4K / UHD
Four-Input HDMI Switcher with Auto-Switching and Return Optical Audio
## Version Information

<table>
<thead>
<tr>
<th>Version</th>
<th>Release Date</th>
<th>Notes</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>Jun 2018</td>
<td>Initial release - new format</td>
</tr>
<tr>
<td>2</td>
<td>Jul 2019</td>
<td>Added missing factory-default setting information</td>
</tr>
<tr>
<td>3</td>
<td>Jul 2019</td>
<td>Updated to reflect 1.2.10 firmware; press and hold the INPUT button to display the IP address of the AT-JUNO-451.</td>
</tr>
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Welcome to Atlona!

Thank you for purchasing this Atlona product. We hope you enjoy it and will take an extra few moments to register your new purchase.

Registration only takes a few minutes and protects this product against theft or loss. In addition, you will receive notifications of product updates and firmware. Atlona product registration is voluntary and failure to register will not affect the product warranty.

To register your product, go to http://www.atlona.com/registration

Sales, Marketing, and Customer Support

Main Office
Atlona Incorporated
70 Daggett Drive
San Jose, CA 95134
United States

Office: +1.877.536.3976 (US Toll-free)
Office: +1.408.962.0515 (US/International)

Sales and Customer Service Hours
Monday - Friday: 6:00 a.m. - 4:30 p.m. (PST)

International Headquarters
Atlona International AG
Ringstrasse 15a
8600 Dübendorf
Switzerland

Office: +41 43 508 4321

Sales and Customer Service Hours
Monday - Friday: 09:00 - 17:00 (UTC +1)

http://www.atlona.com/

Operating Notes

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### Index
Introduction

The Atlona JunoX™ 451 (AT-JUNO-451) is a 4x1 HDMI switcher for high dynamic range (HDR) formats. It is HDCP 2.2 compliant and supports 4K/UHD video @ 60 Hz with 4:4:4 chroma sampling, as well as HDMI data rates up to 18 Gbps. The JunoX 451 is ideal for residential applications with the latest as well as emerging 4K/UHD and HDR sources and displays. It is compatible with all video resolutions, audio formats, and color space formats supported in the HDMI 2.0a specification, plus the ability to pass metadata for HDR content. The JunoX 451 includes EDID management features and automatic input switching. It also supports the HDMI Audio Return Channel (ARC) for receiving digital audio from a television. A TOSLINK digital audio output is provided for sending ARC or de-embedded HDMI audio to an AV receiver or soundbar. This JunoX Series HDMI switcher can be controlled via Ethernet, RS-232, and IR. A handheld IR remote control is included.

Features

- 4x1 HDMI Switcher
- 4K/UHD capability @ 60 Hz with 4:4:4 chroma sampling, plus support for HDR formats
- HDCP 2.2 compliant
- Automatic input selection using hot plug detect and video detection technology
- EDID management
- Delivers return audio from a TV to an optical digital audio output
- HDMI audio de-embedding
- Easy, GUI-based configuration using integrated web server
- TCP/IP, RS-232, and IR control
- Multichannel audio compliant
- Front panel input selection status LEDs
- Award-winning 10 year limited product warranty

Package Contents

1 x AT-JUNO-451
1 x 4-pin captive screw connector
2 x Mounting plates
4 x Rubber feet
4 x Screws
1 x IR remote control
1 x DC 5V power supply
1 x IEC cord
1 x Installation Guide
Panel Description

1. **IR Window**
   Receives IR signals from the included IR remote.

2. **Input Indicators**
   These LED indicators glow solid blue to indicate the active input.

3. **POWER**
   Press this button to power-on or power-off the unit. When powered, the LED backlight will be blue.

4. **INPUT**
   Press and release this button to cycle through each of the inputs.

5. **FW**
   Connect a mini USB cable to this port to update the firmware.

6. **INPUT (1 - 4)**
   Connect an HDR source to each of these HDMI ports.

7. **HDMI OUT**
   Connect an HDMI cable from this port to a display or other sink device. This output supports multichannel audio.

8. **OPTICAL**
   Connect an optical audio cable from this TOSLINK port to an audio output device. This port is part of the Audio Return Channel (ARC): audio from the display is routed upstream, back to the switcher over HDMI, to this port.

9. **RS-232 / IR IN**
   Connect the included 4-pin captive screw block to this port. Refer to **RS-232 / IR Control (page 27)** for wiring information, if necessary.

10. **LAN**
    Connect an Ethernet cable from this port to a Local Area Network (LAN).

11. **DC 5V**
    Connect the included 5 V DC power supply to this power receptacle.
IR Remote Control

The AT-JUNO-451 includes an IR remote control unit, allowing the control of the AT-JUNO-451 from a remote location.

1 **On / Off buttons**
   Press the **On** button to power-on the unit. Press the **Off** button to power-off the unit.

2 **Input**
   Press these buttons (1 - 4) to select the desired input.

3 **Mute**
   Press this button to toggle audio muting on the **HDMI OUT** port. The **Output 1** toggle switch, in the web GUI, will also change to reflect the current muting state. Refer to [A/V Settings page (page 34)] for more information.
Installation

Connection Instructions

1. Connect an HD/UHD source to each of the four HDMI inputs (INPUT 1 - INPUT 4).
2. Connect an optical audio cable from the OPTICAL port to a sound bar or other audio output device.
3. Connect an Ethernet cable from the LAN port to the Local Area Network (LAN). Ethernet cables should use EIA/TIA-568B termination.

**IMPORTANT:** Stranded or patch cable is not recommended due to performance issues. Shielded cables are strongly recommended to minimize signal noise and interference.

4. Connect the included four-pin captive screw connector to the RS-232 / IR IN port. Refer to RS-232 / IR Control (page 27) for more information.
5. Connect the included 5 V DC power supply to the DC 5V power receptacle.
6. Connect the power supply to an available electrical outlet.

Connection Diagram
IP Configuration

The AT-JUNO-451 is shipped with DHCP enabled. Once connected to a network, the DHCP server (if available), will automatically assign an IP address to the unit. Use an IP scanner, along with the MAC address on the back of the unit, to identify both the unit and its IP address on the network. If a static IP address is desired, the unit can be switched to static IP mode. Use one of the following procedures to switch between DHCP and static IP mode. The default static IP address of the AT-JUNO-451 is 192.168.1.254.

If the AT-JUNO-451 is unable to detect a DHCP server within 15 seconds, then the unit will set all IP settings to zero.

Setting the IP Mode

1. Make sure the AT-JUNO-451 is powered.
2. Connect an Ethernet cable between the LAN port of the AT-JUNO-451 and the Local Area Network (LAN).
3. Press and hold the INPUT button on the front panel for 20 seconds. Release the INPUT button once the POWER button begins to flash blue and red. The number of flashes will indicate the currently selected IP mode.

<table>
<thead>
<tr>
<th>POWER button flashes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two</td>
<td>Static IP mode</td>
</tr>
<tr>
<td>Four</td>
<td>DHCP mode</td>
</tr>
</tbody>
</table>

Setting the IP Address Using Commands

Use the IPStatic and IPDHCP commands to switch between DHCP and IP mode through RS-232 or Telnet. Refer to API documentation for more information. All commands and their arguments are case-sensitive.

• Setting static IP mode
  1. Connect to the AT-JUNO-451 using RS-232 or Telnet.
  2. At the command line, execute the IPDHCP command using the off argument, as shown.

  IPDHCP off

Execute the IPStatic command. This command requires three arguments: the desired IP address of the AT-JUNO-451, the subnet mask, and the gateway address. All arguments must be entered in dot-decimal notation. The following is an example:

  IPStatic 192.168.1.112 255.255.255.0 192.168.1.1
Installation

- **Setting DHCP mode**
  1. Connect to the AT-JUNO-451 using RS-232 or Telnet.
  2. At the command line, execute the `IPDHCP` command using the `on` argument, as shown. All characters are case-sensitive.

    `IPDHCP on`

    Once DHCP is enabled, the unit will be assigned an IP address by the DHCP server (if present).

Setting the IP Address using the Web GUI

The System page (page 39), in the web GUI, allows the AT-JUNO-451 to use either DHCP or static IP mode. In order to access the web GUI, the IP address of the AT-JUNO-451 must be known. Refer to Introduction to the Web GUI (page 31).

1. Open the desired web browser and enter the IP address of the AT-JUNO-451.
2. Log in, using the required credentials. The factory-default username and password are listed below:

   **Username:** root  
   **Password:** Atlona

3. Click the **System** tab.

   ![IP Address Configuration](image)

   - **IP Mode:** STATIC IP
   - **IP:** 10.0.1.109
   - **Netmask:** 255.255.255.0
   - **Gateway:** 10.0.1.1
   - **Telnet Port:** 23

4. Click the **IP Mode** toggle to switch between the DHCP and **STATIC IP** setting. When set to **STATIC IP**, the IP, Netmask, and Gateway fields can be modified.

5. Click the **Save** button to save the changes.

Displaying the IP Address

Press and hold the **INPUT** button on the front panel for 10 seconds, to display the IP address of the AT-JUNO-451, in the upper-left corner of the connected display.
Basic Operation

**LED Indicators**

The LED indicators on both the front of the unit provide basic information on the current status of the AT-JUNO-451.

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>Blue • Unit is receiving power.</td>
</tr>
<tr>
<td></td>
<td>Off • Unit is not powered. • Press the POWER button to power the unit.</td>
</tr>
<tr>
<td></td>
<td>• Check the power supply and make sure it is securely fastened to the</td>
</tr>
<tr>
<td></td>
<td>locking connector on the rear of the unit.</td>
</tr>
<tr>
<td></td>
<td>• Make sure that the power supply is connected to an available electrical</td>
</tr>
<tr>
<td></td>
<td>outlet and that the outlet is “live” (some outlets are controlled by a</td>
</tr>
<tr>
<td></td>
<td>wall switch).</td>
</tr>
<tr>
<td>INPUT</td>
<td>Blue • The input is the currently selected (active) input.</td>
</tr>
<tr>
<td></td>
<td>Off • The input is not active.</td>
</tr>
</tbody>
</table>
Basic Operation

Input Switching

Switching between any of the four input ports can be performed either manually or automatically. The following section covers both methods.

Manual Switching

1. Press and release the **INPUT** button on the front panel to cycle between **INPUT 1**, **INPUT 2**, **INPUT 3**, and **INPUT 4** HDMI inputs. The **INPUT 1** is the factory-default setting.

After the **INPUT** button is pressed, the INPUT LED indicator will advance to the next input, in sequence. In this example, **INPUT 2** is the active input and is indicated by the **INPUT 2** LED indicator on the front panel.

2. Press the **INPUT** button again to switch to **INPUT 3**. Once INPUT 4 is selected, and the **INPUT** button is pressed again, the unit will return to **INPUT 1**.

Manual input switching can also be performed under the **A/V Settings page** (page 34) of the web GUI, by clicking the **Input Selection** drop-down list and selecting the desired input. In addition, the x1AVx1 command can also be used. Refer to the **Application Programmer's Interface** for more information.

**NOTE:** The AT-JUNO-451 retains the currently selected input, even after the unit is powered-off then powered-on.
Auto Switching

Auto-switching can also be used to automatically select an input. Auto-switch is enabled by default and must be enabled for this feature to work. When auto-switching is enabled, the AT-JUNO-451 will automatically switch inputs, based on the presence of an input signal.

1. Enable auto-switching by using one of the following methods.

   **Using the web GUI**
   
   a. Login to the web GUI and access the A/V Settings page (page 34).
   
   b. Click the **Auto Switch mode** toggle switch to the **ON** position (if not already in the ON position). This is the default setting.

   ![Input Selection](image)

   ![Auto Switch](image)

   ![HDCP Settings](image)

2. Connect a source to any of the four input ports on the rear panel. The AT-JUNO-451 will automatically switch to the port with the connected source. The following rules apply to auto-switching.

   - If a source is disconnected, then the AT-JUNO-451 will fallback to a port with an active source.
   - If all sources are disconnected, then the AT-JUNO-451 will retain the port of the the last-connected source.

   **NOTE:** The AT-JUNO-451 retains the currently selected input, even after the unit is powered-off then powered-on.
HDCP Settings

Normally, if a source is transmitting HDCP content to a display that is not HDCP-compatible, then the resulting image on the display will result in “snow”, image flickering, or no picture.

For example, in the illustration below, a laptop source is connected to the AT-JUNO-451. A non-compliant display is connected to the AT-JUNO-451 using an HDMI cable.

By default, the laptop may transmit HDCP content. However, when connected to a display that does not support HDCP, the laptop must be instructed to send non-HDCP content, in order for the content to be displayed.

1. Open the desired web browser and enter the IP address of the AT-JUNO-451.
2. Log in as the admin user with the required credentials. The factory-default username and password for the admin user are listed below:
   
   Username: root  
   Password: Atlona

3. Click A/V Settings in the menu bar.
4. Click the Input 1 toggle switch, under HDCP Settings, and set it to the OFF position. This will instruct the source device to send non-HDCP content, if possible.

**NOTE:** Not all source devices are capable of transmitting non-HDCP content. For example, Sony PlayStation® gaming consoles and Mac® computers always transmit HDCP-encrypted content.
Controlling Audio

The AT-JUNO-451 provides complete control over audio muting for both the HDMI OUT and OPTICAL outputs.

**HDMI Output Muting**
1. Open the desired web browser and enter the IP address of the AT-JUNO-451.
2. Log in as the **admin** user with the required credentials. The factory-default username and password for the **admin** user are listed below:
   - Username: root
   - Password: Atlona
3. Click **A/V Settings** in the menu bar.
4. Locate the **Audio** section.
5. Click the **Output 1** toggle switch to the **OFF** position. When set to the **OFF** position, the audio on the **HDMI OUT** port will be muted. To re-enable the audio for the **HDMI OUT** output, set the toggle switch to the **ON** position.

**Optical Output Muting**
1. Open the desired web browser and enter the IP address of the AT-JUNO-451.
2. Log in as the **admin** user with the required credentials. The factory-default username and password for the **admin** user are listed below:
   - Username: root
   - Password: Atlona
3. Click **A/V Settings** in the menu bar.
4. Locate the **Audio** section.
5. Click the **Toslink** toggle switch to the **OFF** position. When set to the **OFF** position, the audio on the **OPTICAL** port will be muted. To re-enable the audio for the **OPTICAL** output, set the toggle switch to the **ON** position.

Using the Audio Return Channel (ARC)

The Audio Return Channel (ARC) allows audio to be sent upstream, from the display device, to the AT-JUNO-451 over an HDMI cable. The audio is then output over the OPTICAL port. This technique can be used to send audio from a Smart TV, using an app such as Netflix®, to an A/V receiver, providing a multichannel audio experience. The advantage of ARC is that no additional audio cables are required to be connected between the display and the audio output device.

The illustration below, shows an example of how the Audio Return Channel works. The dark green lines identify the audio coming from the display. The instructions on the following page will reference the diagram below.

**NOTE:** When ARC is enabled, the HDMI inputs will be disabled. To re-activate the HDMI inputs, ARC must be disabled.
Basic Operation

1. Connect an HDMI cable from the **HDMI OUT** port on the AT-JUNO-451 to the HDMI input port on the display. This cable is used to carry the audio from the display to the AT-JUNO-451.

2. Connect an optical cable from the **OPTICAL OUT** port on the AT-JUNO-451 to an A/V receiver. The audio from the display is output over the optical cable.

3. Open the desired web browser and enter the IP address of the AT-JUNO-451.

4. Log in as the admin user with the required credentials. The factory-default username and password for the admin user are listed below:
   
   Username: root  
   Password: Atlona

5. Click **A/V Settings** in the menu bar.

6. Locate the **Audio** section.

7. Click the **HDMI input audio breakout** toggle switch to the **ARC** position. The default setting is **SPDIF**.

8. Set both the **Toslink** and **Output 1** toggle switches to the **ON** position.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPDIF</td>
<td>The HDMI output audio will also be output using the <strong>OPTICAL</strong> port on the back of the unit.</td>
</tr>
<tr>
<td>ARC</td>
<td>Audio being returned from the display, over ARC, will be output on the <strong>OPTICAL</strong> port on the AT-JUNO-451. It should be noted that the audio is limited to formats supported by the SPDIF output, such as PCM, Dolby® Digital, and some formats of DTS. Lossless audio formats, such as Dolby TrueHD and DTS-HD Master Audio™, are not supported by ARC or SPDIF.</td>
</tr>
</tbody>
</table>

9. Setup is complete. Audio from the display will now be heard over the A/V receiver. To disable ARC and hear the audio from the HDMI inputs, set the **HDMI input audio breakout** toggle switch to the **SPDIF** position.

Refer to the next page for information on how to toggle between HDMI inputs and ARC, using a control system.
Basic Operation

Switching between ARC and HDMI inputs

Switching between HDMI inputs and ARC should be performed using a control system. The following describes the setup process.

1. Controlling the AT-JUNO-451 can be accomplished through either IP or RS-232.
   - If using RS-232, refer to RS-232 / IR Control (page 27) for more information.
   - If controlling over IP, connect an Ethernet cable from the control system to the LAN port on the AT-JUNO-451. Refer to the control system user manual for any necessary configuration details.

2. Send the AudioARC command to set the desired operation:

   - AudioARC ARC // enables ARC; only audio from the downstream display is output to the OPTICAL OUT port.
   - AudioARC SPDIF // disables ARC; HDMI inputs are enabled and the embedded HDMI audio is also output to the OPTICAL OUT port.

Refer to the AT-JUNO-451 API manual for a complete listing of commands.
Managing Users

The AT-JUNO-451 allows the admin user to create, edit, and remove additional TCP/IP users. All users have the same level of access to control the AT-JUNO-451. However, only the admin user is allowed to manage other users. Up to three additional users can be created.

Adding Users

1. Open the desired web browser and enter the IP address of the AT-JUNO-451.

2. Log in as the admin user with the required credentials. The factory-default username and password for the admin user are listed below:
   
   Username: root
   Password: Atlona

3. Click the Config tab.

4. Click the Add button, under the Edit column.

5. Enter the desired username and password in the Username&Password Edit dialog box.

6. Click the Save Change button to commit changes or click the Cancel button to return to the Config page without adding the user.

Once created, the new user and the associated password will appear under the All User Login Settings section. To login with the new username, click Logout in the upper-right corner of the screen, then enter the login credentials for the user on the Login page.
Editing / Deleting Users

The username and password of a user can be changed using this method.

1. Open the desired web browser and enter the IP address of the AT-JUNO-451.

2. Log in as the admin user with the required credentials. The factory-default username and password for the admin user are listed below:

   Username: root
   Password: Atlona

   ![AT-JUNO-451 Config](image)

   **Editing Users**
   
   a. Click Config in the menu bar.
   
   b. Click the Edit button next to the user to be changed.
   
   c. Enter the new information for the user in the Username&Password Edit dialog box.
   
   d. Click the Save Change button to commit changes or click the Cancel button to return to the Config page without making changes.

   ![Username&Password Edit](image)

   **Deleting Users**
   
   a. Click the Remove button next to the user to be deleted.
Basic Operation

Resetting to Factory Defaults

The following procedure will reset the AT-JUNO-451 to factory-default settings. The network IP mode will be set to DHCP mode.

Using the Front Panel
1. Make sure the unit is powered.
2. Simultaneously press and hold the POWER and INPUT buttons for more than 15 seconds.
3. Release both buttons.
4. The factory-reset process is complete.

Using the Web GUI
1. Open the desired web browser and enter the IP address of the AT-JUNO-451.
2. Log in as the admin user with the required credentials. The factory-default username and password for the admin user are listed below:
   - Username: root
   - Password: Atlona
3. Click the System tab.
4. Click the Factory Default button.
5. The following message will be displayed at the top of the screen. Click **OK** to continue with the factory-default reset procedure. Click **Cancel** to abort the process.

![Message](image)

6. Once the factory-default process is complete, the web GUI **Login** screen will be displayed.

7. The factory-reset process is complete.
Advanced Operation

RS-232 / IR Control

The AT-JUNO-451 provides an RS-232 / IR port, allowing the unit to be managed using a control system.

RS-232 is a serial data protocol that allows Data Terminal Equipment (DTE) devices, such as a computer or control system, to communicate with Data Communication Equipment (DCE) devices, such as the AT-JUNO-451 or a display. Although IP control is available, RS-232 still plays an integral part of many control systems.

Although the 25-pin D-type connector (DB-25) was defined as the RS-232 standard, it is now commonly implemented in a nine-pin (DE-9) connector package. Each pin is numbered, as shown below.

### Determining the Port Type

Most DTE devices provide a male connector, while DCE devices have a female connector. However, this is not always the case. If the port type is unknown, then a multimeter can be used to determine whether the port is DTE or DCE:

1. Turn on the multimeter and set it to measure DC voltage.
2. Connect the positive and negative leads to pins 3 and 5, respectively.
3. Check the voltage reading:
   - If the voltage is between -3 V DC and -15 V DC, then the device is DTE.
   - Otherwise, it is DCE.

Voltage levels between -3 V and -15 V DC represent a logic “1”. Voltage levels between +3 V and +15 V DC represent a logic “0”.

### Pin Descriptions

#### DTE Pin Descriptions

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>Data Carrier Detect</td>
</tr>
<tr>
<td>2</td>
<td>RxD</td>
<td>Receive Data</td>
</tr>
<tr>
<td>3</td>
<td>TxD</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
<td>Data Terminal Ready</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground (Signal)</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>Data Set Ready</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
<td>Request to Send</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
<td>Clear to Send</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
<td>Ring Indicator</td>
</tr>
</tbody>
</table>

#### DCE Pin Descriptions

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>Data Carrier Detect</td>
</tr>
<tr>
<td>2</td>
<td>TxD</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RxD</td>
<td>Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>DSR</td>
<td>Data Set Ready</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Ground (Signal)</td>
</tr>
<tr>
<td>6</td>
<td>DTR</td>
<td>Data Terminal Ready</td>
</tr>
<tr>
<td>7</td>
<td>CTS</td>
<td>Clear to Send</td>
</tr>
<tr>
<td>8</td>
<td>RTS</td>
<td>Ready to Send</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
<td>Ring Indicator</td>
</tr>
</tbody>
</table>
Advanced Operation

Cable Assembly

When connecting a DTE device to a DCE device, a **straight-through** cable should be used. A straight-through cable is wired in such a way that the pins on one side of the cable are connected to the corresponding pins on the opposite side of the cable, as shown in the table below. However, the AT-JUNO-451 will use only TxD, RxD, and GND signals when communicating with a control system or computer.

### Straight-Through Cable

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Signal</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>DCD</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>RxD</td>
<td>TxD</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>TxD</td>
<td>RxD</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
<td>DSR</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>GND</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>DTR</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
<td>CTS</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
<td>RTS</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>RI</td>
<td>RI</td>
<td>9</td>
</tr>
</tbody>
</table>

1. Identify the DE-9 connector that will be attached to the control system or computer (DCE) equipment.
2. Remove the DE-9 connector at the opposite end of the cable with wire cutters.
3. Remove at least 1” of the cable insulation to expose each of the nine wires.
4. Locate a multimeter and set it to the “continuity” function.
5. Attach one of the leads from the multimeter to pin 2 on the DE-9 connector.
6. Take the other lead and probe each of the wires on the opposite end of the cable. When the wire connected to that pin is detected, the multimeter will emit an audible tone. Once this occurs, identify the current wire, and move it to the side.
7. Repeat step 6 for pin 3 and pin 5 on the DE-9 connector.
8. Group the remaining wires and pull them aside. Electrical tape can be used to secure the wires to the outside of the RS-232 cable.
9. Remove at least 3/16” (5 mm) of insulation from the TxD, RxD, and GND wires.
10. Locate the included 4-pin captive screw block and open each of the terminals by turning the screws counter-clockwise, using a small regular screwdriver.
11. Insert the TxD, RxD, and GND wires into correct terminal, as shown, and tighten the screws to secure each wire. Do not overtighten.
12. Connect the captive screw connector to the **RS-232 / IR IN** port on the AT-JUNO-451.
Advanced Operation

Configuration

1. Launch a web browser and login to the web GUI. Refer to Introduction to the Web GUI (page 31) for more information. The factory-default username and password are listed below:

   Username: root
   Password: Atlona

2. Click RS-232 in the menu bar.

3. Select the proper baud rate, data bit, parity, and stop bit settings. These settings must correspond with the control system RS-232 settings.

   ![RS-232 Parameter Setting](image)

   RS-232 Parameter Setting
   
   Console
   
   Baud rate: 115200
   Data bit: 8
   Parity: None
   Stop bit: 1

4. Click the Save button to commit changes.
**Advanced Operation**

**IR Control**

The illustration below, shows an example of how electrical IR, from either a control system or using the included IR remote, can be used to control the AT-JUNO-451.

To use electrical IR from a control system, the IR commands from the included remote must be “learned”. The AT-JUNO-451 only supports IR codes from the included IR remote control unit. Third-party IR remotes are not supported.

1. Remove at least 3/16” (5 mm) of insulation from the GND and S wires.
2. Locate the included 4-pin captive screw block and open each of the terminals by turning the screws counterclockwise, using a small regular screwdriver.
3. Insert the GND and S wires into correct terminal, as shown, and tighten the screws to secure each wire. Do not overtighten.
4. Connect the captive screw connector to the **RS-232 / IR IN** port on the AT-JUNO-451.
5. Connect the GND and S wires to the control system or to the AT-VCC-IR-KIT.
The AT-JUNO-451 includes a built-in web GUI. Atlona recommends that the web GUI be used to set up the AT-JUNO-451, as it provides intuitive management of all features.

The AT-JUNO-451 is shipped with DHCP enabled. Once connected to a network, the DHCP server will automatically assign an IP address to the unit. Use an IP scanner to determine the IP address of the AT-JUNO-451. If a static IP address is desired, refer to IP Configuration (page 13). The default static IP address of the AT-JUNO-451 is 192.168.1.254.

1. Launch a web browser.
2. In the address bar, type the IP address of the AT-JUNO-451.
3. The Login page will be displayed.

4. Type root, using lower-case characters, in the Username field.
5. Type Atlona in the Password field. This is the default password. The password field is case-sensitive. When the password is entered, it will be masked. The password can be changed, if desired. Refer to the Config page (page 38) for more information.
6. Click the Submit button or press the ENTER key on the keyboard.
7. The **Info** page will be displayed.

![Web GUI Info Page](image)

8. Click **Logout**, on the far-right side of the menu bar, to log out of the web GUI and return to the **Login** page.

**Menu Bar**

The dark-colored bar, near the top of the screen, is the menu bar. When the mouse is moved over each menu element, it will be highlighted in light orange. Once the desired menu element is highlighted, click the left mouse button to access the settings within the menu.

In this example, moving the mouse over the **A/V Settings** menu item will highlight it. Click the **A/V Settings** menu item to display the **A/V Settings** page.
Model Name
The model SKU of this product.

Software Version
The version of firmware that the AT-JUNO-451 is running. Always make sure to check the AT-JUNO-451 product page, on the Atlona web site, for the latest version of firmware.

On-Time (h-m)
The time elapsed since the unit was last powered-on. Turning the unit “off”, using the PWOFF command, will not reset this field.

Active Input
The currently selected input. The active input can be changed under the A/V Settings page (page 34) or by pressing and releasing the INPUT button on the front panel.

Signal Type
Displays the input resolution of the source device.

Video Format
Displays the video format.

Aspect
Displays the aspect ratio of the input video source.

Color Space
Displays the color space of the input video source.

Color Depth
Displays the color depth of the input video source.
A/V Settings page

Video

Input Selection
Click this drop-down list to select the desired input.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input 1</td>
<td>INPUT 1 (HDBaseT)</td>
</tr>
<tr>
<td>Input 2</td>
<td>INPUT 2</td>
</tr>
<tr>
<td>Input 3</td>
<td>INPUT 3</td>
</tr>
<tr>
<td>Input 4</td>
<td>INPUT 4</td>
</tr>
</tbody>
</table>

Auto Switch
Set the Auto Switch mode toggle to ON to enable auto-switching. When auto-switching is enabled, the switcher will automatically switch to the previous input, if a signal loss is detected on the current input. If a new source is connected, the AT-JUNO-451 will automatically switch to that input. The default setting is ON.

HDCP Settings
Sets the HDCP reporting mode of the specified HDMI port: Input 1 = INPUT 1 (HDBaseT), Input 2 = INPUT 2, Input 3 = INPUT 3, Input 4 = INPUT 4. Some devices will transmit HDCP content if an HDCP-compliant display/sink is detected. Setting this value to OFF, will instruct the source to send non-HDCP content (if possible) to non-HDCP display and/or sink devices. Note that setting this value to OFF will not decrypt HDCP content.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>HDCP content is always transmitted by the source</td>
</tr>
<tr>
<td>OFF</td>
<td>Instructs the source to send non-HDCP content, if possible</td>
</tr>
</tbody>
</table>
The Web GUI

Audio

Output 1
Toggles audio muting on the HDMI OUT port. Set the Output toggle to OFF to disable HDMI audio on the output. The default setting is ON.

HDMI Input audio breakout
Sets the audio source used by the OPTICAL port on the unit. The default setting is SPDIF.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPDIF</td>
<td>The HDMI output audio will also be output using the OPTICAL port on the back of the unit.</td>
</tr>
<tr>
<td>ARC</td>
<td>Audio being returned from the display, over ARC, will be output on the OPTICAL port on the AT-JUNO-451. It should be noted that the audio is limited to formats supported by the SPDIF output, such as PCM, Dolby® Digital, and some formats of DTS. Lossless audio formats, such as Dolby TrueHD and DTS-HD Master Audio™, are not supported by ARC or SPDIF.</td>
</tr>
</tbody>
</table>

Toslink
Click this toggle to enable or disable the OPTICAL port on the back panel. By default, this option is set to OFF (disabled).
RS-232 Parameter Setting
Click each of these drop-down boxes to select the desired baud rate, data bits, parity bit, and stop bit.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>Sets the baud rate. The following options are available: 2400, 9600, 19200, 38400, 56000, 57600, 115200.</td>
</tr>
<tr>
<td>Data bit</td>
<td>Sets the number of data bits used to represent each character of data. The following options are available: 7 or 8.</td>
</tr>
<tr>
<td>Parity</td>
<td>Sets the parity bit, which can be included with each character to detect errors during the transmission of data. The following options are available: None, Odd, or Even.</td>
</tr>
<tr>
<td>Stop bit</td>
<td>Sets the stop bit. Stop bits are sent at the end of each character, allowing the client to detect the end of a character stream. The following options are available: 1 or 2.</td>
</tr>
</tbody>
</table>
EDID page

EDID Settings
Click these drop-down lists to select the desired EDID to be used for each input. Input 1 = INPUT 1, Input 2 = INPUT 2, Input 3 = INPUT 3, Input 4 = INPUT 4. The source device will use the information in the EDID, before sending A/V data to the sink device.

<table>
<thead>
<tr>
<th>EDID listing</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td>1280x800 DVI</td>
</tr>
<tr>
<td>1080P 2CH</td>
<td>1920x1200 DVI</td>
</tr>
<tr>
<td>1080P MCH</td>
<td>3840x2160@60 4:2:0 2CH</td>
</tr>
<tr>
<td>1080P DD</td>
<td>3840x2160@60 4:2:0 MCH</td>
</tr>
<tr>
<td>1080P 3D 2CH</td>
<td>3840x2160@30 4:4:4 2CH</td>
</tr>
<tr>
<td>1080P 3D MCH</td>
<td>3840x2160@30 4:4:4 MCH</td>
</tr>
<tr>
<td>1080P 3D DD</td>
<td>4096x2160@60 4:2:0 2CH</td>
</tr>
<tr>
<td>720P 2CH</td>
<td>4096x2160@60 4:2:0 MCH</td>
</tr>
<tr>
<td>720P DD</td>
<td>3840x2160@60 4:4:4 2CH</td>
</tr>
<tr>
<td>1280x800 2CH</td>
<td>3840x2160@60 4:4:4 MCH</td>
</tr>
<tr>
<td>1366x768 2CH</td>
<td>4K 60 4:2:0 HDR 2CH</td>
</tr>
<tr>
<td>1080P DVI</td>
<td>4K 60 4:2:0 HDR multichannel audio (HD lossless)</td>
</tr>
</tbody>
</table>

EDID Saved
Click this drop-down list to select the memory location to save the downstream EDID. Eight memory locations are available. Once an EDID is saved to a memory location, it can be access from the EDID Settings drop-down lists.
### Old Username
This field cannot be changed. “root” is the administrator user.

### Old Password
Enter the current password for the “root” username in this field. The default password is “Atlona”.

### New Username
This field cannot be changed.

### Save
Click this button to save all changes.

### New Password
Enter the new password for the “root” username in this field.

### Confirm New Password
Verify the new password by retyping it in this field.

### All User Login Settings

- **Username**
  Displays the username.

- **Password**
  Displays the password for the associated username.

- **Edit**
  Click the Add button, in this column, to edit the username and password in the row.

- **Del**
  Click the Remove button to delete the user in the row. This button will only be available if both a username and password have been created.
The Web GUI

**System page**

**Network**

**IP Mode**
Click this toggle to set the IP mode of the AT-JUNO-451. The default setting is DHCP. Available settings: **STATIC IP**, **DHCP**.

**IP**
Enter the IP address of the AT-JUNO-451 in this field. This field will only be available if **IP Mode** is set to **STATIC IP**. The default IP address is 192.168.1.254.

**Netmask**
Enter the subnet mask in this field. This field will only be available if **IP Mode** is set to **STATIC IP**.

**Gateway**
Enter the gateway (router) address in this field. This field will only be available if **IP Mode** is set to **STATIC IP**.

**Telnet Port**
Enter the Telnet listening port in this field.

**Telnet Login Mode**
Click this toggle to set the login mode to either **ON** or **OFF**. If this feature is set to **ON**, then the AT-JUNO-451 will prompt for both the username and password at the start of a Telnet session. Use the same credentials as the web GUI.

**Telnet Timeout**
Click this drop-down list to select the timeout interval, in seconds, before the Telnet connection is automatically closed after no activity. Range: 1 to 3600 (seconds).

**Broadcast**
By default, broadcast mode is set to **ON**. When set to **ON**, any system changes will be announced over TCP/IP connections. To separate control between the web GUI and Telnet, set this feature to **OFF**. Read queries, such as **IPCFG** and **Type** commands, are not announced and will only return information to the requester.
System

Power
Under normal operation conditions, this toggle is set to ON. Click this toggle to OFF, to turn the AT-JUNO-451 “off”. When “off”, the POWER LED indicator on the front panel will turn red. The PWOFF and PWON commands can also be used to control the power state.

Reset to Default
Click the Factory Default button to set the AT-JUNO-451 to factory-default settings.

Firmware Update
Click the Choose File button to select the firmware file, when upgrading the firmware on the AT-JUNO-451. Once the firmware file is selected, click the Update button. Refer to Updating the Firmware (page 41) for more information.
Updating the Firmware

Updating the firmware can be completed using either the USB interface or the web GUI. Atlona recommends using the web GUI for updating the firmware. However, if a network connection is not available, the AT-JUNO-451 firmware can be updated using a USB-A to USB mini-B cable.

Using the Web GUI

Requirements:

- AT-JUNO-451
- Firmware file
- Computer running Microsoft Windows

1. Connect an Ethernet cable from the computer, containing the firmware, to the same network where the AT-JUNO-451 is connected.
2. Go to the System page (page 39) in the web GUI.
3. Click the Choose File button, under Firmware Update.
4. Browse to the location of the firmware file, select it, and click the Open button.
5. Click the Update button to begin the update process.
6. The following message box will be displayed.
7. Click the OK button to begin the firmware update process. Click the Cancel button to cancel the process.
8. After the firmware update process is complete, the Login screen will be displayed.
Appendix

Using USB

Requirements:

- AT-JUNO-451
- Firmware file
- Computer running Microsoft Windows
- USB-A to USB mini-B cable

1. Disconnect power from the AT-JUNO-451.
2. Press and hold the INPUT button while connecting power to the AT-JUNO-451.
3. Release the INPUT button. The POWER button will glow solid red, indicating that the AT-JUNO-451 is in update mode.
4. Connect the USB-A to USB mini-B cable between the PC and the firmware port on the AT-JUNO-451. The unit will be powered by the USB cable.
5. The USB UPDATE folder will be displayed.

If this folder is not displayed, automatically, select the USB UPDATE drive from Windows Explorer.

7. Delete all files from the USB UPDATE drive, if any are present.
8. Drag-and-drop the firmware file to the drive. During the firmware update procedure, the POWER button will flash.
9. After the file has been copied, disconnect the USB cable from both the computer and the AT-JUNO-451.
10. The firmware update process is complete.
## Default Settings

The following tables list the factory-default settings for the AT-JUNO-451.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A/V Settings</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Video</strong></td>
<td></td>
</tr>
<tr>
<td>Input Selection</td>
<td>Input 1</td>
</tr>
<tr>
<td>Auto Switch</td>
<td>ON</td>
</tr>
<tr>
<td><strong>HDCP Settings</strong></td>
<td></td>
</tr>
<tr>
<td>Input 1</td>
<td>ON</td>
</tr>
<tr>
<td>Input 2</td>
<td>ON</td>
</tr>
<tr>
<td>Input 3</td>
<td>ON</td>
</tr>
<tr>
<td>Input 4</td>
<td>ON</td>
</tr>
<tr>
<td><strong>Audio</strong></td>
<td></td>
</tr>
<tr>
<td>Output 1</td>
<td>ON</td>
</tr>
<tr>
<td>HDMI input audio breakout</td>
<td>SPDIF</td>
</tr>
<tr>
<td>Toslink</td>
<td>ON</td>
</tr>
<tr>
<td><strong>RS-232</strong></td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td>115200</td>
</tr>
<tr>
<td>Data bit</td>
<td>8</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Stop bit</td>
<td>1</td>
</tr>
<tr>
<td><strong>EDID</strong></td>
<td></td>
</tr>
<tr>
<td><strong>EDID Settings</strong></td>
<td></td>
</tr>
<tr>
<td>Input 1</td>
<td>Default</td>
</tr>
<tr>
<td>Input 2</td>
<td>Default</td>
</tr>
<tr>
<td>Input 3</td>
<td>Default</td>
</tr>
<tr>
<td>Input 4</td>
<td>Default</td>
</tr>
<tr>
<td><strong>EDID Saved</strong></td>
<td>---</td>
</tr>
<tr>
<td>Output 1</td>
<td></td>
</tr>
<tr>
<td><strong>Config</strong></td>
<td></td>
</tr>
<tr>
<td>Username (default)</td>
<td>root</td>
</tr>
<tr>
<td>Password (default)</td>
<td>Atlona</td>
</tr>
<tr>
<td><strong>System</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td></td>
</tr>
<tr>
<td>IP Mode</td>
<td>DHCP</td>
</tr>
<tr>
<td>Static IP Address (default)</td>
<td>192.168.1.254</td>
</tr>
<tr>
<td>Netmask</td>
<td>255.255.0.0</td>
</tr>
<tr>
<td>Gateway</td>
<td>192.168.1.1</td>
</tr>
<tr>
<td>Telnet Port</td>
<td>23</td>
</tr>
<tr>
<td>Telnet Login Mode</td>
<td>OFF</td>
</tr>
<tr>
<td>Telnet Timeout</td>
<td>120</td>
</tr>
<tr>
<td>Broadcast</td>
<td>ON</td>
</tr>
<tr>
<td><strong>System</strong></td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>ON</td>
</tr>
<tr>
<td>Lock</td>
<td>UNLOCK</td>
</tr>
</tbody>
</table>
## Specifications

### Connectors, Controls, and Indicators

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT</strong></td>
<td>4 - Type-A, 19-pin female</td>
</tr>
<tr>
<td><strong>OUTPUT</strong></td>
<td>1 - Type A, 19-pin female</td>
</tr>
<tr>
<td><strong>OPTICAL</strong></td>
<td>1 - TOSLINK™</td>
</tr>
<tr>
<td><strong>RS-232/IR</strong></td>
<td>1 - 5-pin captive screw</td>
</tr>
<tr>
<td><strong>LAN</strong></td>
<td>1 - RJ45</td>
</tr>
<tr>
<td><strong>DC 5V</strong></td>
<td>1 - Barrel connector, 5.5 mm, locking</td>
</tr>
<tr>
<td><strong>FW</strong></td>
<td>1 - Type mini-B, 5-pin female</td>
</tr>
<tr>
<td><strong>INPUT button</strong></td>
<td>1 - momentary, tact-type</td>
</tr>
<tr>
<td><strong>POWER button</strong></td>
<td>1 - momentary, tact-type, backlit power LED</td>
</tr>
<tr>
<td><strong>Input Indicators</strong></td>
<td>4 - LED, blue</td>
</tr>
<tr>
<td><strong>IR window</strong></td>
<td>1 - Round, front panel</td>
</tr>
</tbody>
</table>

### Video

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UHD/HD/SD</strong></td>
<td>4096x2160@24/25/30/50/60Hz, 3840x2160@24/25/30/50/60Hz, 2048x1080p, 1080p@23.98/24/25/29.97/30/50/59.94/60Hz, 1080@50/59.94/60Hz, 720p@50/59.94/60Hz, 576p, 576i, 480p, 480i</td>
</tr>
<tr>
<td><strong>VESA</strong></td>
<td>2560×2048, 2560×1600, 2048×1536, 1920×1200, 1680×1050, 1600×1200, 1600×900, 1440×900, 1400×1050, 1366×768, 1360×768, 1280×1024, 1280×800 1280×768, 1152×768, 1024×768, 800×600, 640×480</td>
</tr>
<tr>
<td><strong>Color Space</strong></td>
<td>YUV, RGB</td>
</tr>
<tr>
<td><strong>Chroma Subsampling</strong></td>
<td>4:4:4, 4:2:2, 4:2:0*</td>
</tr>
<tr>
<td><strong>Color Depth</strong></td>
<td>8-bit, 10-bit, 12-bit</td>
</tr>
<tr>
<td><strong>HDR</strong></td>
<td>HDR10 and Dolby® Vision™ @ 60 Hz</td>
</tr>
</tbody>
</table>

### Audio

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HDMI IN / HDBaseT IN</strong></td>
<td>PCM 2Ch, LPCM 5.1, LPCM 7.1, Dolby® Digital, DTS® 5.1, Dolby Digital Plus™, Dolby TrueHD, DTS-HD Master Audio™, Dolby Atmos®, DTS:X</td>
</tr>
<tr>
<td><strong>Sample Rate</strong></td>
<td>32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz</td>
</tr>
<tr>
<td><strong>Bit Rate</strong></td>
<td>24-bit (max.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Resolution / Distance</strong></th>
<th>4K - Feet</th>
<th>4K - Meters</th>
<th>1080p - Feet</th>
<th>1080p - Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HDMI IN/OUT</strong></td>
<td>15</td>
<td>5</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

### Signal

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum TMDS Clock</td>
<td>600 MHz</td>
</tr>
<tr>
<td>HDBaseT</td>
<td>18 Gbps</td>
</tr>
<tr>
<td>HDMI</td>
<td>2.0</td>
</tr>
<tr>
<td>USB</td>
<td>2.0</td>
</tr>
<tr>
<td>HDCP</td>
<td>2.2</td>
</tr>
<tr>
<td>CEC</td>
<td>1.4</td>
</tr>
</tbody>
</table>

*4096x2160@50/60Hz and 3840x2160@50/60Hz supports 8-bit 4:2:0 chroma subsampling, only.
# Appendix

## Temperature

<table>
<thead>
<tr>
<th></th>
<th>Fahrenheit</th>
<th>Celsius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>32° to 122°</td>
<td>0° to 50°</td>
</tr>
<tr>
<td>Storage</td>
<td>-4° to 140°</td>
<td>-20° to 60°</td>
</tr>
<tr>
<td>Humidity (RH)</td>
<td>20% to 90%, non-condensing</td>
<td></td>
</tr>
</tbody>
</table>

## Power

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>6.6 W</td>
<td></td>
</tr>
<tr>
<td>Idle Consumption</td>
<td>5.9 W</td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td>Input: 100 - 240 V AC, 50/60 Hz, Output: 5 V DC</td>
<td></td>
</tr>
</tbody>
</table>

## Dimensions

<table>
<thead>
<tr>
<th></th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>H x W x D</td>
<td>1.0 x 8.6 x 5.9</td>
<td>26 x 219 x 152</td>
</tr>
</tbody>
</table>

## Weight

<table>
<thead>
<tr>
<th></th>
<th>Pounds</th>
<th>Kilograms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>1.82</td>
<td>0.82</td>
</tr>
</tbody>
</table>

## Certification

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>CE, FCC</td>
</tr>
<tr>
<td>Power Supply</td>
<td>CE, FCC, Level VI, RoHS, cULus, RCM, CCC</td>
</tr>
</tbody>
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