

# USER GUIDE:

# Flex and Flex Link Cables

VERSION 1.1

# USER GUIDE
## Flex and Flex Link Cables
Version 1.1

## TABLE OF CONTENTS


Table of Contents ..... 1

1. Introduction ..... 3

2.0 Product Architecture ..... 4

2.1 Flex IP (Ethernet) and IP with PoE ..... 5

2.2 Flex WiFi ..... 5

3.0 Unit Configuration ..... 6

3.1 Network Connection ..... 6

3.1.1 Flex IP and Flex IP with PoE ..... 6

3.1.2 Flex WiFi ..... 7

3.2 Configuration Web pages ..... 8

3.3 Network Settings ..... 8

3.3.1 DHCP and DHCP reservations ..... 9

3.3.2 Static IP addresses (Advanced) ..... 10

3.4 Flex Link Cable Settings (Configuration) ..... 12

3.4.1 Infrared ..... 13

3.4.2 Serial ..... 14

3.4.3 Relay and Sensor ..... 14

3.5 SECURITY/Access Control ..... 16

3.5.1 Web Lock ..... 16

3.5.2 API Lock ..... 17

3.5.3 System Lock ..... 18

3.6 Advanced Settings ..... 19

4.0 Integration and Usage Details ..... 21

4.1 Infrared ..... 21

4.1.2 IR Transmitters ..... 21

4.1.3 Obtaining Infrared (IR) codes ..... 22





160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com



Information subject to change without notice.

4.1.4 Troubleshooting IR ..... 22
4.2 Serial ..... 23
4.2.2 Flex Link RS232 Serial Cable (DB9) Pinout ..... 24
4.2.3 Flex Link RS232 Mini Jack Cable (3.5mm) Pinout ..... 25
4.2.4 Straight-Through and Null-Modem cables ..... 25
4.2.5 Flex Link RS485 Serial Cable Pinout ..... 26
4.3 Relays ..... 27
5.0 Input and Output connector blocks ..... 27
5.1.1 Troubleshooting Relays ..... 29
5.2 Sensors ..... 30
5.2.1 Troubleshooting Sensors ..... 31
6.0 Factory Default ..... 33



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

# USER GUIDE
## Flex and Flex Link Cables
Version 1.1

## 1. INTRODUCTION

Global Caché's iTach Flex (Flex) and Flex Link cables are a versatile and compact family of connectivity products from the company that has revolutionized the way you connect, command, and control. Built with flexibility in mind, Flex 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.





This document intends to provide additional information, insight, and instruction on installing, configuring, and using the Flex product line. For initial setup instructions, or TCP and HTTP APIs please refer to the **Flex IP and WiFi Quick Starts**, or **Flex APIs** on our downloads page: https://www.globalcache.com/downloads



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

## 2.0 PRODUCT ARCHITECTURE

Flex is a cable-based product available in three models:

- Flex IP (Ethernet)
- Flex IP with Poe (Ethernet with Power over Ethernet)
- Flex WiFi (Flex-WF)

Each unit can be used with any of the **Flex Link Cables** to allow for the control and automation of different types of devices. A variety of Flex Link Cables are available for use with the Flex to provide infrared, serial, and relay and sensor control functionality.

The following **Flex Link Cables** are available for use with the Flex:

**Infrared Flex Link Cables:**

When used with the Flex, infrared (IR) cables allow transmission of IR codes. IR cables can be used to control any devices that are controllable with an Infrared Remote. Infrared cables vary in the amount of independent IR outputs they support as well as the transmission distance. Emitter outputs are short-range (<1 inch) while Blaster outputs are long range (>35 feet).

- Flex Link 3 Emitter Cable (FLC-3E)
- Flex Link 2 Emitter 1 Blaster Cable (FLC-2E1B)
- Flex Link Blaster Cable (FLC-BL)
- Single IR Emitter Cable (G-IR-E)
- Flex Link Tri-Port Cable (FLC-T3)*

*Note: The Flex Link Tri-Port Cable is a breakout cable only. It provides three 3.5mm outputs which can be used with up to three single IR emitter cables or two single IR emitter cables and one Flex Link Blaster Cable.

**Serial Flex Link Cables**:

When used with the Flex, serial cables provide communication with serial (RS232 or RS485) capable devices. Serial control is preferred for cases where feedback is required or where hardwired communication is preferred.

- Flex Link RS232 Serial Cable (FLC-SL-232) – DB9 connection
- Flex Link RS232 Mini Jack Cable (FLC-SL-MJ) – 3.5mm connection
- Flex Link RS485 Serial Cable (FLC-SL-485) – 5-pin terminal connection

**Relay and Sensor Flex Link Cable:**

When used with the Flex, the **Flex Link Relay & Sensor Cable** provides four relay outputs with SPST, SPDT, and DPDT options, and four sensor inputs which can sense contact closure or the presence of voltage.


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

- Flex Link Relay & Sensor Cable (FLC-RS)

Note: A connected Flex and Flex Link Cable are required together for proper functionality. Depending on the distributor or reseller, Flex units may be sold with or without a bundled Flex Link Cable. You may need to order the Flex Link Cable separately from the Flex unit.

## 2.1 FLEX IP (ETHERNET) AND IP WITH POE

| Unit Feature | Description |
|---|---|
| **Network Connector** | RJ45 |
| **Network Speed** | 100Mbps, Full Duplex |
| **Power Connector** | Micro USB<br>RJ45 (Flex Ethernet with PoE only) |
| **Power Input** | USB: 5V, 300mA<br>RJ45 (PoE units only): 802.3af compliant input, 2 watts |

## 2.2 FLEX WIFI

| Unit Feature | Description |
|---|---|
| **Network Connector** | Internal WiFi Antenna |
| **Network Speed** | 2.4GHz – 802.11g/b |
| **Power Connector** | Micro USB |
| **Power Input** | USB: 5V, 300mA |



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

# 3.0 UNIT CONFIGURATION

## 3.1 NETWORK CONNECTION

### 3.1.1 FLEX IP AND FLEX IP WITH POE

Flex IP and IP with PoE provide a hardwired connection to the TCP/IP network.

To connect a Flex IP or IP with PoE unit to the network follow these steps:

1. Connect the unit to the local network using an RJ45 (Ethernet) cable. If plugging into a router or switch, connect the unit to a LAN port (not WAN).

2. Connect the unit to power using the included USB power supply. If the unit is a PoE (Power over Ethernet) model (FLEX-IP-P) then USB power is not necessary if the unit is networked to a PoE capable switch port. When powered, LED nearest the USB port will blink indicating the unit is powered.

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

Flex units feature a beacon message that can assist in locating Flex and other Global Caché units on the network. The beacon is a UDP packet sent to the multicast IP address **239.255.250.250** on UDP port number **9131**. Any system listening to this address and port will receive the periodic beacon message. Some firewalls, routers, or anti-virus apps may block UDP traffic. We recommend unblocking or whitelisting this port to allow the UDP discovery message for iHelp to work properly. The message is sent shortly after power on and then at every 10 seconds. The beacon message has the following format:

```
AMXB
<-UUID=GlobalCache_000C1E04E5D9>
<-Make=GlobalCache>
<-Line=iTachFlex>
<-Model=iTachFlexEthernet>
<-Revision=710-3000-24>
<-PCB_PN=025-0034-13>
<-I/O_Class=IR>
<-I/O_ID=FLC-2E1B>
<-Status=Net:Eth-Up,Host:OK>
<-Config-URL=http://192.168.0.147>
<-Config-Ver=GC_16.1.0>
<-SDKClass=Utility>
```

Other discovery methods are available:

1. Use a network IP scanner app or software to return a list of detected IP assigned devices on the local network. Check for the MAC ID of the Global Caché device or UUID name in that list to find the IP address.
2. Check the router configuration for the DHCP reservation table and look for the MAC ID of the Global Caché device to find the assigned DHCP IP address.


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

Flex units have a default IP address of **192.168.1.70**. If the unit is configured for DHCP on networks without a DHCP server, it will take the IP address 192.168.1.70.

You can also connect directly to the Flex with a PC by configuring your PC with a local IP address that is within the subnet range of the default IP of 192.168.1.70. Example below:

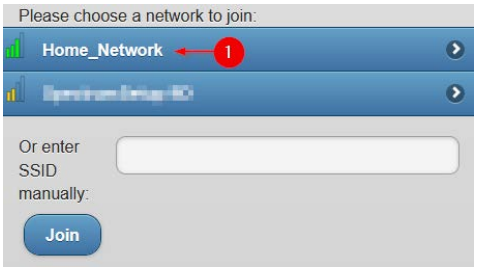
**IPv4 IP address: 192.168.1.85**
**Subnet Mask: 255.255.255.0**
**Gateway: NO GATEWAY**

Once connected, you will be able to access the web-based configuration page of the Flex at the default IP address: http://192.168.1.70 and configure the device directly. To learn more about the different ways Flex will obtain IP addresses, visit section **4.3 Network Settings**.

### 3.1.2 FLEX WIFI

Flex WiFi connects to a 2.4GHz WiFi network. In the factory default state, Flex WiFi creates its own SoftAP WiFi network for initial configuration. The following process can be followed to connect to this setup network and provision the Flex WiFi for the installation network. For Flex WiFi prior to Firmware release -24, the unit uses the Adhoc WiFi network for initial configuration. Please check the firmware version and update to the current release to use the following instructions:

1. Plug the unit into power using the included USB power supply.
2. Using a PC, MAC, or mobile device (phone/tablet) connect to the unit's WiFi setup SoftAP network. The WiFi setup network will be "iTachFlex" followed by the unit's MAC address (example: iTachFlex000C1E000000).
3. Once connected, open a web browser and enter the URL with default IP address: **http://192.168.1.70**.
4. When the web page loads, select the installation network from the list of WiFi networks and enter the wireless password.
5. (Optional) If a static IP address is desired expand the DHCP option to disable DHCP and enable static provisioning (see section **3.3 Network Settings** for additional information on setting a static IP). Enter the desired static settings.
6. Click *Join Network*.







7. Reconnect the computer or mobile device WiFi to the home or installation network.



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

8. Return to the browser and wait up to 60 seconds for the unit to connect to the installation network. Use the *Proceed* button in the browser or follow the instructions under **Discover the IP address** below.

If the unit was not set to a static IP address (step 5) the unit will obtain an IP address via DHCP. To determine what IP address has been obtained, download and run iHelp from our website at https://www.globalcache.com/downloads. iHelp will discover any Global Caché units on the network and display their IP address, and MAC address.

Flex units configured for DHCP on networks without a DHCP server will take the 192.168.1.70 IP address. If the unit detects that 192.168.1.70 is already taken the unit will sequentially check IP addresses (192.168.1.71, 192.168.1.72, 192.168.1.73, and so forth) until it finds an available IP address.

To learn more about the different ways Flex modules will obtain IP addresses visit section **4.3 Network Settings**.

## 3.2 CONFIGURATION WEB PAGES

Once the Flex unit has been connected to the WiFi or Ethernet network the configuration web pages can be accessed by entering the unit's IP address in a browser.

Note: Make sure the computer or mobile device being used is connected to the same local network as the Flex unit.




## 3.3 NETWORK SETTINGS

Network settings for Flex units are set through the **Network Settings** page. DHCP and static IP address assignment are supported.


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.




Many control apps and systems expect the IP address of a Flex unit to remain the same. If the IP address of a unit changes (which is possible when using DHCP) the control software may not be able to communicate with the unit. To prevent this, we recommend creating a DHCP reservation from the router configuration. You can assign a static IP address to Flex, but without the DHCP reservation on the router there is a risk of an IP conflict with other network devices if the IP address is not managed properly.

### 3.3.1 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 Flex units.

**Configuration Example:**

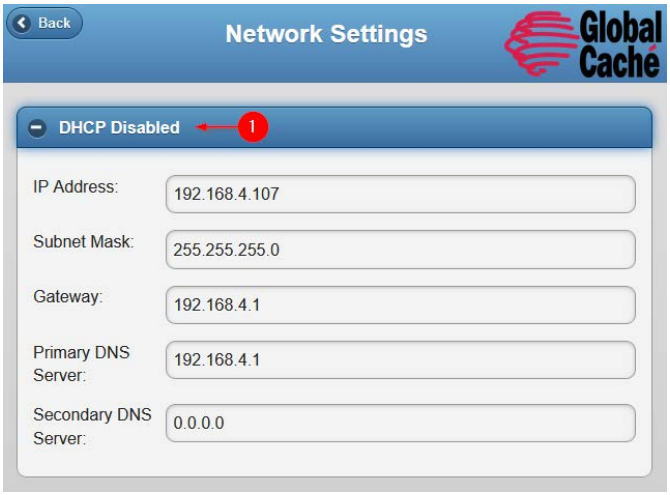
To return a static assigned unit to DHCP, navigate to the **Network Settings** page of the Flex web configuration pages.

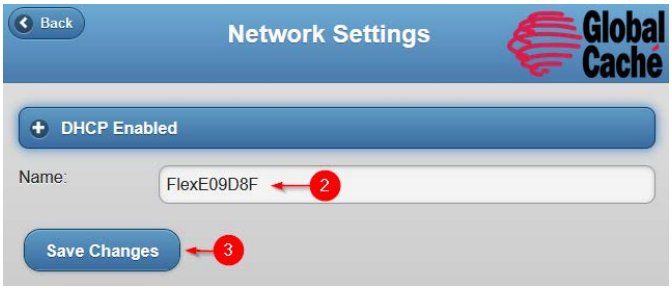



To change the DHCP settings from Disabled to Enabled, press the *DHCP Disabled* bar to collapse the IP settings and select *Enable DHCP*. The device's network name (hostname) can optionally be changed by entering a value in the name field. Press *Save Changes* to apply the settings.



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.




**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 Flex 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.

## 3.3.2 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 loss of communication with that device. If an IP address conflict is created, or a module is assigned a non-communicable IP


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

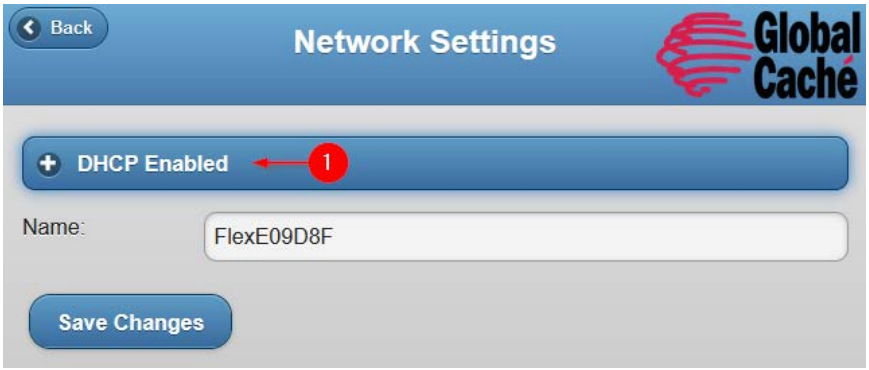
address, one simple way to recover the module is to perform a factory default as explained in section Error! Reference source not found..**0**.

**Configuration Example:**

To set a static IP address assignment, navigate to the **Network Settings** page of the Flex web configuration pages.

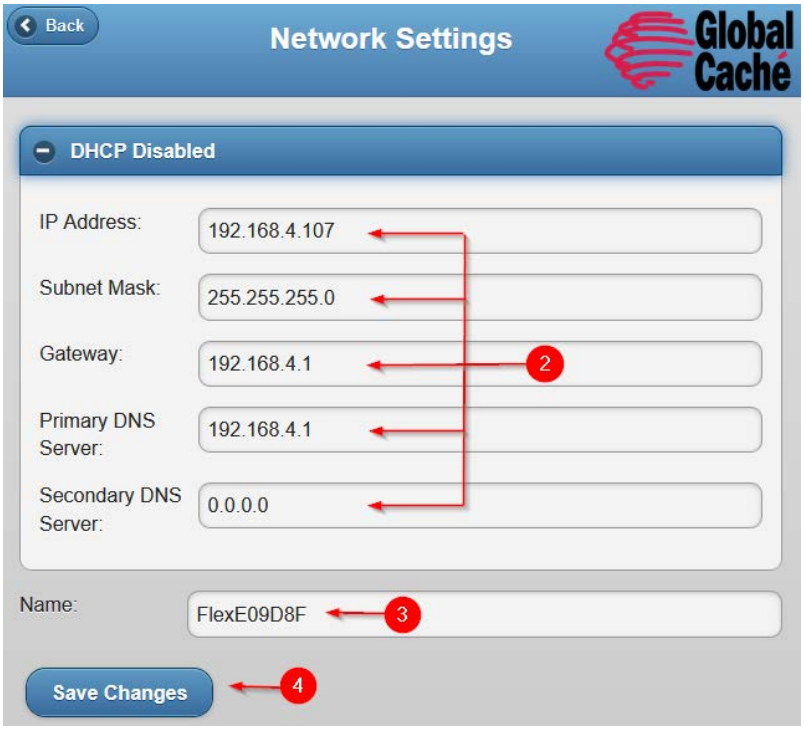



Press the *DHCP Enabled* bar to expand it and change it to *DHCP Disabled*, enter the desired IP address, subnet mask, gateway, and primary and secondary DNS servers. The Flex network name (hostname) can also optionally be changed by entering a value in the Name field. After the settings have been entered press *Save Changes* to save the configuration.



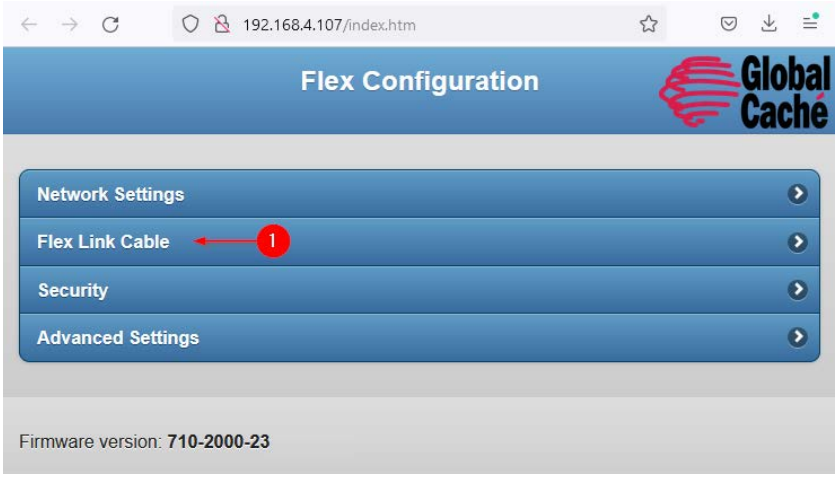



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.




## 3.4 FLEX LINK CABLE SETTINGS (CONFIGURATION)

The Flex unit's I/O function is based on which Flex Link Cable is attached. The unit supports infrared, serial, and relay and sensor capabilities depending on what cable is used with the unit. The Flex Link Cable page can be used to configure the unit for the type of control and cable needed.

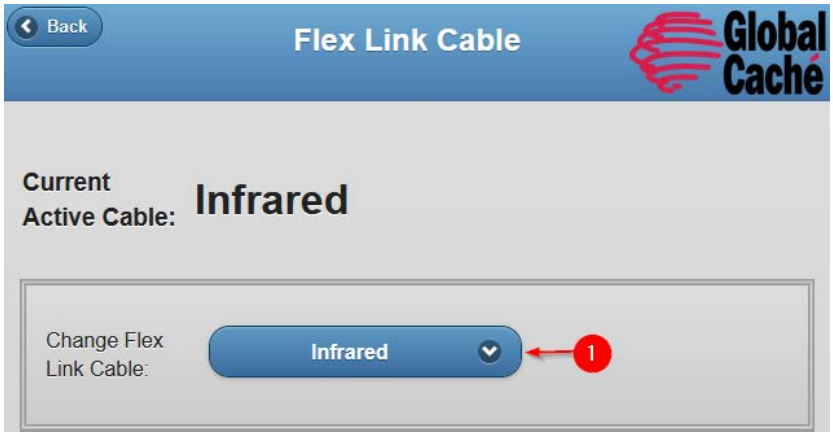




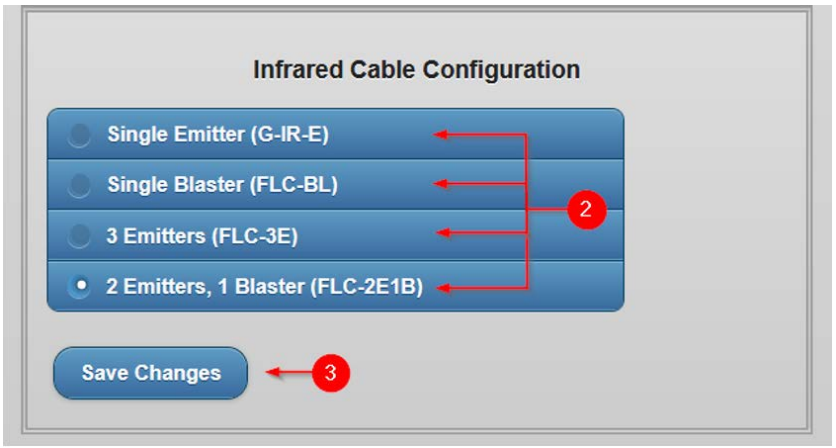

160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

### 3.4.1 INFRARED

To configure the unit for Infrared mode, change the Flex Link Cable to infrared.




Select the option that corresponds to the Flex Link infrared cable that will be installed with the Flex unit. Press *Save Changes* to apply the selection.

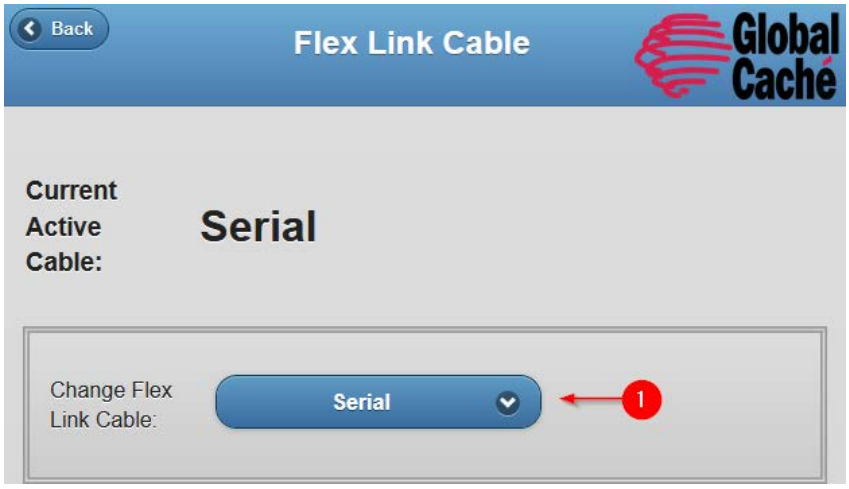




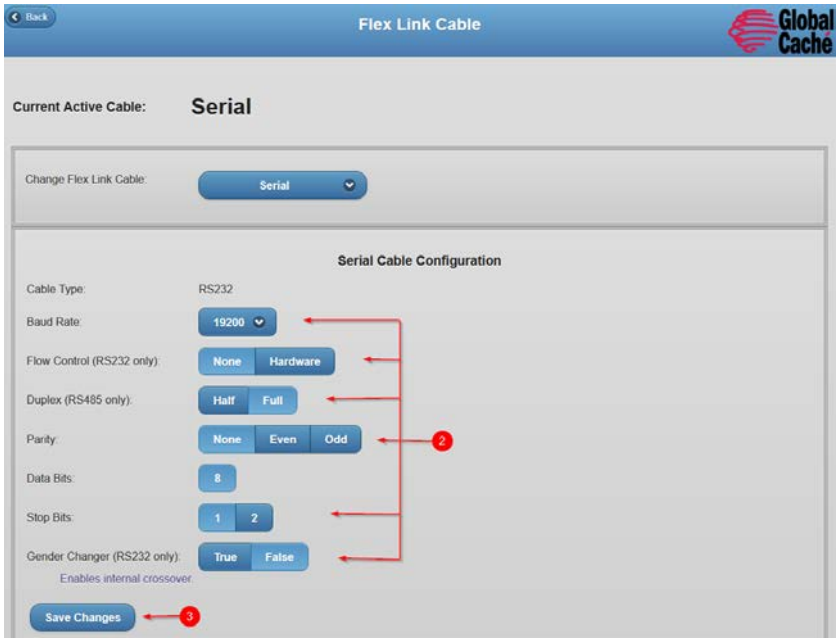

160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

### 3.4.2 SERIAL

To configure the Flex for serial mode and access serial configuration settings change the Flex Link Cable to *Serial*.




Set the serial cable configuration settings as specified by the serial device manufacturer of end device that you will be connecting to with the serial cable and click *Save Changes*.

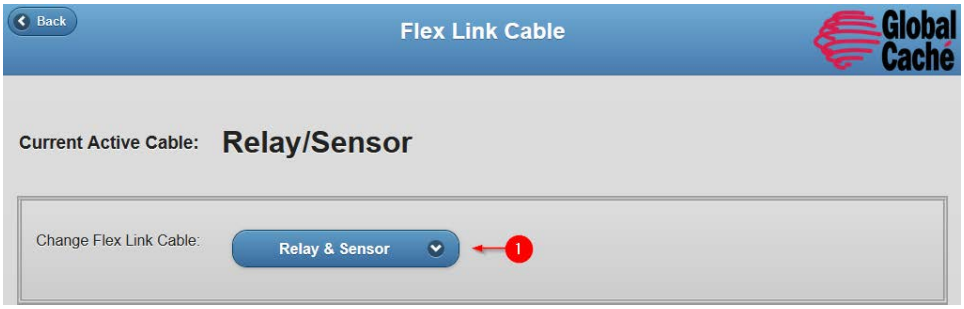



### 3.4.3 RELAY AND SENSOR

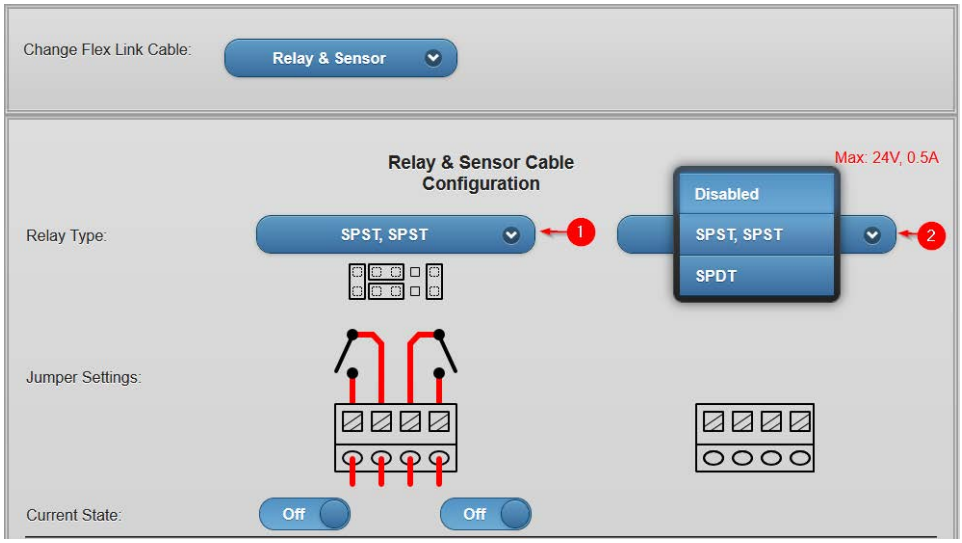
To configure the Flex unit for the Flex Link Relay and Sensor cable and access relay and sensor configuration settings, change the Flex Link Cable to *Relay/Sensor*.



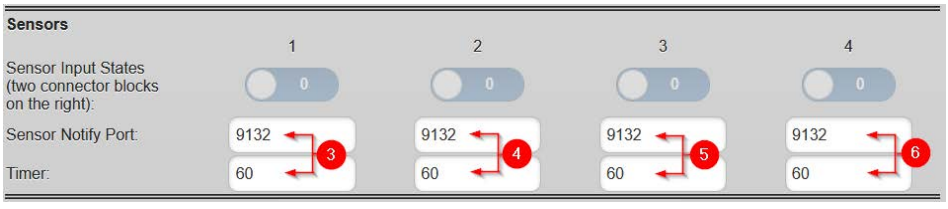
160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.




Change the Relay Type from *Disabled* to the desired logical relay type. Most installations can use SPST relays.




If your selected control app/system supports Sensor Notification functionality, enter the Sensor Notify Port and Timer values as specified by your control app/system provider. If your selected control app/system does not support Sensor Notification these values can be left at default (all zeros).




Press Save Changes to apply the configuration.






160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

## 3.5 SECURITY/ACCESS CONTROL

Starting with Firmware version -24, the Flex supports several access control settings to limit access to the Flex unit configuration and filesystem. These features are intended to stop unauthorized users from making configuration changes to the unit or gaining unintended access to the unit's built-in filesystem.

Settings for the user authentication features can be accessed from the configuration pages under the **Security** page.




In the event of a forgotten username/password or if a system lock has been applied, the security settings can be cleared by doing a physical factory reset (see section **6.0**).

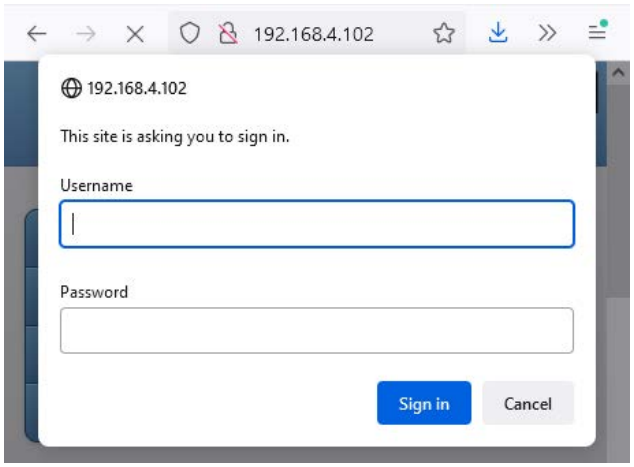
Note: The sending of API or serial control commands (IR codes, serial commands, relay state changes etc.) is not affected by settings under the **Security** page.

### 3.5.1 WEB LOCK

The **Web Lock** feature utilizes a username and password to secure the Flex unit's filesystem. When activated files cannot be written or read to the filesystem without providing the username and password. This includes the unit's configuration pages. When activated, users will be prompted to enter a username and password to access the unit's configuration pages.



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.




**Configuration Example:**




After navigating to the **Security** page, enter a User Name, Password, and check the *Web Lock* option. Then click *Save Changes.*

### 3.5.2 API LOCK

The API Lock requires a username and password to make configuration changes to the unit. Configuration changes include network settings, cable selection, and cable configuration. Control commands, such as sending an IR code, serial/relay



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

command or querying the state of a sensor is unaffected. After an API Lock**,** only authenticated API commands can make configuration changes to the unit. TCP configuration commands are disabled.

**Note**: An API Lock cannot be set without setting a Web Lock.

**Configuration example:**




After navigating to the Security page, enter a User Name, Password, and check the *Web Lock* then *API Lock* options. Then click *Save Changes*.

### 3.5.3 SYSTEM LOCK

The *System Lock* is an alternative to the Web Lock and API lock and **disables** all configuration commands, including network settings, cable selection, and cable configuration. Control commands, such as sending an IR code, serial/relay command or querying the state of a sensor are unaffected. Once a *System Lock* has been enabled, the only way to change the configuration of the unit is to physically factory reset the unit (see section **6.0**). No username or password is required when setting a System Lock.


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

**Configuration example:**




After navigating to the *Security* page, check the *System Lock* option. Then click *Save Changes*.

## 3.6 ADVANCED SETTINGS

The **Advanced Settings** page contains additional operations that can be performed by the Flex unit that are not directly related to the unit's Network Settings, Cable Configuration, or Security features. The Flex supports both a soft reboot and a soft factory reset option.

The **Reboot** option will restart the unit from boot which is equivalent to physically power cycling the unit.

The **Factory Reset** option will return the unit to its factory default settings. The soft factory reset will **NOT** clear a **System Lock** (see section **4.5.3**). To clear a system lock, perform a physical factory reset (see section **6.0**).

Both a reboot (if the unit is configured for DHCP) and factory reset operation may result in the unit acquiring a new IP address from the DHCP server

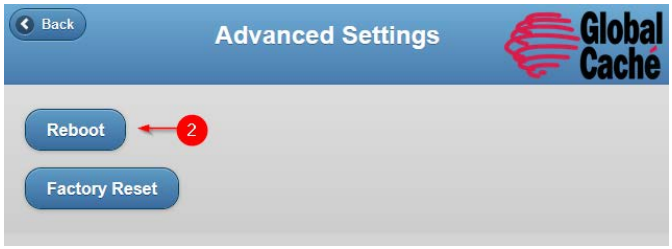


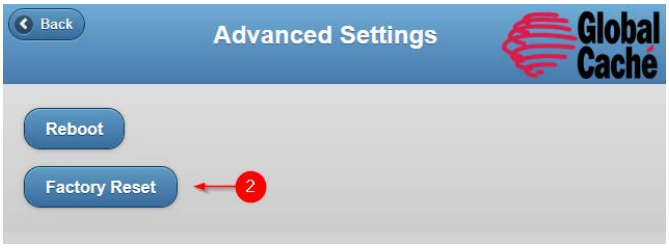
160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

**Configuration example:**

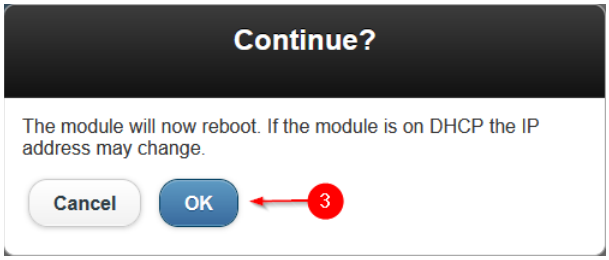


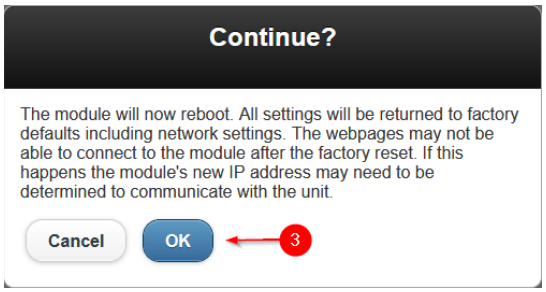

On the unit's configuration pages navigate to **Advanced Settings**.




Select either *Reboot* or *Factory Reset*, depending on which operation is needed.




Confirm the operation to initiate the reboot or factory reset operation.



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

# 4.0 INTEGRATION AND USAGE DETAILS

## 4.1 INFRARED

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. Flex's Flex Link infrared cables can control any device that utilizes an IR remote.







| Flex Infrared Feature | Description |
|---|---|
| **Ports** | Up to three IR Outputs (depending on cable) |
| **IR Output Frequency** | 20KHz – 500KHz |
| **IR Learner Frequency** | 20KHz – 200KHz |

### 4.1.2 IR TRANSMITTERS

**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 crosstalk with neighboring devices. Visible IR emitters, such as the emitters on the Flex Link 2 Emitter 1 Blaster Cable, 3 Emitter Cable, and Single IR Emitter Cable 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. IR blasters, like the blaster on the Flex Link 2 Emitter 1 Blaster cable, or Flex Link Blaster cable are designed to transmit up to 35 feet (10 meters).



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

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 LED nearest the 3.5mm Flex Link port on the Flex unit. On each IR transmission (for both emitters and blasters), the lightpipe above the IR output will blink indicating transmission.

### 4.1.3 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 Caché'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 Flex has a built in IR learner. iLearn is a free Global Caché utility for use learning IR codes (https://www.globalcache.com/downloads/).

Information about how to use the IR database is available on the Control Tower website:
https://www.globalcache.com/controltower

### 4.1.4 TROUBLESHOOTING IR

**Confirming Transmission**

When sending an IR code to a Flex Link Infrared cable the unit will respond with a completeir,... response. If sending the IR code via iTest (https://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.

In addition to the completeir response, transmission can also be visibly confirmed on the unit. A green LED near the Flex Link Port (3.5mm jack) will blink during an IR transmission. Also, if standard, 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 cable, 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.

**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 Caché's free 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


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

codes fail, or no similar devices are available then the IR codes will either need to be learned using iLearn (**Section 5.1.3**) 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.

## 4.2 SERIAL

RS232 is a common serial protocol that is utilized on devices ranging from TVs and amplifiers to security panels and pool controllers. The Flex Link Serial cables allow the Flex to bidirectionally communicate with RS232 and RS485 devices.

| Flex Link Serial Feature | Description |
|---|---|
| **Ports (Flex Link RS232 Serial Cable)** | 1 x Male DB9 |
| **Ports (Flex Link RS232 Mini Jack Cable)** | 1 x Male 3.5mm jack |
| **Ports (Flex Link RS485 Serial Cable)** | 1 x 5 position terminal block |
| **Baud Rate** | 300-115200 baud |
| **Flow Control (RS232 cables only)** | Hardware, None |
| **Duplex (RS485 cables only)** | Full, Half |
| **Parity** | None, Even, or Odd |


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

| | |
|---|---|
| **Data Bits** | 8 |
| **Stop Bits** | 1, or 2 |

### 4.2.2 FLEX LINK RS232 SERIAL CABLE (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 Flex Link Serial RS232 cable has a male (DTE) connector, but also includes a gender changer which in conjunction with a software configurable Gender Changer setting can convert it to a female (DCE pinout) connector. The Flex Link Serial RS232 pinout (with software configurable Gender Changer setting set to False) is shown below.



| Pin Number | Description (DTE – Gender Changer setting is False) |
|---|---|
| **1** | No Connection |
| **2** | Receive (Rx) |
| **3** | Transmit (Tx) |
| **4** | Data Terminal Ready (DTR) |
| **5** | Ground |
| **6** | Data Set Ready (DSR) |
| **7** | Request to Send (RTS) |
| **8** | Clear to Send (CTS) |
| **9** | No Connection |



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

## 4.2.3 FLEX LINK RS232 MINI JACK CABLE (3.5MM) PINOUT

The 3.5mm serial is an increasingly used connector for RS232 interfaces. Most 3.5mm jacks labeled as "Serial" or "Service Port" utilize 3.5mm serial communications.* The main difference between 3.5mm serial and DB9 serial is that 3.5mm serial only utilizes 3 pins (Transmit, Receive, and Ground).




| Pin | Description (Gender Changer setting is False) |
|---|---|
| **Tip** | Receive (Rx) |
| **Ring** | Transmit (Tx) |
| **Sleeve** | Ground (GND) |

The Flex Link RS232 Mini Jack Cable also supports a software definable crossover which can be configured from the Flex unit's web interface. By change the Gender Changer setting from False to True the Transmit and Receive pins above will be swapped.

***Note**: It is strongly suggested to refer to device manufacturer documentation to confirm the service ports utilize RS232 before connecting.

## 4.2.4 STRAIGHT-THROUGH AND NULL-MODEM CABLES

The Flex Link RS232 cables also support software configurable crossover.

For the Flex Link RS232 Serial Cable this feature swaps the Tx and Rx, and RTS and CTS signals pin positions converting it to a DCE pinned connector. For most installations, the Gender Changer setting should be set (through the unit's web interface) to True when the included gender changer is used and False if the gender changer is not used.

The following table may also be referenced to determine what Gender Changing setting should be used.

| Gender of connected device | Setting |
|---|---|



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

| | |
|---|---|
| **Male** | Use gender changer, set Gender Changer to **True** |
| **Female** | Connect without gender changer, set Gender changer to **False** |

***Note:** The above table lists the suggested cable configuration 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, use the gender changer if it allows you to physically connect to the device and then set the Gender Changer setting based on whether a crossover is needed per the manufacturer's documentation.

For the Flex Link RS232 Mini Jack Cable, no gender changer is typically needed The **Gender Changer** setting can still be used to swap Tx and Rx signals if required.

### 4.2.5 FLEX LINK RS485 SERIAL CABLE PINOUT

The Flex Link RS485 Serial Cable utilizes a 5 position terminal block for making connections to RS485 buses or devices. RS485 is commonly (although not always) used by devices that are often installed in numbers greater than one. With RS485, multiple devices can be connected to one RS485 bus allowing for control of many devices from one Flex endpoint.




**Half Duplex**

| Pin Number | Description |
|---|---|
| **1** | Data positive (B+) |
| **2** | Data negative (A-) |
| **3** | No Connection |
| **4** | No Connection |
| **5** | Ground (GND) |



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

Half Duplex only allows for data to go one direction at a time. This means that only one device can talk at any given time without creating a data collision. While there are different ways half duplex RS485 communication is used it is most commonly used to allow a single master (in most installations the Flex unit will act as the master) to issue commands to many slaves that either will not transmit data themselves or will only do so when prompted by the master.

**Full Duplex**

| Pin Number | Description |
|---|---|
| **1** | Transmit positive (TDB+) |
| **2** | Transmit negative (TDA-) |
| **3** | Receive positive (RDB+) |
| **4** | Receive negative (RDA-) |
| **5** | Ground (GND) |

Full duplex allows for data to be transmitted and received simultaneously. This allows the master (in most installations the Flex unit will act as the master) to receive data while transmitting.

### 4.3 RELAYS

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 on and off, or by providing control input to voltage inputs or dry contact inputs.

This section refers to the relay portion of the Flex Link Relay and Sensor Cable. For details on the sensors please see section **5.4**.

## 5.0 INPUT AND OUTPUT CONNECTOR BLOCKS

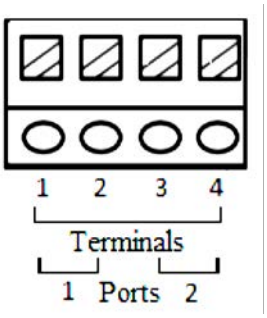
The board provides terminal connector blocks for connecting external devices. These connector blocks are physically grouped as relay outputs, and sensor inputs. Each distinct port within the relay outputs or sensor inputs uses 2 terminals. For example, in Figure 1 above, Port 1 uses terminals 1 and 2, and Port 2 uses terminals 3 and 4.

Relay ports can be configured as individual SPST relays but can also be logically grouped with other ports to create other common relay type configurations. Input ports are all individually configurable and support either voltage sensing or contact closure modes.



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

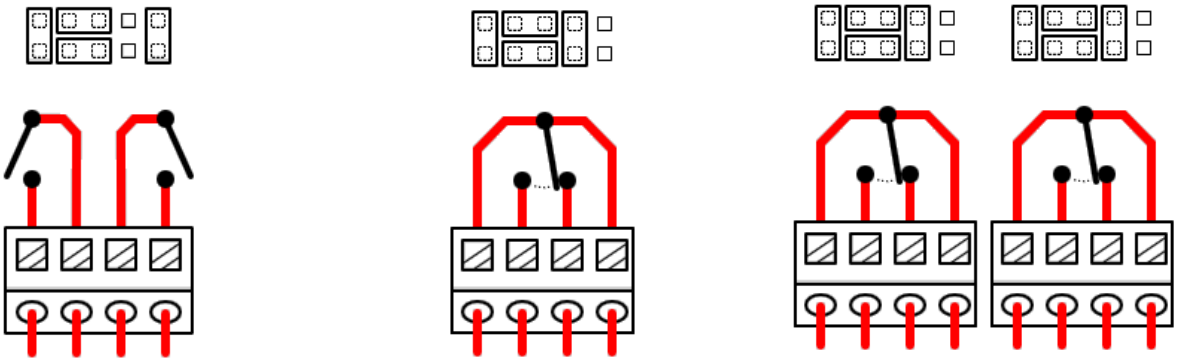





| Flex Link Relay and Sensor Cable Relay Specs | Description |
|---|---|
| **Ports** | 4 x SPST Relays* |
| **Maximum Rating** | 24V AC/DC, or 0.5 Amps |
| **Relay Type** | Normally Open (NO) |

*The Flex Link Relay & Sensor Cable relays can be configured as SPDT or DPDT relays. A full description of the supported relay types and how they behave can be found below:

The relay outputs can be configured (via hardware jumpers and software API) to operate as various common relay types. The supported relay types and associated jumper settings are shown in the following illustrations.



*(2) SPST Relays*
*(Single Pole, Single-Throw)*

*SPDT Relay*
*(Single Pole, Double-Throw)*

*DPDT Relay*
*(Double Pole, Double-Throw)*

*Figure 2. Supported Relay Types and Jumper Settings*



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

Each relay configuration has a configurable default state. This allows relays to be set up as either normally open or normally closed. The above illustrations depict the relays in an open state with a default state of open.

**Single Pole, Single-Throw (SPST)**

Each physical port functions as an individual relay, and each relay uses a single port. For example, Port 1 uses terminals 1 & 2, Port 2 uses terminals 3 & 4.

**Single Pole, Double-Throw (SPDT)**

Two physical relay output ports are grouped such that pins 1 and 4 are connected as the common pole, with double (2) throws (positions), to terminal 3 and terminal 2. This mode is useful for applications where two separate outputs are needed, rather than simply turning a device on or off.

**Double Pole, Double-Throw (DPDT)**

Four ports (two relay blocks) are configured as a pair of SPDT relays. In this mode, the two SPDT relays are linked, so that both throw simultaneously.

### 5.1.1 TROUBLESHOOTING RELAYS

**Confirming Relay Actuation**

To confirm that the unit has received the relay state change command, look at the LED beneath each relay port. When changing the relay, the LED indicator will turn on when the relay is turned on and off when the relay is turned off.

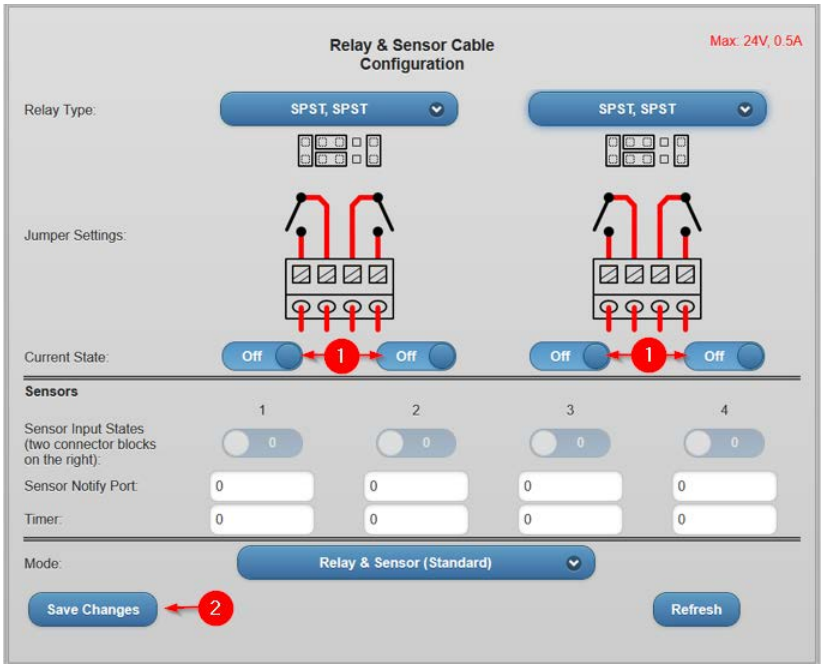
To confirm that the relay is physically closing or opening a continuity test can be used.* Disconnect all wires from the relay terminal blocks. Using a multimeter, set the meter to the continuity setting. Touch one probe to each terminal corresponding to the relay that is being tested. Using the web 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 relay terminals.

**Configuration example:**

On the Flex Link Cable configuration page test commands can be sent to the relays.


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.




Change the Current State to the desired relay state then press *Save Changes* to apply the change.

## 5.2 SENSORS

Sensors allow for feedback or input into a control system. The Flex Link Relay and Sensor Cable provides four sensor inputs that allow for detecting the presence of contact closure or the presence of voltage.

This section refers to the sensor portion of the Flex Link Relay and Sensor Cable. For details on the relays, see section **5.3**.



| Flex Link Relay and Sensor Cable Relay Specs | Description |
|---|---|
| **Ports** | 4 x Sensor Inputs |
| **Maximum Rating** | 24V AC/DC |
| **Sensor Type** | Contact Closure or Voltage |



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

## 5.2.1 TROUBLESHOOTING SENSORS

**Confirming Sensor Actuation**

To confirm that the Flex Link Relay & Sensor Cable has received the input voltage or contact closure, look at the LED indicator beneath each sensor port. For sensors configured for voltage sensing, the indicator will activate when voltage is applied and turn off when voltage is removed. For sensors configured for contact closure sensing, the indicator will activate when the circuit is open (no contact closure) and turn off when contact closure is applied (closed).

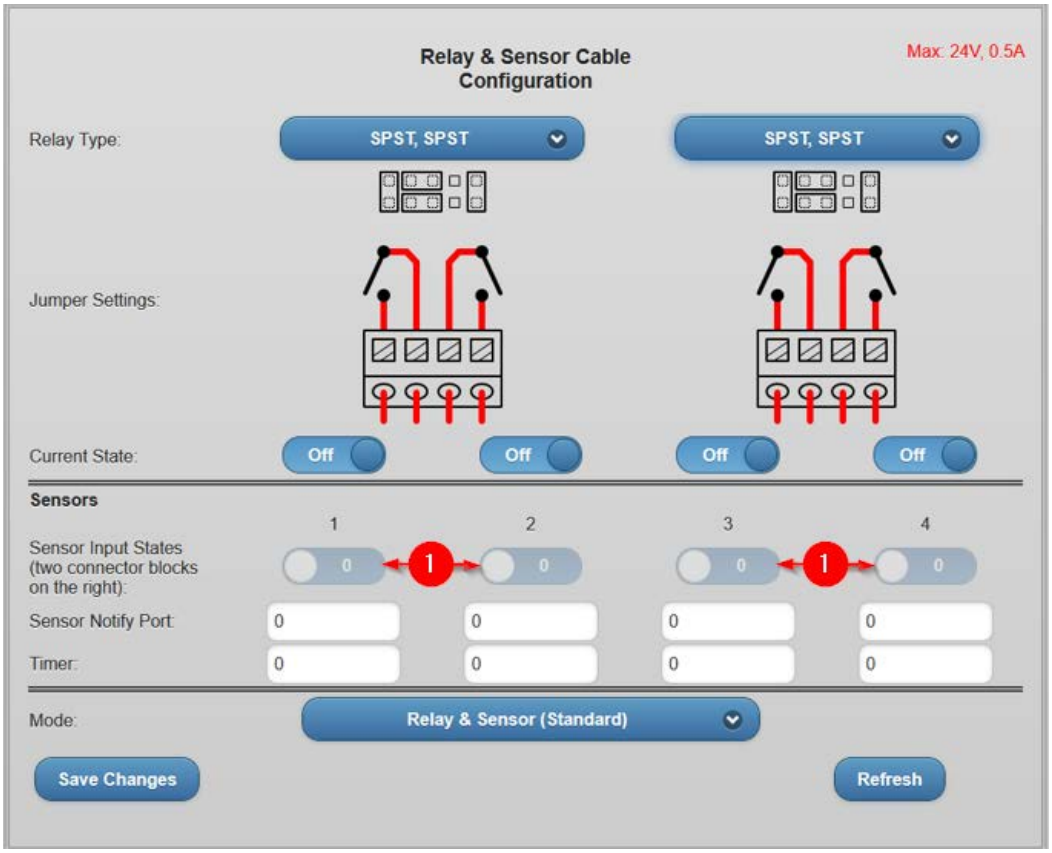
Sensor states will update about once per second.

**Configuration example:**

The sensor state can also be viewed through the Flex web configuration pages. A one (1) state corresponds to an active LED indicator and a zero (0) corresponds to the LED indicator being off. (see screenshot below).

**Maximum Voltage Warning:**

The maximum applied voltage is 24 v/500mA. If the voltage maximum is exceeded, the contacts may be fused closed, requiring replacement and repair**. Fused contacts are not covered under warranty**. Check the voltage of the attached wiring before connecting, including startup voltage that might surge during initial power on cycle.






160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

SENSORS Configuration Options:

- **SENSOR NOTIFY PORT** Field
  - Defines the UDP Multicast Port to send state change notifications. The UDP state change notification utilizes the Internet Group Management Protocol (IGMP) to send a multicast UDP message when an I/O port changes state, and/or at a configured time interval. The format of the notification message follows exactly the Sensor class *getstate* command response. Please refer to the TCP API for more information
- **TIMER** Field
  - Sets the Notify Interval in seconds. A notification via the configured UDP port will always be sent on a change of state (auto-notify). A value of "0" will disable interval notifications (auto-notify ONLY).

**MODE Selection**:

There are 3 Sensor Modes available.

- **RELAY & SENSOR (STANDARD)**
  - Default mode for the Flex Link Relay & Sensor cable. Utilizes all functions visible on the web interface and API.
- **ITACH SENSOR**
  - For backwards compatibility with the iTach IP2IR SENSOR IN mode using the IT-SC1 (Contact Closure Sensor) or IT-SP1 ( (Voltage Sensor) cable. Disables the TCP API interface on the physical Relay cable interface (left side of cable). Changes the Sensor interface (right side of cable) of the FLC-RS cable from MODULE 2 to MODULE 1 so that drivers available for the iTach will be compatible with the Flex with FLC-RS cable. Enables *getstate* API queries via TCP Port as defined in the TCP API documentation.
  - For drivers designed for the iTach, port 4 will likely be unavailable, as the iTach IP2IR only has 3 ports.
- **ITACH SENSOR NOTIFY**
  - For backwards compatibility with iTach IP2IR SENSOR NOTIFY mode. The UDP broadcast port and timer are set with Sensor Notify and Timer fields. This will send sensor notifications with the UDP broadcast packet designed for the iTach. The *getstate* API queries via TCP Port can also be used as described in ITACH SENSOR mode. See the TCP API documentation for more information.


160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.

## 6.0 FACTORY DEFAULT

To factory default a Flex, locate the button that protrudes from the side of the unit. Depress the button for approximately twelve seconds. The LED nearest the button will go through several blink patterns. After twelve seconds the LED nearest the button will begin blinking rapidly (almost a flicker) indicating the unit will reset. Release the button to complete the factory default. Wait for sixty seconds for the reset to complete and for the device to reboot. After a reboot, the blink pattern of the Flex IP unit will be either once-per-second if connected to a network and a DHCP address has been assigned, or rapidly if a network connection is not available. On a Flex WF unit, the blink pattern will be a non-standard intermittent pattern to indicate it has been reset back into SoftAP WiFi mode and is ready for a new WiFi connection.




Units can also be factory defaulted through the web configuration pages. See **Section 4.6** for details.



160 East California Street, PO Box 1659
Jacksonville, Oregon 97530
Phone: 541-899-4800
www.globalcache.com
Information subject to change without notice.