

INSTRUCTION MANUAL

## CE-Series Universal Control Extenders

CE-IRS4, CE-IO4, CE-COM2, CE-REL8



## IMPORTANT SAFETY INSTRUCTIONS

1. READ these instructions.
2. KEEP these instructions.
3. HEED all warnings.
4. FOLLOW all instructions.
5. DO NOT use this apparatus near water.
6. CLEAN ONLY with dry cloth.
7. DO NOT block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. DO NOT install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. DO NOT defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wider blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. PROTECT the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point wherethey exit from the apparatus.
11. ONLY USE attachments/accessories specified by the manufacturer.



12. USE ONLY with a cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. UNPLUG this apparatus during lightning storms or when unused for long periods of time.
14. REFER all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. DO NOT expose this apparatus to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the apparatus.
16. To completely disconnect this apparatus from the AC Mains, disconnect the power supply cord plug from the AC receptacle.
17. Where the mains plug or an appliance coupler is used as the disconnect device, the disconnect device shall remain readily operable.
18. DO NOT overload wall outlets or extension cords beyond their rated capacity as this can cause electric shock or fire.
19. Please use the HDMI cable with magnetic ring.



The exclamation point, within an equilateral triangle, is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.



The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electrical shock to persons.



ESD Warning: The icon to the left indicates text regarding potential danger associated with the discharge of static electricity from an outside source (such as human hands) into an integrated circuit, often resulting in damage to the circuit.

**WARNING:** To reduce the risk of fire or electrical shock, do not expose this apparatus to rain or moisture.

**WARNING:** No naked flame sources - such as candles - should be placed on the product.

**WARNING:** Equipment shall be connected to a MAINS socket outlet with a protective earthing connection.

**WARNING:** To reduce the risk of electric shock, grounding of the center pin of this plug must be maintained.

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## AMX WARRANTY AND RETURN POLICY

The AMX Warranty and Return Policy and related documents can be viewed/downloaded at [www.amx.com](http://www.amx.com).

## ESD WARNING

	<p>To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal materials.</p> <p>When working with any equipment manufactured with electronic devices, proper ESD grounding procedures must be followed to make sure people, products, and tools are as free of static charges as possible. Grounding straps, conductive smocks, and conductive work mats are specifically designed for this purpose. These items should not be manufactured locally, since they are generally composed of highly resistive conductive materials to safely drain static discharges, without increasing an electrocution risk in the event of an accident.</p> <p>Anyone performing field maintenance on AMX equipment should use an appropriate ESD field service kit complete with at least a dissipative work mat with a ground cord and a UL listed adjustable wrist strap with another ground cord.</p>
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	<p><b>WARNING:</b> Do Not Open! Risk of Electrical Shock. Voltages in this equipment are hazardous to life. No user-serviceable parts inside. Refer all servicing to qualified service personnel.</p> <p>Place the equipment near a main power supply outlet and make sure that you can easily access the power breaker switch.</p>
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### WARNING:

This product is intended to be operated ONLY from the voltages listed on the back panel or the recommended, or included, power supply of the product. Operation from other voltages other than those indicated may cause irreversible damage to the product and void the product's warranty. The use of AC Plug Adapters is cautioned because it

can allow the product to be plugged into voltages in which the product was not designed to operate. If the product is equipped with a detachable power cord, use only the type provided with your product or by your local distributor and/or retailer. If you are unsure of the correct operational voltage, please contact your local distributor and/or retailer.

## FCC AND CANADA EMC COMPLIANCE INFORMATION:

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Approved under the verification provision of FCC Part 15 as a Class A Digital Device.

Caution:

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this device. CAN ICES-3 (B)/NMB-3(B)

## EU COMPLIANCE INFORMATION:

Eligible to bear the CE mark; Conforms to European Union Low Voltage Directive 2006/95/EC; European Union EMC Directive 2004/108/EC; European Union Restriction of Hazardous Substances Recast (RoHS2) Directive 2011/65/EU; European Union WEEE (recast) Directive 2012/19/EU; European Union Radio and Telecommunications Terminal Equipment (R&TTE) Directive 1999/5/EC

## WEEE NOTICE:

	<p>This appliance is labeled in accordance with European Directive 2012/19/EU concerning waste of electrical and electronic equipment (WEEE). This label indicates that this product should not be disposed of with household waste. It should be deposited at an appropriate facility to enable recovery and recycling.</p>
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# CE-Series Universal Control Extenders

## Overview

The CE-Series of Universal Control Extenders provide port expansion over Ethernet for any control system. The HControl protocol provides a simple path and value approach to actuating the device functions. The use of the CE-Series Control Extender with other HControl-aware Harman products makes a seamless extension of those systems. The Ethernet connectivity helps break distance limitations and provide flexibility of installation.

CE-Series Control Extender boxes			
Name	SKU	Description	Page Reference
CE-IRS4	AMX-CEB001	Control Extender – 4 IR	
CE-REL8	AMX-CEB002	Control Extender – 8 Relay	
CE-COM2	AMX-CEB003	Control Extender – 2 COM	
CE-IO4	AMX-CEB004	Control Extender – 4 IO	

## Common Features

CE-Series Common Features		
<b>DIMENSIONS</b>	1" x 4 1/16" x 4 3/32" 2.5 cm x 10.3 cm x 10.4 cm (1/4 RU Width x <1 RU Height)	
<b>WEIGHT</b>	1lb 454 g	
<b>POWER REQUIREMENTS</b>	PoE – 802.3af Class 0 Maximum	15.4W
	CE-IRS4	2.6W
	CE-REL8	4.1W
	CE-COM2	5.6W
	CE-IO4	14.7W
<b>Enclosure</b>	Powder-coated steel w/ grey matt finish	
<b>Certifications</b>	FCC Part 15 Class B, CE, and IEC 60950	
<b>Environmental Requirements</b>	<i>Operating Temperature:</i> 0° C (32° F) to 40° C (104° F) <i>Storage Temperature:</i> -10° C (14° F) to 60° C (140° F) <i>Operating Humidity:</i> 5% to 85% RH (non-condensing) <i>Heat Dissipation (Typical):</i> 36.9 BTU/hr Designed for indoor use only.	
FRONT PANEL COMPONENTS		
<b>ID Pushbutton</b>		
<b>Status LED</b>	A multi-colored LED indicating the device status (see fig ???)	
<b>L/A LED</b>	A network link/activity light	
REAR PANEL COMPONENTS		
<b>Ethernet</b>	RJ-45 connector provides IP communication and PoE	
<b>Phoenix Connector</b>	Module-specific captive wire connectors (See below)	

## LAN/PoE Port

The LAN/PoE (RJ45) port on all CE Modules provides 10/100 Base-T network connectivity. Use standard Cat5/6/6E ethernet cable to connect the CE Module to the network.

The Ethernet Port LEDs show communication activity, connection status, speeds, and mode information:

- SPD (speed) - Yellow LED lights On when the connection speed is 100 Mbps and turns Off when the speed is 10 Mbps.
- L/A (link/activity) - Green LED lights On when the Ethernet cables are connected and terminated correctly, and blinks when receiving Ethernet data packets.

## Detailed LED Behavior

The table below provides detailed descriptions of all blink patterns for the Status and A/L LEDs on the front panels of all CE modules.

## LED PATTERNS

The CE-series features one tri-color LED for status.

Color	Frequency	Status
Green	Solid	Power, no connection
Green	1 Hz	HControl connection
Yellow	Solid	Booting
Cyan	3 Hz	Updating*
White	Solid	Locate mode
Red	1 Hz	Error, not running

\* - Please do not disconnect from power when updating

## ID Button

The ID button located on the front panel of the CE-Series module has two main functions: Reset and Locate.

Time	Function	Description
<10 seconds	Locate	An HControl Locate message is broadcast
10 – 20 seconds	Reset Configuration	The username, password, and relevant device settings are set back to defaults
>20 seconds	Revert to Factory Firmware	The CE module is restored to the factory firmware image with all default settings.

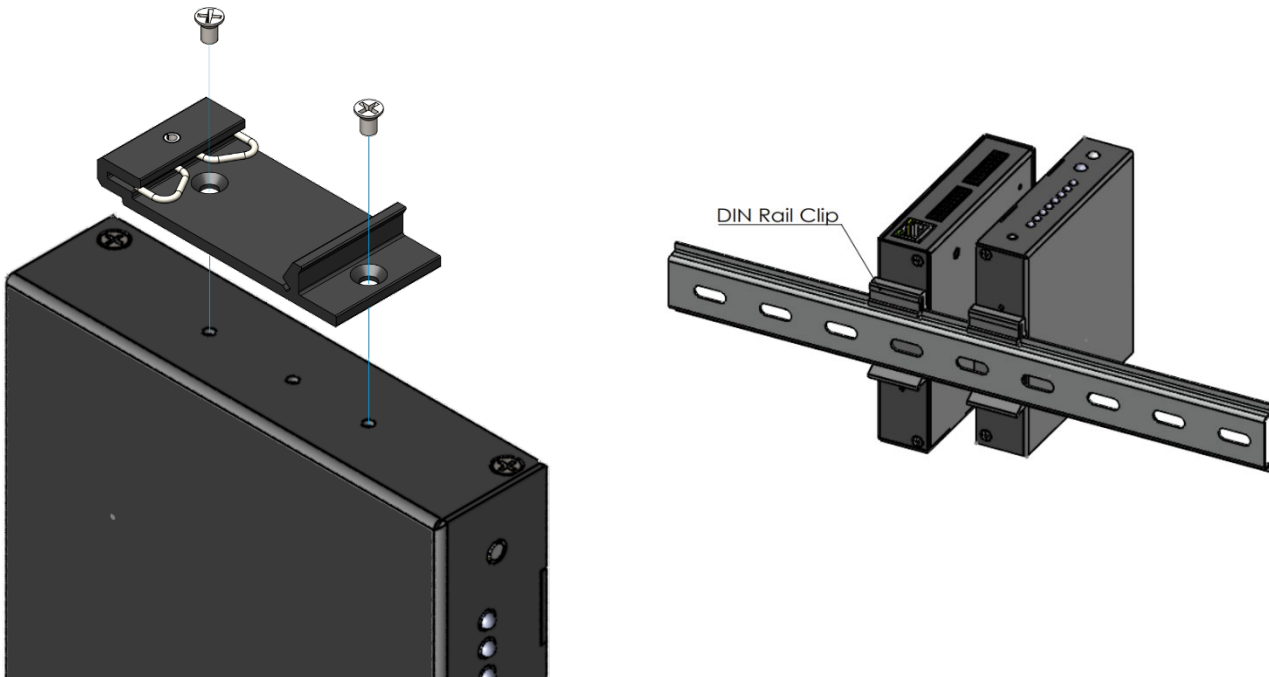
## Installation

### Mounting Options (Rack Trays and Mounting Brackets)

Refer to the documentation provided with each of the mounting kits for installation instructions (also available online at [www.amx.com](http://www.amx.com)).

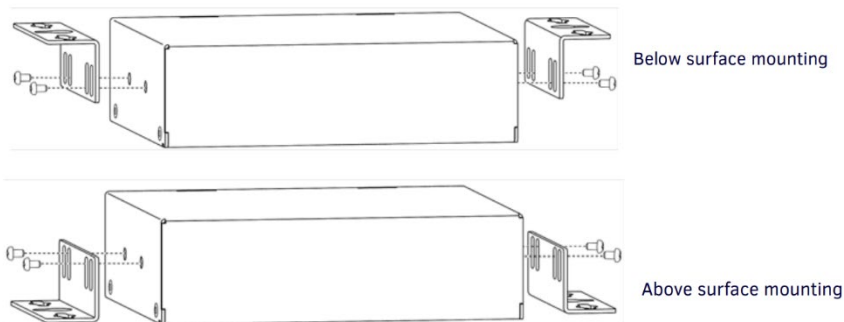
### VSTYLE DIN Rail Clip (AMX-CAC0001)

Small VSTYLE compatible modules can be mounted on a DIN rail with the VSTYLE DIN Rail Clip



### AVB-VSTYLE-SURFACE-MNT (FG1010-722)

V Style Single Module Surface Mount Brackets - Mount a single module to the wall, under a desk, etc. (FIG. 2).



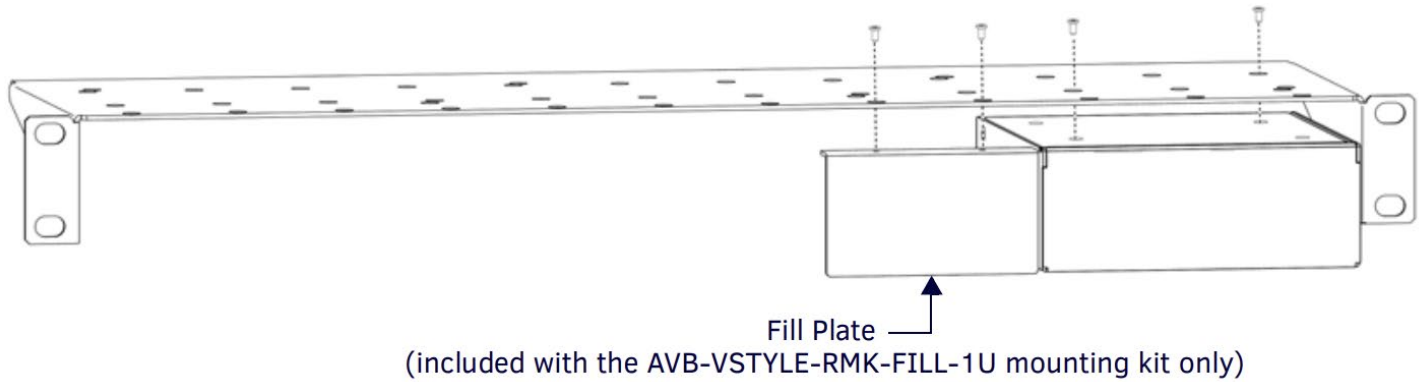
### AVB-VSTYLE-RMK (FG1010-720)

V Style Module Tray Rack - Mount up to four modules side by side in a 1 RU space (FIG. 3).



### AVB-VSTYLE-RMK-FILL-1U (FG1010-721)

V Style Module Tray Rack - Mount up to four modules side by side in a 1 RU space, with Fill Plates for instances when the entire tray is not full (FIG. 3).



Note that the tray illustrated in FIG. 3 is shown upside down for ease of installation. However, the tray can be rack-mounted in a rack either way.

Also note that the Fill Plate included in this illustration is included only in the AVB-VSTYLE-RMK-FILL-1U (FG1010-721).

NOTE: The AVB-VSTYLE-RMK and AVB-VSTYLE-RMK-FILL-1U mounting kits are appropriate for the CE-COM2, -IRS4, -IO8 and -REL8

### AVB-VSTYLE-POLE-MNT (FG1010-723)

V Style Single Module Pole Mounting Kit - Suspend a single module to a pole (FIG. 4).

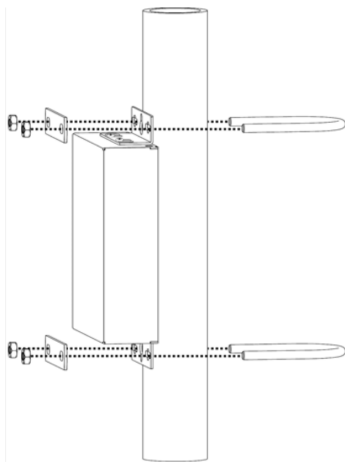


Fig xxx – AVB-VSTYLE-POLE-MNT

## SAFETY INSTRUCTIONS

- For UL compliance, the CE family of ICSLan Device Control Boxes should be powered directly via any listed external IEC/UL 60950-1 2nd edition certified LPS PoE switch or injector, such as the AMX NXA-ENET8POE or PS-POE-AF.
- The CE-series family of ICSLan Device Control Boxes are intended for Network Environment 0 per IEC TR62101, and are to be connected only to PoE networks without routing to the outside plant.

## Preparing/Connecting Captive Wires

1. Strip 0.25 inch of wire insulation off all wires.
2. Insert each wire into the appropriate opening on the connector according to the wiring diagrams and connector types described in this section.

Note: Do not tighten the screws excessively; doing so may strip the threads and damage the connector.

## LAN/PoE Port

The LAN/PoE (RJ45) port on all CE Modules provides 10/100 BaseT network connectivity. Use standard Cat5/6/6E ethernet cable to connect the CE Module to the LAN. The Ethernet Port LEDs show communication activity, connection status, speeds, and mode information:

- SPD (speed) - Yellow LED lights On when the connection speed is 100 Mbps and turns Off when the speed is 10 Mbps.
- L/A (link/activity) - Green LED lights On when the Ethernet cables are connected and terminated correctly, and blinks when receiving Ethernet data packets.

# Network Configuration

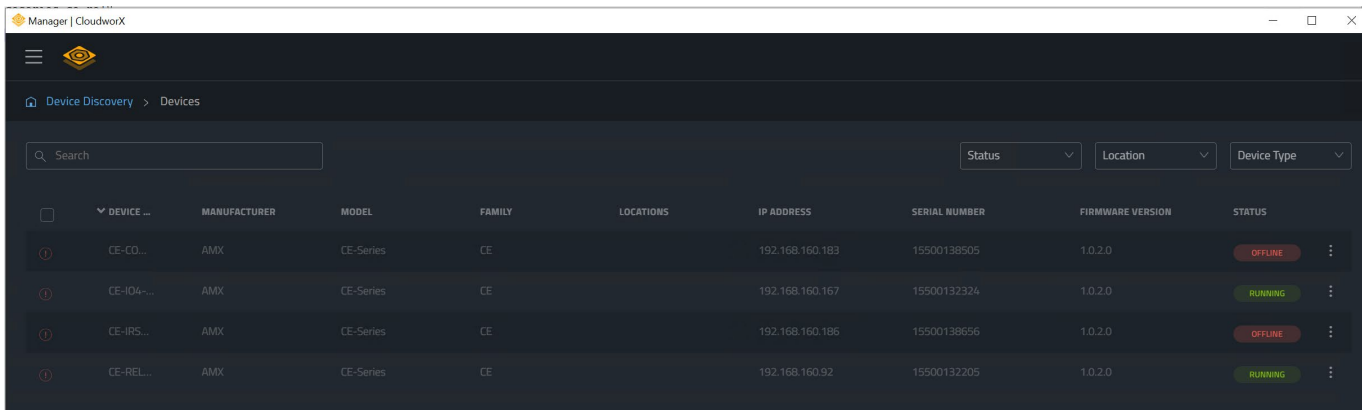
## Defaults

The CE- family of Control Extenders defaults to using DHCP to obtain a network address. If a DHCP server is unavailable, the CE will use a link-local address.

## Network Discovery

The CE family of Control Extenders use the Harman HControl Protocol for communication and network discovery. HControl aware software and devices are able to detect other HControl devices on their subnet. Software such as Manager can be used to discover the IP address that has been assigned via DHCP.

## Manager Desktop



The screenshot shows the Manager Desktop interface with a table of discovered devices. The table has columns for Device ID, Device Name, Manufacturer, Model, Family, Locations, IP Address, Serial Number, Firmware Version, and Status. There are four rows of data, with the first and third rows marked as 'OFFLINE' and the second and fourth rows marked as 'RUNNING'.

Device ID	Device Name	Manufacturer	Model	Family	Locations	IP Address	Serial Number	Firmware Version	Status
1	CE-CO...	AMX	CE-Series	CE		192.168.160.183	15500138505	1.0.2.0	OFFLINE
1	CE-IDA...	AMX	CE-Series	CE		192.168.160.167	15500132324	1.0.2.0	RUNNING
1	CE-IRS...	AMX	CE-Series	CE		192.168.160.186	15500138656	1.0.2.0	OFFLINE
1	CE-REL...	AMX	CE-Series	CE		192.168.160.92	15500132205	1.0.2.0	RUNNING

Additionally, each CE-Series module has an ID button that, when tapped, causes the module to send a broadcast message to facilitate discovery. The discovery beacon is sent as a UDP packet on port 4197 to 255.255.255.255, which is the universal broadcast address. If use a laptop on the same switch as the CE device and use packet capture software like Wireshark, you can see the broadcast message as well as any other HControl devices that reply:

\*Ethernet (port 4197)

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.160.174	255.255.255.255	UDP	101	4197 → 4197 Len=59
2	0.000032	192.168.160.174	192.168.160.255	UDP	101	4197 → 4197 Len=59

> Frame 1: 101 bytes on wire (808 bits), 101 bytes captured (808 bits) on interface \Device\NPF\_{7DD751B0-EA79-43D8-89C3-4624DC1D2204}, id 0  
 > Ethernet II, Src: Phast\_aa:ef:44 (00:60:9f:aa:ef:44), Dst: Broadcast (ff:ff:ff:ff:ff:ff)  
 > Internet Protocol Version 4, Src: 192.168.160.174, Dst: 255.255.255.255  
 > User Datagram Protocol, Src Port: 4197, Dst Port: 4197  
 > Data (59 bytes)  
 Data: 646973636f207b227265706c79706f7274223a343139372c22706172616d73223a5b2269...  
 [Length: 59]

```

0000 ff ff ff ff ff ff 00 60 9f aa ef 44 08 00 45 00
0010 00 57 94 fb 40 00 40 11 44 44 c0 a8 a0 ae ff ff
0020 ff ff 10 65 10 65 00 43 57 05 64 69 73 63 6f 20
0030 7b 22 72 65 70 6c 79 70 6f 72 74 22 3a 34 31 39
0040 37 2c 22 70 61 72 61 6d 73 22 3a 5b 22 69 70 22
0050 2c 22 6e 61 6d 65 22 2c 22 6c 6f 63 61 74 69 6f
0060 6e 22 5d 7d 0a
  
```

Data (data.data), 59 bytes | Packets: 2 · Displayed: 2 (100.0%) · Dropped: 0 (0.0%) | Profile: Default

In this example, the CE module sent the discovery broadcast from 192.168.160.174 when the ID button was tapped.

## Web Server Controls

Once you know the IP address that has been assigned to the CE box, all configuration settings are available through the built in web server. Navigate to the target address, use the default credentials of:

Default Credentials	
Username	admin
Password	password

**Note:** You will be forced to choose a new username and password upon login. Follow the prompts to set a new username and password for the device.

**Note:** On the first login, your browser will likely ask you to trust the CE module's self-signed certificate. This is required to access the module's web pages. You are able to provide a new certificate later if desired.

## Network

The Network tab displays the current network settings and allow the user to set new network settings.

The screenshot shows a web browser window with the URL <https://192.168.160.92/setting.html>. The page title is "CE-REL8-AB0FD0 | CE-REL8-AB0FD0 | 192.168.160.92 | 15500132205". The navigation menu includes "Network", "Device", "Security", "Administrator", and "Firmware". The "Network" tab is active, showing two panels: "General" and "IPv4 Address".

**General Panel:**

- MAC Address: 00:60:9F:AB:0F:D0
- IP Hostname: CE-REL8-AB0FD0

**IPv4 Address Panel:**

- Mode: DHCP (selected), Specific IP Address
- IP Address: 192.168.160.92
- Subnet Mask: 255.255.255.0
- Gateway: 192.168.160.1
- Preferred DNS: 192.168.160.1
- Alternate DNS: 0.0.0.0

Buttons: Cancel, Accept

Footer: AMX HARMAN © 2022 HARMAN International. All Rights Reserved.

The MAC address field is read only and displays the preprogrammed MAC address of the CE box.

The IP address settings allow the choice of DHCP addressing or static addressing.

If DHCP is chosen, the IP Address and subnet mask setting are read-only as they will be determined by interaction with the DHCP server. If a DHCP server is not present, a fallback link local address will be assigned.

If Static is chosen, all fields related to the IP address are editable. Choose the IP address, subnet mask, gateway and DNS server that is appropriate for the network the CE box is installed on.

## Device

This is the device-specific web page content for each type of CE-series box. Different content is displayed for each.

CE-REL8 – 8 Relay Module

CE-REL8-AB0FD0 | CE-REL8-AB0FD0 | 192.168.160.92 | 15500132205 Logout

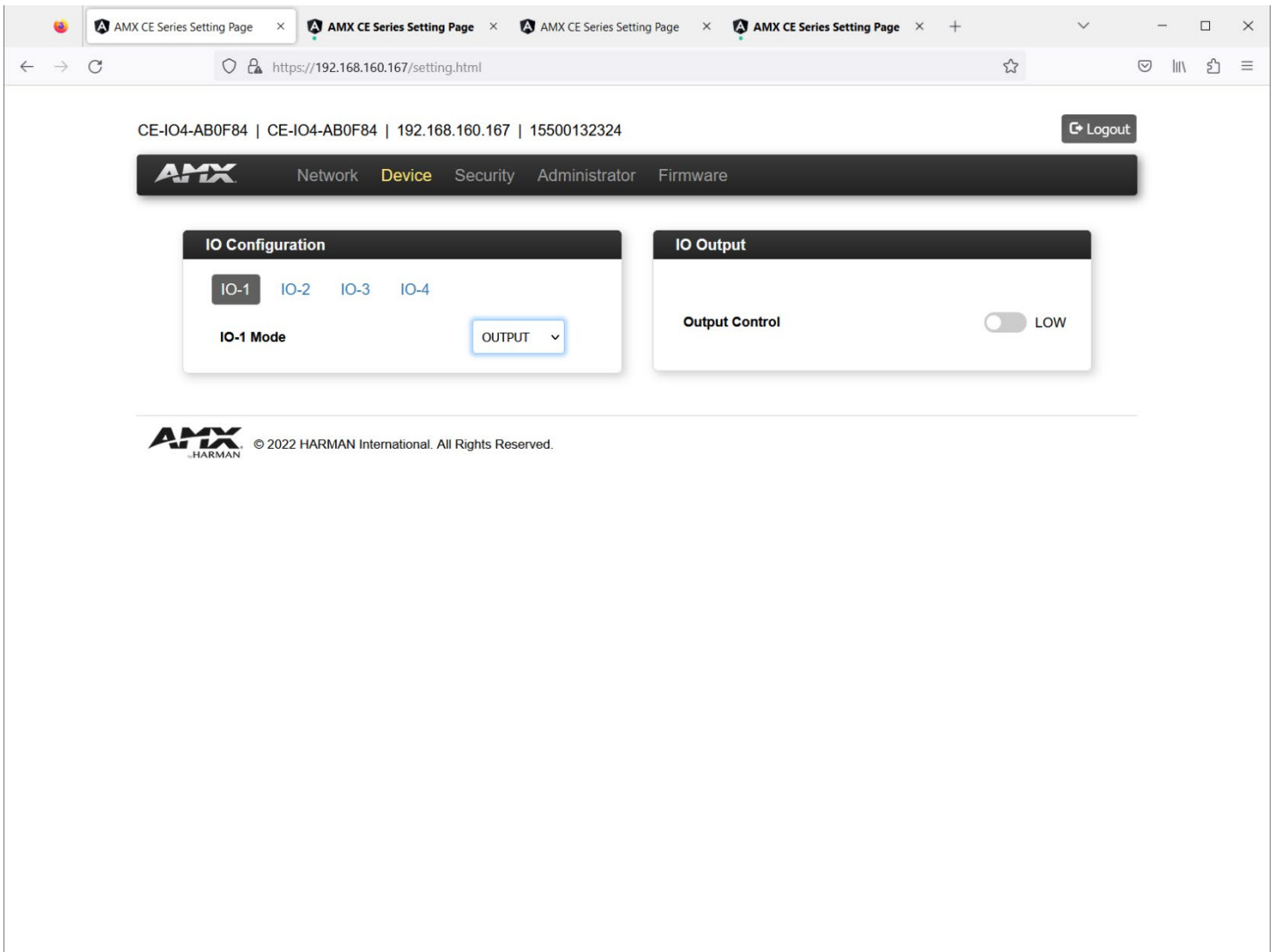
**AMX** Network **Device** Security Administrator Firmware

Relay 1~4 Config		Relay 5~8 Config	
Relay-1 Enable	<input type="checkbox"/> OFF	Relay-5 Enable	<input type="checkbox"/> OFF
Relay-2 Enable	<input type="checkbox"/> OFF	Relay-6 Enable	<input type="checkbox"/> OFF
Relay-3 Enable	<input type="checkbox"/> OFF	Relay-7 Enable	<input checked="" type="checkbox"/> ON
Relay-4 Enable	<input type="checkbox"/> OFF	Relay-8 Enable	<input type="checkbox"/> OFF

**AMX**  
HARMAN © 2022 HARMAN International. All Rights Reserved.

The status of each relay is displayed in the CE-REL8's Device page. Clicking on the label or slider for a particular relay will toggle the status of the relay. As pictured, Relay 7 is engaged.

## CE-IO4 (configured as Output)



First, select from the list of I/O ports to see the status. Those labels act as radio buttons. When one is selected, all the settings shown are for that particular I/O. Each I/O is individually configurable.

If the I/O is set as an output, there is only one further setting available. Similar to the Relay, the Output can be driven high or low by the toggle switch represented on this page. The current status is displayed this way.

- **IO Output: Output Control** (sets output status)  
The current setting for the digital output state: low or high

## CE-IO4 (Configured as Input)

The screenshot displays the AMX CE Series Setting Page for CE-IO4 (Configured as Input). The page is accessed via a browser at <https://192.168.160.167/setting.html>. The device ID is CE-IO4-AB0F84 | CE-IO4-AB0F84 | 192.168.160.167 | 15500132324. The page features a navigation bar with the AMX logo and tabs for Network, Device (selected), Security, Administrator, and Firmware. A Logout button is located in the top right corner.

The main content area is divided into four sections:

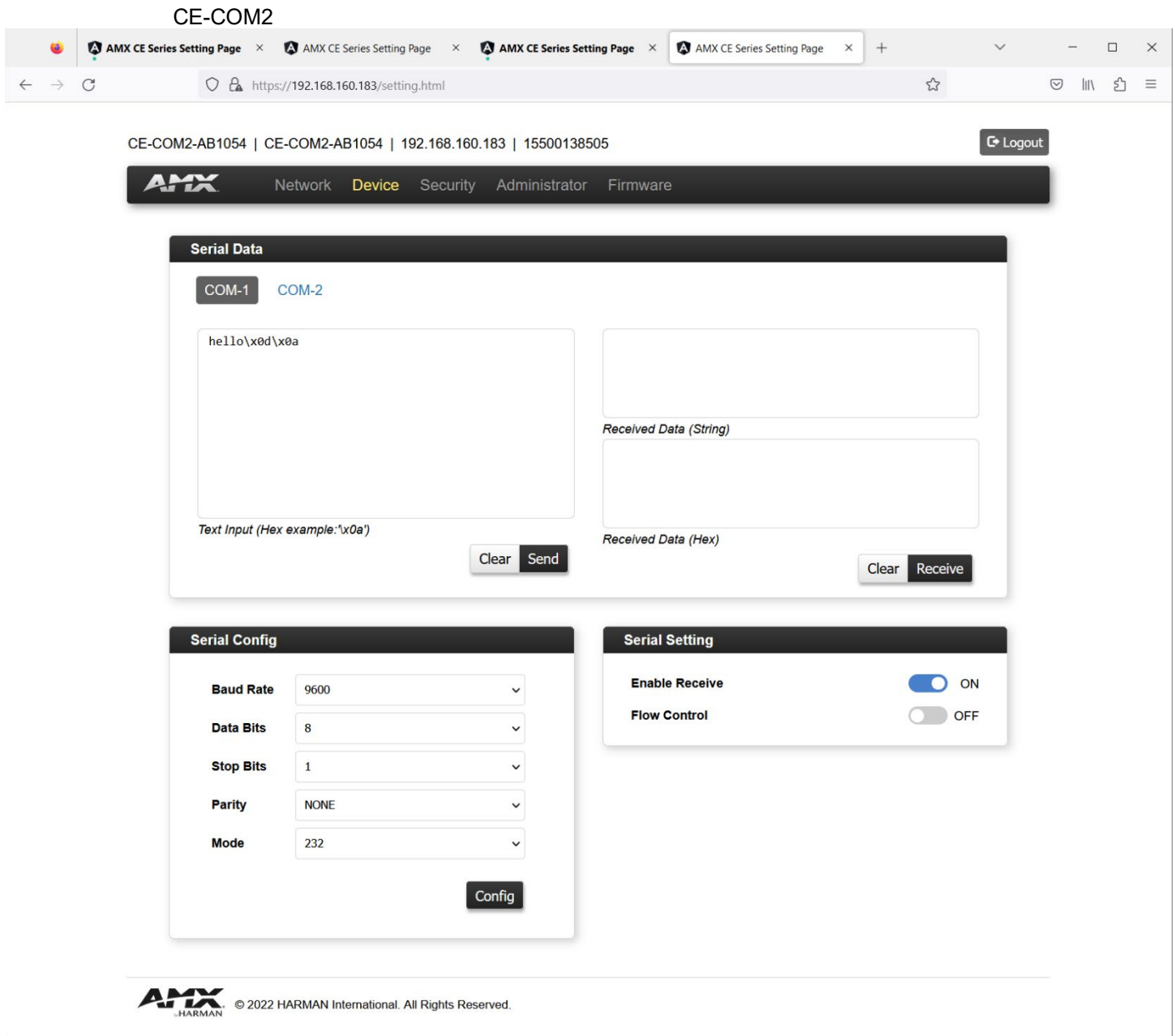
- IO Configuration:** Shows tabs for IO-1, IO-2 (selected), IO-3, and IO-4. The IO-2 Mode is set to INPUT.
- IO Input:** Shows Input Mode set to BOTH and Pull Up Enable set to ON.
- Digital Setting:** Shows Input State (High/Low) set to Low, Debounce Time (5~250 ms) set to 75, High Threshold (0.0~10.0 Volts) set to 2.7, and Low Threshold (0.0~10.0 Volts) set to 0.8.
- Analog Setting:** Shows Input Voltage (Volts) set to 0.1 Volts and Trigger Delta (0.1~4.9 Volts) set to 0.2.

The footer contains the AMX logo and the text: © 2022 HARMAN International. All Rights Reserved.

If the I/O is configured as an Input, there are many more settings available:

- **I/O input mode:** Analog, Digital, or Both  
Depending on the choice made from this pulldown, the following additional settings will appear:
- **Digital Settings: Input State** (feedback for the input)  
The current reading for the digital input state: low or high
- **Digital Settings: Debounce Time** in ms  
This is the polling interval for the input state. This prevents flooding of updates from unstable sources.
- **Digital Settings: High Threshold** in volts  
This sets the boundary for what is considered 'high' for an input.
- **Digital Settings: Low Threshold** in volts  
This sets the boundary for what is considered 'low' for an input  
**Note:** If the voltage is between the high and low threshold, the previous input state will be unchanged.
- **Analog Settings: Input Voltage**  
This is the current voltage detected on the Analog input pin
- **Analog Settings: Trigger Delta in Volts**  
This is the magnitude of change that must occur before a new value is reported.





The CE-COM2 has two configurable COM ports. First, select the COM port you wish to view or set the parameters for (COM-1 or COM2)

The **Serial Config** settings contain the standard COM port settings. Match these settings for those specified on the target serial-controlled device. Once set, press the Config button to commit these changes.

The **Serial Setting** dialog contains two controls: Enable Receive and Flow Control. Enable Receive determines if any messages received by that COM port should trigger an event for any clients that have subscribed. If receiving a response is not desired, turning Enable Receive off can reduce traffic and control system overhead for handling these events. The Flow Control switch enables or disables the use of the hardware handshaking pins.

The **Serial Data** dialog shows the last received message in both ASCII encoding and hexadecimal representation. The Text input field allows you to send a serial message through the selected COM port. This allows for testing of the COM port and wiring without using a control system.

In the example below, the string *hello* followed by a carriage return and line feed are ready to be sent from COM-1

The interface is titled "Serial Data" and has a dark header. Below the header, there are two buttons: "COM-1" (selected, dark grey) and "COM-2" (light blue). On the left, there is a large text input field containing the text "hello\r\n". Below this field is the label "Text Input (Hex example: '\x0a')". To the right of the input field are two buttons: "Clear" and "Send". On the right side of the interface, there are two empty text boxes. The top one is labeled "Received Data (String)" and the bottom one is labeled "Received Data (Hex)". Below these boxes are two buttons: "Clear" and "Receive".

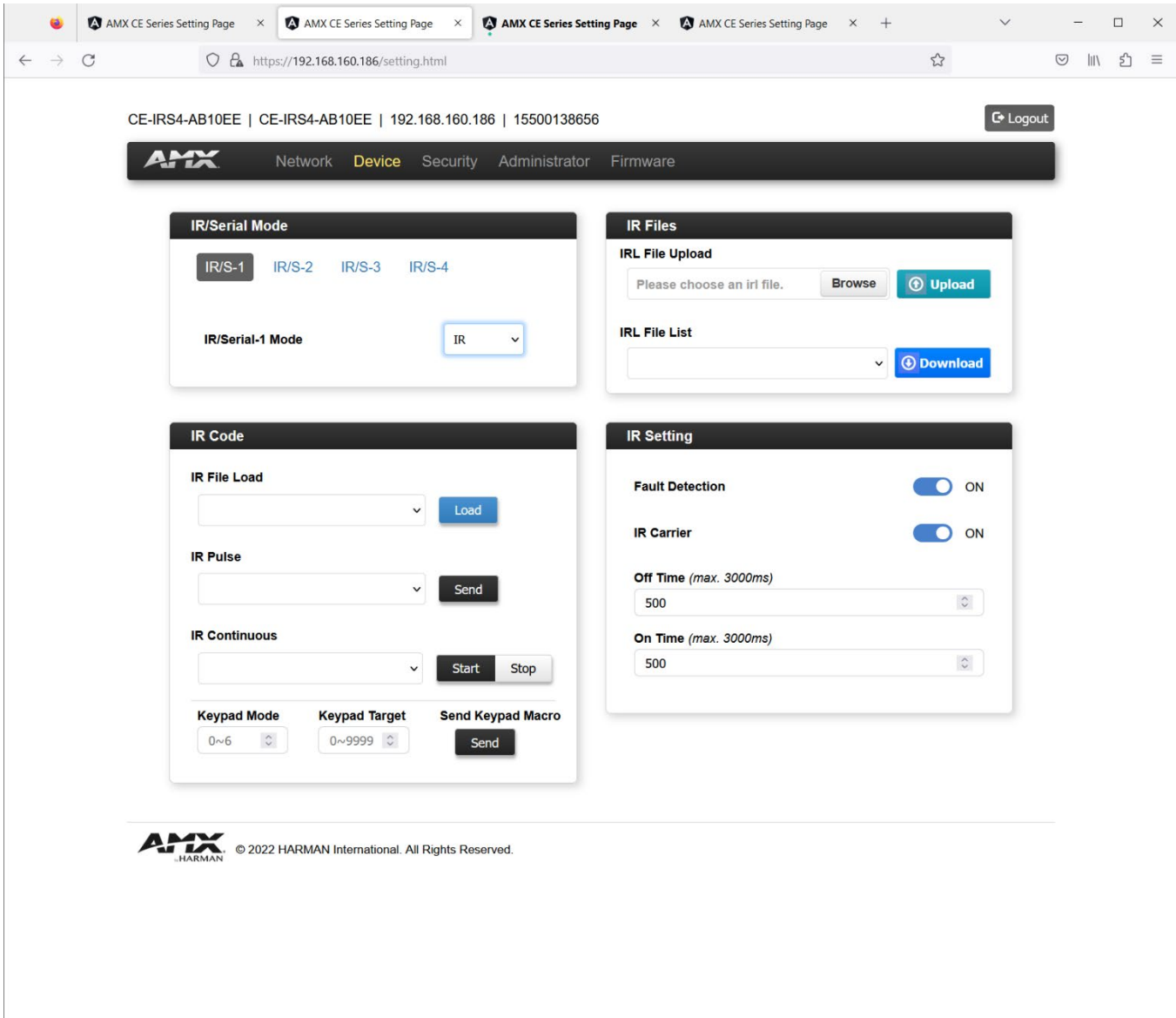
Clicking **Send** will transmit the message in the Text Input window out of the COM port selected using the present RS-232 protocol settings for that port.

For demonstration purposes, I wired COM-1 to COM-2 to show the Receive function. To see the last message received by the CE-COM2's COM port, click the **Receive** button.

The interface is titled "Serial Data" and has a dark header. Below the header, there are two buttons: "COM-1" (light blue) and "COM-2" (selected, dark grey). On the left, there is an empty text input field with the label "Text Input (Hex example: '\x0a')". To the right of the input field are two buttons: "Clear" and "Send". On the right side of the interface, the top text box labeled "Received Data (String)" now contains the text "hello\r\n". The bottom text box labeled "Received Data (Hex)" contains the text "\x68 \x65 \x6c \x6c \x6f \r\n". Below these boxes are two buttons: "Clear" and "Receive".

The last message received will be represented as mixed ASCII & hexadecimal in the **Received Data (String)** window, and as strictly hexadecimal for the **Received Data (Hex)** window.

## CE-IRS4



The CE-IRS4 has 4 individually configurable outputs.

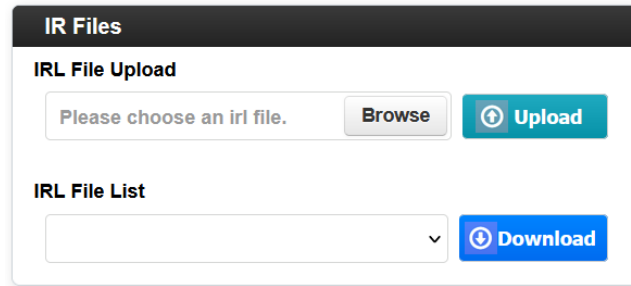
First, select the output you want to configure. The labels **IR/S-1**, **IR/S-2**, **IR/S-3**, and **IR/S-4** act as radio buttons allowing you to select one particular IR/Serial port to configure. In the above example, IR/S-1 is selected.

Next select the desired mode using the pulldown labelled **IR/Serial-n Mode**. The modes are: **IR**, **Serial**, and **Data**

- The **IR** mode expects to drive an IR emitter (CC-NIRC). This emitter should be placed on the IR receptive area of the controlled device.
- The **Serial** mode expect to be wired directly to a controlled device, but still uses the IR waveform as control
- The **Data** mode works as a 1-way RS-232 port. The effective distance and available baud rates are reduced from a dedicated RS-232 port.

## IR Mode

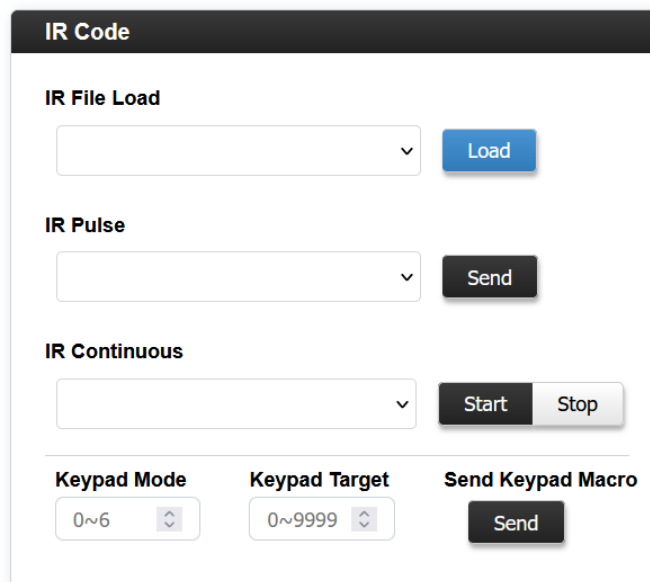
If the port selected is in IR modes, the following dialog boxes will appear: IR Files, IR Code, and IR Setting



In **IR Files**, you may upload multiple AMX .irl files. These .irl files contain the IR data for each button that has been captured.

The **IR File List** allows you to browse all of the loaded .irl files present on this module. You may also back up the .irl file by selecting the file and pressing the **Download** button.

The **IR Code** window has several setting and controls:



- The **IR File Load** allows you to select the actual .irl file that will be in use from all the .irl files that have been loaded. This will load all the captured buttons that will be available to this web page and the connected control system. Only one IR file is active at a time.
- **IR Pulse** allows you to select from a list of loaded captured IR buttons and send the button for testing that function. The pulses are queued, so pressing the button repeated will send a pulse for each press. The timing for the pulse is in the IR Setting window.
- **IR Continuous** allows you to send an IR code for an arbitrarily long time. The IR code is emitted when Start is pressed and ceases when Stop is pressed.
- **Keypad Mode** defines the pattern of IR codes that are queued for the purpose of sending a multidigit number with an IR Remote.
- **Keypad Target** is the series of numbers that will be sent when **Send** is pressed
- **Send Keypad Macro** will send the sequence of numbers in the pattern specified by **Keypad Mode**

The **Keypad Mode** values are based on the NetLinx NX implementation of an IR Port. The available Keypad modes are:

**Mode 0:** No leading zeros, use Enter key, up to 3 digits

- “3” transmits the IR code as 3-enter.
- “34” transmits the IR code as 3-4-enter.
- “343” transmits the IR code as 3-4-3-enter.

**Mode 1:** Use leading zeros, use Enter key, always 3 digits

- “3” transmits the IR code as 0-0-3-enter.
- “34” transmits the IR code as 0-3-4-enter.
- “343” transmits the IR code as 3-4-3-enter.

**Mode 2:** No leading zeros, no Enter key, up to 3 digits

- “3” transmits the IR code as 0-0-3.
- “34” transmits the IR code as 0-3-4.
- “343” transmits the IR code as 3-4-3.

**Mode 3:** Use leading zeros or Hundred key, No Enter key, up to 3 digits

- “3” transmits the IR code as 0-3.
- “34” transmits the IR code as 3-4.
- “343” transmits the IR code as 100-100-100-4-3

**Mode 4:** Legacy Keypad mode, values 0-199 only, use Enter if present

- “3” transmits the IR code as 0-0-3-enter.
- “34” transmits the IR code as 0-3-4-enter.
- “343” returns an error message

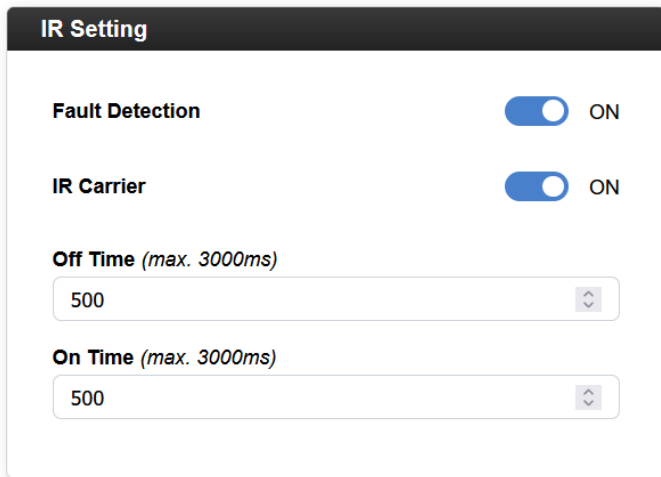
**Mode 5:** Use leading zeros, use Enter key, always 4 digits

- “3” transmits the IR code as 0-0-0-3-enter.
- “34” transmits the IR code as 0-0-3-4-enter.
- “343” transmits the IR code as 0-3-4-3-enter.
- “3434” transmits the IR code as 3-4-3-4-enter.

**Mode 6:** Use leading zeros, no Enter key, always 4 digits

- “3” transmits the IR code as 0-0-0-3.
- “34” transmits the IR code as 0-0-3-4.
- “343” transmits the IR code as 0-3-4-3.
- “3434” transmits the IR code as 3-4-3-4.

The **IR Setting** window has the following controls:



The screenshot shows a window titled "IR Setting" with a dark header. Below the header, there are four settings:

- Fault Detection**: A blue toggle switch is turned on, followed by the text "ON".
- IR Carrier**: A blue toggle switch is turned on, followed by the text "ON".
- Off Time (max. 3000ms)**: A text input field contains the number "500" and has a small up/down arrow icon on the right.
- On Time (max. 3000ms)**: A text input field contains the number "500" and has a small up/down arrow icon on the right.

- **Fault Detection** – If an IR code is sent but no IR emitter is connected, a fault will be registered
- **IRCarrier** – This setting determines whether the IR carrier frequency (typically 41kHz) is present in the output signal. This should always be on for use with an IR emitter. Some wired IR connections may require removal of the IR carrier frequency
- **Off Time** – For queued IR pulses such as Keypad Macros and IR Pulse this setting determines the time between queued IR pulses
- **On Time** – For queued IR pulses such as Keypad Macros and IR Pulse this setting determines the total transmission time for the IR pulse

## Security

CE-IRS4-AB2408 | CE-IRS4-AB2408 | 192.168.160.199 | 15500074173 Logout

**AMX** Network Device **Security** Administrator Firmware

**Certificates**

**Server Certificate**

Please choose server cert

**Server Key**

Please choose server key

**Security Setting**

**H-Control Secure Connection**  OFF

**AMX** HARMAN © 2022 HARMAN International. All Rights Reserved.

The Security tab allows the upload of certificates for HTTPS and secure HControl functionality.

The CE-series modules will have a self-signed certificate installed from the factory. To add your own certificate, use the **Browse** button under Server Certificate to choose the file and **Upload** to install it. The expected certificate format is an X.509 certificate (PEM file).

To change the CE-

The **HControl Secure Connection** switch allows you to enforce the use of Secure HControl. With the switch set to 'off', both secure and plain text connections are allowed. With the switch set to 'on', only a TLS-based connection is accepted.

## Administrator

The Administrator tab has two functions: setting the module's credentials and rebooting.

The screenshot shows a web browser window with the URL <https://192.168.160.186/setting.html>. The page header displays the device information: CE-IRS4-AB10EE | CE-IRS4-AB10EE | 192.168.160.186 | 15500138656. A navigation bar includes the AMX logo and tabs for Network, Device, Security, Administrator (selected), and Firmware. A Logout button is in the top right. A Reboot button is located below the navigation bar. The main content area features a 'User & Password' form with the following fields:

- Old Username:** administrator
- Old Password:** [masked with 8 dots]
- New Username:** [text input field]
- New Password:** [text input field with a note: >= 8 characters, including at least 1 Uppercase Letter, 1 Lowercase Letter, 1 Number and 1 Special Character !@#%\*&'()]
- Confirm Password:** [text input field]

At the bottom of the form are 'Cancel' and 'Accept' buttons. The footer contains the AMX logo and the text: © 2022 HARMAN International. All Rights Reserved.

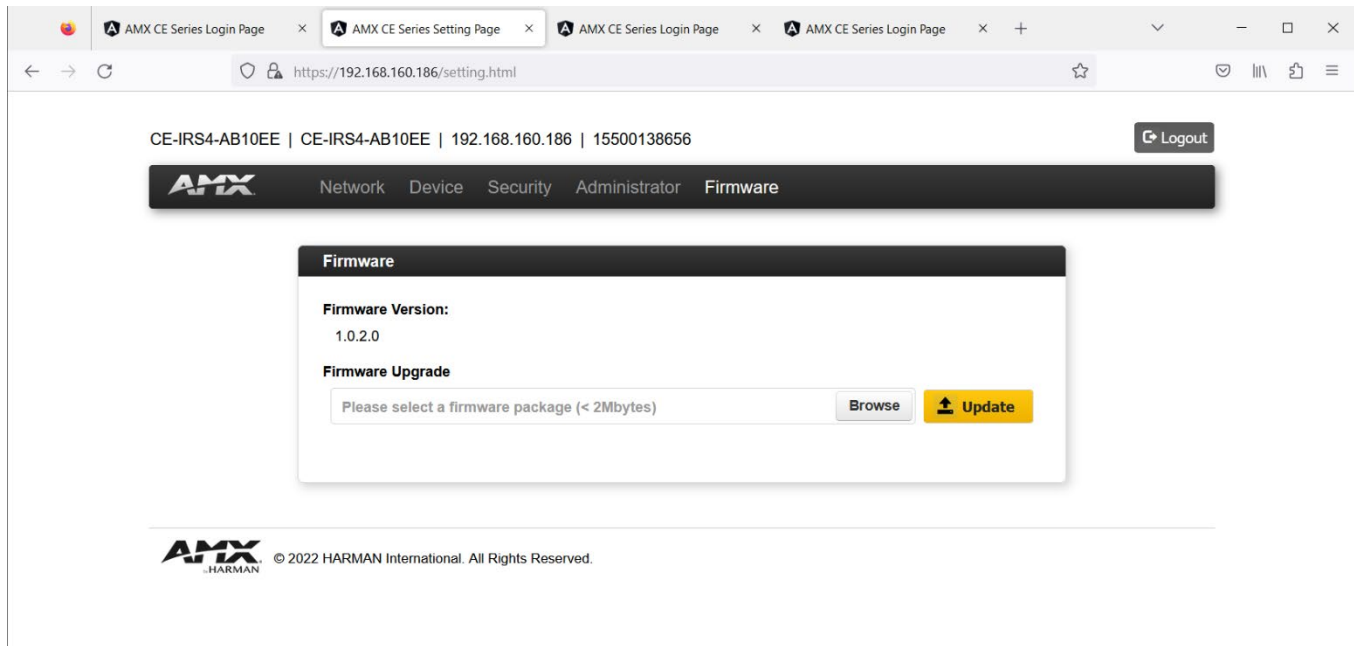
To set a new username and password, fill out the **User & Password** form.

Note: Only one set of credentials exist within the CE-series module. Setting a new username and password will remove the previous set.

To reboot the module, click the **Reboot** button on the upper right portion of the window.

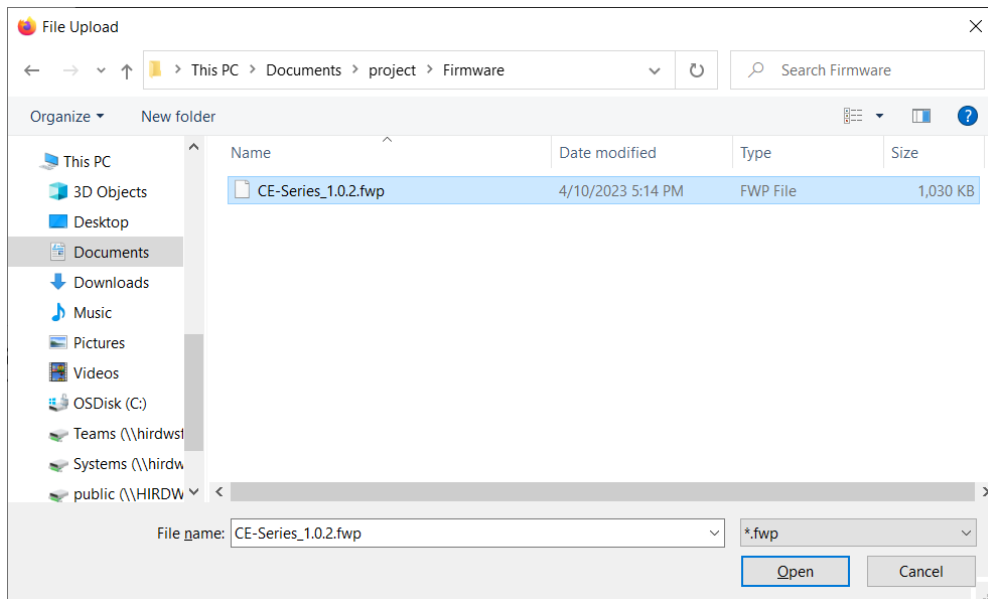


## Firmware



The Firmware tab displays the current firmware version of the CE box.

To update the firmware of the CE-series Control Extender, Select the Firmware Tab then click **Browse...** to select the firmware image you wish to load. The firmware file extension for a firmware update package is **.fwp**.



Once selected, click **Update** to commit this firmware change.

Note: Please do not remove power from the CE module during this process.

# CE-Series Control Protocol

## Introduction to HControl

### TCP/IP Connection information

HControl is a text-based control protocol for a variety of Harman devices. Future Harman Audio, Video, and Control products will implement this protocol for easy interoperability between Harman devices. As an added bonus, the text-based protocol allows other control systems and network-capable devices to integrate Harman devices in to their systems without the need of a dedicated Harman control product.

HControl occurs on TCP Port 4197. A discovery protocol (described [here](#)) is present on UDP Port 4197 for easy discovery of any Harman HControl devices nearby on the network.

### Message types

There are a handful of message types in HControl, and which message type you use depends on whether you are trying to use a Command or a Parameter.

Commands are ephemeral – they are not stored on the device and are generally used to execute a function

Parameters are persistent – they are generally device setting that stay set. Parameters can be queried.

### Message format

Each message starts with the message type followed by a JSON data packet containing the information you are trying to convey. Each HControl message is terminated with a linefeed character (variously 0x0a, \n, \$0a,... depending on your programming environment)

For Commands, you use the **exec** message type:

```
exec {...JSON formatted target...} \n
```

A common example of a Command is for setting the COM port parameters for RS-232/422/485 communication. To set a COM port to the most common setting, you would send:

```
exec {"path":"/serial/1","command":"setCommParams","arguments":{"baudRate":"9600","dataBits":8,"stopBits":1,"parity":"N"}}  
...followed by a linefeed.
```

Every **exec** will feature these key:value pairs:

**path** – This is a representation of the target of the command (COM Port 1 in the above example)

**command** – The name of the command that is to be invoked on the target (setCommParams in this case)

**arguments** – This optional datapoint contains any method parameters that need to be conveyed. (9600,N,8,1 here)

Commands are acknowledged with a response of **@exec** if successful, or an error message if unsuccessful.

For Parameters, there are several message types that apply. They all have the same basic structure as Commands.

### **set**

Set is used to push a value to a specific target. A common example of a Parameter set is latching a relay:

```
set {"path":"relay/1/state","value":false}
```

Parameter **set** consists of:

**path** – This is a representation of the target of the command (Relay 1 in the above example)

**value** – The value you wish to push to that target. This can be string values, integers, or booleans.

### **get**

get is used to query a specific parameter. The device will respond with **@get** and the current Parameter state.

To query for the state of Relay 1, you send:

```
get {"path":"relay/1/state"}
```

**get** messages, if successful, will be acknowledged with a **@get** message with the current parameter state.

```
@get {"path":"relay/1/state","value":true}
```

### **subscribe**

subscribe is used to receive unsolicited updates about a specific parameter. Any change will trigger a **publish** containing the current Parameter state.

To subscribe for unsolicited updates of the state of Relay 1, you send:

```
subscribe {"path":"relay/1/state"}
```

**subscribe** messages, if successful, will be acknowledged with a **@subscribe** message with the current parameter state.

```
@subscribe {"path":"relay/1/state","value":true}
```

Subsequent changes to the relay state result in a **publish**

```
publish {"path":"relay/1/state","value":false}
```

## Device specific controls

### CE-REL8 Controls

The CE-REL8 is the simplest device, containing only one path format for control

#### Parameters

Path	Read/Write	Data Type	Description
/relay/#/state	rw	boolean	Engage the relay

...where # is the one-based index of the relay. Example – engage relay 3:

```
set {"path":"/relay/3/state","value":true}
```

### CE-COM2 Controls

#### Commands

Path	Command	Arguments	Description
/serial/#	send	data	Send data from the port
/serial/#	setFlowControl	mode	NONE or HARDWARE
/serial/#	setCommParams	baudRate	1200, 4800, 9600, 19200, 38400, 57600, 115200
		dataBits	7 or 8
		stopBits	1 or 2
		parity	NONE, EVEN, ODD
		mode	232, 422, 485
/serial/#	enableReceive	-	Listen for message on the port
/serial/#	disableReceive	-	Stop incoming messages
/serial/#	flushReceiveBuffer	-	Clear incoming buffer

Syntax example:

Send Hello out of COM Port 1:

```
exec {"path":"/serial/1", "command":"send","arguments":{"data":"SGVsbG8="}}
```

Note: the **data** parameter is BASE64 encoded to eliminate disallowed characters in the JSON packet.

If the **enableReceive** Command has been sent, serial messages sent to the COM port from the connected device will be received as an event of this form:

```
event {"path":"/serial/1/receive","arguments":{"data":"SGVsbG8="}}
```

...where the data parameter is also BASE64 encoded. Decode data's value to reveal the original string.

To disable the hardware handshaking available on COM Port 1, send:

```
exec {"path":"/serial/1","command":"setflowControl","arguments":{"mode":"NONE"}}
```

To clear the receive buffer on COM Port 2, send:

```
exec {"path":"/serial/2","command":"flushReceiveBuffer"}
```

To enable strings sent to the COM port from the controlled device to be received by the control system, send:

```
subscribe {"path":"serial/1/receive"}
exec {"path":"/serial/1","command":"enableReceive"}
```

...without the subscribe message, the strings will not be transmitted to the client.

To set the first COM port to the most common transmission settings, send:

```
exec {
  "path": "/serial/1",
  "command": "setCommParams",
  "arguments": {
    "baudRate": "9600",
    "dataBits": 8,
    "stopBits": 1,
    "parity": "NONE",
    "mode": "232"
  }
}
```

#### Parameters

Path	Read/Write	Data Type	Values
/serial/#/baudRate	Read Only	Enumeration	1200, 4800, 9600, 19200, 38400, 57600, 115200
/serial/#/dataBits	Read Only	Integer	7 or 8
/serial/#/mode	Read Only	Enumeration	232, 422, 485
/serial/#/parity	Read Only	Enumeration	NONE, EVEN, ODD
/serial/#/stopBits	Read Only	Integer	1 or 2

For the CE-COM2, all of the communication Parameters are read only. If the COM settings are changed, either through the web interface or the setCommParams Command, each Parameter will be updated. If you are subscribed to that parameter, you will receive a **publish** message with the new value. For example:

```
publish {"path":"/serial/1/dataBits","value":8}
```

...will be sent if the number of data bits has been set to 8.

## CE-IRS4 Controls Commands

Path	Command	Arguments	Description
/ir/#	bufferedSendIr	code	Queue a timed pulse of IR by index
/ir/#	bufferedSendNamedIr	code	Queue a timed pulse invoked by name
/ir/#	clearAndSendIr	code	Clear the queue, then send the new IR pulse
/ir/#	clearAndSendNamedIr	code	Clear the queue, then send the named IR pulse
/ir/#	keypadMacro	code	Queue digits based on the keypadMode pattern
/ir/#	keypadMode	mode	Set the pattern for keypad digit transmission
/ir/#	loadIrFile	file	The .irl filename to use
/ir/#	offIr	-	Turn off IR on the port
/ir/#	onIr	code	Send IR code continuously by #
/ir/#	onNamedIr	code	Send IR code continuously by name
/ir/#	setOffTime	millis	Set the queue timing interval
/ir/#	setOnTime	millis	Set the queue active interval
/ir/#	enableFaultDetection	-	Alert if no IR LED detected
/ir/#	disableFaultDetection	-	Do not alert
/ir/#	setCommParams	baudRate	1200, 4800, 9600, or 19200
		dataBits	7 or 8
		stopBits	1 or 2
		parity	NONE, ODD, or EVEN
/ir/#	send	data	Use IR as 1-way COM port

### Syntax Example:

To send the IR code in position 1 for a pre-determined pulse time (or add to the queue if there are already bufferedSendIR or bufferedSendNamedIR or keypadMacro commands active, send:

```
exec {"path":"/ir/3","command":"bufferedSendIr","arguments":{"code":1}}
```

To send that same code if it happens to be named 'PLAY', send:

```
exec {"path":"/ir/3","command":"bufferedSendNamedIr","arguments":{"code":"PLAY"}}
```

To send the codes on the number pad of the remote for station 345, send:

```
exec {"path":"/ir/3","command":"keypadMacro","arguments":{"code":345}}
```

To change the pattern used to execute keypad macros, use:

```
exec {"path":"/ir/3","command":"keypadMode","arguments":{"mode":2}}
```

See the [Keypad Mode](#) section of the web server documentation for pattern information.

To load a new IR from the collection of .irl files uploaded to the CE-IRS4 configuration web page, send:

```
exec {"path":"/ir/3","command":"loadIrFile","arguments":{"file":"samsung01.irl"}}
```

When using buffered (queued) IR, to set a 1 second interval between IR pulses, send:

```
exec {"path":"/ir/3","command":"setOnTime","arguments":{"millis":1000}}
```

When using buffered (queued) IR, to set the active pulse width to 0.5 second, send:

```
exec {"path":"/ir/3","command":"setOffTime","arguments":{"millis":500}}
```

## Parameters

Path	Read/Write	Data Type	Values
/ir#/carrier	Read/Write	Boolean	true or false
/ir#/mode	Read/Write	Enumeration	IR, SERIAL, or DATA
/ir#/baudRate	Read Only	Enumeration	1200, 4800, 9600, 19200, 38400, 57600, 115200
/ir#/dataBits	Read Only	Integer	7 or 8
/ir#/parity	Read Only	Enumeration	NONE, EVEN, ODD
/ir#/stopBits	Read Only	Integer	1 or 2
/ir#/carrier	Read/Write	Boolean	true or false

### Syntax Examples:

To set the IR port to use the carrier frequency specified in the .irl file (typically 41Hz modulation of the near infrared signal), send:

```
set {"path":"ir/3/carrier","value":1}
```

To set the IR port mode to use as a COM port, send:

```
set {"path":"ir/3/mode","value":"DATA"}
```

For the COM related parameters, see the CE-COM2 Parameters for syntax examples.

## CE-IO4 Controls Parameters

Path	Read/Write	Data Type	Values
/io#/debounceTimeMilliseconds	Read/Write	Integer	5-250
/io#/mode	Read/Write	Enumeration	INPUT or OUTPUT
/io#/output	Read/Write	Boolean	true or false
/io#/debounceMinDelta	Read/Write	Float	0.1 - 4.9
/io#/inputMode	Read/Write	Enumeration	DIGITAL, ANALOG, BOTH
/io#/digitalInputLowMax	Read/Write	Float	0.0 - 9.9
/io#/digitalInput2KPullup	Read/Write	Boolean	true or false
/io#/analogInput	Read Only	Float	0.0 - 10.0
/io#/digitalInput	Read Only	Boolean	true or false
/io#/digitalInputHighMin	Read/Write	Float	0.1 - 10.0

Syntax examples:

Set the debounce time (minimum time between updates) to 123ms:

```
set {"path":"/io/1/debounceTimeMilliseconds","value":123}
```

Set the mode for the particular input (input or output):

```
set {"path":"/io/1/mode","value":"INPUT"}
```

```
set {"path":"/io/1/mode","value":"OUTPUT"}
```

Set the state of an IO that is in output mode and output 0 or 10v:

```
set {"path":"/io/1/output","value":true}
```

```
set {"path":"/io/1/output","value":false}
```

Set the minimum amount of voltage change that will cause an update to 0.5v:

```
set {"path":"/io/1/debounceMinDelta","value":0.5}
```

Set the events that an IO in input mode will generate:

```
set {"path":"/io/1/inputMode","value":"DIGITAL"}
```

```
set {"path":"/io/1/inputMode","value":"ANALOG"}
```

```
set {"path":"/io/1/inputMode","value":"BOTH"}
```



Set the threshold voltage that is considered to be a digital 'low':

```
set {"path":"/io/1/digitalInputLowMax","value":0.1} //0.0-9.9
```

Set the state of the pull-up resistor used in the input configuration:

```
set {"path":"/io/1/digitalInput2KPullup","value":true}  
set {"path":"/io/1/digitalInput2KPullup","value":false}
```

Set the threshold voltage this is considered to be a digital 'high':

```
set {"path":"/io/1/digitalInputHighMin","value":1.1} //0.1-10.0
```

