system.

- 2. User Level Select an Administrator or Operator level for the new user.
- 3. User List List of users on the system.
- 4. Options Check the box to require login when the system boots up.

	View Only	Maintenance	Operator	Administrator
Home Page Status/Reports	Х	Х	Х	Х
Controls Editing			Х	Х
Device Monitoring	Х	Х	Х	Х
Device Overrides		Х	Х	Х
Device Calibration		Х	Х	Х
Device Settings			Х	Х
System & Groups Run/Stop		Х	Х	Х
System Settings				Х

System Files

The system files page is where settings files, data logs and other files are managed on the system.

System Settings

All of the device settings, control functions, dosing recipes and other user settings are stored in various files on the system. These files can be backed up to external memory or email, and can be imported to other controllers or if there is a problem where a backup must be restored.

Data Logs

The system stores device log files to the internal memory in a standard .csv format. These files can be exported to USB for historical records or other data manipulations purposes.

Logo Image

A custom logo image can be imported to be displayed on the login screen when users are logged out of the system. The file must be .png format and be named "logo.png" to be imported by the system.



1. System Memory	Status of system memory and capacity.
2. External Memory	Drop down box to select the external USB memory source.
	"No External Memory Detected" is shown if no USB memory is connected.
3. File to Transfer	Select a system file to import or export.
4. File Commands	Commands to import/export or delete the selected file.
5. Service Email	Sends all system files to Agrowtek using the service email account.
	Email configuration is not required to use this function.
б. Email Files	Send system files to system email recipients.
7. Backup Options	Options for how system backups are taken.
8. Backup List	List of all system backups; select a backup to restore or remove.
9. Backup Buttons	Perform operations related to backups including restore, delete and 'backup now.'
•	

Data Log Files

System data log files can be scheduled to automatically upload to an FTP server for remote storage and consumption by third party data analysis solutions. To use the FTP scheduler, configure the connection credentials for your server and test the connection with either individual file uploads or the "Upload Now" button.

To access the FTP server configuration and scheduler, select the FTP Folder icon (1) on the System Files tab:

	S		(1)
	FTP Server Address	i	
(2)	ttp:// agrowtek.com:21		
\smile	FTP Server Credentials		
\odot	User: ttpaccount@agrowtek	com	
U U	Password:	•	
_	FTP Upload Scheduler		\sim
4-[Upload Time: 8 🔻 : 00 😽	+ADD -DEL UPLOAD NOW	(7)
Ē	1. Upload files at 8:00		
5			
6-L	File Name: 🗹 Include System Name	Include Date 🔲 Include Time	

1. FTP Tab 2. FTP Server	Select the FTP tab to access the FTP configuration and scheduler (System Files page.) FTP server address. Include the port number in the address as shown.
3. FTP Credentials	Enter the user name and password for accessing the FTP server.
4. Upload Time	Select an upload time and press "+ADD" to create a new upload event.
5. Event List	Displays when the system will attempt to upload files to the FTP server.
6. File Name Options	Select how to format the file name when uploading to the server.

System Name

File names can include the controller's system name when multiple controllers are uploading data logs to the same directory.

Date

Include the date in the file name to create separate files for each day on the server.

Time

Include the time in the file name to allow multiple files per day to be uploaded to the server.

System Settings

The system settings page is where system commands are accessed and settings are configured including:

- Controller name
- System sensor units
- Time zone
- System weather station & alerts
- Chart display mode
- Check for updates
- Enable diagnostic options
- Reboot the system

	\$	\bowtie			*	*
	System Settings					ABOUT
	System Name			Temperature	Conductivity	Flow/Volume
(1)	GrowControl GCX			Fahrenheit (*F)	microSiemens (uS)	O Lpm / Liters
\mathbf{O}	System Commands			O Celcius (°C)	O ppm (NaCl 500)) gpm / Gallons
Г	0 2	رج <u>ب</u>	ch	Chart Display		Report Increment
\bigcirc	SET CLOCK CHECK U	PDATES RESTART	SHUT DOWN	New Data on Left	O New Data on Right	15 seconds
E		C		System Weather Station		
L	CPU STATUS CONS	OLE SCREEN TES		п		. 2
\bigcirc	Display Power					
(3)	Shut Off:		500 mins	(1) Wind Speed Alarm:	40 💿 mph	🔿 km/h
$\tilde{\mathbf{C}}$	Advanced Options			Low Temperature A	larm: 55 F	
(4)	Show Advanced Options	(Contact Support)		🎓 Rain Sensor: is Dry		
\smile				Output Options		
				Sequence Delay:		1000 ms
			IT			\$

1. System Name

Name Reference name of the controller included in email alerts.

- 2. Commands System commands including status, updates, shutdown and reboot.
- 3. Display Timer Time-out for display power; turns off display automatically. Set to 0 to disable.
- 4. Advanced Options Settings for diagnostics and repair; contact service.
- 5. Reset Devices Functions for resetting device addresses when a PC with LX1 is not available.
- 6. About Button Opens the about dialog with system version number and revision history.
- 7. System Units Global units selection for sensors to report in.
- 8. Report Increment Interval to automaticall change through reports on home screen.
- 9. Weather Alarms Settings for global weather alarm conditions used by control functions.
- 10. Sequnce Delay Sets a minimum delay between simultaneously activated outputs.

System Commands

The system commands group includes buttons for accessing the clock configuration dialog, update dialog, cpu status dialog, system console and system reboot/shutdown options.



1. Set Clock

Opens the system clock/time zone dialog window.

2. Check Updates

Opens the updater dialog to check the internet for system updates.

3. Restart

4. Shut Down

5. CPU Status

Opens a dialog to restart the GrowControl system app or reboot the operating system. Shuts down and powers off the GCX controller. (Requires power cycle to restart.)

Displays information and statistics about the main system processor.

6. Screen Test Test dialog to check touch screen controller operation.

7. Load Firmware Opens the AgrowLINK updater utility for loading firmware on GrowNET[™] devices.

System Date & Time

The system time zone can be set so that the system reports the correct time for your geographic location. Time is automatically updated from the internet when there is a connection, otherwise the time and date can be manually configured from this dialog. To access the dialog, press the "SET CLOCK" button in the System commands group on the System Settings page.

~	٩	Syst	em Da	ate &	Time	•			
(3)—	•<							Time Zone	(1)
\smile	Mon	70ê	Wes 30	thu	2	Sat	5un	America/Chicago 🗸	
	5	6	7	8	9	10	11	Hour Minute Sécond	
	12	13	14	15	16	17	18	17 + 32 + 05 +	(2)
	19	20	21	22	23	24	25		
	26	27	28	29	30	31	1	Time and date are updated automatically when connected to the internet.	
	2	3	4	5	6	7	8	SET CLOCK CLOSE	

1. Time Zone

2. Time

Set the local time zone for the GCX system.

Manual system time configuration (only when internet connection is unavailable.) 3. Date Picker Manual system date configuration (only when internet connection is unavailable.)

Device Management

This section of the manual covers details of adding devices to the system and managing the devices.

Topics

- Adding a device
- Removing a device
- Replacing an offline device
- Sorting the Device List
- Changing device addresses
- Editing names
- Searching "where used"

GCX controllers can handle up to 100 device addresses per 8-port bus located on the bottom panel of the controller. GCX+ model controllers feature two 100 device busses.

Each GrowNET[™] device must have a unique device address number between 1-100. Addresses are automatically selected based on the next available address when they are added to the system, or an address may be specified from available addresses.

Add a Device

New devices must be added **one at a time** to the system (unless devices are pre-addressed prior to adding them to the system.) If multiple new devices are connected to the system without adding them one at a time, the device search may be unable to detect the devices.

How to add new devices to the system:

- 1. Connect a single new device to an available GrowNET[™] port on the GCX controller or a HX8 hub.
- 2. Ensure the device is powered by the hub (dosing pumps and RX relays require their own power source.)
- 3. Navigate to the Devices page and press the [+ ADD] button.



4. The "Add Device" dialog will pop up. Select the device bus to scan.

5. Press the [START SEARCH] button and the system will search the bus for new devices.

0 mm n	0.000		
0 805 0	O aus r	START SEARCH	
status			
	Select a bur and press	E START SEARCH to begin	
	Select a bus and press	START SCARET & Degin.	

6. If a device is found, the next available address will be assigned or select a custom address to assign.7. If desired, modify the device name then press [SAVE].

💿 BUS O	ОB		START SEARCH STOP
Device Found			
Device Addre	255	Device Name	
		SXE20110125	

The device will now be shown in the system device list.

Select the device in the list to monitor the device or modify the device properies.



Remove a Device

If a device is no longer in use on a system it can be deleted from the device list.

NOTE: Removing a device that is in use by control functions will disable the control function.

If the device is still connected and communicating with the system it should be de-comissioned first to remove the address that is assigned to the device.

1. If the device is still connected, press the [DE-COMISSION] button.



2. Confirm decomissioning of the device; press the [DECOMISSION DEVICE] button in the dialog.



3. Press the [- DEL] button to remove the device selected in the device list.



4. Press the [DELETE DEVICE] button to confirm removal of the device or press [CANCEL] to leave the device on the system.



The device will be deleted from the device list and the data logs will be erased from the system memory.
Sort Device List

The system will poll devices in the order they are listed in the device list, however, the list can be organized in any order that is generally convenient.

When a new device is added it is automatically populated at the top of the list. It may be desirable to sort the new device to a different order in the list.

To organize the device list:

- 1. Select the [ALL] button to show all devices in the device list.
- 2. Press the [CHANGE ORDER] button to open the change order dialog.



- 3. When the dialog opens, select the location in the list to move the device to.
- 4. Press [MOVE DEVICE] to perform the move operation.

$\uparrow \equiv \downarrow$ Change Device Order	$ ightarrow \overline{\equiv} ightarrow$ Change Device Orde	r
Select New Device Location	Select New Device Location	
Outlet Relays	Dry Contact Relays	•
Room 1 Climate		
Mi Room 2 Climate		CAN
Tank 1 Hydro		
Tank 1 Pumps		
Dry Contact Relays		
Motor Controller		
DC Output Module		
DC Input Module		

5. The device will now be moved to the new location in the device list.



Change Address

A device address can be manually changed if desired. This will change the address assignment on the device and in the system device list.

NOTE: Changing the address will create a new data log file and erase the previous log data.

To change a device address:

1. Press the [CHANGE ADDRESS] button to open the change address dialog.

Device Bus	Device Address	
BUS 0 ○ BUS 1	10 -	
GCX+ Model Only	Available Addresses	

- 2. Select a new address from the list of available addresses (not in use on the bus.)
- 3. Press [SET ADDRESS] to confirm the new address.

Dev	vices 🔟			10	•	
AL			Device Ma	nag 11		
0/1						
				12		
0/2			Device Out	of Servi 13		
		F Set De	vice Address	14		
0/3				_ 15		
		Device Bus			INE	DE-COMISSION
0/4		🔘 BUS 0	O BUS 1	16		
-		GCX+ Mod	iel Only	17		
				18		
		SET ADDRES	S	19	CANCEL	
0/6		11.1		20		
11 H				21		
0/7						
3				22		
0/8				23		
				24		
0.70				25		*

Replace a Device

If a device fails or is otherwise offline, it can be "replaced" with another similar device. This allows the new device to assume the names and assignments in the control functions of the original device without the need to review the controls and update the assignments to the replacement device.

- 1. Leave the offline device on the system (do not remove it.)
- 2. Add a new device (the replacement) following the "Add a Device" procedure on previous pages.
- 3. Select the new device and press the [REPLACE DEVICE] button to open the replace device dialog.



4. Select the offline device you want to replace with the new device.

SXC Device f	us	Offline Device	
Room 2			USSION
SXH 🔘 B	IS 0 O BUS 1	Room 1 Climate	
Tank 1			
AD4			

5. The new device will replace the old device. Use the [CHANGE ADDRESS] button to modify the device address.



Device Name

Each device must have a unique name which is used to identify the device.

The device name is used in:

- Control function programming
- Data log files
- Alert messages

Device names can be assigned in the "Add Device" dialog, or can be edited on the device information page.

- 1. Select the device and then select the device name text field.
- 2. A keyboard will appear; enter the new name.
- 3. Press the save button to save the new name to the system memory.

Devices ? + 🕅 🕅	F 🚯 🏠 🔶 🗡
ALL SENSORS I/O PUMPS	Device Information 2
0/1 SXE OK	Device Name
Room 1 Climate	Dry Contact Relays
0/2 SXC OK	
Room 2 Climate	Device Location
0/3 SXH OK	Room 2 -
Tank 1 Hydro	Show in Report
0/4 AD4 OK	Outputs
Tank 1 Pumps	Output 1 - Q Output 1
0/5 RD8 OK	
Dry Contact Relays	
0/6 RX4	
Outlet Relays	ertyuiop 🗵
0/7 MX1	
Motor Controller a	sdfghjkl 🖵
0/8 DX08	x c v b n m , · fr
DC Output Module	
© / 0 DVIR & &123	· :-)

Input & Output Names

Each input or output on devices with I/O require a unique name to identify the channel.

Devices that have I/O names:

- Relays (RX & RD series)
- DIN Rail I/O (DX)
- Motor Controllers (MX)
- Valve Controllers (VX)
- Dosing Pumps (AD)

Each output should be named to describe what is connected to the input, output or pump head. The descriptions are used to configure the control functions.

To set an output name:

- 1. Select the output (or input) channel to edit.
- 2. Enter the new name.
- 3. Press the save button to store the new name in system memory.

Devices 7 +1	11 1 1	-/~•	0	Ŷ	Ð	بو	
ALL SENSORS I/O	PUMPS	Device Info	mation			- E	—(3
0/1 SXE		Device Name					
Room 1 Climate		Outlet Relays					
0/2 SXC							
Room 2 Climate		Device Location					
0/3 SXH		Room 1				÷	
Tank 1 Hydro		M Show in Report					
0/4 AD4		Outputs					
Tank 1 Pumps		Output 1	Q Output 1				_(
0/5 RD8		0.1-1.2					
Dry Contact Relays		Output 2					
0/6 RX4		Output 3					
Outlet Relays		Output 4					
0/7 MX1							
Motor Controller							

Input Setup & Scaling

Devices with inputs (DXI8, DXIO, VX8) require configuration to set the input to a custom scale or standard sensor offering (such as SXM moisture sensors.)

Each input should be named to describe what is connected to the input, then the input should be configured to match the type of sensor connected to the input.

To configure an Input:

- 1. Select the output (or input) channel to edit.
- 2. Enter the new name.
- 3. Press the save button to store the new name in system memory.
- 4. Select discrete or analog sensor type. On/Off sensors are discrete, sensors which report a value are analog.
- 5. Select a standard or custom sensor type.

Custom sensor Type:

- 6. Select millivolts or milliamps scale (must match jumpers in the DX input device.)
- 7. To configure a custom scale, enable the switch and set the Ymin and Ymax scale values.

	-1	0	()	\clubsuit	¥	
	Device Info	rmation 🤉				
	Device Name					
	Q DXI8					
	Device Location					
					-	
	Show in Report					
\frown	Inputs					
(1)	Input 1	• Q _{Name:} My S	Sensor			-(2)
3	Analog (variable)	- Custom Sei	nsor - milliV	olts (0-5V) 🔫 🖕		-8
C	Custom Scale	Y-Min: 0	- Y-Max: 20.0			
						I
	\downarrow		\downarrow \downarrow			
	(5)	(6)	4) (7)			
ut Selection	Select an ii	nput number to	o edit the name	and settings.		

- 1. Inpu
- 2. Input Name Enter a name to describe the input channel.
- 3. Input Type Select between a discrete or analog type of sensor on the input.
- 4. Sensor Type Select a standard sensor or a custom sensor type.
- 5. Custom Scale Enable a custom scale on the input instead of voltage (or current) readings.
- Custom scale minimum value. 6. Ymin
- 7. Ymax Custom scale maximum value.
- Configure to match module jumper settings for voltage or current modes. 8. Input Units Voltage (millivolts) is default unless jumpers have been set for current mode.

Where Used Search

Controls can become complex and when multiple team members work on a system mistakes can be made that can become difficult to track down. If a device is not functioning properly the first thing that must be considered is how it is being controlled.

The where-used search is designed to help a user identify the control functions that are assigned to a specific input or output. This can then be used to identify potential sources of problems or ensure the output is properly assigned to the correct functions.

To search where an input or output is used:

- 1. Select the output to search.
- 2. Press the search icon.

0/3 SXH	ок				
Tank 1 Hydro		Show in Report			-(2)
0/4 AD4	ок	Outputs			-
Tank 1 Pumps		Output 1	Q Output 3		
Dry Contact Rel	lays	Output 2		ł	
0/6 RX4	ок	Output 3	•		-(1)
Outlet Relays		Output 4			\mathbf{O}
0/7 MX1	ОК	Output 5			
Motor Controlle	r'	Output 6			

3. The search results dialog is shown indicating the control group and control function name of any functions using the output or input.



If the same function is using the output for multiple settings, it will be shown for each setting.

Controls

This section of the manual covers general information about the controls workspace, how to add and manage controls, and descriptions of each control function. *See the "Programming" section for usage examples*.

Topics

- Control Groups
- Control Workspace
- Control Functions

Control functions are how logic is created to control equipment in a growing environment. A variety of control functions are available to create simple or complex nested logic by linking functions together.

The controls page has three main areas:

- 1. Workspace Bar
- 2. ControlsToolbar
- 3. Workspace
- 4. Workspace Settings

Select and edit the properties of the workspace. Add functions to the workspace by pressing them on the toolbar. Area where controls in the group are monitored, edited and added. Global settings for the workspace functions.



Control Groups

Controls functions are sorted by "control groups." Each control group that is created gets it's own "work space" in which to add, edit and monitor control functions.

Control groups are often modeled after the physical spaces they are controlling (room 1, room 2, etc.) but can also be created based on any type of organization that makes sense for the application. *At least one control group is required.*

ONOTE: Controls are executed in the order that they are listed in the group list.

Control groups are managed by the workspace bar at the top of the controls page:



1. Run/Pause

Open a dialog to place the group into run or pause mode.

- 2. Current Group Select which control group workspace to show.
- 3. Rename Group Open a dialog to rename the current control group.
- 4. Add Group Open a dialog to add a new control group to the system.
- 5. Move Group Open a dialog to move the current control group in the list order.
- 6. Delete Group Open a dialog to delete the current group and all of it's control functions.

Controls Workspace

Control functions in each control group are edited and monitored in the workspace.

- 1. Toolbar Functions
- 2. Workspace Functions

The toolbar is used to add new control functions to a workspace. Workspace functions show the logic in the workspace. *Click the workspace function to edit the settings.*



Workspace Settings

The bottom tool bar in the workspace area contains several features specific to the selected workspace.



- 1. Day Counter
- Counter that increments at midnight; see function schedules for more information. Coordinate rules for day & night between functions; see function schedules.
- 2. Day/Night Mode 3. Date & Time
 - Displays current system time and date for convenience.
- 4. Show Report
 - ort Show this workspace on the home page report view.

Run/Pause Mode

It is occassionally necessary to pause or suspend all control functions in an environment for maintenance or other purposes. All controls in a group can simultaneously paused to prevent further commands to outputs until the group is returned to run mode.

When the control group is paused:

- Functions are suspended in their current status state.
- Any outputs controlled by the functions will no longer be operated by the functions.
- Any dosing pumps will complete their current dose and then suspend dosing.

Contro	ols	ÞII	Room 1												-	HE >	10	+=		≡ŧ		×
(-)	X			Т	A E	Т	1	T	Г	-	Т	« <mark>?</mark> »	-	4			<u>h</u>	6	2)	1

Press the run/pause button to open the dialog; confirm you wish to pause the control group execution.



When the control group is paused, the run/pause button (1) and workspace background (3) change to a red shade to indicate they are stopped. The function icons status dot (2) will turn yellow to indicate it is paused.



Function Order

Function order dictates priority of commands. Controls are executed in the order that they are shown in the workspace beginning at the top left, going across to the right and beginning at the left again on the next line. If two functions have conflicting aims then the function that is executed last will take the priority.

Re-arranging Functions

To move a function within a workspace, press and hold on the function icon's title text. The function will be highlighted green; drag the function to the new location in the workspace then release.



Workspace Icons

Each function that is added to the workspace has it's own button icon in the workspace. The button icons include information about the function and it's status.



1. Function Button 2. Function Name

3. Function Status

Icon depicts the type of control function; see the tool bar for reference. The function name (set by the user) is shown under the function button. The status of each function is shown in the upper left with a colored dot:

Empty	Function is valid but not active (idle.)
Green	Function is active.
Yellow	Function is paused (group or system paused.)
Red	Function has invalid parameters or is disabled.

4. Analog Output5. Invalid Status6. Invalid Status7. Invalid or disabled function will show a red dot; this function is not active.

Controls Toolbar

Control functions are added to workspaces using the controls tool bar.

Press on any function tool bar item and a new function will be added to the end of the current workspace. The function will be added in the disabled state with no settings. Press the function in the workspace to open the editor.



1. Clock Timer Activate a discrete (on/off) output or analog (variable) output during a specified time range.

2. Count Timer Delay-on, delay-off and single-shot timers in seconds, minutes, or hours.

3. Cycle Timer Repeating timer with on and off times in seconds, minutes, or hours.

4. Thermostat Standard heat or cool temperature control function with set point and dead-band to control outputs such as fans, HVAC and A/C systems.

5. Humididstat Standard humidify or dehumidify humidity control function with set point and dead-band to control outputs such as a humidifier or dehumidifier.

6. Photostat Photo sensitive control to operating an output device based on solar/light levels. *For light dimming in conjuction with the sun, use the LIGHTS function.*

7. CO2 Standard ppm-based CO2 injection or exhaust control function with set point and dead-band. Control a discrete relay for a CO2 valve or burner for injection, or an exhaust fan or alarm horn for high CO2.

8. Lights Control for discrete or dimmable lighting systems. Integrate dimming profiles for sunrise/sunset and/or dim lights when sun intensity increases or temperature exceeds limits.

9. Position Advanced position control for greenhouse vent motors, side-walls and shade/blackout curtains. *Requires MX1i digital reversible motor controllers for position control.*

10. Irrigation Control up to 99 stages, repeat settings, feed pump/valve control and drain valve control.

11. Tank Level Automatically re-fill a tank when it has reached a low level until it returns to the high level.

12. Dosing Nutrient and pH dosing for stock tanks, reserviors and recirculating hydroponics systems. Automate ppm and pH control for up to 24 nutrient parts with a recipe library.

13. Output Link Connect and daisy-chain multiple outputs together.

14. Input Integrate analog or discrete sensor inputs in control functions with the Input function.



15. Logic Logical operations between functions and physical I/O can be used to create more advanced rules within control functions.

16. Message Create notes, reminders and alert messages to be stored in workspaces or sent to email or SMS when the rule is triggered.

Adding & Editing Controls

Controls functions are added to a workspace by pressing the desired toolbar button. An un-named function will be added to the workspace.



Press the new un-named function icon in the workspace to open the editor dialog and configure the function.

Function Editor

When a function in a workspace is pressed, the function editor is opened. The function editor is where "rules" are configured for the function including the scheduling, set-points, and device assignments.

- As many rules can be added to a function as required.
- Rules can be scheduled to achieve multiple settings through out a day, or a complete grow cycle.
- At least one valid rule is required to make a function work.

The layout of the function editor is generally the same for all functions with the "configuration area" having unique fields and options for each type of control function.



Header
 Rule List
 Configuration Area

General operations including function name, save, delete and exit. List of rules in the control function. Displays the selected rule's settings for editing.

Function Header

The function header is shown at the top of the function editor window.



2. Function Name	Press the [X] button to delete the name or press the text field to edit the name.
	The name field must not be empty or the changes to the control function can not be saved.
3. Delete Function	Open a dialog to delete the current control function from the workspace.
4. Save Settings	Press the save button to save the changes to the system memory.
	The save button will be highlighted green when settings on the page have changed.
5. Exit Editor	Closes the editor dialog and returns to the workspace.

If changes have been made and are not saved before exiting they will be lost.

Function Rule List

The function rule list is used to select the rule to edit, and can also add, copy and delete rules from the function. If there are conflicting rules, the last rule will be the one executed by the system.



- 1. Delete
- 2. Copy
- 3. Add
- 4. Rule List
- 5. Rule, with Error
- 6. Rule, Active
- 7. Rule, Inactive
- Delete the selected rule from the function.
- Copy the selected rule to a new setting.
- Add a new blank rule to the function.
- List of all rules in the function.
 - A red dot indicates there is an error condition in the rule and it will not function.
 - A green dot indicates the rule is currently active.
 - A grey dot indicates the rule is currently idle.

Enabling Rules

Rules can be enabled in different ways in order to create either simple or complex logic.

The "Enable Mode" settings are found in every rule configuration.



- 1. Disabled The rule is disabled and will not activate.
- 2. Enabled The rule is enabled and will activate by schedule and other function settings.
- 3. If Output... The rule is enabled if a selected output is on or off.
- 4. If Function The rule is enabled if a selected function status is true (active) or false (idle.)

If Output On/Off

To coordinate a rule with the status of another device, the rule can be configured to be enabled only if an output is currently on or currently off.

1. Press the [IF OUTPUT ...] button in the desired on or off mode.

The Enable Mode area will expand and the drop-down menus to select an output will be displayed.

- 2. Select an output device.
- 3. Select an output on the device.



The rule will now only be enabled according to the status of the selected output.

This type of feature is useful for enabling or disable equipment in coordination. For example, it may be desirable to disable a CO2 control when the exhaust output is activated.

If Function True/False

To enable a rule on another function's status (instead of a physical output) select the "If Function" mode.

- 1. Press the [IF FUNCTION ...] button in the desired on or off mode.
- The Enable Mode area will expand and the drop-down menus to select a function will be displayed.
- 2. Select a control group.
- 3. Select a function.



Rule Schedule

Every rule can be scheduled by time of day, day/night, start/end date, or start/end day number. NOTE: *If no switches are enabled in the "Rule Schedule" group, the rule will be ALWAYS scheduled.*



Time Range

To configure a rule to be active only during a specific time range, enable the Time Range switch. Set a start time and end time for the rule to be enabled.



Date Range

To configure a rule to be active only during a specific date range, enable the Date Range switch. Set a start and end date for the rule to be enabled.

rst D	ay						Last D	Last Day								
		JL	ily 202	1				July 2021								
Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun			
28	29	30	1	2	3	4	28	29	30	1	2	3	4			
5	6	7	8	9	10	11	5	6	7	8	9	10	11			
12	13	14	15	16	17	18	12	13	14	15	16	17	18			
19	20	21	22	23	24	25	19	20	21	22	23	24	25			
26	27	28	29	30	31	1	26	27	28	29	30	31	1			
2	3	4	5	б	7	8	2	3	4	5	6	7	8			

Day Range

Each control group workspace has a dedicated "day counter" that increments each day when the date changes. The day counter allows rules to be configured to operate during specific phases of a growth cycle based on the day number in the cycle.

To configure a rule to be active only during a specific day number range, enable the Day# Range switch. *Set a start day# and end day# for the rule to be enabled.*



The Day Coutner is located in the bottom tool bar of the control group work space. *Press the counter button to display the count editor dialog to adjust the current day number.*

🖬 DAY# 65	C. NIGHT N	Node 02/17/2022	19:24:29	1	=● 自
Â		I			\$
		📅 Control Group Day Counte			
		Day Number			
		65	UPDATE COUNTER		
				CANCEL	

Day & Night Mode

Each control group workspace has a dedicated "day & night" function that can be configured to operate based on time of day, or light intensity levels from a light sensor. The day & night mode function is a powerful and simple way to coordinate rules within your workspaces according to the status of day or night.

To configure a rule to be active only during the day or night, enable the Day & Night switch. *Select if the rule should be active only durig the day, the night or both.*



The Day & Night mode function is located in the bottom tool bar of the control group work space. *Press the mode button to display the editor dialog to adjust the rules for day & night.*



Day and night time can be simply scheduled with a morning and evening time of day, or multiple rules can be created to schedule the day/night to adjust based on the date range or day number count. Day and night can also be coordinated with a light sensor to set the state based on the intensity of a light sensor reading.



1. Current Status

2. Rule Lust

3. Rule Name

4. Rule Schedule

5. Time Range

6. Light Sensor

Select a rule in the list to display and edit on the right hand side of the display. Each rule can be named for reference. If desired, the rule can be restricted to a date range or day number range.

Set the day time and night time values if using a time range.

Shows the current status of the day/night control function.

Select and configure a light sensor and set points if using a light level reading.

Rule Output

Many functions feature the ability to set an output according to the status of the rule.

The output can in most cases be either a discrete type (on/off only) or an analog type (variable output. Discrete types are typically relays such as RX or RD series relays. Other devices such as VX and DX series include analog outputs in either 0-10V or PWM.

Discrete (on/off) Output

A discrete output is one that can only turn on or off such as a relay contact.

	Output		
	🔿 None 💿 Discrete (d	on/off) 🔿 Analog (variable)	
2	Dry Contact Relay	/5	•
3	G- Output 1		•
	🕛 💿 Turn Output ON	ı	
4	U O Turn Output OF		
	1		-
1. Output Type	Sets the type o	f output that the function will operate.	
	None	The rule will be status-only.	
	Discrete	The rule will operate a discrete on/off output.	
	Analog	The rule will operate an analog output.	

2. Device Select the GrowNET[™] device that the output is located on.

3. Output Select the equipment output to be controlled.

4. Output Mode Select if the rule should turn the output on or off when activated.

Analog (variable) Output

A analog output is one that can vary; typically PWM or analog voltage to control light dimming signals or motor speed controllers.

	Output	
	O None O Discrete (on/off) Analog (variable)	
		*
(2)	C Output 4	*
<u>ă</u>	Analog Output Value: ⁵⁰ (0-100)	
\mathbf{G}		

- 1. Device Select the GrowNET[™] device that the output is located on.
- 2. Output Select the analog output to be set by the rule.
- 3. Value Enter a value (0-100%) to be sent to the output when the rule is active.

Clock Timer 🕒

The clock timer is the most basic control function in the system featuring only the basic rule properties:

- Enable
- Schedule
- Output

Configure the enable and schedule settings, then if desired, set the output to be controlled. *The clock timer function can also be status-only if no output is assigned.*

	🕛 Clock Timer 👔 🕌 📋	Circulation Fans	
Schedule C Time Range 7 • : 00 • 15 • : 00 • Date Range Output None O Discrete (on/off) () Analog (variable) T Dry Contact Relays C Output 1 O Tum Output ON O Tum Output OFF	Rules List 1: All Dates 7:00 - 15:00	Rule Name DISABLED ENABLED IF (OUTPUT ON) IF (OUTPUT OFF) IF (FUNCTION TRUE) IF (FUNCTION FALSE) Schedule Image Ima]1)]2]3

- 1. Enable Mode Select a mode to enable the rule.
- 2. Schedule Time Range: Enter the start and end time for the rule.
 - Date Range: Set dates if the rule should be active only during a date range.
- 3. Function Output Select an output type if desired.

A "None" type will not act on an output but will still set a function status.

In the example above, the timer rule is "enabled" without any pre-conditions. The output named "Output 1" on the device named "Dry Contact Relays" will be turned on according to the schedule setting from 7am to 3pm (20:00).

Count Timer 🔟

The count timer has several modes that operate based on when the rule's enable input and scheduling becomes true or false. Count timers are typically used to delay an action or operate a device for a set period based on the action of another device or function.

Example uses:

- Sequencing light banks or other outputs with an on-delay.
- Set an off-delay on a HAVC fan with the AC as the enable input.



- 1. Delay-On Activate the rule after the preset delay has elapsed.
- 2. Delay-Off Immediate activate then keep the rule activated for the preset delay.
- 3. One-Shot On Activate the rule for a preset time when the rule is enabled.
- 4. One-Shot Off Activate the rule for a preset time when the rule is disabled.

The diagram below depicts how the different timer modes will activate depeding on the status of the enable input or change in schedule status:



To setup a count timer:

- Set the rule enable mode.
- Set the rule schedule if applicable.
- Configure the timer settings.

Cycle Timer 🖾

A cycle timer is a classic function where a device is operated in repeating off-on cycles. The cycle timer, like all functions, can be scheduled to operate during a set time of day or can operate continuously.

Example uses:

- Cycling circulation fans
- Agitating tanks with a mixing pump
- Basic irrigation timer



- Cycle timers only operate on discrete type outputs.
- 4. Preview A preview of the timer actions is shown in this field.
- 5. Units Select the units for the off and on presets; seconds, minutes or hours.

Maximum time values:

Seconds	65500
Minutes	1092
Hours	18

1 NOTE

To ensure accurate timing, cycle timers operate locally at the GrowNET[™] device. The cycle timer function will show active when the timer is operating but will not change status based on the cycle timer. Observe the physical output for the status of the cycle.

Thermostat 🌡

Thermostat controls are used to operate heating or cooling equipment based on a temperature set point and temperature sensor reading. A setpoint determines the target temperature and a "deadband" determines the allowed drift from the target before activating the thermostat to return the reading to the target.

Example uses:

- Heating / Cooling HVAC equipment
- Exhaust fans
- Chillers
- Floor heating



1. Mode

2. Sensor

Cool: Rule activates when temperature exceeds setpoint.

Heat: Rule activates when temperature is below setpoint.

- Temperature sensor input to evaluate the set point against.
- 3. Setpoint The target sensor value to achieve.
- 4. Deadband 5. Preview

The allowed drift from the target before taking action to return to the target. A preview of the rule settings.

When configuring a thermostat on HVAC systems it is recommended to control the "heat" or "cool" output from the thermostat function, then control the "fan" output with a off-delay count timer that is activated from either the heat/cool output, or the thermostat control function. This will activate the fan with the heat or cool signal and inlcude an off-delay retaining the fan on for a set time after the heat/cool signal. *See the "Programming" section for more details.*



Humidistat controls are used to operate humidification or dehumidification equipment based on a humidity set point and humidity sensor reading. A setpoint determines the target humidity and a "deadband" determines the allowed drift from the target before activating the humidistat to return the reading to the target.

Example uses:

- Dehumifiers
- Exhaust fans
- Humidifiers
- Misters



Dehumidify: Rule activates when humidity exceeds setpoint.

Humidity sensor input to evaluate the set point against.

- 1. Mode
- 2. Sensor

Humidify:

- 3. Setpoint
- 4. Deadband

The target sensor value to achieve. The allowed drift from the target before taking action to return to the target. A preview of the rule settings.

Rule activates when humidity is below setpoint.

5. Preview

Photostat 🔌

Photostat controls are used to operate equipment based on a light intensity set point and light sensor reading. A setpoint determines the target light intensity and a "deadband" determines the allowed drift from the target before activating the photostat. When the light intensity returns to the target the photostat is deactivated.

Example uses:

- Activate fans with high sunlight for pre-emtpive cooling
- Alarms



- 1. Mode
- 2. Sensor
- 3. Setpoint
- 4. Deadband
- 5. Preview

High Light: Rule activates when light intensity exceeds setpoint. Low Light: Rule activates when light intensity is below setpoint.

Light sensor input to evaluate the set point against.

The target sensor value to achieve.

The allowed drift from the target before activating the function.

A preview of the rule settings.

Carbon Dioxide (CO2)

CO2 controls are used to operate CO2 valves, burners and exhaust equipment based on a carbon dioxide intensity set point and sensor reading. A setpoint determines the target CO2 concentration and a "deadband" determines the allowed drift from the target before activating the CO2 control.

Example uses:

- CO2 valves / burners
- Exhaust fans
- Alarm horn / strobe



1. Mode	Exhaust:	Rule activates when CO2 concentration exceeds setpoint.
	Inject:	Rule activates when CO2 concentration is below setpoint.
2. Sensor	CO2 ppm s	ensor input to evaluate the set point against.
3. Setpoint	The target s	sensor value to achieve.
4. Deadband	The allowed	d drift from the target before activating the function.
5. Dark Switch	Disables inj	ection when the CO2 sensor unit detects the ambient light level is 0.
6. Preview	A preview o	of the rule settings.

When configuring a CO2 control for injection, ensure the rule is set to inject during the day period only. *CO2 augmentation should only occur during the day photoperiod.*

To coordinate CO2 control with the day photo period, either:

- Turn on the "Disable when Dark" switch to disable when the CO2 sensor detects the ambient light level is 0.
- Set the rule time schedule to the lighting or other schedule time.

Lights ¶

The lights function can operate basic on/off discrete control and for dimmable control with PWM or 0-10V dimming. Dimming controls can be ramped up and down with a ramp-rate setting. Multiple dimming rules can be layered to create a complex lighting profile. Lighting control includes features to dim lights based on a light intensity or if a high temperature condition exists.

To configure a lighting control:

- 1. Set the enable and schedule properties.
- 2. Select a control mode (discrete or dimmable.)
- 3. Configure the output assignments and if the light is dimmable, set the the target intensity and ramp rate.

It is possible to configre both a discrete output for controlling mains/circuit power and a dimmable output for controlling intensity.

Light Control Modes

(1)	Enable Discrete (on/off) Output	1
\odot	TT Dry Contact Relays	•
	G- Output 4	-
3	Dimmable Lights	
	DC Output Module	•
	G- Output 1	•
(5)	Maximum Intensity: 50 0-100% Target (maximum) Intensity: 50%	
(6)	Minimum Intensity: 20 0-100% Start/End (minimum) Intensity: 20%	
õ	Change Rate: 100 % per minute Transition time duration: 0.3 mins	

- 1. Discrete Mode Enables discrete (on/off) output control.
- 2. Discrete Output Select a device and output on the device to operate.
- 3. Dimmable Mode Enable the analog dimmable output control.
- 4. Analog Output Select a device and an analog output on the device to operate the dimming control.
- 5. Max Intensity Target intensity for the dimmable output to reach.
- 6. Min Intensity Minimum intensity*
- 7. ChangeRate Rate of change from current dimmable output intensity to new intensity.

*Minimum intensity is where the dimming function will start when ramping up, and end when ramping down. When ramping up, the output starts at 0 and jumps immediately to the minimum before ramping. When ramping down, once at the minimum, the output will drop to 0 without ramping.

Intensity Control

Lighting can be dimmed or brightened in greenhouses when the sunlight has reached sufficient intensity or if light intensity has becom too low. In the event the sun intensity exceeds the light sensor target, the function will begin dimming the output until the intensity setting is reached; lights may dim to 0% if the sun provides sufficient intensity. If sunlight is too low, the lighting will be increased in brightness until the intensity setting is reached. Indoor or outdoor light sensors can be used in the light dimming function.

(1)—	Intensity Control		
(2)-	SXC PLIR	•	
<u>(3)</u>	Light Sensor Target: 200 W/m2	Preview: Adjust intensity to maintain: 200 W/m2	(4)
\smile	Minimum Intensity Action: 🔘 Hold at Minimum %	O Turn Off at Minimum %	(5)

- 1. Solar Dimming Enables solar dimming control.
- 2. Light Sensor Select the light sensor input to measure sunlight intensity.
- 3. Light Target Target light intensity.
- 4. Preview Preview display of the dimming settings.
- 5. Minimum Action Behavior of the intensity output when the minimum is reached.

Temperature Dimming

Lighting can be dimmed in the even temperatures exceed a limit in order to help reduce stress on plants and limit the heating of the space. If dimming is enabled, the system will begin to dim at the ramp rate until the temperature is reduced below the preset. If dimming is not enabled, the discrete output will be shut down.

High-Temperature Dimming/Shut-Down		
2 SXC PLIR		•
Start Dimming Lights @ 100 F	Preview: Dim lights if reading exceeds: 100 F	4

- 1. Hi-Temp Dimming
- 2. Temperature Sensor
- 3. Max Temperature
- 4. Preview

Enables high temperature dimming / discrete shutdown control. Select the light sensor input to measure sunlight intensity. Temperatre to start dimming (or shutdown.) Preview display of the dimming settings.

Hotfire Delay

A hot-fire delay can be set to prevent re-activation of the lighting output for a set period to prevent hotfiring arc lamps.



The position function is used to manage control of reversible motors used in shade and black-out curtains, ridge vents, side-wall vents and similar applications.

Position is controlled by tracking how long the motor is moving in the forward or reverse direction. The "travel time" is the total amount of time it takes for the motor to move from the fully opened position to the fully closed position, or vice-versa. If the system needs to open to 50% it will operate the motor in the forward (open) direction for half of the travel time.

Position Tracking

The travel time parameter and current position are stored in the MX1i motor controller. *See the device information page.*

If an operator manipulates the manual override knob, the position will continue to be updated by the MX1i controller and the position relayed back to the GCX control system. Upon returing the knob to the Auto position, the system will regain control of the MX1i controller.

-1	0		()	\odot	۶
Device Info	rmatior	7			
Device Name					
Motor Controller					
Device Location					
Room 2					•
Show in Report					
Outputs					
Output 1	- Q 0	utput 1			
Travel Time		Delay Tirr	ie		
120	seconds	10	seconds		

General Parameters

The position control must be specified as a curtain (shading) or ventilation rule. Absolute minimum and maximum position limits can be placed on the rule with the range limit high and low slider positions. If a static (fixed) position is desired, turn on the switch and set the position. The setting will move the MX1 position to this static value when the rule is active.

(1)	MX Device Position Settings	•
2	Mode: Shade Curtain Ventilation	
3	Position Range Limit	100% max % open
4	Static Position	
5	Position 90	% open

- 1. Motor Controller
- 2. Vent/Shade Mode
- 3. Position Limits
- 4. Static Mode
- 5. Static Position

Select the motor controller this rule will operate on. Select if the motor is for ventilation or shading. Minimum and maximum positions that the rule will allow. Enables the setting of a fixed position (such as a light dep curtain.) Adjust the slider to set the fixed position.

Shade / Blackout Curtain Mode

This mode is designed to control shade curtains and black-out curtains using the static position option.

Override positions for high light intensity, high temperature and weather alarms can also be configured to actively adjust the position depending on conditions if desired. To enable a position option, turn on the appropriate switch and the settings will be shown.

Shade mode will reduce the %open position in the solar shading and temperature shading modes in an effort to reduce solar radiation resulting in excess heat. Shading from high intensity light can reduce solar heating or when the interior temperature is too high can help alleviate excess heat.

	C Solar Shading			٦
(2)			-	
3	10%	Solar Position	— %open	-(1)
4	Light Sensor Limit: 800 W/r	n2 Preview: Move to: 10% if light exceeds: 800 W/m2		
	Temperature Shading			7
6	Room 1 Climate		*	
7	10%	Temperature Position	— % open	-(5)
8	Temperature Limit: 82 F	Preview: Move to: 10% If temperature exceeds: 82		

1. Solar Shading

- 2. Light Sensor
- 3. Solar Position
- 4. Solar Limit
- 5. Temperature Shading
- 6. Temperature Sensor
- 7. Temperature Position
- 8. Temperature Limit

Set this option to limit the position based on light intensity.
If intensity is high, the shade will reduce %open to the selected position.
Select the sensor to read the light intensity.
Maximum %open position when limit is exceeded.
Light intensity high limit; if reached, the position limit is activated.
Set this option to limit the position based on high temperature.
If temperature is high, the shade will reduce %open to the selected position.
Select the sensor to read the temperature.
Maximum %open position when limit is exceeded.
Temperature high limit; if reached, the position limit is activated.

Ventilation Mode

This mode is designed to control ridge vents and side-wall curtains for cooling. Multiple stages can be configured to open the vent in increments according to the temperature.

Override positions for high light intensity and weather alarms can also be configured to actively adjust the position depending on conditions if desired. To enable a position option, turn on the appropriate switch and the settings will be shown.

Shade mode will reduce the %open position in the solar shading and temperature shading modes in an effort to reduce solar radiation resulting in excess heat. Shading from high intensity light can reduce solar heating or when the interior temperature is too high can help alleviate excess heat.

	Solar Venting]
(2)—	🐳 Room 1 Climate		
3	Solar	Position % open	$ \vdash 1$
4	Light Sensor Limit: 800 W/m2	Preview: Move to: 90% if light exceeds: 800 W/m2	
6)	Temperature Staging Room 1 Climate	•	
7	Temperature	e Position Range 100% final % open	
(8)	First Stage Temperature: 82 F	Preview: Stage 1: at 82F open to: 10% Stage 2: at 84F open to: 32% Stage 3: at 86F open to: 54% Stage 4: at 88F open to: 76%	
10	Stage Separation: 2 F	Stage 5: at 90F open to: 100%	

1. Solar Venting

- 2. Light Sensor
- 3. Solar Position
- 4. Solar Limit
- 5. Temperature Staging
- 6. Temperature Sensor
- 7. Position Range
- 8. First Stage Temperature
- 9. Number of Stages
- 10. Stage Separation

Set this option to limit the position based on light intensity. *If intensity is high, the shade will reduce %open to the selected position.* Select the sensor to read the light intensity. Maximum %open position when limit is exceeded. Light intensity high limit; if reached, the position limit is activated. Set this option to limit the position based on high temperature. *If temperature is high, the shade will reduce %open to the selected position.* Select the sensor to read the temperature. First and Final temperature stage positions. First temperature stage activation; move to first stage position. Select how many stages to break the position movements into. Degrees between ventilation stages. *Separation is used both when rising and falling to segregate stage reversal.*

Weather Positions

Ventilation and Shade control settings both feature weather override positions which can be set when the system weather alarms are activated for rain, wind speed or low temperature.

To set weather position limits, turn on the Weather Positions switch and move the sliders to the desired positions.

🔁 TIP

To disable a specific weather override position, set the position to 100%. This will prevent the override from reducing the position even if the alarm is active.



- 1. Weather Positions
- 2. Rain Position
- 3. Wind Position
- 4. Temperature Position

Set this option to limit the position based on system weather alarms. Sets the maximum position allowed during a rain alarm. Sets the maximum position allowed during a high wind alarm. Sets the maximum position allowed during a low temperature alarm.

Irrigation 🌘

Multi-stage irrigation controls operate watering stages in a sequential fashion. Each stage may have a unique irrigation duration and output assignment (output channels do not need to be sequential.) Once all of the stages have completed, they can be repeated at specific intervals for a specific count, or, multiple irrigation rules can be configured to activate through out the day.

Irrigation stages can coordinate with an irrigation pump or main supply valve, and can operate a drain valve output for flood tables between stages. Irrigation may be triggered based on time of day when the rule is enabled, or by moisture level if a moisture sensor is connected.

Irrigation Status

The current irrigation cycles and status can be observed in the function rule editor. Irrigation cycles can also be manually skipped with the SKIP button.



Irrigation Stages

To configure irrigation stages:

- 1. Press the [+ ADD STAGE] button (1) and a new stage will be created.
- 3. Enter a time duration for the stage to irrigate in the STAGE FEED TIME field (4).
- 3. Select the device and output of the stage to operate the attached irrigation valve (5).

To edit a stage, select the stage number from the stage drop-down (3).



- 1. Add Stage
- 2. Remove Stage
- 3. Stage
- 4. Stage Feed Time
- 5. Stage Output
- 6. Repeat Settings

Adds a new irrigation stage to the rule.

Deletes the currently selected stage from the rule.

- Select the stage number to edit or remove.
- Duration to run the stage output for irrigation.
- Stage output device and channel (irrigation valve.)

If the irrigation is to repeat, set the number and delay between repeat cycles.

Feed Pump/Valve

Irrigation can be coordinated with a main supply valve or feed pump if the pump requires external control (does not have a pressure switch to maintain pressure.) The output type can be a standard discrete on/off type of control or analog voltage/pwm output for variable speed motor controls. The main valve/pump can also be delayed behind the opening of the stage valve to allow time for the valve to open if it is a slow acting valve.



1. Enable Pump/Valve	Enable the switch to show and configure the output settings.
2. Output Settings	Set the output device and output channel that the pump/valve is connected to.
3. On-Delay	Seconds delay to wait after the zone valve is opened before operating the
	feed pump/main valve.
4. Discrete Output	Sets a discrete (on/off) type of output to operate the pump/valve.
5. Analog Output	Sets an analog (vaiable) type of output to operate the pump/valve.

Drain Valve

A drain valve can be incorporated to allow return of water back to a specific area in between irrigation stages.



1. Enable Drain Valve

2. Output Settings

Enable the switch to show and configure the rule.

Set the output device and output channel that the valve is connected to. Enter a time duration (seconds) that the valve should drain before the system proceeeds to the next irrigation stage.

Moisture Sensor Triggering

Irrigation can be triggered based on the output of a moisture sensor. Currently, 0-5V type moisture sensors are supported. The moisture level trigger point is set in millivolts. If moisture sensor triggering is enabled, the irrigation stages will not be activated until the sensor output is at or below the trigger level.

Ensure that the "Repeat Settings" are configured to allow irrigation until the moisture sensor is satisfied, or set the function for a specific time range to reset when it is off.

O TIP

If a time range is set on the rule, then stages will only be activated during the time range.

If no time range is set, then the rule may activate any time the sensor output is low and will require the user to ensure the system can irrigate until the trigger level is restored.



- 1. Enable Tirggering
- 2. Input Settings
- 3. Trigger Preset

Enable the switch to show and configure the trigger settings. Set the input device and input channel that the sensor is connected to. Set the VWC reading from the sensor to trigger the irrigation.

Notes on Irrigation Timing

	Schedule			
	🕒 💶 Time Range 🏴	8 🕶 : 00 🕶	⁸⁸⁸ 12 ▼ : 00 ▼	
	🛗 🌒 Date Range			
	Irrigation Stages		[+] ADD STAGE [-] REMOVE STAGE	
(2)-[1 - Stage Feed Time: 100	seconds		
	DC Output Module			
	C → Output 6			
~	C Repeat Settings			
(3)-[Number of Repeats: 3 Delay	y Between Repeats: 90	O Seconds Minutes	

If the irrigation rule is set for a TIME RANGE (1) then be sure the time range includes enough time for the stages (2) and the number of repeat cycles (3) that are configured, otherwise, stages or cycles outside of the time range may be cut off.

🔁 TIP

To set alternate time intervals or irrigation schedules for lighter or heavier waterings at different times, copy and create multiple rules within the irrigation function.
Tank Level ا

Water level in a tank can be automated with a high and low sensor, and a fill valve. Tank level can be controlled for filling, draining or flushing modes.

Agrowtek's SXL optical liquid level sensors are an excellent choice for sensing water level, or float switches and other sensors are also suitable.

Sensor Electrical Connections

An input module (DXIO or DXO8) is required to connect high and low sensors to the system to use the tank level control function. SXL optical liquid sensors may be used, or standard float switch sensors may also be used .When using float switches, omit the black wires in the diagram below.



Control Modes

Tank level can be managed in a standard fill or drain mode which will top up or drain off a tank automatically by continuously monitoring the high and low level sensors while the rule is active. In the case of fill-mode, if the level falls below the low sensor, it will activate an output to fill back up to the high sensor. In the opposite case of drain mode, if the high sensor is activated, it will activate an output to drain the tank until the low level sensor is clear (dry.)

The Flush mode will start as soon as the rule is activated. A drain output will activate until the low level sensor is clear (dry) and then a fill output will activate until the high level sensor is wet. This will drain down the tank and re-fill it from a water source. Two outputs are required for flush mode.

Mode Settings

	Level Control Settings		
(1)	Mode: 🍥 Fill 🔘 🛛	Drain 🔘 Flush	
\bigcirc	Time-out: 0	Seconds	(Set to 0 to disable time-out.)

1. Control Mode

Fill:Activates when water level is low to return to the high position.Drain:Activates when water level is high to return the to low postion.

Flush: When activated, drain output will activate until low level is detected, then fill output will activate until high level is detected. Time limit for the fill or drain event to prevent over-fill or drain lock-out.

2.Time-out

Input/Output Connections

	High Level Sensor	Ţ
	Input 1	•
	Low Level Sensor	-
	Input 2	•
Г	Fill Output	
(3)	Outlet Relays	•
	G Output 1	Ť
	Preview:	
	If Input 1 is dry and Input 2 is dry, then turn on Output 1 until both sensors are wet.	

- 1. High Sensor
- 2. Low Sensor
- 3. Fill (Drain) Output

Select the input device and channel of the high level sensor. Select the input device and channel of the low level sensor. Select the output device and channel to operate for fill (or drain.) *A separate drain output will be listed for "Flush" mode*. A preview describes how the rule will behave when enabled.

4. Preview

Dosing

Nutrient dosing functions on the GCX control system are designed for managing the nutrient levels and pH in a stock tank for irrigation in drain-to-waste applications, or a continuosly recirculating type of hydroponic system such as an undercurrent system. Stock tanks for irrigation can be coordinated with the irrigation function to prevent dosing while the system is feeding.

- SXH, PHX or GXH series hydroponic sensor transmitter is used to monitor the water conditions.
- ADi series peristaltic dosing pumps are used to inject nutrients, ph buffers and ORP solutions.
- Recipes designate the dosing targets and component properties for the function to use.

When the rule is enabled, it will monitor the sensor readings and compare them to the recipe. If the recipe dictates a correction, the rule will operate the assigned dosing pumps.

Recipes can contain up to 24 nutrient parts.

Hydroponics Sensor

Select the hydroponics sensor unit (1) that the rule will use to read the pH, conductivity (EC) and other water properties. A hydroponics sensor must be connected to the system to use the dosing function.



1. Hydroponics Sensor Select the hydro sensor for the reservoir to be dosed.

Recipe

The recipe contains the target set points for pH, conductivity and ORP, as well as the nutrient dosing formula.

If the desired recipe exists in the system library you can select it in the drop-down (1), otherwise the recipe can be created using the recipe editor button (2).



```
1. Dosing Recipe
2. Recipe Editor
```

Use the drop-down to select a recipe from the library. Open the recipe editor to create or modify dosing recipes.

Nutrient Pumps

The nutrient pumps are assigned by creating a list of dosing pumps; the corresponding recipe part will be shown in parenthesis. Up to 24 nutrient pumps may be added to the rule.

To create a list of pumps, use the **Add Pump** button (6), then modify the pump device (1) and pump head (2) selection. Add and edit additional pumps until all of the pumps have been added. Adjust the order of pumps to match the recipe order if necessary by using the sort buttongs (4) to move the selected pump up or down in the list.



1. Dosing Pump Device	Select the device that has the desired chemical pump head on it.
2. Pump Head	Select the pump head on the pump device.
3. Pump List	List of dosing pumps by pump name (description.)
	Corresponding recipe part name is shown in parenthesis.
4. Sort Buttons	Use the sort buttons to move the selected pump up or down in the list.
	Sort buttons help match the pump order to the recipe order.
5. Delete Pump	Deletes the selected pump from the pump list.
6. Add Pump	Adds a new pump to the pump list.

1 TIP

To edit the pump assignment, select the pump then modify the pump device or pump head, and save the settings.

pH & ORP Pumps

pH and ORP pumps must all be on the same dosing pump device (but may be assigned to individual pump heads.) pH and ORP dosing is performed at a specific flow rate (ml/min) until the target value is achieved. pH and ORP dosing can be disabled while nutrient dosing is being performed so that it occurs after the nutrient dosing instead of simultaneously.

To configure pH dosing, select a dosing pump device (1) and then enable the pH Up (2) and/or pH Down (3) switch options. When enabled, select the pump head (5) on the pump device to use and enter a flow rate (6) to dose at.



- Dosing Pump Device
 pH Up Dosing
 pH Down Dosing
 ORP Dosing
 Pump Head
- 6. Flow Rate F
- 7. Disable Switch

Select the device that has the desired chemical pump heads on it. Enable the switch to show the configuration settings. When enabled, the dosing pump head and flow rate settings are shown. Enable the switch for ORP dosing settings. Select an available pump head on the pump device for the dosing mode. Flow rate for the respective pump head to dose at. Disables the pH/ORP dosing when the nutrient dosing is active.

Discrete Output

A discrete output can be activated when ever the dosing function is operating in order to control a mixing pump, operate a valve, or run some other device while the dosing is running.

Enable Discrete (on/off) Output	
TI Outlet Relays	×
G- Output 4	*
	Enable Discrete (on/off) Output Outlet Relays Output 4

- 1. Enable Output
- 2. Output Device Settings

Enable the discrete output to show the output device settings. Select a device and output to operate when the dosing rule is active.

Recipe Editor

The dosing recipe editor screen is opened by pressing the recipe editor button in the DOSING RECIPE group.

The editor is where new recipes can be created, or existing recipes can be modified.



The recipe editor screen is divided into three main sections:



Editor Controls
 Targets
 Nutrient Parts

Select the recipe to edit or use the buttons to create or delete recipes. Enable dosing modes and set the sensor target values and deadbands. Editor area for nutrient recipe.

Editor Controls

The editor controls is where the recipe is selected and the recipe name can be edited. Recipes can also be added or removed and the current settings saved to memory.



- 1. Recipe Selection
- 2. Recipe Name
- 3. Clear Name
- 4. Delete Recipe
- 5. Add Recipe
- 6. Save

Select the recipe to edit or use the buttons to create or delete recipes. Edit the recipe name to a useful description. Erases the existing name for entry of a new name. Deletes the currently selected recipe. Adds a new blank recipe to the system. Saves the current recipe settings to memory.

Targets

Dosing targets are compared to the sensor readings for pH, conductivity (nutrients,) and ORP. If the targets are outside of the allowed drift range, the recipe will activate the dosing function to take corrective action.



1. Target Enable 2. Target Value

3. Deadband

Enable the switches to turn on dosing modes. Target value for the dosing mode. Deadband (drift) for the dosing mode.

Nutrient Parts

Nutrient parts are entered in a fashion similar to most manufacturer's recipe recommendations in ml/gal. Alternative units are also available.

Each nutrient part may be named for reference and assigned to a dosing "group." Parts that are assigned to the same group will dose at the same time. Otherwise, parts will dose sequentially in order of their group assignment. Nutrient parts will be mated with the dosing pumps in the dosing function according to the order in the part list (1).



- Select a group for the nutrient part; groups are dosed sequentially.
- Dose size per manufacturer recipe (ml/gal.)
- Delay after dosing before moving to the next group.
- Move the selected part up or down in the list.
- 7. Delete Part Delete the selected part from the list.
- 8. Add Part

4. Dose Size

5. Mix Delay 6. Sort Buttons

Add a new part to the list.

O TIP

The smallest dose that the ADi-200 pumps can produce is 3ml. Recipes with parts smaller than 3ml will have the entire recipe multiplied automatically to produce a minimum dose of 3ml when dosing.

Output Link 🔗

Output Link controls are used to connect multiple outputs together ("daisy chain.") A "trigger source" output is monitored and when it is active, the "linked" output can be assigned to activate or de-activate.

Example uses:

- Linking HVAC outputs (FAN linked to COOL or HEAT outputs)
- Exhaust fans (disable when CO2 is active or vice-versa)

	Trigger Source	
	G→ Output 2	-
	Linked Output	
	G→ Output 5	-
3-[Image: Constraint of the second se	

1. Trigger Source
 2. Linked Output
 3. Output Mode

Select the device and output to monitor as the "trigger" for the linked output. Select the device and output to activate (or disable) when the trigger is active (on.) Select whether the rule should activate or disable the linked output when the trigger source output is active.

Input ightarrow

Input controls use physical sensor inputs from input modules to operate outputs or integrate with control function logic in ways other than those built into specific functions. Input functions can be used to enable or disable outputs, or other functions, based on the status or value of the input.

Example uses:

- Custom sensors; 0-5V or 4-20mA sensor integration.
- Qualifying a rule with the status of an input.

ſ	Input	
(1)		
	⊖ Input 4	
\bigcirc	Configuration	
E	Input Type: Discrete (on/off) Analog (variable) 	
[Output	
	O None O Discrete (on/off) O Analog (variable)	
\bigcirc	DXR6	
37	G→ Output 6	
	U Turn Output ON	

 Input Source Select the device and input to monitor/read.
 Configuration Select whether the input is discrete or analog type. If analog is selected, a setpoint and deadband setting are enabled.
 Output If required, configure an output to act on, or leave as "none." If no output is set, the function's status can still be used in other rules.

Analog Configuration:



4. ActionSets whether to activate when the sensor is too high (lower) or too low (raise.)5. SetpointsEnter the set point and dead band values.

Check the preview to ensure the operation will be as desired.



Logic functions evaluate a boolean expression between two values, A & B. The values may be the status of a function in a work space, or the status of a physical I/O point such as an output. The logic function's status will be the result of the boolean operation. An output can also be controlled with the result of the operation if one is selected.

	AND	OR	XOR	
		\rightarrow		
	A B	A B	A B	
	0 1 0	0 1 1	0 1 1	
	1 1 1	1 1 1	1 1 0	
	NAND	NOR	XNOR	
		1 0 0	1 0 0	
	0 1 1	0 1 0	0 1 0	
	1 1 0	1 1 0	1 1 1	
	Logical Operator			
(1)—			KNOR	
Ľ	Value A			
	Output 💿 Function			
2 -	Greenbouse West			
	f_{\star} dosing			Χ.
는	Value B			1
	Output Function			
$\overline{\mathbf{x}}$	H D			
	RD821100281			
	G Exhaust Fans			-
	Preview:			
(4)	If [dosing] -AND- [Exhaust Fans] are	e True, then the function is Fals	e.	
\smile \square	a factorial true ferticate anal an			

1. Logical OperatorSelect the operatio2, 3. Value A, BSelect an output or4. PreviewDisplays a preview

Select the operation for the function to evaluate between values A & B Select an output or function to use as the value in the expression. Displays a preview of how the expression will be evaluated.

Message 🗎

Message functions can be used to leave notes in workspaces, create and send reminders, or send custom alert messages when certain conditions arise. A full text message body can be stored in the work space, and can be sent by email or SMS text message. Messages can be sent once when the rule is activated, or can be sent continuosly depending on the system's message frequency settings.

Rules	Date Range Date Range Start Dav# 0 Pinal Dav# 0	
Calibration Reminder		
	Message Settings	
	Action: 💿 No Action 🔿 Email Once 🔿 Email Repeatedly	
	Type: Note Reminder Alert	2
	Message Body	
	Check sensor filters. Calibrate ph probe.	
Q W	ERTYUIOP 🔀	
A S	DFGHJKL	
仓 z	х с v в N м , . 🗘	

- 1. Action
- 2. Type
- 3. Message

Select if an email should be sent once, repeated or not at all. Action type will be included with messages so the can be differentiated. Type multi-line notes, reminders or alert messages in the body area.



Alert functions allow more advanced alerts from sensor values than those provided in the device alerts. The Alert function may be scheduled to operate only during specific times and may have multiple rules in the same way as other functions. This allows different alarm values for day versus night, for example.

To configure an alert, place the function into a workspace and create a rule. Select a sensor type and then select the device to use as a sensor. A high and/or low alert may be set to trigger an email message or operate an output device (such as a buzzer or alarm indicator light.)



1. ActionSelect if an email should be sent once, repeated or not at all.2. TypeAction type will be included with messages so the can be differentiated.3. MessageType multi-line notes, reminders or alert messages in the body area.

VNC Remote Access

The GCX system has full remote control capabilities using a standard VNC application (virtual network computing) on a phone, tablet or computer. VNC applications allow control of the system as if you were at the screen. VNC connections are secured using 128bit AES encryption and a user-set passcode.

There are a variety of free VNC client applications that can run on any device:• RealVNC• TigerVNC• UltraVNC• Mocha VNC Lite• noVNC• UltraVNC

Agrowtek currently recommends the free "Real VNC" viewer application:



Local Network Access

A VNC application can connect directly to the controller's local IP address when the vnc viewer application has access to the local network. If a pc or phone is connected to the wifi or Ethernet network that the controller is on, use the controller IP address to test the VNC application.

1. Locate the Ethernet or Wi-Fi I.P. address of the controller on the Network page:



2. Open the app and press the + button.



Enter the I.P. address of the controller and a reference name for the connection, then press Connect.
 Enter the password then accept the new identity check message to allow the connection to establish.

Address Book GCX Edit Cancel Authentication Continue Cancel Identity Check Continue VNC Server identity check failed Required 0 Password Are you sure you want to connect? Forgot your password? VNC Server's identity has changed since you last connected to it. It may not be safe to connect. You won't be Remember Password warned about this again if you do. Passwords are stored locally and never synced to other devices. **VNC Server** 192.168.1.154::5900 ę Passwords Connect New catchphrase Politic infant Felix. Valery bonanza W t u i 0 p q е y Alex. Address 192.168.1.154 86-31-84-New signature а S d f g h j k d4-20-6e-1e-03 Name GCX Ζ Х С ٧ b n m X **Picture Quality** Automatic > space .?123

• Picture Quality

If you experience picture quality problems (low resolution) change the picture quality from automatic to medium or high.

Mouse Pointer Alignment

If the mouse pointer on your device is not aligned with the mouse pointer on the VNC display, move the mouse to the **upper-left** corner of the screen to align the pointers on the devices.

Remote Network Access

There are currently two recommended methods for accessing the VNC screen control remotely; port forwarding or VPN.

VPN

VPN (virtual private network) connections provide a secure tunnel between a remote computer and the local network that the controller is operating on. The advantage is that VPN connections are very secure when configured correctly, and the controller can be connected to with the same IP address as on-site. Configuring VPN connections may require the assitance of your IT professional.

Port Forwarding

Port forwarding is done at the network router that the system is connected to. Each router has slightly different configuration screens for port forwarding, however the concept is the same. Traffic is routed between the internet and a device on the network at a specific IP address by allowing it to flow between an internal and external port number. This is common with gaming systems and other equipment.

GCX controllers use the standard VNC port number of 5900, making the configuration simple.

Notes:

- A static IP address should be assigned to the controller in the network router's DHCP table.
- An external port of your choice should be opened and directed to port 5900 on the GCX controller.
- If the internet service is not static IP, consider dyndns or similar service for a static access url.

Firewall	/ NAT /	Port F	orward							0
Port Forward	d 1:1	Outbo	und NPt							
Rules	Interface	Protocol	Source Address	Source Ports	Dest. Address	Dest. Ports	NATIP	NAT Ports	Description	Actions

For "port forwarding" instructions, please reference the manual for your network router. Each router has unique menus, however, the process is generally the same.

Security

GCX controllers operate on a Linux OS using direct frame buffering without any windowing system. VNC connections are password protected and encrypted, with access only to the framebuffer. Internally managed security certificates and phrases will invalidate and require resetting if excessive unathorized access is attempted. If using port forwarding, use an uncommon external port number to reduce likelyhood of unathorized access attempts. Additionally, the GCX system may be secured with user access control to prevent physical or remote access to the screen.

With secure passwords there are no known security vulnerabilities on GCX systems using VNC. *It is highly recommended to change the default VNC password when seting up your system.*

Email Configuration

The GCX system can send alerts and system files by email using a built-in SMTP mail client. *An email account is required to send email or text messages from the system*.

Email Account Requirements:

Access Type: IMAP (SMTP) Port: 465 (SSL)

To configure email alerts:

- 1. Add recipients to the recipient list; type an address and press +ADD.
- 2. Configure the account settings; SSL and SMTP are required.
- 3. Press the TEST button to send a test message and check if the email settings are properly configured.



Using Gmail

Gmail requires an "app password" to be generated to allow applications to use the account.

To generate app passwords, the account must have two-factor authentication enabled.

- 1. Log into your google account (manage your account) and select "security."
- 2. Locate the "Signing in to Google" panel and click "2-Step Verification".
- Follow the prompts to turn on 2-step verification.

Google Account Q Se	earch Google Account		0
Home Home Personal info	Signing in to Google		
Data & personalization Security	Password	Last changed Jul 2/) * *
 People & sharing Payments & subscriptions 	2-Step Verification	🥑 On	>
_	App passwords	None	>

3. An app password may now be created; click "App passwords".

٢	Home	Signing in to Google		
	Personal info			
٦	Data & personalization			
₫	Security	Password	Last changed Jul 27	>
3	People & sharing	2-Step Verification	On	>
8	Payments & subscriptions		- 1827)-	40
		App passwords	None	>

4. From the "Select app" drop-down, choose "Mail."5. From the "Select device" drop-down, choose "Other (custom name)."

App passwords	App passwords let you sign in to your Google Account from apps on devices that don't support 2-Step Verification. You'll only need to enter it once so you don't need to remember it. Learn more
App passwords let you sign in to your Google Account from apps on devices that don't support 2-Ste Verification. You'll only need to enter it once so you don't need to remember it. Learn more You don't have any app passwords. Select the app and device you want to generate the app password for. Select app Select device Calendar	P You don't have any app passwords. Select the app and device you want to generate the app password for. Mail Select device iPhone iPad BlackBerry Mac
Contacts YouTube Other (Custom name)	Windows Phone Windows Computer Other (Custom name)

6. Enter a name for reference, then click the "GENERATE" button to create the app password.

← App passwords

ou don't have any a	pp passwords.	
elect the app and o	levice you want to generate the app	bassword for.

7. Use the password in the yellow box in place of your account password in the email account settings.

fugs acqm rdig fbkm
How to use it Go to the settings for your Google Account in the application or device you are trying to set up. Replace your password with the 16- character password shown above. Just like your normal password, this app

Firmware Update

Agrowtek occasionally releases updates to system firmware that add new features or resolve bugs. Firmware may be updated via the internet if an internet connection is available, or by USB memory. A system reboot is required to complete a firmware update. It is recommended to place all relays into "Off" status.

Internet Update

An internet connection is required to update the firmware from the internet. Check that the network is connected and the system has an IP address on the network tab.

<u>수</u>			5
Network 7			
Ethernet IP Address			TCP/IP C
Connected: 192.168.1.154		INFO	•
WiFi (optional)			Port N
No Network Connection		INFO	0

1. Navigate to System Settings and press [CHECK UPDATES] to check if the system is up to date.

Ŷ	\geq	3	a		*	*	
System Set	tings 👔					ABOUT	
System Name				Temperature	Conductivity	Flow/Volume	
GrowControl GCX Engineering			Fahrenheit (°F)	microSiemens (uS)	O Lpm / Liters		
System Commands			O Celcius (°C)	O ppm (NaCl 500)) gpm / Gallons		
O	2	U	ወ	Chart Display		Report Increment	
SET CLOCK	CHECK UPDATES	RESTART	SHUT DOWN	New Data on Left	O New Data on Right	10 seconds	
	00						

2. If a new update is available, press [DOWNLOAD UPDATE] to download it to the system.



3. When the download completes, press REBOOT to restart the system.



Skip to the "System Firmware Loader" section.

USB Update

A USB flash drive is required for the USB update procedure. Contact the factory for firmware.

- 1. Copy the firmware file on to a USB flash drive.
- 2. Plug the USB flash drive into an available USB port.
- 3. Press the [RESTART] button on the system settings page.



4. In the Restart dialog, press [REBOOT SYSTEM] and the system will reboot.

🕐 Restart	
Please choose: Restart application (soft boot) or Reboot system.	
RESTART APP	CANCEL

It is recommended to place equipment into Off mode prior to rebooting. Once the system is rebooted, place equipment back into Auto mode.

🔁 USB File

USB memory will retain the update file so that it may be used on multiple machines without loss of the file. *Remove the USB memory after the update or the loader will update the firmware on each boot.*

USB Troubleshooting

Some memory cards are not read properly by the GCX system. If the firmware file is not detected by the System Loader, then please try another USB flash drive or another format when formatting the flash drive. *Recommended Format: Fat16*

System Firmware Loader

When the GCX system boots up, the system loader checks:

- If new firmware has been downloaded from the internet,
- If new firmware is found on a USB memory source.

If firmware is found from either source, it will update the system with the firmware found.

Fachrology t	DUTEK
System Memory: OK	Capacity: 7 GB / Free: 2 GB
GCX System Loader started. Checking for new firmware Firmware file found on: 998C-4982 Backing up old firmware file System firmware backed up successfully. Copying new firmware file Failed to copy new firmware file to system.	

To confirm the firmware has loaded go to the System Settings page and press the [ABOUT] button. Check the firmware version matches the expected new version.



GrowNET™ Device Update

Agrowtek occasionally releases updates to GrowNET[™] device hardware (environment sensors, hydroponics sensors, relay boxes, dosing pumps, etc.) The devices which physically connect to the GCX system can be updated with a LX1 AgrowLINK[™] plugged into the GCX system's USB ports.

To update a GrowNET device, navigate to the System Settings page and press the LOAD FIRMWARE button:



When the loader dialog is opened, the system will automatically attempt to download the latest device firmware files to the GCX controller. These firmware files can then be loaded to individual devices as required with an LX1 USB AgrowLINK.



A LX1 USB AgrowLINK is required to load firmware from the GCX system onto a GrowNET[™] device. Follow the on-screen diagram and connect the LX1 to the GCX system's USB ports, then connect the device to update.



- 1. Press the CONNECT TO LX1 AGROWLINK button to detect the LX1.
- 2. If the LX1 is detected, you can then select the device type to match the device you are updating:



3. Press the LOAD FIRMWARE TO GROWNET DEVICE button to begin the firmware update.

IMPORTANT: GrowNET[™] devices allow a 30 SECOND WINDOW from power-up to begin the update. If the loader window displays "Synchronizing..." for more than a few seconds, disconnect and re-connect the device to power-cycle it. The update should begin immediately if it has not timed out and failed.

MODBUS TCP/IP

MODBUS registers are available to read and write data to peripheral devices on the GCX system. *The TCP Command server must be enabled and may be operated on port 502 or 4040.*

Each device on the GCX system can be accessed individually by the device address assigned to each device on the GrowNET[™] bus.

Device Address

GrowNET[™] devices on the GCX system are assigned a device address from 1 to 100 on each GrowNET[™] bus. GCX+ systems suport two GrowNET[™] busses for a total of 200 devices.

MODBUS addresses on bus 0: Device address on GCX system. MODBUS addresses on bus 1: Device address on GCX system +100.

Example:

Device Address 20 on bus 0 is MODBUS device address 20. Device Address 20 on bus 1 is MODBUS device address 120.

Supported Commands

0x01 Read Output Coils 0x02 Read Input Coils 0x03 Read Holding Registers 0x05 Force Single Output Coil 0x06 Write Single Holding Register

Standard Error Responses

-Unsupported MODBUS commands will return an 'illegal function' error (0x01.) -Unsupported registers or request lengths will return an 'illegal data address' error (0x02.) -Writing invalid data to a register will return an 'illegal data value' error (0x03.) -Writing data to regsiters that require diagnostic mode will return a 'slave device busy' error (0x06.)

Register Types

All 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 (text strings) are stored with two characters (bytes) per register in hexadecimal format with trailing 0x00 for empty bytes.

Coil Registers

Devices with discrete coil registers (relays) may be accessed beginning with the first output (1) up to the number of outputs on the device (8 max. typical.) Forcing a coil register will set the output to Off or On mode, disabling the Auto mode.

Input Registers

Devices with discrete input registers (input modules) may be accessed beginning with input 1 (register 10001) up to the number of inputs on the device (8 maximum typical.) Input modules feature both analog and discrete registers for each input. Discrete inputs register "true" when the analog voltage is above 20% of the input range.

Device Holding Registers

Holding registers contain data and from sensors and devices in 16 bit or 32 bit "word" data structures.

Parameter	Description	Values	Туре	Access	Address
Name (max 100 char)	Device Name	ASCII Characters	2 chars/register	R	40001
	Integer Value 1				40101
	Integer Value 2				40102
	Integer Value 3				40103
Integer Degister	Integer Value 4			Б	40104
integer Register	Integer Value 5		To bit, signed	К	40105
	Integer Value 6	Sensor Reading Analog Input Value			40106
	Integer Value 7				40107
	Integer Value 8				40108
	Floating Point Value 1	PWM Output (% Duty)	32 bit, floating pt	R	40201
	Floating Point Value 2	Pump Speed (%)			40203
	Floating Point Value 3				40205
Float Dogistor	Floating Point Value 4				40207
ridal Register	Floating Point Value 5				40208
	Floating Point Value 6]			40211
	Floating Point Value 7				40213
	Floating Point Value 8				40215

Integer Register Scaling

Sensor values are available in integer or floating point formats depending on the register requested (see map.) Some integer formatted values are scaled by factors of 10's to maintain decimal precision and require division to calculate the final value.

Environment Sensors (SXC, SXE)

Sensor #	Туре	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
5	VPD	x100	0 - 10 kPa

Weather Sensors (SXW)

Sensor #	Туре	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
5	Speed	x1	0 - 125mph
6	Direction	x1	0 - 359°
7	Barometric Pressure		NOT CURRENTLY AVAILABLE
8	Rain		0 - 1

Hydroponics Sensors (SXH, GXH, PHX)

Sensor #	Туре	Integer Scale	Range
1	Temperature	x100	-2000 - 6000 (-20 - 60°C)
2	рН	x100	0 - 1400 (0 - 14.00pH)
3	Conductivity	x1	0 - 2500 ppm
4	O.R.P.	x1	-1000 - +1000 mV
5	D.O.	x100	0 - 2000 (0 - 20.00 mg/L)
6	Flow	x10	0 - 125 gpm

Input Modules (DXI8)

Туре	Integer Scale	Range
Voltage	x1	0 - 5000 mV
Current	x100	0 - 2000 (0 - 20 mA)

Sensor Calibration Registers

Offset Calibration

Offset (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, write the correct sensor value to the offset calibration regsiter (consider the integer scaling noted.)

Span Calibration

Span, or slope calibration, corrects the slop of the sensor reading at a second point, away from the zero calibration. Operations performed using the span register are:

-pH 4.01 or 10.0 calibration

-Conductivity, ORP or DO calibration to solution standard

Environment Sensors (SXC, SXE)

Parameter	Description	Range	Туре	Access	Address
Calibration Input, Offset (Zero)	Temperature	See integer ranges.	16 bit, signed	w	41101
	Humidity				41102
	Light				41103
	CO2				41104

Hydroponics Sensors (SXH, PHX)

Parameter	Description	Range	Туре	Access	Address
	Temperature				41101
Calibration Input, Zero D.R.P. / D.O. See integer ranges.	рН	Coo internetion	16 bit, signed		41102
	Conductivity	see integer ranges.		vv	41103
			41104		
	рН		16 bit, signed		41202
Calibration Input,	Conductivity	See integer ranges.		w	41203
	O.R.P. / D.O.				41204

Discrete Registers

Discrete registers provide details on the I/O status of on/off type of outputs, and allow manual overrides of outputs. Output status registers are read-only; manual control is accomplished via the override registers.

Override Registers

A "force-on" and "force-off" register is available for each output. To force an output on or off, set the respective register to "true." To return an output to "auto" mode, set both overrides to "false". *Note: Setting one override to true will automatically set the opposite override to false.*

Parameter	Description	Туре	Access	Address
	Output 1		-	1
	Output 2]		2
	Output 3			3
Outrout Status Desister	Output 4] 		4
Output Status Register	Output 5		ĸ	5
	Output 6			6
	Output 7]		7
	Output 8			8
	Force-Off 1			101
	Force-Off 2]	R/W	102
	Force-Off 3	- bit		103
	Force-Off 4			104
	Force-Off 5			105
	Force-Off 6			106
	Force-Off 7			107
	Force-Off 8			108
	Force-On 1			201
	Force-On 2			202
	Force-On 3]		203
	Force-On 4	hi+	DAM	204
Output Overnae ON	Force-On 5	DIC		205
	Force-On 6			206
	Force-On 7]		207
	Force-On 8			208

Control Function Registers

Control function values can be accessed if a MODBUS register is set for the specific control function setting. This allows read and write of control parameters using MODBUS registers.

Device Address

Access to control functions is performed through device address **201**.

Register Index

Function registers are accessed by setting a primary register which subsequent registers are indexed from. The user or integrator must set an index register for each function setting to access the settings.



3. Register Preview

Number to use as the first (index) register for accessing the settings. Displays the range of registers used for this setting according to the index.

Accessing Registers

The settings are accessed by sending read-register requsts to device address 201, at the index or specific register number requested according to the offset tables on the following pages. Multiple registers can be requested up to the Modbus limit.

For example; requesting the registers from the graphic above for the "Function Status" and "Function Value":

Device Address = 201 Start Register = 1000 Number of Registers = 2

All Functions

Index	Parameter	Description	Values	Туре	Access
+0	Status, Parent	Function Status <1 = False, 1 = True	-1 = Error 0 = Idle 1 = Active	Int	R
+1	Value, Parent	Analog Value of Function	0 - 100, etc.	Int	R
+2	Status, Setting	Setting Status <1 = False, 1 = True	-1 = Error 0 = Idle 1 = Active	Int	R
+3	Reserved	^ 			
+4	Enable Mode	Setting Enable Mode	0 = Disabled 1 = Enabled 2 = If(Output On) 3 = If(Output Off) 4 = If(Function True) 5 = If(Function False)	Int	R/W
+5	Start Hour	Scheduler Start Time	0 - 23	Int	R/W
+6	Start Minute		0 - 59	Int	R/W
+7	End Hour	Scheduler End Time	0 - 23	Int	R/W
+8	End Minute		0 - 59	Int	R/W
+9	First Day#	Scheduler Day Range	1 - 9999	Int	R/W
+10	Last Day#		1 - 9999	Int	R/W
+11	Output Type	Discrete or Analog	0 = No Output 1 = Discrete 2 = Analog	Int	R/W
+12	Analog Output	Value to send to output	0 - 100%	Int	R/W

Count Timer

Index	Parameter	Description	Values	Туре	Access
+13	Mode	Timer Operation Mode	0 = Delay-On 1 = Delay-Off 2. = One-Shot On 3. = One-Shot Off	Int	R/W
+14	Preset	Timer Value	1 - 65535	Int	R/W
+15	Units	Timer Units	0 = Seconds 1 = Minutes 2 = Hours	Int	R/W

Cycle Timer

Index	Parameter	Description	Values	Туре	Access
+13	Preset	Off Timer Value	1 - 65535 (Seconds)	Int	R/W
+14	Units	Timer Units	0 = Seconds 1 = Minutes 2 = Hours	Int	R/W
+15	Preset	On Timer Value	1 - 65535 (Seconds)	Int	R/W
+16	Units	Timer Units	0 = Seconds 1 = Minutes 2 = Hours	Int	R/W

Thermostat/Humidistat/Photostat

Index	Parameter	Description	Values	Туре	Access
+13	Mode	Operation Mode	0 = Cool / DeHumidify / High Lt 1 = Heat / Humidify / Low Lt	Int	R/W
+14	Set Point	Sensor Setting	- 40F to 160F (-20C to 60C) (x10) 0 - 100% (x10) 0 - 1000 W/m2	Int	R/W
+15	Dead Band	Difference from Set Point	0 - 999	Int	R/W

CO2

Index	Parameter	Description	Values	Туре	Access
+13	Mode	Operation Mode	0 = Exhaust 1 = Inject 2 = Inject with Dark Disabled	Int	R/W
+14	Set Point	Sensor Setting	0 - 5000	Int	R/W
+15	Dead Band	Difference from Set Point	0 - 1000	Int	R/W

Lighting

Index	Parameter	Description	Values	Туре	Access
+13	Current Intensity	Current Dimming Output	0 - 100 %	Int	R
+14	Target Intensity	Dimming Set Point	0 - 100 %	Int	R/W
+15	Ramp Rate	Dimming Change Rate	0 - 100 % per Minute	Int	R/W
+16	Solar Dimming	Enable Solar Dimming	0 = Disabled, 1 = Enabled	Int	R/W
+17	Light Set Point	Set Point for Dimming	W/m2	Int	R/W
+18	High Temp Dimm.	Enable High Temperature Dimm	0 = Disabled, 1 = Enabled	Int	R/W
+19	Max Temperature	Dim/Shut Down Temperature	°F/°C	Int	R/W

Position Control

Index	Parameter	Description	Values	Туре	Access
+13	Position Target	Output Target of Setting	0 - 100%	Int	R
+14	Active Stage	Current Vent Stage	0 - 8	Int	R
+15	Mode	Operation Mode	0 = Shade 1 = Ventilation	Int	R/W
+16	Minimum Position	Minimum % open limit	0 - 100 %	Int	R/W
+17	Maximum Position	Maximum % open limit	0 - 100 %	Int	R/W
+18	Static Position	Static position setting	0 - 100 %	Int	R/W
+19	Solar Position	Position for Solar setting	0 - 100 %	Int	R/W
+20	Solar Sensor	Sensor value for solar setting	W/m2	Int	R/W
+21	Stage First Position	Position for First Vent Stage	0 - 100 %	Int	R/W
+22	Stage Final Position	Position for Final Vent Stage	0 - 100 %	Int	R/W
+23	Stage Tempeature	Temperature for Stage 1	°F/°C	Int	R/W
+24	Number of Stages	Position stages in ventilation	1-8	Int	R/W
+25	Stage Separation	Temperature between stages	°F/°C	Int	R/W
+26	Rain Position	Position limit during rain	0 - 100 %	Int	R/W
+27	Wind Position	Position limit during high wind	0 - 100 %	Int	R/W
+28	Low Temp Position	Position limit during low temp	0 - 100 %	Int	R/W

Irrigation

Index	Parameter	Description	Values	Туре	Access
+13	Current Mode	Active Irrigation Mode	0 = Pump Delay 1 = Feeding 2 = Draining	Int	R
+14	Current Stage	Active Irrigation Stage#	0 - 65535	Int	R
+15	Cycle Count	Completed Irrigation Cycles	0 - 65535	Int	R
+16	Repeats	Number of Repeats Set	0 - 9999	Int	R/W
+17	Repeat Delay	Delay between Repeats	0 - 65535 (seconds)	Int	R/W
+18	Output Delay	Delay for Pump/Valve Output	0 - 65535 (seconds)	Int	R/W
+19	Enable Drain Valve		0 = Disabled, 1 = Enabled	Int	R/W
+20	Drain Time	Time Delay for Drain Valve	0 - 65535 (seconds)	Int	R/W
+21	Enable Moisture	Use Moisture Sensor Triggering	0 = Disabled, 1 = Enabled	Int	R/W
+22	Moisture Level	Minimum Moisture Level	0 - 100%	Int	R/W
+23	Stage Count	Number of Irrigation Stages	0 - 65535 (seconds)	Int	R
+24 + n	Stage Time	Time Duration of Stage n	0 - 65535 (seconds)	Int	R/W

Tank Level

Index	Parameter	Description	Values	Туре	Access
+13	Is Triggered	Drain/Fill is Active	0 = Inactive, 1 = Active	Int	R
+14	Active Stage	Current Operation Stage	0 = Off 1 = Drain 2 = Fill	Int	R
+15	Mode	Operation Mode	0 = Fill 1 = Drain 2 = Flush	Int	R/W
+16	Timeout	Fill/Drain Time-out	0 - 65535 (seconds)	Int	R/W
+17	Timeout Units	Seconds/Minutes	0 = Seconds 1 = Minutes	Int	R/W

Nutrient Dosing

Index	Parameter	Description	Values	Туре	Access
+13	Current Group	Dosing Group (A, B, C)	0 - 26	Int	R
+14	Mode	Operation Mode	0 = Recirculating 1 = Inline (future)	Int	R/W
+15	Nutrient Lock	Stop pH/ORP when dosing	0 = Disabled, 1 = Enabled	Int	R/W
+16	pH Up Enable	Enable pH Up Dosing	0 = Disabled, 1 = Enabled	Int	R/W
+17	pH Up Flowrate	ml/Min dosing rate	0.1 - 999 (x10)	Int	R/W
+18	pH Down Enable	Enable pH Down Dosing	0 = Disabled, 1 = Enabled	Int	R/W
+19	pH Down Flowrate	ml/Min dosing rate	0.1 - 999 (x10)	Int	R/W
+20	ORP Enable	Enable ORP Dosing	0 = Disabled, 1 = Enabled	Int	R/W
+21	ORP Flowrate	ml/Min dosing rate	0.1 - 999 (x10)	Int	R/W
+22	Name Length	Length of Recipe Name	0 - 80	Int	R
+23 + n	Recipe Name	Name of Recipe	ASCII Characters	2 Chars/Register	R

Note: Read registers +0 to +22, then using the name length returned, request registers starting at +23 with quantity equal to the name length to retrieve the name in character format.

Output Link

Index	Parameter	Description	Values	Туре	Access
No additional Modbus registers available.					

Input

Index	Parameter	Description	Values	Туре	Access
+13	Input Type	Discrete / Analog	0 = Discrete 1 = Analog	Int	R/W
+14	Mode	Action Mode (analog)	0 = Lower 1 = Raise	Int	R/W
+15	Set Point	Analog set point	0 - 6553.5 (x10)	Int	R/W
+16	Deadband	Analog comparator deadband	0 - 6553.5 (x10)	Int	R/W

Dosing Recipe Registers

Dosing recipe values can be accessed and modified by MODBUS TCP.

Device Address

Access to dosing recipes is performed through device address **202**.

Register Index

Function registers are accessed by setting a register in the recipe which subsequent registers are indexed from. The user or integrator must set an index register for each recipe to access the settings.



- 1. Enable Modbus
- 2. Register Index

Enable access to the recipe registers with MODBUS (administrator only.) Number to use as the first (index) register for accessing the settings.

Recipes

Register	Parameter	Description	Values	Туре	Access
+0	Dosing Units	Recipe Units	0 = ml/gal 1 = ml/l (future) 2 = 1:n ratio (future)	Int	R/W
+1	pH Mode	Enable pH Dosing	0 = Disabled, 1 = Enabled	Int	R/W
+2	pH Target	pH Set-Point	0 - 1400 (pH x100)	Int	R/W
+3	pH Deadband	pH Drift Allowed		Int	R/W
+4	ORP Mode	Enable ORP Dosing	0 = Disabled, 1 = Enabled	Int	R/W
+5	ORP Target	ORP Set-Point	-1000 to 1000mV	Int	R/W
+6	ORP Deadband	ORP Drift Allowed		Int	R/W
+7	Nutrient Mode	Enable Nutrient Dosing	0 = Disabled, 1 = Enabled	Int	R/W
+8	Nutrient Target	EC/ppm Set-Point	0 - 5000uS (0 - 2500ppm)	Int	R/W
+9	Nutrient Deadband	EC/ppm Drift Allowed		Int	R/W
+10	Nutrient Count	Number of Nutrient Parts	0 - 24	Int	R
+11	Part Index	Nutrient Part Selector	1 - 24	Int	R/W
+12	Nutrient Group	Group A - Z	0 - 25	Int	R/W
+13	Dose	mL Dose Size	0 - 999.9 (x10 mL)	Int	R/W
+14	Mix Delay	Time Delay, seconds	0 - 65535	Int	R/W
+15	Name Length	Nutrient Part Name Length	0 - 30 (60 characters max)	Int	R
+20	Nutrient Name	Name of Nutrient Part	ASCII Characters	2 Chars/Register	R
+50	Name Length	Recipe Name Length	0 - 30 (60 characters max)	Int	R
+51	Recipe Name	Name of Recipe	ASCII Characters	2 Chars/Register	R

Specifications

Input Power	12 - 24 Vdc, 2.5A Max
Included Power Supply	UL Listed Class II Limited Energy Power Supply 90-265VAC Input, 24Vdc 2.5A Max Output
Control Interface	GCX: 10.1″ (1024 x 800) Capacitive Touch Screen GCX+: 15.6″ (1920 x 1080) Capacitive Touch Screen
GrowNET [™] Ports / Devices	GCX: 8 / 100 GCX+: 16 / 200 (100 devices per 8-port bus)
Network Communication	10/100 Ethernet (RJ-45) WiFi (optional, USB)
USB Ports	4x USB A 2.0 Host, 1x USB B Slave (boot loader)
Processor	Quad-Core 1.2GHz ARM
OS	Linux
Operating System Memory	8GB, Industrial Flash
RAM	1GB (512MB shared GPU memory)
Enclosure	Powder Coated Aluminum
Working Environment	Maximum 70% RH non-condensing. Avoid direct sunlight.

These specifications are subject to change without notice as hardware updates and improvements occur.

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, tubing 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 three (3) years 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 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.

