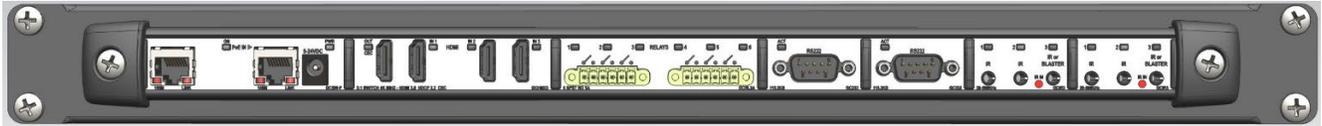


Global Connect User Guide

1.0 INTRODUCTION

Global Caché's modular Global Connect is the newest high-performance family of connectivity products from the company that has revolutionized the way you connect, command, and control. Built with performance, flexibility, and empowering in mind, Global Connect delivers a simple cost-effective way to extend the reach of any control system, from legacy hardware-based systems to leading-edge cloud-based control software; from current projects to future installations.



Known for award-winning products connecting infrared (IR), serial (RS232 and 485), relay, and sensor input, to a WiFi or IP network, Global Caché introduces Global Connect, adding the ability to build the scalable I/O you need, with customizable configuration, and added modules including local computing capability (Raspberry Pi slot), and HDMI switching and CEC control. Global Connect features individual IP addresses for each module with individual web pages for easy configuration and advanced addressability.

This document intends to provide additional information, insight, and instruction on installing, configuring, and using Global Connect.

For initial setup instructions, or TCP and HTTP APIs please refer to the **Global Connect Quick Start**, or **Global Connect APIs** respectively on our downloads page: <http://www.globalcache.com/downloads>



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3.0 PRODUCT ARCHITECTURE



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Global Connect is a modular product. Each module has its **own IP address**, and configuration web pages. Modules can be different sizes and occupy either 1, 2, or 3 slots in the unit chassis. The following chassis sizes are available:

- 19" rack mount enclosure with 10 available module slots
- 19" rack mount enclosure with 7 available module slots
- 19" rack mount enclosure with 5 available module slots
- 15" freestanding enclosure with 10 available module slots
- 10.5" freestanding enclosure with 7 available module slots
- 7.5" freestanding enclosure with 5 available module slots
- 6" freestanding enclosure with 4 available module slots
- 4.5" freestanding enclosure with 3 available module slots

The modularity of the Global Connect allows for ordering units with custom combinations of modules within the chassis sizes above. Please see our Global Connect configurator to get started building your unit.

The modular design of Global Connect also allows for simplified compatibility with previous Global Caché product drivers. Drivers for previous Global Caché products can generally be expected to work on Global Connect devices when functionality overlaps between the product line the driver was written for and the Global Connect module. When compatibility is not certain we recommend contacting our support team (support@globalcache.com) for any questions about driver compatibility.

4.0 DISCOVERING MODULES ON THE NETWORK

When a unit is initially connected to the network, or after it has been reset to factory defaults, its modules will obtain an IP address via DHCP. To determine what IP address has been obtained, download and run iHelp from our website at <http://www.globalcache.com/downloads>. iHelp will discover any Global Caché units on the network and display their IP address, and MAC address.

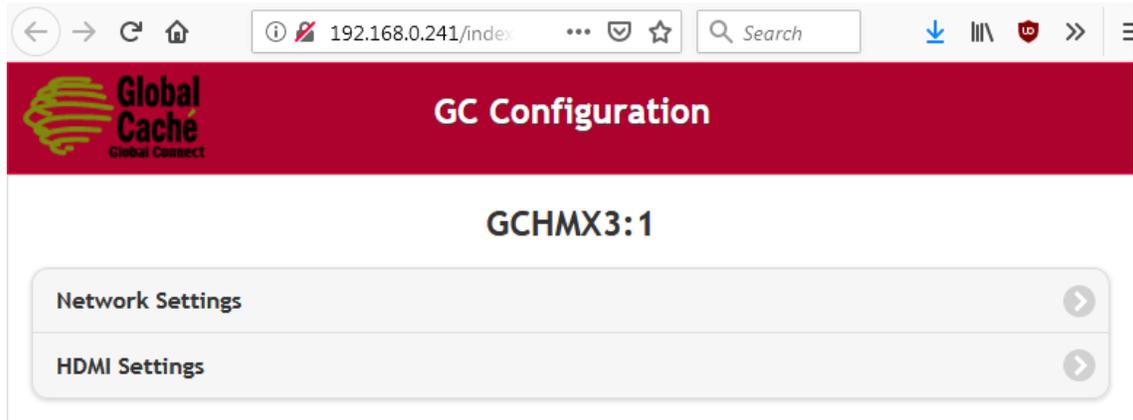
To learn more about the different ways Global Connect modules will obtain IP addresses visit section **5.3 Network Settings**.

4.1 CONFIGURATION WEB PAGES

Once the IP address of a module has been obtained the configuration pages can be loaded by typing the IP address of the module into a browser.



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From the configuration pages, network settings can be changed and the control interface can be configured. For more information on network configuration see **5.3 Network Settings**. For more information on control interface configuration see the relevant section for the control module being configured.

5.0 NETWORK MODULES

Each Global Connect includes a network module. The network module provides the network connection for the unit. The network module also provides the power input for the entire unit. Network modules can be powered with any power supply between 5v and 24V DC. All Global Connect units ship with an appropriately rated power supply. The GCSW-P module includes PoE capabilities. The GCSW-P module can be powered from any 802.3af compatible Power Sourcing Equipment (PSE).

The power wattage requirement for a unit depends on the number and type of modules contained within the unit, however a 10W supply is suitable for all units that do not power a Raspberry Pi. For units that do power the Raspberry Pi a 5V 20W power supply must be used.

5.1 NE MODULE – SINGLE ETHERNET NETWORK MODULE

The NE module provides a hardwired networking solution to the Global Connect.

NE Module Feature	Description
Network Connector	RJ45
Network Speed	100Mbps, Full Duplex
Power Connector	Barrel Jack: 5.5mm x 2.1mm (Center Positive)
Power Input	Range: 5V-24V
Chassis Slots Occupied	1



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5.2 NS MODULE – DUAL ETHERNET NETWORK SWITCH MODULE

The NS module provides a hardwired networking solution for Global Connect devices with built in network switch capabilities. The additional ethernet port and switch capabilities allow for daisy-chaining of Global Connect units, or to connect the Raspberry Pi (in units that contain the Raspberry Pi module) to the network. The NS module also is able to be powered up via 802.3af compliant PoE.

NS Module Feature	Description
Network Connector	2 x RJ45
Network Speed	100Mbps, Full Duplex
Power Connector	Barrel Jack: 5.5mm x 2.1mm (Center Positive)
Power Input	Range: 5V-24V
Power over Ethernet (PoE) capability	802.3af Powered Device (PD)
Chassis Slots Occupied	2

5.3 NETWORK SETTINGS

Network settings for Global Connect units are set individually on each Global Connect module. Modules support DHCP as well as static IP address assignment.

When a unit initially connects to the network, or after a factory default, it will be assigned an IP address by the DHCP server. To determine what IP address has been assigned, follow the instructions in section **4.0 Discovering Modules on the Network**.

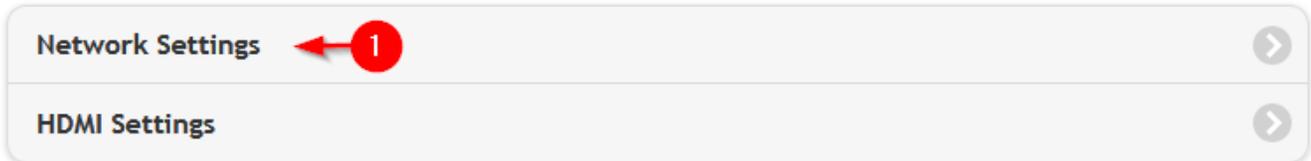
Global Connect modules installed on networks without a DHCP server will take a predetermined static IP address two minutes after boot. The IP address taken will be based on the module's unit address. The unit address is the position that the module occupies in the Global Connect chassis. The module that occupies the first position next to the network module will have unit address 1 and will take IP address 192.168.1.71. Subsequent modules will take IP addresses 192.168.1.72, 192.168.1.73, and so forth.



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The network settings for a module can be set through the unit's configuration pages. Please refer to the Global Connect Quick Start for instructions on accessing the configuration pages.

The Network Settings page is further described in sections 5.3.1 and 5.3.2 which deal with DHCP and Static IP address assignments.

Many control apps and systems expect the IP address of Global Connect modules to remain the same. If the IP address of a module changes (which can happen when using DHCP) the control software may not be able to communicate with the module. To prevent this, we recommend creating a DHCP reservation (preferred) or assigning a static IP address to Global Connect Modules.

5.3.1 DHCP AND DHCP RESERVATIONS

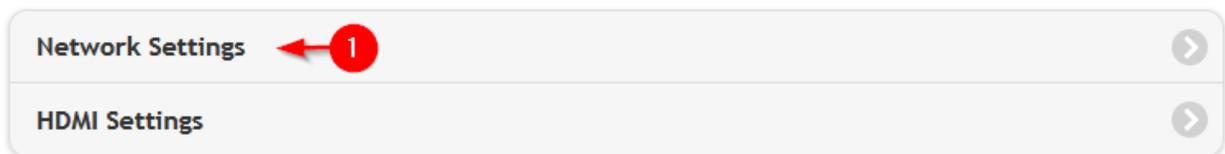
DHCP is the most common form of network IP assignment on residential and commercial networks. The purpose of a DHCP server is to dynamically assign unique IP addresses to all connected network clients. DHCP is enabled by default on Global Connect modules.

Configuration Example:

To return a static assigned unit to DHCP, navigate to the Network Settings page of the module's configuration pages.



GCHMX3:1



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Change the DHCP setting from Disabled to Enabled and press Apply Changes. The module's network name (hostname) can optionally be changed by entering a value in the name field and pressing Apply Changes.

The screenshot shows the 'GC Configuration' interface for 'Network Settings'. At the top left is the Global Cache logo. The page title is 'GC Configuration' and the section is 'Network Settings'. A 'Back' button is in the top left. The DHCP setting is a toggle switch currently set to 'Enabled', with a red circle and arrow labeled '1' pointing to it. Below are input fields for IP Address (192.168.0.241), Subnet Mask (255.255.255.0), Gateway (192.168.0.1), Primary DNS Server (192.168.0.11), Secondary DNS Server (8.8.8.8), and Name (GC_F00000). At the bottom is an 'Apply Changes' button with a red circle and arrow labeled '2' pointing to it.

DHCP Reservations

The purpose of a DHCP reservation is to ensure that a networked device always receives the same IP address every time it requests one from the DHCP server. This is important for automation devices as many control systems rely on an unchanging IP address. While exact instructions may vary, typically DHCP reservations are made in the router and can be set somewhere under DHCP settings.

When setting a DHCP reservation the MAC address of the module is associated with the IP address it should be assigned. This allows the DHCP server to assign the reserved IP address every time it sees a DHCP request from the module with the MAC address entered in the reservation.

5.3.2 STATIC IP ADDRESSES (ADVANCED)

Setting static IP address settings allows manual configuration of network settings. Static IP address assignments must be used on networks that do not have a DHCP server. On networks that do have a DHCP server static IP settings can be used as an alternative to a DHCP reservation, however mixing DHCP and static IP address assignments can cause issues if not implemented properly. DHCP reservations are therefore suggested for all but advanced users.

When static IP address assignment is used it is important to keep track of what IP addresses have already been assigned on the network. Assigning two devices or modules to the same IP address will cause an IP address conflict which will result in



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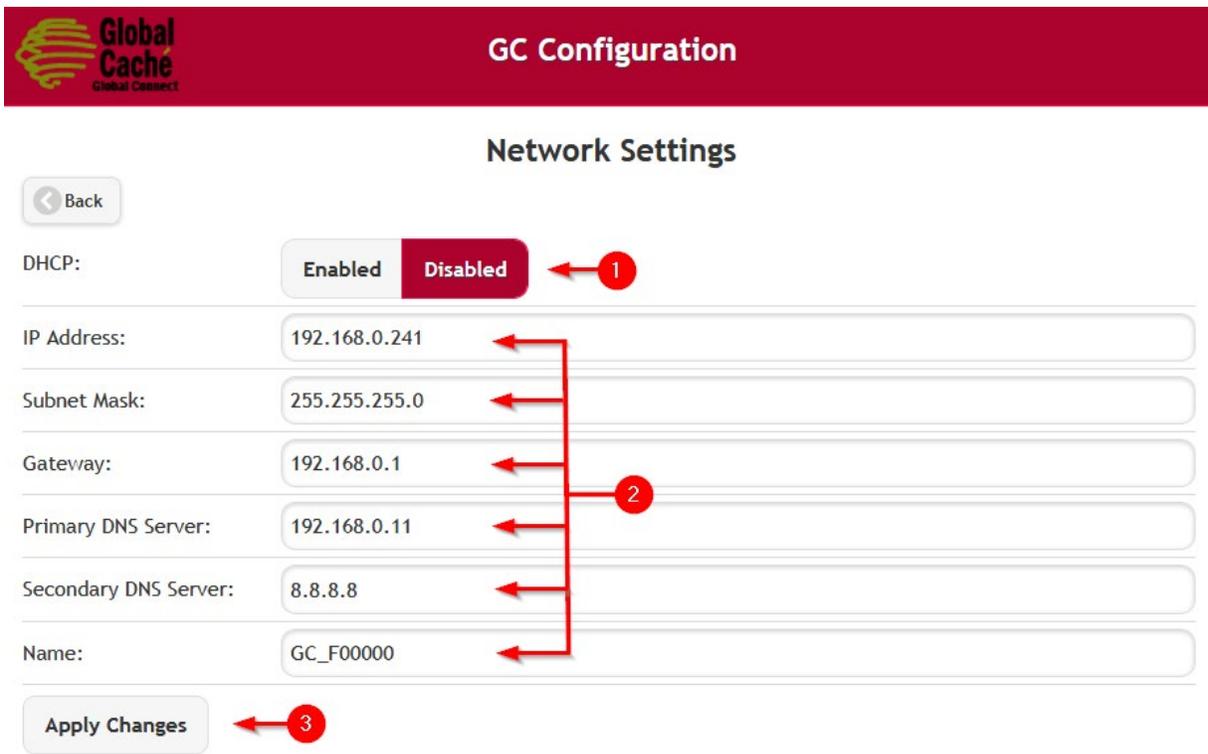
loss of communication with that device. If an IP address conflict is created, or a module is assigned a non-communicable IP address, one simple way to recover the module is to perform a factory default as explained in section 10.0.

Configuration Example:

To set a static IP address assignment, navigate to the Network Settings page of the module's configuration pages.



Set DHCP to Disabled, and enter the desired IP address, subnet mask, gateway, and primary and secondary DNS servers. The module's network name (hostname) can also optionally be changed by entering a value in the Name field. After the settings have been entered press Apply Changes to save the configuration.



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6.0 HM MODULE – HDMI 3:1 SWITCHING MODULE

The HM module allows for network-controlled switching between 3 different sources at resolutions up to UHD 4K at 60Hz. The module also includes HDMI-CEC (Consumer Electronic Control) injection and snooping capabilities which provides command and control of devices connected through the HDMI cable. The GCHMX3 module includes support for HDCP 2.2 (High-bandwidth Digital Content Protection), allowing for seamless use with the latest HDCP 2.2 devices.

GCHMX3 Module Feature	Description
Ports	3 Inputs, 1 Output
Data Bandwidth	18Gbps
4K Resolutions	UHD 4K 60Hz, 4:4:4 8 bit UHD 4K 60Hz, 4:2:2 8 bit 10 bit 12 bit UHD 4K 60Hz, 4:2:0 8 bit 10 bit 12 bit
Chassis Slots Occupied	2

6.1 CONSUMER ELECTRONIC CONTROL (CEC)

Consumer Electronic Control (CEC) is designed to allow control commands to pass over HDMI. While typically control systems have not had access to the CEC bus, the Global Connect HM module allows access to control over CEC by allowing for injection and reception of CEC commands. With CEC control many commands typically sent with a physical remote can be performed over a hard-wired HDMI connection.

6.2 HDMI SWITCHING

The HM module provides 3 in 1 out HDMI switching functionality. The module allows for switching to any one of the 3 HDMI inputs as well as turning off transmission completely from the HDMI switch. The switch also can detect whether the connected HDMI devices are on or powered off/in standby.

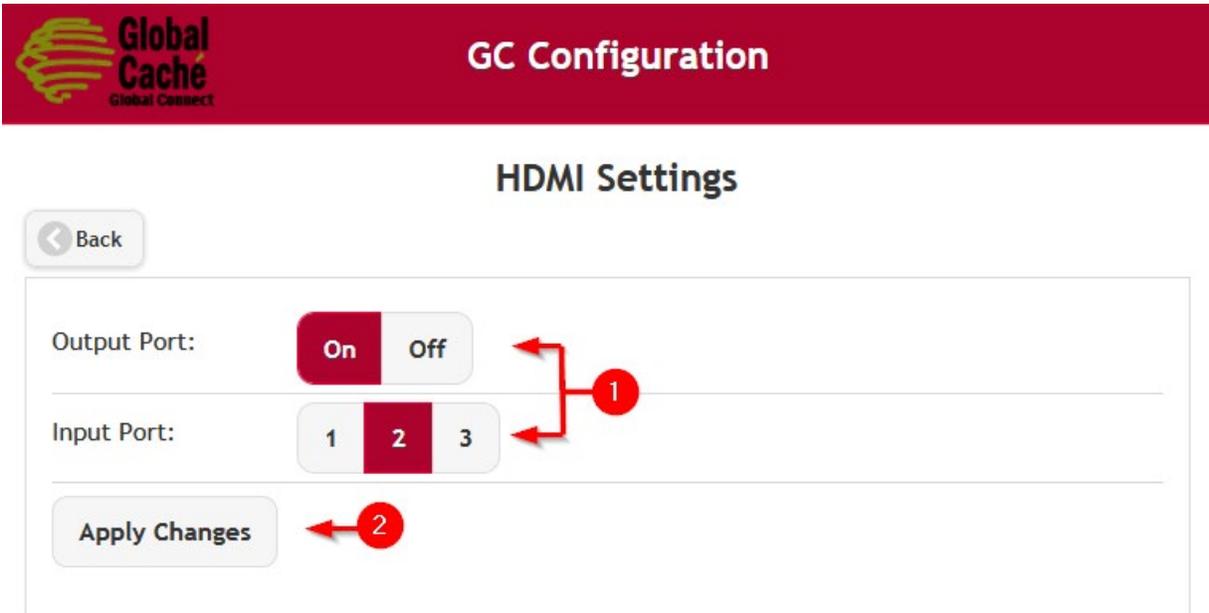
Configuration Example:

To access the HDMI configuration settings, navigate to the HDMI Settings page on the unit's configuration pages.



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While the HDMI module does not require configuration of any HDMI settings, a testing interface is provided for switching the HDMI switcher through the web interface. To switch the HDMI switcher to a port, turn the output port On, then select the desired input port and press Apply Changes. All other setup options can be configured in the chosen control software.



7.0 IR MODULE - INFRARED (IR) CONTROL MODULE

Infrared (IR) is a common control type and is commonly used for AV control, but also used in applications for climate control systems, blinds, fans, and IP cameras. Global Connect's GCIR3 Infrared modules can control any device that utilizes an IR remote.

In addition to IR control the IR module IR ports can be configured for Sensor Input. This allows for the use of iTach sensor cables for sensing the presence of voltage, contact closure, or composite video.

GCIR3 Module Feature	Description
Ports	3 x IR Outputs/Sensor Inputs
Included Cables	3 x IR Emitters, 1 x IR Blaster
IR Output Frequency	20KHz – 500KHz
IR Learner Frequency	20KHz – 200KHz
Chassis Slots Occupied	1

7.1 IR TRANSMITTERS



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IR Emitters:

IR emitters are short-range IR transmitters. Short-range IR transmitters are designed to physically transmit IR signals to a single device while avoiding cross-talk with neighboring devices. Visible IR emitters, such as the emitters included with the IR module have a range of around 1" (2.5 cm). Due to the short range of IR emitters it is important to place the IR emitters directly on top of the IR receiver of the controlled device.

To find the IR receiver on a device look for a shiny black window in the front of the device. If the device does not have a window, or is made of a uniform material, use a flashlight to search for the receiver. IR receivers typically are made of black shiny plastic and are typically placed as close to the front of the device's enclosure as possible.

IR Blasters:

IR Blasters are long-range IR transmitters. Long-range IR transmitters are designed to control devices across the room or to control multiple devices that are near each other. The IR blaster included with the GCIR3 module is designed to transmit up to 35 feet (10 meters).

To allow long transmission distances, IR signals using IR blasters are non-visible. Non-visible IR transmitters are not visible to the human eye but are very visible to the IR receivers within IR controlled devices. To determine if a non-visible IR transmitter is transmitting look at the lightpipe above the IR port on the IR module. On each IR transmission (for both emitters and blasters), the lightpipe above the IR output will blink indicating transmission.

Note: IR Blasters can only be used on IR port 3.

Sensors:

The IR module works with three sensor cables:

- GC-SC1: This cable senses the presence of contact closure.
- GC-SP1: This cable senses the presence of voltage (up to 24v).
- GC-SV1: This cable senses the presence of a (legacy) component video signal.

For more information about the Sensor cables please see the pertinent sensor cable's quickstart on our downloads page:

<https://www.globalcache.com/downloads/>

IR Receiver:

The IR receiver cables allow for reception of IR codes. Unlike the built in IR learner IR receiver cables can receive IR codes at distances up to 35 feet (10 meters). Control applications can use long range IR reception for several purposes. The most common are as follows:

1. As an input to trigger events. By identifying the code the control software can use the buttons of a remote to trigger events elsewhere in the system. For example, receiving digit 1 from a remote may trigger the control software to send an RS232 command through another GC device to open the blinds in a room.



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2. To send IR elsewhere in the install. By receiving IR codes and then sending them to an IR output device the control software can take IR codes received by the cable and send them to a device that is not in line of sight of the user such as devices in a cabinet, closet, or other room.
3. To let the control application know that the user has controlled a device from outside of the control software. Some devices do not provide feedback and it is sometimes useful to know what state a device is in. By monitoring the IR codes sent to a specific device (by putting an IR receiver cable next to that device) it is possible for the control software to know if a user is controlling that device with an IR remote that is not otherwise connected to the system.

Configuration Example:

To access the Infrared configuration settings, navigate to the IR Settings page on the unit's configuration pages.



Select IR Emitter, Sensor, Sensor Notify or IR Receiver on each port depending on which cable will be used. If Sensor Notify is selected enter the desired Port and Timer values. Press Apply Changes to save the configuration. All remaining configuration will be done in the chosen control software.

Choosing Sensor Notify puts the port in Sensor mode with the additional functionality that UDP multicast beacons will be sent out whenever the sensor state changes as well as at the timer interval (if the timer value is not zero). Beacons will be sent to the UDP port specified. Refer to your control software documentation to determine if Sensor or Sensor Notify should be used.



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GC Configuration

IR Settings

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Port 1:	IR Emitter	Sensor	Sensor Notify	IR Receiver	
Port 2:	IR Emitter	Sensor	Sensor Notify	IR Receiver	
Port 3:	IR Emitter	IR Blaster	Sensor	Sensor Notify	

Port: **2** → 9132

Timer: **3** → 60

Apply Changes ← **4**

7.2 OBTAINING INFRARED (IR) CODES

Before an Infrared device can be controlled the appropriate IR codes need to be obtained. IR codes and code sets are the control data for your IR device. Global Cache's Control Tower (<https://www.globalcache.com/controltower>), the first IR database in the cloud, provides IR code sets. Control Tower is updated quarterly and contains IR codes for thousands of IR devices. If IR codes for your device are not available on Control Tower Global Connect has a built in IR learner on every IR module. iLearn is a Global Cache free utility for use learning IR codes (<https://www.globalcache.com/downloads/>).

A tutorial for learning IR codes with iLearn is available on our website:

<https://www.globalcache.com/support/ilearntutorial/>

Information about how to use the IR database is available on the Control Tower website:

<https://irdb.globalcache.com/Home/About>.

7.3 TROUBLESHOOTING IR

Confirming Transmission

When sending an IR code to a GCIR3 port the unit will respond with a `completeir,...` response. If sending the IR code via iTest (<http://www.globalcache.com/downloads/>) this can be seen in the ASCII response field. If an error response is received instead, then there is likely something wrong with the IR code or IR code format being used. A list of Error Codes and their meanings is available as a chart within iTest.



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In addition to the complete response, transmission can also be visibly confirmed on the unit. A green LED near each IR port will blink during an IR transmission. Also, if the included, visible IR emitters are used the emitter should also blink red during the IR transmission.

Troubleshooting Reception

If an IR code is being transmitted, but the AV device is not reacting, one possibility is that the IR signal is not being received by the AV device's IR receiver. Infrared emitters are short range IR transmitters. As a result, they must be physically placed directly on top of the IR receiver for the receiver to receive a strong enough signal to respond.

If using an IR blaster, it is also important to note that while IR blasters send strong signals, they are directional. While the signal may reflect off surfaces in the environment, to be received when transmitting from long distances, or when troubleshooting the blaster should be pointed directly at the AV device's receiver.

For more information about the differences between IR transmitters please see section **7.1 IR Transmitters**.

IR code Issues

Getting good IR codes is often the most difficult portion of any IR control project. Fortunately, Control Tower (<https://www.globalcache.com/controltower>), Global Cache's IR database in the cloud, makes this a simple process for the majority of common AV equipment. If the AV device needed is not present in Control Tower it is often beneficial to try any similar codesets by the same manufacturer, as often manufacturers re-use IR codes between device models. If those codes fail, or no similar devices are available then the IR codes will either need to be learned using [iLearn](#) (section **7.2**) or obtained from a 3rd party source (in which case they are often in Pronto Hex format, which can be converted to GC format using iConvert (<https://www.globalcache.com/downloads>)).

IR code repeats

One of the simplest changes that can affect whether an IR code works is the repeat value. The repeat value defines how many times the IR code is transmitted. The repeat value can be set as a learning parameter in iLearn, or can be edited directly by changing the following <repeat> value in this example IR code:

`sendir,<module>:<connector>,1,38000,<repeat>,...`The most common manufacturer that requires repeats is Sony. For Sony and other manufacturers that require repeats in the IR code the suggested value is 3.

RF Remotes

AV devices commonly utilize IR remotes for control. However, there are some devices that utilize RF remotes which are not controllable or learnable via IR. Because IR uses line of sight communication, a simple way to determine if a remote utilizes IR or RF is to perform a line of sight test. To do this, point the remote at the device and send a command that will create a noticeable response (such as power on/off). The device should react accordingly. Now, cover the front of the remote completely using your hand and repeat the test. If the command still completes successfully then the remote likely utilizes RF and is not an IR remote. If the command does not react to the command then the device uses IR.

Note: A small handful of devices that utilize RF remotes also have IR functionality as well. To determine if an RF device has IR capabilities refer to the product manual or contact the product manufacturer.



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8.0 SL MODULE – RS232 SERIAL CONTROL MODULE

RS232 is a common serial protocol that is utilized on devices ranging from TVs and amplifiers, to security panels and pool controllers. The SL module connects RS232 devices to a network and serial devices. The bidirectional SL module connects RS232 devices to a network and includes an easy to use, highly configurable web interface.

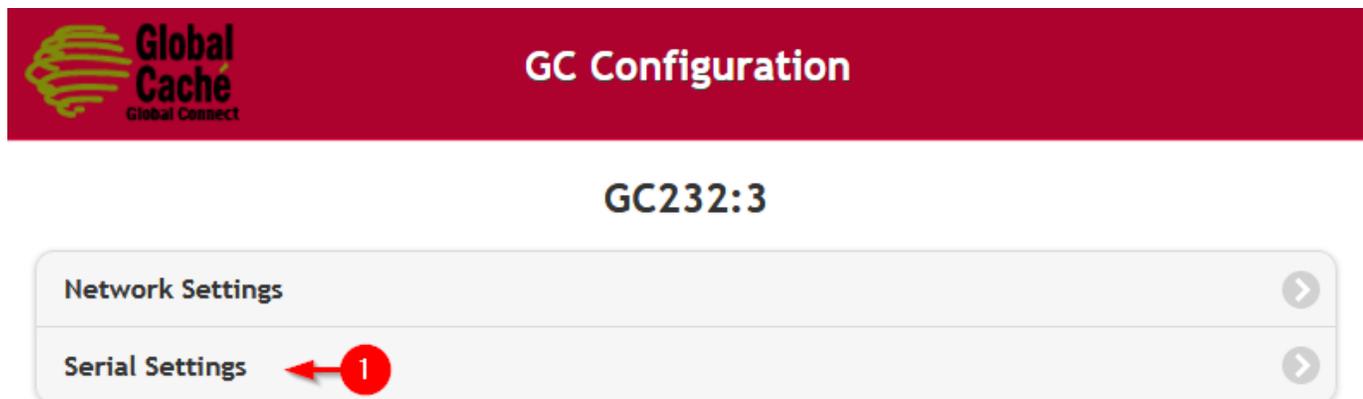
GCSL232 Module Feature	Description
Ports	1 x Male DB9
Baud Rate	300-115200 baud
Flow Control	Hardware, None
Parity	None, Even, or Odd
Data Bits	8
Stop Bits	1, or 2
Chassis Slots Occupied	1

8.1 SERIAL CONFIGURATION

The SL module must be configured with the serial settings of the device that will be controlled.

Configuration Example:

To access the serial configuration settings, navigate to the Serial Settings page on the unit's configuration pages.



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On the Serial Settings page, select the desired baud rate, Flow Control, Parity, and Stop Bits values. Click Apply Changes to save the configuration. All remaining configuration will be done in the chosen control software.



Serial Settings

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The image shows a configuration form for serial settings. It includes a "Back" button at the top left. Below it are five rows of settings: "Baud Rate" with a dropdown menu set to "19200"; "Flow Control" with radio buttons for "None" and "Hardware", where "Hardware" is selected; "Parity" with radio buttons for "None", "Even", and "Odd", where "None" is selected; "Data Bits" with a dropdown menu set to "8"; and "Stop Bits" with radio buttons for "1" and "2", where "1" is selected. At the bottom is an "Apply Changes" button. Red arrows point from a central vertical line to each of these settings. A red circle with the number "1" is next to the "Parity" section, and a red circle with the number "2" is next to the "Apply Changes" button.

8.2 DB9 PINOUT

The DB9 connector is a common connector for RS232 interfaces. Typically, RS232 devices will either have a male or female DB9 connector. The devices with male connectors are usually known as DTE (Data Terminal Equipment). Devices with the female connector are known as DCE (Data Communications Equipment). The SL module has a male (DTE) connector and its pinout is shown below.



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Pin Number	Description
1	No Connection
2	Receive (Rx)
3	Transmit (Tx)
4	Data Terminal Ready (DTR)
5	Ground
6	No Connection
7	Request to Send (RTS)
8	Clear to Send (CTS)
9	No Connection

When using Straight-Through DB9 to 3.5mm jack converter cables the typical pinout will be Rx, Tx, Ground on the Tip, Ring, and Sleeve of the 3.5mm jack respectively. Both Straight-Through and Null-Modem cables exist for DB9 to 3.5mm jack cables as well (Section 8.3).

8.3 STRAIGHT-THROUGH AND NULL-MODEM CABLES

When connecting the GCSL232 to a serial device the correct cable must be used. The following table lists the correct cable type that should be used when connecting the GCSL232 to serial devices with the DB9 connector.

Gender of connected device	Cable
Male	Female to Female, Null-modem/Crossover Cable*
Female	Female to Male, Straight-Through Cable*

*Note: The above table lists the suggested cable based on the widely and most prominent accepted pinout for DB9 serial devices. Though rare, some manufacturers do not follow this pinout. For those cases, a different cable may be needed.

9.0 RT MODULE – RELAY CONTROL MODULE (6 RELAYS)



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Relays are some of the most basic forms of control. Contact closure relay uses a simple dry contact to trigger a relay event and is one of the most basic forms of control. Despite their simplicity, the ability to provide power or a dry contact makes them suitable for controlling devices through powering them on and off, or by providing control input to voltage inputs or dry contact inputs.

GCSL232 Module Feature	Description
Ports	6 x SPST Relays
Maximum Rating	250V AC, 30V DC, or 6 Amps
Compatible Wire Gauges (Connector)	14-30 AWG
Relay Type	Normally Open (NO)
Chassis Slots Occupied	2

Configuration example:

To access the relay configuration settings, navigate to the Relay Settings page on the unit's configuration pages.



While the GCRL3A module does not require configuration of any relay settings, a testing interface is provided through the web interface for switching the relays. To switch a relay, press the desired ports toggle to turn it On or Off. The relay will change to the set state. All remaining configuration will be done in the chosen control software.

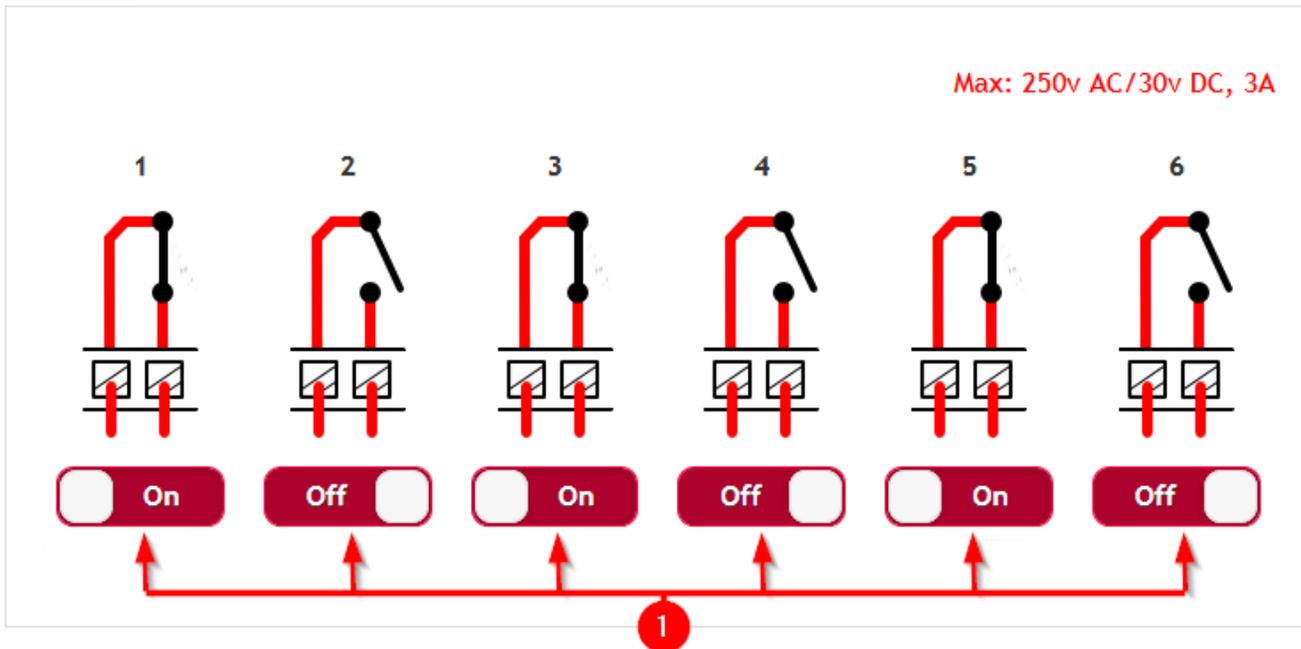
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GC Configuration

Relay Settings

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9.1 TROUBLESHOOTING RELAYS

Confirming Relay Actuation

To confirm that the unit has received the relay state change, look at the lightpipe above the related relay port. When changing the relay, the lightpipe will turn on when the relay is turned on and off when the relay is turned off.

To confirm that the relay is physically closing or opening a continuity test can be used.* Disconnect all wires from the relay terminal blocks. Using a multimeter set the meter to the continuity setting. Touch one probe to each terminal corresponding to the relay that is being tested. Using the web interface, or the control software, switch the relay to on and check for continuity. Once confirmed, switch the relay to Off and confirm that there is no longer continuity.

***Note:** This test uses a multimeter with a continuity test function. The test should never be performed with voltage applied to any of the terminal blocks on the RT module.



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10.0 FACTORY DEFAULT

To factory default a Global Connect unit locate the first or left-most lightpipe on each module. Depress the lightpipe for approximately 10 seconds. After 10 seconds all lightpipes on the module will begin rapidly indicating the unit is ready to reset. Release the lightpipe to complete the factory default. Due to the modular nature of the Global Connect product line each module is individually factory defaulted.



Modules can also be factory defaulted through the module's web interface on the Advanced Settings page.



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Network Settings

HDMI Settings

Advanced Settings

Once on the Advanced Settings page press Factory Reset and press Save to factory reset the module.

Advanced Settings

