User Guide

HDMI

HAI 100 4K Plus

HDMI Audio Embedder

Extron

68-3110-01 Rev. B
01 22

Safety Instructions

Safety Instructions • English

WARNING: This symbol, ⚠, when used on the product, is intended to alert the user of the presence of uninsulated dangerous voltage within the product's enclosure that may present a risk of electric shock.

ATTENTION: This symbol, ⚠, when used on the product, is intended to alert the user of important operating and maintenance (servicing) instructions in the literature provided with the equipment.

For information on safety guidelines, regulatory compliances, EMI/EMF compatibility, accessibility, and related topics, see the Extron Safety and Regulatory Compliance Guide, part number 68-290-01, on the Extron website, **www.extron.com**.

تعليمات السلامة • العربية

تحذير: هذا الرمز، ⚠، عند استخدامه على المنتج، مخصص لتنبيه المستخدم فيما يتعلق بوجود جهد كهربائي غير معزول على الغلاف الخارجي للمنتج وهو ما قد ينطوي على مخاطر حدوث صدمة كهربائية.

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WARUNG: Dieses Symbol ⚠ auf demProdukt soll den Benutzer darauf aufmerksam machen, dass im Inneren des Gehäuses dieses Produktes gefährliche Spannungen herrschen, die nicht isoliert sind und die einen elektrischen Schlag verursachen können.

VORSICHT: Dieses Symbol ⚠ auf dem Produkt soll dem Benutzer in der im Lieferumfang enthaltenen Dokumentation besonders wichtige Hinweise zur Bedienung und Wartung (Instandhaltung) geben.

Weitere Informationen über die Sicherheitsrichtlinien, Produkthandhabung, EMI/EMF-Kompatibilität, Zugänglichkeit und verwandte Themen finden Sie in den Extron-Richtlinien für Sicherheit und Handhabung (Artikelnummer 68-290-01) auf der Extron-Website, **www.extron.com**.

Instrucciones de seguridad • Español

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ATENCIÓN: Este símbolo, ⚠, cuando se utiliza en el producto, avisa al usuario de la presencia de importantes instrucciones de uso y mantenimiento estas estan incluidas en la documentación proporcionada con el equipo.

Para obtener información sobre directrices de seguridad, cumplimiento de normativas, compatibilidad electromagnética, accesibilidad y temas relacionados, consulte la Guía de cumplimiento de normativas y seguridad de Extron, referencia 68-290-01, en el sitio Web de Extron, **www.extron.com**.

Instructions de sécurité • Français

AVERTISSEMENT : Ce pictogramme, ⚠, lorsqu'il est utilisé sur le produit, signale à l'utilisateur la présence à l'intérieur du boîtier du produit d'une tension électrique dangereuse susceptible de provoquer un choc électrique.

ATTENTION : Ce pictogramme, ⚠, lorsqu'il est utilisé sur le produit, signale à l'utilisateur des instructions d'utilisation ou de maintenance importantes qui se trouvent dans la documentation fournie avec l'équipement.

Pour en savoir plus sur les règles de sécurité, la conformité à la réglementation, la compatibilité EMI/EMF, l'accessibilité, et autres sujets connexes, lisez les informations de sécurité et de conformité Extron, réf. 68-290-01, sur le site Extron, **www.extron.com**.

Istruzioni di sicurezza • Italiano

AVVERTENZA: Il simbolo, ⚠, se usato sul prodotto, serve ad avvertire l'utente della presenza di tensione non isolata pericolosa all'interno del contenitore del prodotto che può costituire un rischio di scosse elettriche.

ATTENTZIONE: Il simbolo, ⚠, se usato sul prodotto, serve ad avvertire l'utente della presenza di importanti istruzioni di funzionamento e manutenzione nella documentazione fornita con l'apparecchio.

Per informazioni su parametri di sicurezza, conformità alle normative, compatibilità EMI/EMF, accessibilità e argomenti simili, fare riferimento alla Guida alla conformità normativa e di sicurezza di Extron, cod. articolo 68-290-01, sul sito web di Extron, **www.extron.com**.

Instrukcje bezpieczeństwa • Polska

OSTRZEŻENIE: Ten symbol, ⚠, gdy używany na produkt, ma na celu poinformować użytkownika o obecności izolowanego i niebezpiecznego napięcia wewnątrz obudowy produktu, który może stanowić zagrożenie porażenia prądem elektrycznym.

UWAGI: Ten symbol, ⚠, gdy używany na produkt, jest przeznaczony do ostrzegania użytkownika ważne operacyjne oraz instrukcje konserwacji (obsługi) w literaturze, wyposażone w sprzęt.

Informacji na temat wytycznych w sprawie bezpieczeństwa, regulacji wzajemnej zgodności, zgodność EMI/EMF, dostępności i Tematy pokrewne, zobacz Extron bezpieczeństwa i regulacyjnego zgodności przewodnik, część numer 68-290-01, na stronie internetowej Extron, **www.extron.com**.

Инструкция по технике безопасности • Русский

ПРЕДУПРЕЖДЕНИЕ: Данный символ, ⚠, если указан на продукте, предупреждает пользователя о наличии неизолированного опасного напряжения внутри корпуса продукта, которое может привести к поражению электрическим током.

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Для получения информации о правилах техники безопасности, соблюдении нормативных требований, электромагнитной совместимости (ЭМП/ЭДС), возможности доступа и других вопросах см. руководство по безопасности и соблюдению нормативных требований Extron на сайте Extron: , **www.extron.com**, номер по каталогу - 68-290-01.

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警告: 产品上的这个标志意在警告用户，该产品机壳内有暴露的危险电压，有触电危险。

注意: 产品上的这个标志意在提示用户，设备随附的用户手册中有重要的操作和维护(维修)说明。

关于我们产品的安全指南、遵循的规范、EMI/EMF 的兼容性、无障碍使用的特性等相关内容，
敬请访问 Extron 网站，**www.extron.com**，参见 Extron 安全规范指南，产品编号 68-290-01。

安全記事 • 繁體中文

警告: 若產品上使用此符號，是為了提醒使用者，產品機殼內存在未隔離的危險電壓，可能會導致觸電之風險。

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安全上のご注意 • 日本語

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安全上のご注意、法規厳守、EMI/EMF適合性、その他の関連項目については、エクストロンのウェブサイト **www.extron.com** より『Extron Safety and Regulatory Compliance Guide』(P/N 68-290-01) をご覧ください。

안전 지침 • 한국어

경고: 이 기호가 제품에 사용될 경우, 제품의 인클로저 내에 있는 접지되지 않은 위험한 전류로 인해 사용자가 감전될 위험이 있음을 경고합니다.

주의: 이 기호가 제품에 사용될 경우, 장비와 함께 제공된 책자에 나와 있는 주요 운영 및 유지보수(정비) 지침을 경고합니다.

안전 가이드라인, 규제 준수, EMI/EMF 호환성, 접근성, 그리고 관련 항목에 대한 자세한 내용은 Extron 웹 사이트(**www.extron.com**)의 Extron 안전 및 규제 준수 안내서, 68-290-01 조항을 참조하십시오.

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FCC Class A Notice

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. The Class A limits provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference. This interference must be corrected at the expense of the user.

Conventions Used in this Guide

Notifications

The following notifications are used in this guide:

ATTENTION:

- Risk of property damage.
- Risque de dommages matériels.

NOTE: A note draws attention to important information.

Software Commands

Commands are written in the fonts shown here:

```
^AR Merge Scene,,Op1 scene 1,1 ^B 51 ^W^C
[01] R 0004 00300 00400 00800 00600 [02] 35 [17] [03]
```

Esc X1 * X17 * X20 * X23 * X21 CE ←

NOTE: For commands and examples of computer or device responses mentioned in this guide, the character "0" is used for the number zero and "O" is the capital letter "o."

Computer responses and directory paths that do not have variables are written in the font shown here:

```
Reply from 208.132.180.48: bytes=32 times=2ms TTL=32
C:\Program Files\Extron
```

Variables are written in slanted form as shown here:

```
ping xxx.xxx.xxx.xxx –t
SOH R Data STX Command ETB ETX
```

Selectable items, such as menu names, menu options, buttons, tabs, and field names are written in the font shown here:

From the **File** menu, select **New**.

Click the **OK** button.

Specifications Availability

Product specifications are available on the Extron website, **www.extron.com**.

Contents

Introduction

This section covers the following topics:

About the HAI 100 4K Plus HDMI Audio Embedder

The Extron HAI 100 4K Plus is an audio embedder that embeds two-channel analog audio, or two-channel or multi-channel S/PDIF digital audio onto the HDMI output signal. The HAI 100 4K Plus includes an HDMI input, analog stereo audio and S/PDIF audio inputs, as well as an HDMI output. It is HDCP compliant and supports data rates up to 18 Gbps. The HAI 100 4K Plus is compatible with video resolutions up to 4K.

It includes several integrator-friendly features such as adjustable gain control for the analog audio input, EDID Minder for simplified EDID management between the input source and the display, plus HDMI input cable equalization and comprehensive LED status display. The compact enclosure size simplifies installation in a variety of applications.

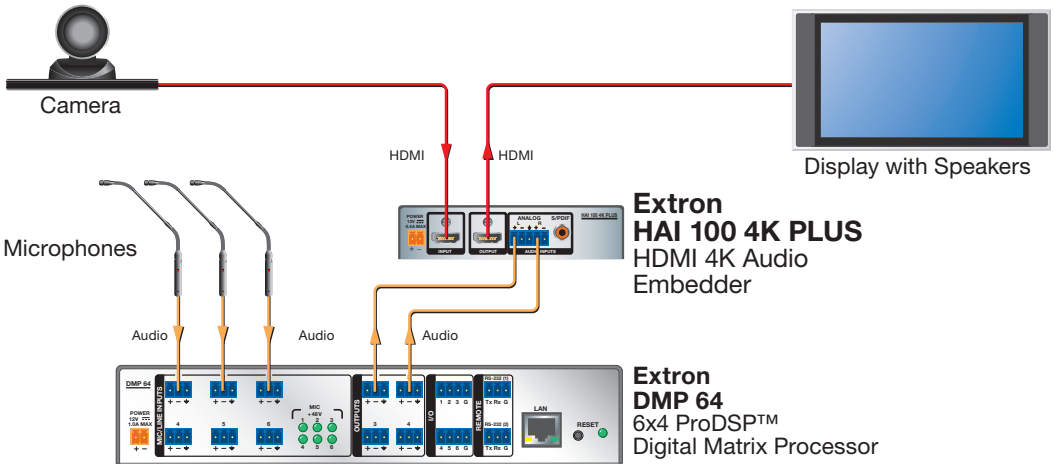

Figure 1. HAI 100 4K Plus Application Diagram

Features

- **Embeds two-channel analog or S/PDIF digital audio onto an HDMI signal** — The HAI 100 4K Plus offers the flexibility to embed separate analog or digital audio signals onto an HDMI signal.
- **Supports two-channel stereo analog audio, or two-channel or multi-channel S/PDIF digital audio** — The HAI 100 4K Plus supports incoming analog stereo audio, two-channel LPCM, or Dolby® or DTS® multi-channel audio.
- **Supports 4K/60 @ 4:4:4** — 4K (4096x2160) @ 60 Hz or UHD (3840 x 2160) @ 60 Hz with 4:4:4 chroma sampling
- **Supported HDMI 2.0b specification features include data rates up to 18 Gbps, HDR, Deep Color up to 12-bit, 3D, and HD lossless audio formats.**
- **HDCP compliant with user-selectable authorization** — Ensures display of content-protected media and interoperability with other HDCP-compliant devices. Allows individual inputs to appear HDCP compliant or non-HDCP compliant to the connected source, which is beneficial if the source automatically encrypts all content when connected to an HDCP-compliant device. Protected material is not passed in non-HDCP mode.
- **EDID Minder automatically manages EDID communication between connected devices** — EDID Minder ensures that the source powers up properly and reliably outputs content for display.
- **Selectable output format** — Allows the output video format and color space to be manually configured.
- **HDMI audio pass-through** — The HAI 100 4K Plus provides audio signal pass-through for all embedded audio formats on the HDMI output. The embedded audio output can also be muted.
- **Automatic HDMI input cable equalization** — Actively conditions incoming HDMI signals to compensate for signal loss when using long cables, low quality cables, or source devices with poor signal output.
- **Comprehensive, real-time status LED indicators for troubleshooting and monitoring** — Front panel LEDs verify the presence of HDMI input and output signals, and HDCP authentication.
- **Front panel USB configuration port**
- **Easy setup and commissioning with Extron PCS (Product Configuration Software)** — Conveniently configure multiple products using a single software application.
- **Rack-mountable 1" (2.5 cm) high, quarter rack width metal enclosure**
- **Includes LockIt HDMI cable lacing brackets**
- **External Extron Everlast power supply included, replacement part #70-1175-01** — Provides worldwide power compatibility with high-demonstrated reliability and low power consumption. This power supply is compatible with the ZipClip 50 Mounting Kit.
- **Extron Everlast Power Supply is covered by a 7-year parts and labor warranty**

Panels and Cabling

This section covers the following:

Front Panel Features

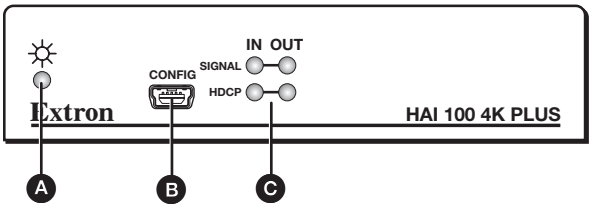

Figure 2. HAI 100 4K Plus Front Panel

A **Power LED** — The LED indicator lights when the unit is receiving power.

B **Config port** — Connect a control PC to this female mini-B USB Config port to update the firmware, configure various functions of the unit, and view the current status of the unit.

C **Input and Output LEDs** — These four LEDs provide the status of the HDMI input and output:

- **Signal** — Input LED lights when the unit is receiving a signal on the HDMI input. Output LED lights when a sink device is connected to the HDMI output.
- **HDCP** — Input LED lights when the input signal is HDCP encrypted. Output LED lights when an HDCP compliant sink device is detected and the output is encrypted.

Rear Panel Features and Cabling

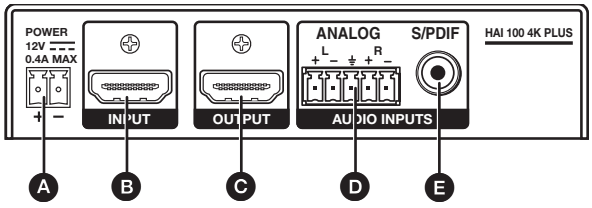

Figure 3. HAI 100 4K Plus Rear Panel

A **Power input** (see the next page)

B **INPUT** (see page 5)

C **OUTPUT** (see page 5)

D **ANALOG** (see page 5)

E **S/PDIF** (see page 5)

Ⓐ **Power input** — Connect the provided power supply to the 3.5 mm, 2-pole captive screw power receptacle (see figure 4).

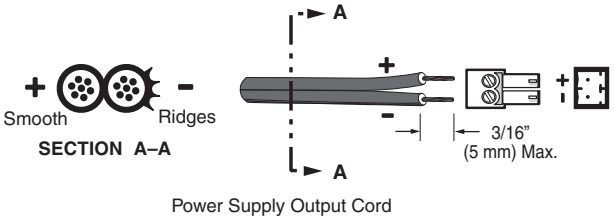

Figure 4. Power Connection

ATTENTION:

- The length of the exposed wires in the stripping process is critical. The ideal length is 3/16 inches (5 mm). Any longer and the exposed wires may touch, causing a short circuit between them. Any shorter and the wires can be easily pulled out even if tightly fastened by the captive screws.
- La longueur des câbles exposés est primordiale lorsque l'on entreprend de les dénuder. La longueur idéale est de 5 mm (3/16 inches). S'ils sont un peu plus longs, les câbles exposés pourraient se toucher et provoquer un court circuit. S'ils sont un peu plus courts, ils pourraient sortir, même s'ils sont attachés par les vis captives.

- Always use a power supply supplied by or specified by Extron. Use of an unauthorized power supply voids all regulatory compliance certification and may cause damage to the supply and the end product.
- Utilisez toujours une source d'alimentation fournie par Extron. L'utilisation d'une source d'alimentation non autorisée annule toute conformité réglementaire et peut endommager la source d'alimentation ainsi que l'unité.

- If not provided with a power supply, this product is intended to be supplied by a power source marked "Class 2" or "LPS" and rated at 12 VDC and a minimum of 0.4 A.
- Si ce produit ne dispose pas de sa propre source d'alimentation électrique, il doit être alimenté par une source d'alimentation de classe 2 ou LPS et paramétré à 12 V et 0.4 A minimum.

- Unless otherwise stated, the AC/DC adapters are not suitable for use in air handling spaces or in wall cavities. The power supply is to be located within the same vicinity as the Extron AV processing equipment in an ordinary location, Pollution Degree 2, secured to the equipment rack within the dedicated closet, podium, or desk.
- Sauf mention contraire, les adaptateurs AC/DC ne sont pas appropriés pour une utilisation dans les espaces d'aération ou dans les cavités murales. La source d'alimentation doit être située à proximité de l'équipement de traitement audiovisuel dans un endroit ordinaire, avec un degré 2 de pollution, fixé à un équipement de rack à l'intérieur d'un placard, d'une estrade, ou d'un bureau.

- The installation must always be in accordance with the applicable provisions of National Electrical Code ANSI/NFPA 70, article 725 and the Canadian Electrical Code part 1, section 16. The power supply shall not be permanently fixed to building structure or similar structure.
- Cette installation doit toujours être en accord avec les mesures qui s'applique au National Electrical Code ANSI/NFPA 70, article 725, et au Canadian Electrical Code, partie 1, section 16. La source d'alimentation ne devra pas être fixée de façon permanente à une structure de bâtiment ou à une structure similaire.

B **HDMI input** — Connect an HDMI input source into this female HDMI type A connector.

> **NOTE:** By default, the EDID stored at the HDMI input is set to 1080p at 60 Hz with 2-channel audio. EDID can be configured using Extron PCS.

C **HDMI output** — Connect an HDMI output device into this female HDMI type A connector.

> **NOTES:**
>
> - The HDMI output passes all audio formats, regardless of configuration. The embedded audio output can also be muted through SIS command.
> - If the HDMI input signal is HDCP encrypted, the HDMI output signal is also encrypted. If the HDMI input signal is not HDCP encrypted, the output signal is not encrypted.
> - If the HDMI input signal is HDCP encrypted and the HDMI output device is not HDCP compliant, the unit outputs a green screen.

D **Analog audio input** — Connect an analog audio device to this 5-pole 3.5 mm captive screw connector (see figure 5). This connector accepts 2-channel stereo balanced or unbalanced audio.

> **NOTE:** By default, the HAI 100 4K Plus is configured to always embed analog audio. This can be configured using Extron PCS or SIS commands (see **Set Input Audio Format command** on page 14).

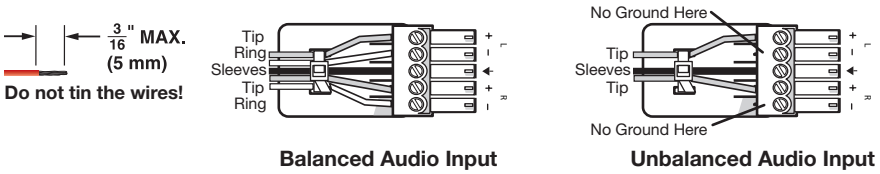

Figure 5. Analog Input Connector Wiring

> **ATTENTION:**
>
> - Connect the sleeve to the ground (Gnd) terminal. Connecting the sleeve to a negative (-) terminal will damage the audio output circuits.
> - Connectez le manchon à la terminaison terre (Gnd). Connecter le manchon à une terminaison négative (-) endommagera les circuits de la sortie audio.

E **S/PDIF audio input** — Connect a S/PDIF audio input device into this female RCA connector. This connector accepts digital S/PDIF audio formats (2-channel LPCM, Dolby Digital, or DTS).

> **NOTE:** The HAI 100 4K Plus can be configured to embed S/PDIF audio using Extron PCS or SIS commands (see **Set Input Audio Format command**).

Configuration

The following HAI 100 4K Plus features can be configured to ensure that the sink devices can handle the signal provided. Use **SIS Commands** (see page 9) to make these configurations. This section provides information on:

- **Audio Insertion**
- **EDID Minder**
- **Output Compatibility Correction**
- **HDCP**

Audio Insertion

The audio insertion setting determines whether audio from the analog audio input or S/PDIF input is inserted, or if the original embedded audio is passed.

The following audio insertion settings can be configured using the **Set Input Audio Format** SIS command on page 14:

- The default setting always embeds analog audio, replacing any existing embedded digital audio.

  NOTE: The input analog audio signal gain can also be adjusted through SIS command, from -18 dB to +24 dB in 1dB steps, prior to being embedded. The default is unity gain (0 dB).

- The Auto setting passes embedded audio when detected on the HDMI input and reverts to analog audio when it is not detected.
- The S/PDIF setting inserts audio from the S/PDIF input on the HDMI signal as is.

EDID Minder

EDID Minder allows a source device connected to the HAI 100 4K Plus input to continuously see the EDID of a sink device, even if the sink is not physically connected.

By default, the EDID is set to 1080p @ 60 Hz with 2-channel audio.

EDID can be configured using PCS (see **Product Configuration Software** on page 17).

Output Compatibility Correction

EDID Minder manages the EDID stored at the HDMI input and presented to the source device.

The HAI 100 4K Plus scans and monitors the EDID of the sink device connected to the HDMI output. It determines the interface (DVI or HDMI) and color depth, and uses that information to adjust the signal so that it is compatible with the output device.

TMDS Output Format

The TMDS output format has three components:

- **Video format** — either DVI or HDMI
- **Color space** — RGB 4:4:4, YUV 4:2:2, or YUV 4:4:4
- **Quantization range** — either full (0-255) or limited (16-235)

To set the TMDS output format, use the TMDS SIS commands shown on **page 13**.

By default, the output format is configured for Auto, which automatically forces RGB 4:4:4 Full. The video format depends on the source signal and the sink capabilities.

NOTE: When the source signal is detected as 4K/UHD @ 60Hz with YUV 4:2:0 (based on AVI infoframe data), it passes unaltered, overriding the TMDS output format setting. If the TMDS output format is changed while the signal is passing, the setting is applied, but with no observable change. The TMDS output format resumes as configured when the source signal changes to a signal other than 4K/UHD @ 60Hz with YUV 4:2:0.

Other TMDS output formats, which can be set using the **TMDS Output Format** SIS command on page 13, include:

- DVI RGB 4:4:4
- HDMI RGB 4:4:4 Full
- HDMI RGB 4:4:4 Limited
- HDMI YUV 4:4:4 Limited
- HDMI YUV 4:2:2 Limited

Color bit depth support

If the incoming signal uses deep color but the sink device does not support it, the color depth is truncated to the next best color depth, as reported in the sink EDID. The options are:

- 12-bit > 10-bit
- 12-bit > 8-bit
- 10-bit > 8-bit

This feature can be set to always force 8-bit, using the **Output Color Bit Depth** SIS command on page 13.

Hot Plug Detect (HPD)

The HAI 100 4K Plus monitors HPD on the HDMI output to determine if a new sink has been connected. If necessary, the signal for that output is modified in response to the EDID of the connected device.

HDCP

Input

The HAI 100 4K Plus input authenticates HDCP with the source device if the source requires HDCP encryption. The authentication process is repeated whenever the stored EDID is changed or updated.

HDCP support can be disabled using the **Input HDCP Authorization** SIS command on page 12.

Output

The output is authenticated and encrypted according to the configured HDCP output mode (see output modes below). If the output requires encryption but the connected sink device cannot be authenticated, the HAI 100 4K Plus outputs a green screen.

HDCP output modes

- **Follow input** — Output is always authenticated but only encrypted when required by input. HDMI authentication is continuous. DVI authentication occurs for a maximum of 10 seconds, then fails. This is the default mode.
- **Always encrypt output** — Output is always authenticated and encrypted. HDMI authentication is continuous. DVI authentication occurs for a maximum of 10 seconds, then fails.
- **Follow Input (with continuous DVI trials)** — Output is always authenticated but only encrypted when required by the input. Both HDMI and DVI authentication are continuous.
- **Always encrypt output (with continuous DVI trials)** — Output is always authenticated and encrypted. Both HDMI and DVI authentication are continuous.

SIS Commands

This section provides information on:

- **Connecting a Control Computer**
- **Simple Instruction Set (SIS) Control**
- **Command and Response Table for SIS Commands**

Connecting a Control Computer

Connect a control PC to the front panel config port using a USB cable (see **Front Panel Features** on page 3). Use a communication utility, such as Extron DataViewer, to send SIS commands and view the responses.

Simple Instruction Set (SIS) Control

Host-to-Device Communications

SIS commands consist of one or more characters per field. No special characters are required to begin or end a command sequence. When a command is valid, the HAE 100 4K Plus device executes the command and sends a response to the host device. All responses from the device to the host end with a carriage return and a line feed (CR/LF = ↵), which signals the end of the response character string. A string is one or more characters.

Error Responses

When the device receives a valid SIS command, it executes the command and sends a response to the host device. If the device is unable to execute the command because the command is invalid or it contains invalid parameters, it returns an error response to the host.

The error response codes and their descriptions are as follows:

`E10` – Invalid command

`E13` – Invalid parameter

Timeout

Pauses of 10 seconds or longer between command ASCII characters result in a timeout. The command operation is aborted with no other indication.

Using the Command and Response Table

The **Command and Response Table for SIS Commands** starts on page 12. Command and response examples are shown throughout the table. Symbols are used throughout the table to represent variables in the command and response fields. Use the ASCII to HEX conversion table on the next page with the command and response table.

Space →

ASCII to Hex Conversion Table															
	20	!	21	"	22	#	23	$	24	%	25	&	26	'	27
(	28	)	29	*	2A	+	2B	,	2C	-	2D	.	2E	/	2F
0	30	1	31	2	32	3	33	4	34	5	35	6	36	7	37
8	38	9	39	:	3A	;	3B	<	3C	=	3D	>	3E	?	3F
@	40	A	41	B	42	C	43	D	44	E	45	F	46	G	47
H	48	I	49	J	4A	K	4B	L	4C	M	4D	N	4E	O	4F
P	50	Q	51	R	52	S	53	T	54	U	55	V	56	W	57
X	58	Y	59	Z	5A	[	5B	\	5C	]	5D	^	5E	_	5F
`	60	a	61	b	62	c	63	d	64	e	65	f	66	g	67
h	68	i	69	j	6A	k	6B	l	6C	m	6D	n	6E	o	6F
p	70	q	71	r	72	s	73	t	74	u	75	v	76	w	77
x	78	y	79	z	7A	{	7B	|	7C	}	7D	~	7E	DEL	7F

Esc 1B CR 0D LF 0A

Symbol definitions

• = Space

↵ = Carriage return with line feed

← = Carriage return with no line feed (used interchangeably with the pipe character, |)

| = Pipe (vertical bar) character (used interchangeably with the carriage return with no line feed character, ←)

Esc = Escape key (used interchangeably with the <**W**> key)

X1 = Embedded input audio format:
0 = auto (pass existing HDMI audio if it exists, otherwise embed analog)
1 = Pass existing digital/embedded audio
2 = Embed analog audio (default)
3 = embed S/PDIF input

X2 = Video mute:
0 = off (default)
1 = video only
2 = video + sync

X3 = **0** = off, disabled or not detected
1 = on, enabled, or detected

X4 = Output HDCP mode (default = 0):
0 = Encrypt as required by input.
Continuous trials for HDMI sinks
Attempt for 10 seconds on DVI sinks and then fail
1 = Always encrypt
Continuous trials for HDMI sinks
Attempt for 10 seconds on DVI sinks and then fail
2 = Encrypt as required by input. Continuous trials for HDMI and DVI sink
3 = Always encrypt. Continuous trials for HDMI and DVI sinks.

X5 = TMDS output format:
0 = Auto (default)
1 = DVI RGB 4:4:4 Full
2 = HDMI RGB 4:4:4 Full
3 = HDMI RGB 4:4:4 Limited
4 = HDMI YUV 4:4:4 Limited
5 = HDMI YUV 4:2:2 Limited

X7 = EDID data as 128 or 256 bytes of HEX data (text representation)

X8 = Native resolution and refresh rate from currently assigned EDID
For example: 1920x1080 @ 60 Hz

X9 = Output color bit depth:
0 = Auto, based on sink EDID (default)
1 = force 8-bit/color

X10 = Verbose mode:
0 = Clear or none
1 = verbose mode (default)
2 = tagged responses for queries
3 = verbose mode and tagged responses for queries

X11 = Device name

NOTE: The name is a text string of up to 24 characters drawn from the alphabet (A-Z), digits (0-9), and minus sign/hyphen (-). No blank or space characters are permitted as part of a name. The first character must a letter, and the last character must not be a minus sign/hyphen. The factory default is HAI-100-4K-PLUS.

X12 = Analog audio gain/attenuation: -18 to +24 in 1dB steps (default = 0)

X13 = Analog audio gain: 0 to 24 in 1dB steps

X14 = Analog audio attenuation: 1 to 18 in 1 dB steps

X15 = Input HDCP status:
0 = No active video source detected
1= Video detected without HDCP (not encrypted)
2 = Video detected with HDCP (encrypted)

X16 = Output HDCP status:
0 = No sink detected
1 = Non-HDCP sink detected (sink is not HDCP compliant)
2 = HDCP sink detected not encrypted
3 = HDCP sink detected and encrypted

X17 = Output 5V mode:
1 = Auto
5 V is enabled when a source with 5 V is present. Otherwise, it is off.
2 = 5 V is always enabled (default).

Command and Response Table for SIS Commands

Command	ASCII Command (host to unit)	Response (unit to host)	Additional Description
Signal status			
Input/Output Signal Status	Esc0LS←	X3•X3↵	Input*Output
		SigX3•X3↵	Verbose mode 2/3
Input HDCP Status	EscIHDCP←	X15↵	
		HdcpIX15↵	Verbose mode 2/3
Output HDCP Status	EscOHDCP←	X16↵	
		HdcpOX16↵	Verbose mode 2/3

KEY:

X3 = Status	0 = off, disabled or not detected 1 = on, enabled, or detected
X15 = Input HDCP status	0 = No video detected 1 = Video detected without HDCP 2 = Video detected with HDCP
X16 = Output HDCP status	0 = No active sink detected 1 = Sink detected, output not encrypted 2 = Sink detected, output encrypted

Video			
Video Mute	X2B	VmtX2↵	
Video Mute Status	B	X2↵ VmtX2↵	Verbose mode 2/3
Input HDCP Authorization	EscEX3HDCP←	HdcpEX3↵	
HDCP Authorization Status	EscEHDCP←	X3↵ HdcpEX3↵	Verbose mode 2/3
Output HDCP Mode	EscSX4HDCP←	HdcpSX4↵	
Output HDCP Mode Status	EscSHDCP←	X4↵ HdcpSX4↵	Verbose mode 2/3

KEY:

X2 = Video mute	0 = off (default) 1 = video only 2 = video + sync
X3 = Status	0 = off, disabled or not detected 1 = on, enabled, or detected
X4 = Output HDCP mode (default = 0)	1 = Encrypt as required by input. Continuous trials for HDMI sinks. Attempt for 10 seconds on DVI sinks and then fail. 2 = Always encrypt. Continuous trials for HDMI sinks. Attempt for 10 seconds on DVI sinks and then fail

Command	ASCII Command (host to unit)	Response (unit to host)	Additional Description
TMDS			
TMDS Output Format	Esc X5 VTPO ←	Vtpo X5 ↵	
TMDS Output Format Status	Esc VTPO ←	X5 ↵ Vtpo X5 ↵	Verbose mode 2/3
Output Color Bit Depth	Esc V X9 BITD ←	BitdV X9 ↵	
Output Color Bit Depth Status	Esc VBITD ←	X9 ↵ BitdV X9 ↵	Verbose mode 2/3
Set Output Hot-Plug Mode (5V)	Esc M X17 HPLG ←	HplgM X17 ↵	
Output Hot-Plug Mode (5V) status	Esc MHPLG ←	X17 ↵ HplgM X17 ↵	Verbose mode 2/3
HDCP Notification	Esc N X3 HDCP ←	HdcpN X3 ↵	
HDCP Notification Status	Esc NHDCP ←	X3 ↵ HdcpN X3 ↵	Verbose mode 2/3

KEY:

X3 = Status	0 = off, disabled or not detected (mutes output to black screen) 1 = on, enabled or detected (displays a green screen)
X5 = Output TMDS format	1 = Auto (default) 2 = DVI RGB 4:4:4 Full 3 = HDMI RGB 4:4:4 Full 4 = HDMI RGB 4:4:4 Limited 5 = HDMI YUV 4:4:4 Limited 6 = HDMI YUV 4:2:2 Limited
X9 = Output color bit depth	0 = Auto, based on sink EDID (default) 1 = force 8-bit/color
X17 = Output 5V mode	1 = Auto (5 V is enabled when a source with 5 V is present; otherwise, it is off.) 2 = 5 V always enabled (default)

Command	ASCII Command (host to unit)	Response (unit to host)	Additional Description
Audio			
Set Input Audio Format	Esc I X1 AFMT ←	AfmtI X1 ↵	X1 = 2 is default
View Input Audio Format	Esc IAFMT ←	X1 ↵ AfmtI X1 ↵	Verbose mode 2/3
Set Analog Input Gain	X12 G	Aud X12 ↵	
Increment Analog Audio Gain	+G	Aud X12 ↵	
Decrement Analog Audio Gain	-G	Aud X12 ↵	
View Analog Audio Gain	G	X12 ↵ Aud X12 ↵	Verbose mode 2/3
Disable TMDS Audio Output	Esc 0AFMT ←	Afmt0 ↵	TMDS audio output (embedded HDMI audio) is disabled
Enable TMDS Audio Output	Esc 1AFMT ←	Afmt1 ↵	TMDS audio output (embedded HDMI audio) is enabled
TMDS Audio Output Status	Esc OAFMT ←	X3 ↵ Afmt0 X3 ↵	Verbose mode 2/3
EDID Minder			
View EDID in HEX format	Esc REDID ←	X7 ↵	HEX data from currently assigned EDID
View EDID Native Rate	Esc NEDID ←	X8 ↵	

KEY:

X1 = Embedded input audio format
- 0 = auto
- 1 = pass existing digital/embedded audio
- 2 = embed analog audio (default)
- 3 = embed S/PDIF input

X12 = Analog audio gain — -18 to +24 in 1dB steps (default = 0)

X3 = Status
- 0 = off, disabled or not detected
- 1 = on, enabled, or detected

X7 = EDID data as 128 or 256 bytes of HEX data (text representation)

X8 = Native resolution and refresh rate from currently assigned EDID. (For example: 1920x1080 @60 Hz)

Command	ASCII Command (host to unit)	Response (unit to host)	Additional Description
Info/Other			
Information (unsolicited)	I	Sig[X3]•[X3]•HdcpI[X15]•HdcpO[X16]↵	Signal presence, input HDCP and output HDCP status
Set Verbose Mode	[Esc][X10]CV←	Vrb[X10]↵	
Verbose Mode Status	[Esc]CV←	[X10]↵ Vrb[X10]↵	Verbose mode 2/3
Set Unit Name	[Esc][X11]CN←	Ipn•[X11]↵	
Set Unit Name to Default	[Esc]•CN←	Ipn•HAI-100-4K-PLUS↵	
View Unit Name	[Esc]CN←	[X11]↵	
Query Part Number	N	60-1682-01↵ Pno•60-1682-01↵	Verbose mode 2/3
Query Model Name	1I	HAI-100-4K-PLUS↵ Inf01*HAI-100-4K-PLUS↵	Verbose mode 2/3
Query Model Description	2I	HDMI Audio Embedder↵ Inf02*HDMI Audio Embedder↵	Verbose mode 2/3
Query Active Signal Information	33I	H_Active*V_Active* V_Freq*Pixel_Clock↵ Inf33*H_Active*V_Active* V_Freq*Pixel_Clock↵	Verbose mode 2/3
Query Firmware Version	Q	*x.xx*↵	
Query Firmware Version with Build	*Q	*x.xx.xxxx*↵	
Reset settings to default	[Esc]ZXXX←	Zpx↵	

KEY:

[X3] = Status
- 0 = off, disabled or not detected
- 1 = on, enabled, or detected

[X15] = Input HDCP status
- 0 = No active video source detected
- 1 = Video detected without HDCP (not encrypted)
- 2 = Video detected with HDCP (encrypted)

[X16] = Output HDCP status
- 0 = No sink detected
- 1 = Non-HDCP sink detected (sink is not HDCP compliant)
- 2 = HDCP sink detected not encrypted
- 3 = HDCP sink detected and encrypted

[X3] = Verbose mode
- 0 = Clear or none
- 1 = verbose mode (default)
- 2 = tagged responses for queries
- 3 = verbose mode and tagged responses for queries

[X11] = Device name

NOTE: The name is a text string of up to 24 characters drawn from the alphabet (A-Z), digits (0-9), and minus sign or hyphen (-). No blank or space characters are permitted as part of a name. The first character must a letter, and the last character must not be a minus sign/hyphen. The factory default is HAI-100-4K-PLUS.

Reference Information

This section contains mounting information and updating firmware methods. Topics in this section include:

- **Mounting**
- **Product Configuration Software**
- **Firmware Download**

Mounting

Tabletop Placement

Attach the four provided rubber feet to the bottom of the unit and place it in any convenient location.

Rack Mounting

UL Guidelines for Rack Mounting

The following Underwriters Laboratories (UL) guidelines are relevant to the safe installation of these products in a rack:

1. **Elevated operating ambient temperature** — If the unit is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient temperature. Therefore, install the equipment in an environment compatible with the maximum ambient temperature (TMA = +122 °F, +50 °C) specified by Extron.
2. **Reduced air flow** — Install the equipment in the rack so that safe operation and adequate air flow is provided to the unit.
3. **Mechanical loading** — Mount the equipment in the rack so that a hazardous condition is not achieved due to uneven mechanical loading.
4. **Circuit overloading** — Connect the equipment to the supply circuit and consider the effect that circuit overloading might have on overcurrent protection and supply wiring. Consider the equipment nameplate ratings when addressing this concern.
5. **Reliable earthing (grounding)** — Maintain reliable grounding of rack-mounted equipment. Pay particular attention to supply connections other than direct connections.

Rack Mounting Procedure

These units can be mounted on an optional rack systems listed on the website (see **www.extron.com**). To mount the unit on a rack shelf, follow the instructions provided with the shelf accessories.

Back of the Rack Mounting Procedure

The HAI 100 4K Plus can be mounted to the rear of a rack using an optional back of rack mounting kit (see **www.extron.com**). The kit allows the product to be vertically mounted to the front or rear rack supports and face either the front or the rear of the rack. To mount the unit, follow the instructions provided with the kit.

Under-desk and Furniture Mounting

Mount the unit under a desk or podium, using an under-desk mounting kit. Follow the instructions provided with the kit.

Product Configuration Software

The Product Configureation Software (PCS) can be used to configure the HAI 100 4K Plus.

Downloading PCS

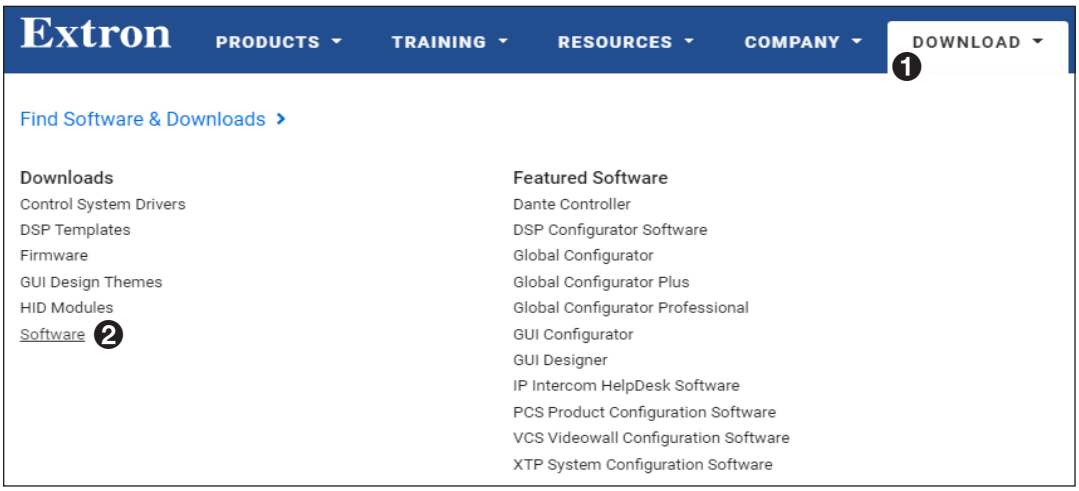

Figure 6. Software on the Extron Website

1. On the Extron website, go to the **`Download`** tab (see figure 6, ❶) and click **`Software`** (❷). A list of available software opens.
2. Navigate to `PCS` (see figure 7, ❶), and click **`Download`** link on the right (see figure 7, ❷).

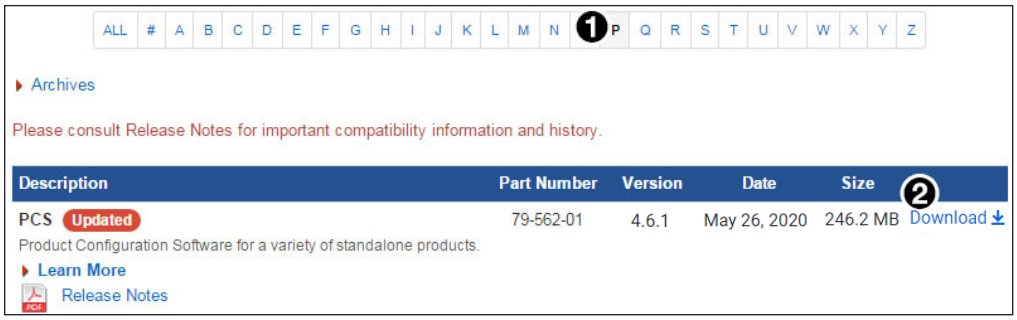

Figure 7. PCS on the Extron Website

3. Submit any required information to start the download.

Using PCS

1. Connect a control PC to the HAI 100 4K Plus front panel Config port (see **figure 2**, Ⓑ, on page 3).
2. Open the PCS software on the control PC. Click **`Start > Programs > Extron Electronics > Extron Product Configuration Software > Extron Product Configuration Software`**.

NOTE: The PCS Help File contains complete information about using the program to configure the HAI 100 4K Plus.

Firmware Download

To download the latest firmware for the HAI 100 4K Plus:

1. On the Extron website, **www.extron.com**, go to the **`Download`** tab and click **`Firmware`** (see figure 8, ❶).

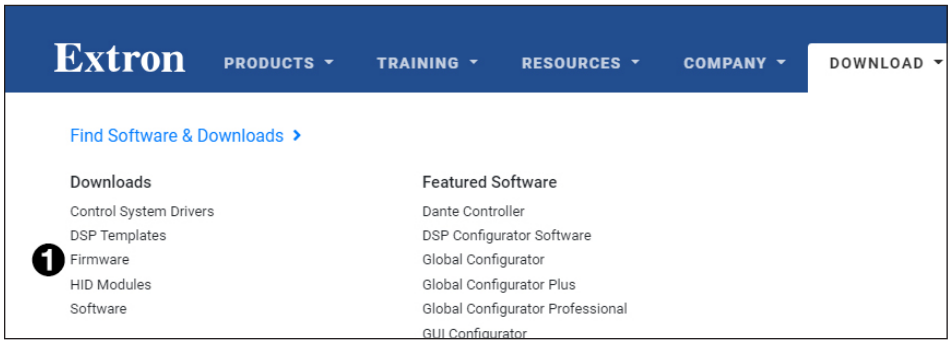

Figure 8. Firmware Link on the Download Tab

2. In the Download Center screen, navigate to the HAI 100 4K Plus (see figure 9, ❶).

NOTE: Your product appears in this list only if a new version of the firmware has been released since the product was first introduced.

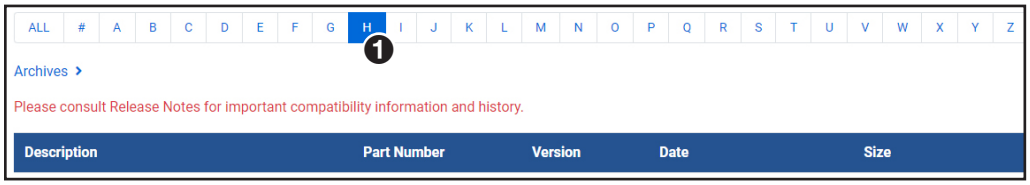

Figure 9. Firmware Download Center

3. Ensure the available firmware version is a later version than the current one on the device, and click the **`Download`** link.

NOTE: The firmware release notes provide details about the changes between different firmware versions. The file can be downloaded from the same page as the firmware.

4. Submit any required information to start the download. Note where the file is saved.

Extron Warranty

Extron warrants this product against defects in materials and workmanship for a period of three years from the date of purchase. In the event of malfunction during the warranty period attributable directly to faulty workmanship and/or materials, Extron will, at its option, repair or replace said products or components, to whatever extent it shall deem necessary to restore said product to proper operating condition, provided that it is returned within the warranty period, with proof of purchase and description of malfunction to:

USA, Canada, South America, and Central America: Extron 1230 South Lewis Street Anaheim, CA 92805 U.S.A.	**Asia:** Extron Asia Pte Ltd 135 Joo Seng Road, #04-01 PM Industrial Bldg. Singapore 368363 Singapore	**Japan:** Extron Japan Kyodo Building, 16 Ichibancho Chiyoda-ku, Tokyo 102-0082 Japan
Europe: Extron Europe Hanzeboulevard 10 3825 PH Amersfoort The Netherlands	**China:** Extron China 686 Ronghua Road Songjiang District Shanghai 201611 China	**Middle East:** Extron Middle East Dubai Airport Free Zone F13, PO Box 293666 United Arab Emirates, Dubai
Africa: Extron South Africa 3rd Floor, South Tower 160 Jan Smuts Avenue Rosebank 2196, South Africa		

This Limited Warranty does not apply if the fault has been caused by misuse, improper handling care, electrical or mechanical abuse, abnormal operating conditions, or if modifications were made to the product that were not authorized by Extron.

NOTE: If a product is defective, please call Extron and ask for an Application Engineer to receive an RA (Return Authorization) number. This will begin the repair process.

USA:	714.491.1500 or 800.633.9876	**Asia**:	65.6383.4400
Europe:	31.33.453.4040 or 800.3987.6673	**Japan**:	81.3.3511.7655
Africa:	27.11.447.6162	**Middle East**:	971.4.299.1800

Units must be returned insured, with shipping charges prepaid. If not insured, you assume the risk of loss or damage during shipment. Returned units must include the serial number and a description of the problem, as well as the name of the person to contact in case there are any questions.

Extron makes no further warranties either expressed or implied with respect to the product and its quality, performance, merchantability, or fitness for any particular use. In no event will Extron be liable for direct, indirect, or consequential damages resulting from any defect in this product even if Extron has been advised of such damage.

Please note that laws vary from state to state and country to country, and that some provisions of this warranty may not apply to you.