Makito X4 Rugged Encoder Installation Guide
Makito X4 Rugged Encoder 1.1

This Installation Guide provides the steps required to install and configure the Makito X4 Rugged Video Encoder (#S-MX4E-R-SDI4-ISR or #S-MX4E-R-SDI4-ISR-UHD) to stream to your compatible decoding device. Please refer to the Makito X4 Encoder User's Guide for detailed configuration and operation information.

We recommend that you familiarize yourself with this guide before installing your encoder.

Use the following guidelines when unsafe conditions exist or when potentially hazardous voltages are present:

- Always use caution and common sense.
- To reduce the risk of electrical shock, do not operate equipment with the cover removed.
- Repairs must be performed by qualified service personnel only.

Improper handling and/or installation practices of sensitive equipment may VOID the warranty.

> ❗ **Caution**
>
> When handling components, or when setting switch options, always use an antistatic wrist strap connected to a grounded equipment frame or chassis. *If a wrist strap is not available, periodically touch an unpainted metal surface on the equipment.* Never use a conductive tool, such as a screwdriver or a paper clip, to set switches.

Waste Electrical and Electronic Equipment (WEEE) Disposal

In accordance with the European Union (EU) WEEE Directive, Haivision products that fall within the scope of the WEEE, are labeled with the above symbol, and customers are encouraged to responsibly recycle their equipment at the time of disposal. Haivision also offers its customers the option of returning Haivision equipment to facilitate its environmentally sound disposal.

For more information, please visit our website at: https://www.haivision.com/environment.

Makito X4 Rugged Encoder Overview

The Makito X4 Rugged video encoder is a ruggedized military-grade appliance designed for deployment in demanding environments such as Intelligence, Surveillance, and Reconnaissance (ISR). The Makito X4 Rugged combines the low latency and performance of Haivision's Makito X4 encoder in a small and ruggedized form-factor with full KLV/CoT metadata support. It supports four video input channels and delivers high-quality, AVC/H.264 and HEVC/H.265 video from analog and digital sources at resolutions up to 1920x1080p60 and 3840x2160p60 (4K UHD).

The Makito X4 Rugged can simultaneously output H.264 and HEVC streams, each at different bit rates per video input. Scaling and frame rate settings can be adjusted on-the-fly.


Applications

The Makito X4 Rugged encoder is designed for integration on both manned and unmanned platforms, including aerial, naval, and ground vehicles. It is a single Line Replaceable Unit (LRU) that will not require major system upgrades to existing platform designs. It has been tested against international standards for ruggedization, including MIL-STD-810G, MIL-STD-461G, MIL-STD-1275E, MIL-STD-704F, and RTCA-DO-160.

Makito X4 Rugged Encoder for Testing Ranges
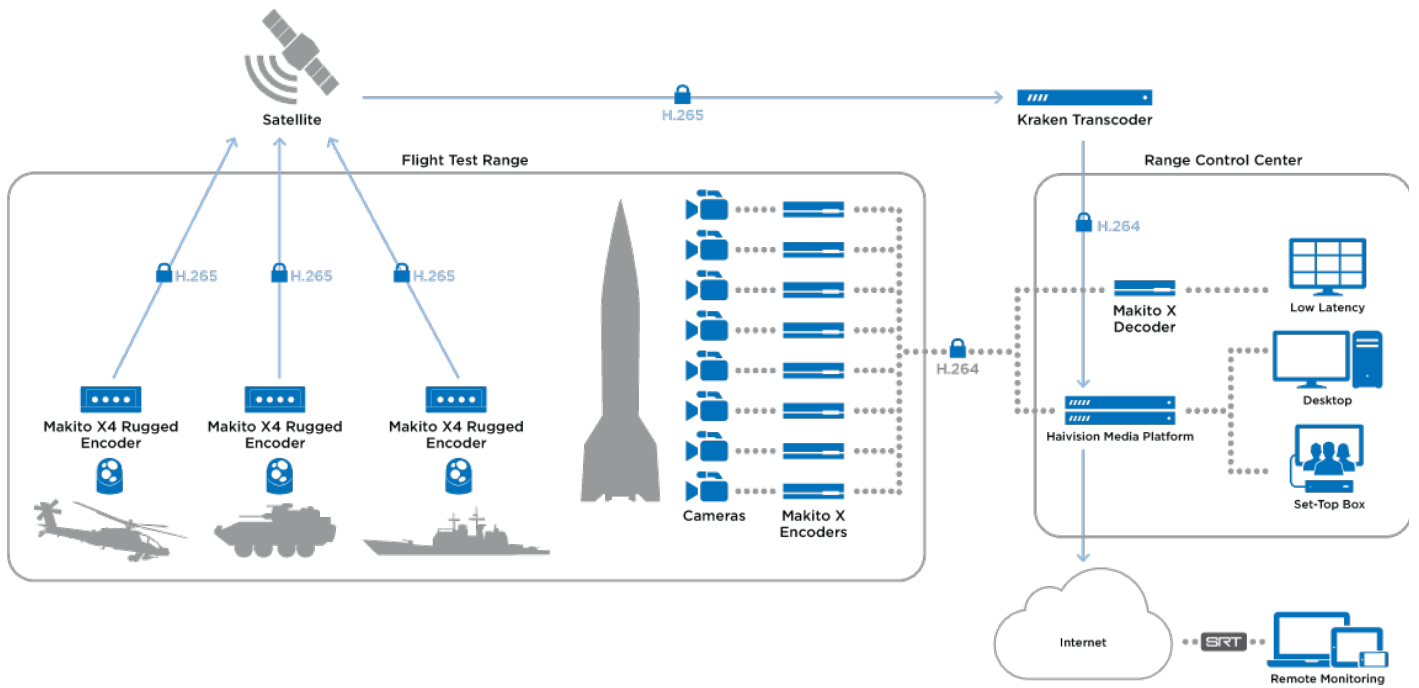
Makito X4 Rugged Encoder for Situational Awareness
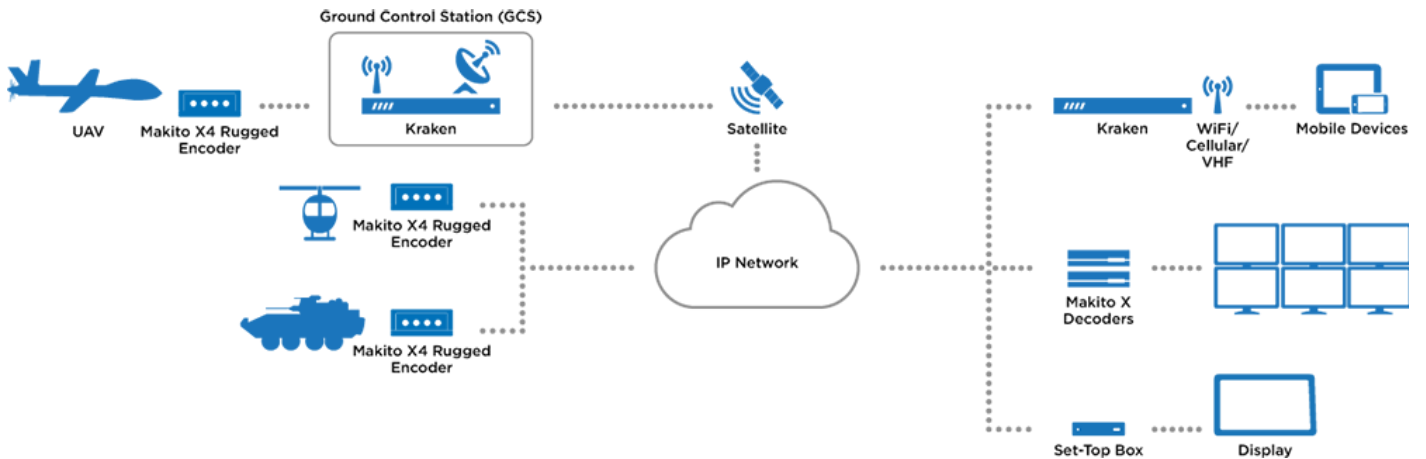
Before You Begin

1. Unpack the box and visually inspect the package contents for any evidence of shipping damage. See the *Important Notice* document in the box for a list of contents.
2. In addition to the contents of the box, you may need to have the following items available:
   - Four #8-32 or M4 screws for mounting (not included)
   - Haivision cabling kits (see Makito X4 Rugged Product Numbers) or your own custom cables (see Makito X4 Rugged Encoder Pinouts)
   - A laptop with Web browser, Telnet client, and video player (e.g., VLC)
3. To view the output from the encoder, make sure you have a decoding device or video player that supports the UDP Transport Stream format.

⚠ **Note**

If the device is to be installed in a remote location (e.g., on a utility pole, or on a mobile platform), we recommend that you follow the instructions in this Installation Guide to perform an initial setup in a "staging" environment, such as a lab or control center. Once the device has been set up and is demonstrated to be operating normally, you can then move it to the remote location.

❗ **Caution**

Before installing the device, please refer to "Safety Guidelines" (below). Only connect the unit to a compatible power source. If an electrical fault occurs, disconnect the unit and contact Haivision Technical Support. Never try to force the connections when setting up the system as this may damage the unit.

❗ **Caution**

Hot surface. Avoid contact. The chassis can achieve a surface temperature 95°C in poorly ventilated environments, and may cause personal injury if touched.
ATTENTION Surface chaude. Eviter le contact. Le châssis peut atteindre une température de surface de 95°C dans des environnements mal ventilés et peut causer des blessures en cas de contact.

❗ **Warning**

This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.
AVERTISSEMENT Ce produit est destiné à être installé dans une zone d'accès restreint. Les zones d'accès restreint sont protégées par un mécanisme spécifique, par une serrure et une clé, ou par tout autre dispositif de sécurité.

❗ **Caution**

The IP67 rating only applies when the connectors are mated.
Otherwise the usage of dust cap connectors (provided by Haivision, shown in the following figures) is required.
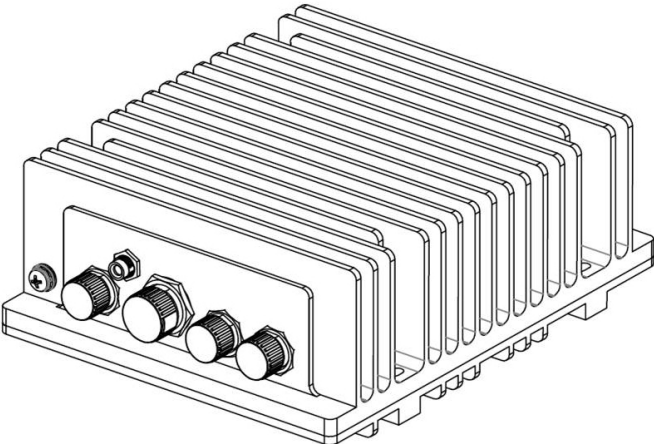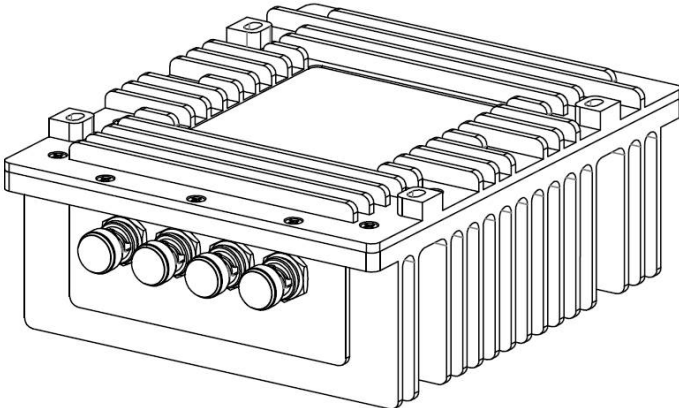
Safety Guidelines

> ⚠️ **Warning**
>
> This product is intended for installation in a restricted area. Limited access areas are protected by a specific mechanism, lock and key or other security device.
> **ATTENTION** Ce produit est destiné à être installé dans une zone d'accès restreint. Les zones d'accès limité sont protégées par un mécanisme spécifique, une serrure et une clé ou tout autre dispositif de sécurité.

> ⚠️ **Warning**
>
> When using the AC/DC power adapter, the power cord is the main disconnect device. Ensure that the socket-outlet is located/installed near the equipment and is easily accessible.
> **ATTENTION** Quand on utilise l'adaptateur AC à DC, le cordon d'alimentation est utilisé comme interrupteur général. La prise de courant doit être située ou installée à proximité de l'équipement et être facile d'accès.

> ⚠️ **Warning**
>
> The installation of the equipment must comply with local and national electrical regulations.
> **ATTENTION** L'installation de l'équipement doit être conforme aux réglementations électriques locales et nationales en vigueur.

> ⚠️ **Warning**
>
> Any power supply shipped with a Haivision Makito X Series encoder or decoder is to be used *only* with that product. Haivision supplied power supplies are *not* for general use.
> **ATTENTION** Tout bloc d'alimentation électrique livré avec un encodeur ou un décodeur de la série Haivision Makito X doit être utilisé uniquement avec ce produit. Les blocs d'alimentation fournis par Haivision ne sont pas destinés à un usage général.

Antistatic Precautions

Electrostatic discharge (ESD) results from the buildup of static electricity and can cause computer components to fail. Electrostatic discharge occurs when a person whose body contains a static buildup touches a computer component.

The equipment contains static-sensitive devices that may be easily damaged, and proper handling and grounding is essential. Use ESD precautionary measures when installing systems or cards, and keep the parts and cards in antistatic packaging when not in use. If possible, use antistatic floor pads and workbench pads.

> ⚠️ **Caution**
>
> When handling components, or when setting switch options, always use an antistatic wrist strap connected to a grounded equipment frame or chassis. *If a wrist strap is not available, periodically touch an unpainted metal surface on the equipment.* Never use a conductive tool, such as a screwdriver or a paper clip, to set switches.

EMC Warnings

Notice with respect to Class A (FCC)

Changes to equipment without the permission of Haivision may result in its failure to comply with the FCC requirements for Class A digital devices. If applicable, your rights to use the equipment may be limited by the FCC rules and you may be able to remedy, at your own expense, any interference with radio or television equipment. 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 that may occur when the equipment is used in a commercial environment. This equipment generates, uses and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Use of this equipment in residential areas may cause harmful interference. If necessary, users will have to resolve these issues at their own expense.

Avis relatif aux appareils de classe A (FCC)

Toute modification de l'équipement sans l'autorisation de Haivision peut entraîner sa nonconformité aux exigences de la FCC concernant les appareils numériques de classe A. Le cas échéant, vos droits d'utilisation de l'équipement seront susceptibles d'être limités par les règlements de la FCC et vous pourrez être amené à remédier, à vos frais, aux éventuelles interférences avec des dispositifs radiophoniques ou télévisuels. Cet équipement a été testé et jugé conforme aux limites d'un périphérique numérique de classe A en vertu de la partie 15 des règlements de la FCC. Ces limites ont pour but de fournir une protection raisonnable contre les interférences nuisibles susceptibles de se produire, lorsque l'équipement est utilisé dans un environnement commercial. Cet équipement génère, utilise et peut émettre de l'énergie radioélectrique. S'il n'est pas installé ni utilisé conformément au manuel d'instructions, il peut provoquer des interférences nuisibles aux communications radio. L'utilisation de cet équipement dans les zones résidentielles est susceptible de causer des interférences nuisibles. Le cas échéant, les utilisateurs devront résoudre ces problèmes à leurs frais.

Notification for Class A (Canada)

This Class A digital apparatus complies with Canadian ICES-003.

Notification pour les appareils de classe A (Canada)

Cet appareil numérique de Classe A est conforme à la norme NMB-003 du Canada.

Safety instructions for Class A for CISPR32

WARNING: This product is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may need to take appropriate measures.

Consigne de sécurité relative à la Classe A pour CISPR32

ATTENTION: Il s'agit d'un produit de Classe A. Dans un environnement domestique, ce produit peut entraîner des perturbations radioélectriques, auquel cas l'utilisateur devra éventuellement prendre des mesures adéquates.

Installing the Makito X4 Rugged Encoder

To install the appliance:

1.
> ⚠ **Caution**
>
> The surface temperature of the chassis can reach 95°C in poorly ventilated environments. We recommend that you fasten the appliance to a metal (cold) plate to increase heat dissipation.

2. Fasten the appliance to its support base with four screws (size 8-32, or M4, not included). Or you can use two stainless steel, harsh-environment cable ties (up to 250 mils wide), which can be passed through slots in the chassis.

4 slots for fastening unit with screws or cable ties
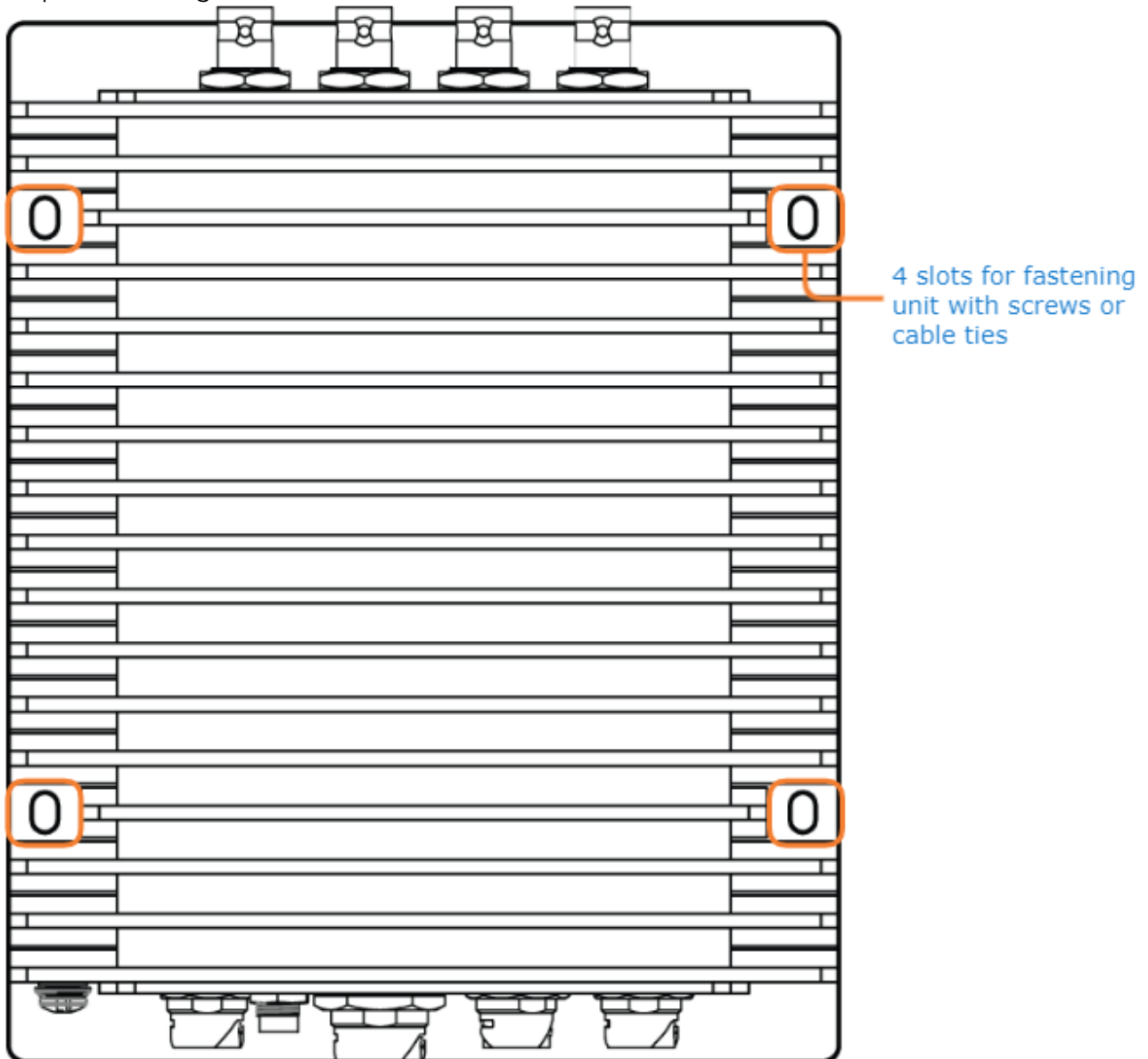
3. Fasten a grounding wire (10 AWG minimum) to the grounding lug using the screw and lock washer provided.

Grounding lug
with M5 thread

POWER

DC IN +28V   AUDIO/SERIAL   NETWORK 1   NETWORK 2

⚠ **Caution**

The chassis must be properly grounded in order to provide protection against lightning strikes and other power surges.

Connecting to the Network and Audio/Video Sources

The Makito X4 Rugged enclosure provides rugged connectors for connecting the encoder's Network interface(s), as well as the Video, Audio, Serial, and Power inputs.

The Makito X4 Rugged encoder supports either one 12G-SDI 4K/UHD video input, or four 3G-SDI inputs, along with three analog composite CVBS (NTSC/PAL/PAL-M) inputs.


> ℹ️ **Note**
>
> Only SDI 1 can support input up to 6/12G-SDI video. All the other inputs support up to 3G-SDI.
> The Serial port is used to ingest KLV/CoT, as a management port or as pass-thru for camera control.
> The Network 1 port is live; Network 2 is for future use.
> The Ethernet and audio/serial breakout cables are shipped as part of the Evaluation Kit (#S-MX4E-R-SDI4-ISR-DK).

To connect the encoder to the network and A/V sources:

1. Remove the protective caps from the encoder's connectors.
2. Connect the encoder's **Network 1** connector to the IP network using the **Ethernet cable**:

I/O Connector for network communications
(Stream output: Web interface)
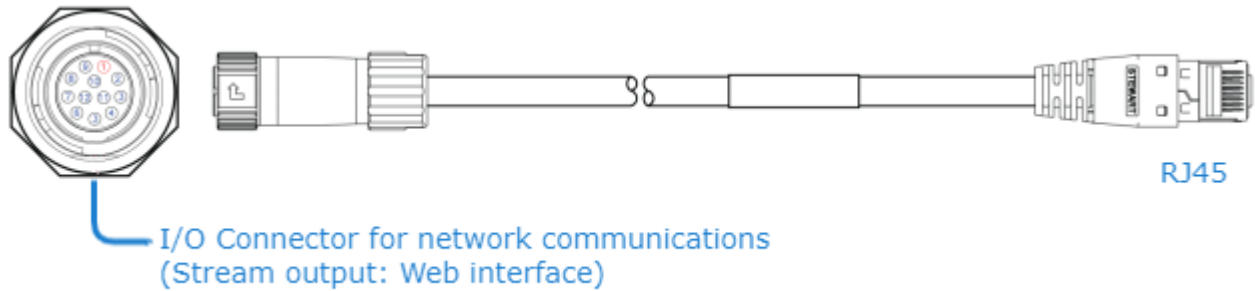
3. (Optional) To configure dual NICs for either streaming or management purposes, connect the encoder's **Network 2** connector to the IP network.
4. Connect one or more of the encoder's **Video** connectors to your video source(s), referring to the above image (front panel, Video Input). The BNC connector(s) are used for SD-SDI (Serial Digital Interface), HD-SDI video, and Composite (CVBS) input signals. It is also a 3G-SDI capable interface supporting 1080p 50/60 fps video @ 3Gbps.

> ⚠ **Note**
>
> The CVBS connectors are used to support legacy Analog NTSC/PAL/PAL-M cameras.

5. (Optional) If you have a KLV or CoT source that uses RS-232 or RS-422, connect the encoder's **Audio/Serial** connector to the metadata source or to the serial port of a computer using the audio/serial breakout cable.
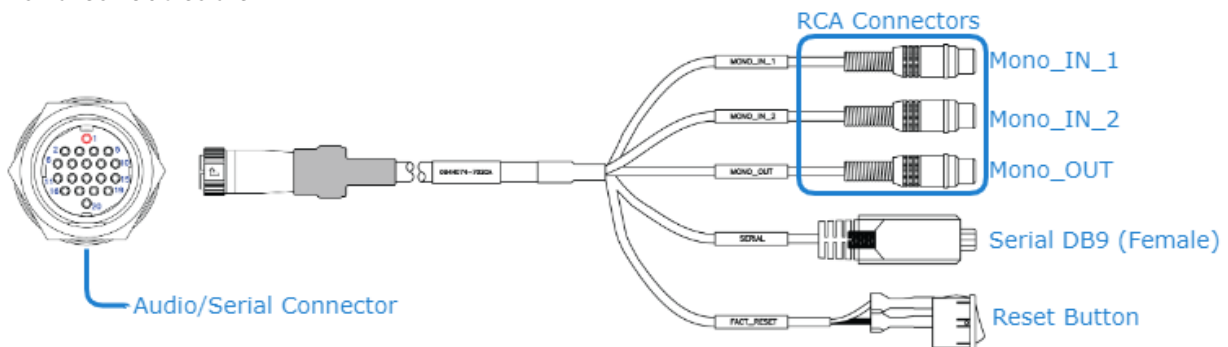
The Serial connector is used to ingest KLV/CoT, as a management port or as pass-thru for camera control.

> ⚠ **Note**
>
> The Reset button provides two options:
> - If you press and hold the button for less than 4 seconds, the system resets and loads the last saved "startup" configuration. If no configuration was previously saved as the startup preset, the default settings prevail.
> - If you press and hold the button for more than 4 seconds, the module performs a complete factory reset. It clears all of the previously configured settings, including IP, streams and encoder configurations.

6. (Optional) To capture analog audio, connect the encoder's **Audio/Serial** connector to your audio source(s) using the the audio/serial breakout cable, shown in the previous step.

Powering up the X4 Rugged Encoder

There is no power switch on the encoder. The power is automatically on when the unit is plugged in.

> ⚠ **Warning**
>
> When using the AC/DC power adapter, the power cord is the main disconnect device. Ensure that the socket-outlet is located/installed near the equipment and is easily accessible.
> **ATTENTION** Quand on utilise l'adaptateur AC à DC, le cordon d'alimentation est utilisé comme interrupteur général. La prise de courant doit être située ou installée à proximité de l'équipement et être facile d'accès.

To power up the encoder:

1. Insert the 4-pin connector of the **power cable** into the power input jack (**DC IN**) at the rear of the encoder. Both power cables are shipped as part of the Evaluation Kit (#S-MX4E-R-SDI4-ISR-DK).

Power Connector (DC IN +28V)   Power Supply Unit (PSU) and AC plug

Power Connector (DC IN +28V)
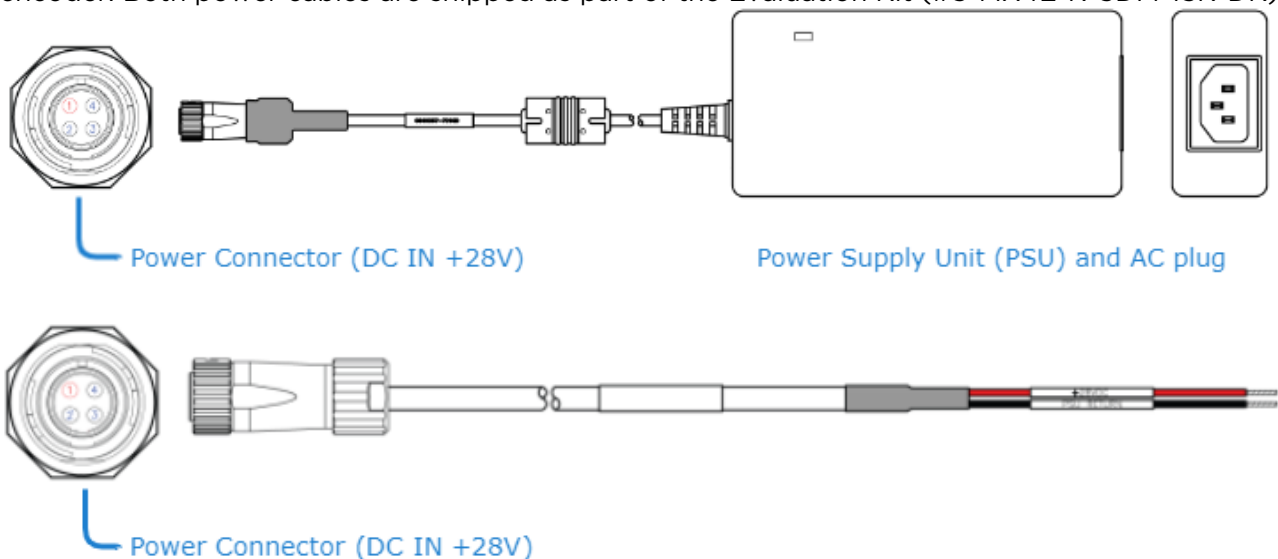
   Make sure the connector is properly inserted and locked to avoid intermittent power problems.
2. Connect the power cable to a 28V power source. (The AC PSU can be used to convert from 120V AC to +24V DC.)

The Status LED next to the video inputs will start blinking green, indicating that the encoder is booting up.

3. Wait until the Status LED stays solid green, indicating that the encoder is ready for operation.

> ⚠ **Note**
>
> The encoder performs Built-in Self Tests (BIST) and Power-On Self Tests (POST) to ensure that the hardware and firmware are operating reliably and correctly. BIST provides a minimal suite of tests that test the various hardware and firmware sub-systems to ensure correct operation. The POST suite of tests (a subset of the BIST suite) are performed every time there is a power-cycle. All BIST/POST configuration, status and test results are available via CLI (serial, Telnet or SSH). For more information, please refer to `bist` (in the *Makito X Encoder User's Guide*, CLI Command Reference).

Related Topics

- For pinout information, see Power Entry Connector.
- To order the PSU, see Makito X4 Rugged Technical Specifications (Product Numbers).

Accessing the Web Interface (X4 Rugged)

1. Open a Web browser of your choice, such as Chrome, Firefox, Safari, or Internet Explorer.
2. Type the IP address for the encoder into the browser's address bar and press Enter.
   The Makito X4 comes pre-configured with the following default settings:

| IP Address	Subnet Mask	Gateway
`10.5.1.2`	`255.255.0.0`	`10.5.0.1`

> ℹ️ **Note**
>
> To access the Web interface, your computer must be in the same IP Address range (subnet). You may have to temporarily change your computer's IP Address to be in the same subnet as the encoder. Only then will you be able to access the encoder and change its IP address, and then afterwards change your computer's IP address back. For details, see Configuring Network Settings in the User's Guide.

3.
> ℹ️ **Note**
>
> The Makito X4 identity certificate and trusted root certificates may be managed from the Web interface (Certificates page) or using the CLI `certificate` command. See Managing Certificates in the User's Guide.

4. Sign in to the Web interface, using the default administrative username and password.
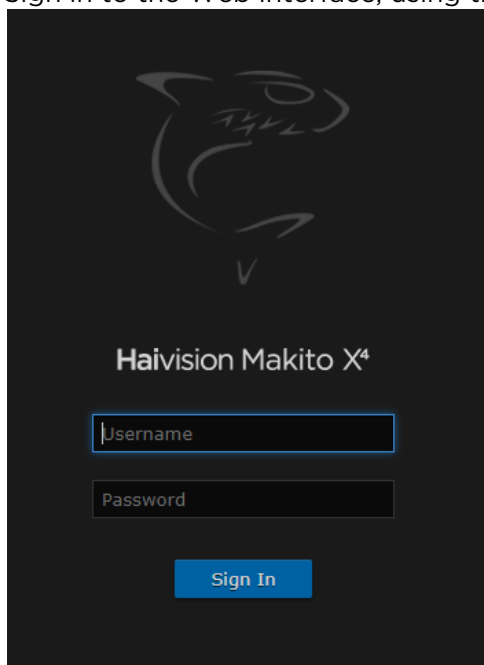
Please refer to the *Important Notice* (postcard included in the box or available from the Download Center on the Haivision Support Portal) for the default sign-in credentials.

> **ⓘ Important**
>
> Makito X Series devices ship from the factory with only the `admin` account enabled. For security reasons, the two default user accounts (`user` and `operator`) are locked at the factory as well as after a factory reset. An administrator must unlock them and change the passwords to use them for the first time.

> **✅ Tip**
>
> For security purposes, be sure to change the default passwords! See Changing Your Password in the User's Guide.

The Web interface opens to the Outputs List View.

Setting Up a Test Stream

Setting up a test stream requires that you have an active video source connected to the Makito X4 Encoder. You will need to configure an encoding instance based on your video source, and then configure an output stream for that encoder. For detailed information, refer to Configuring Video Encoders and Configuring Streaming Outputs (in the User's Guide).
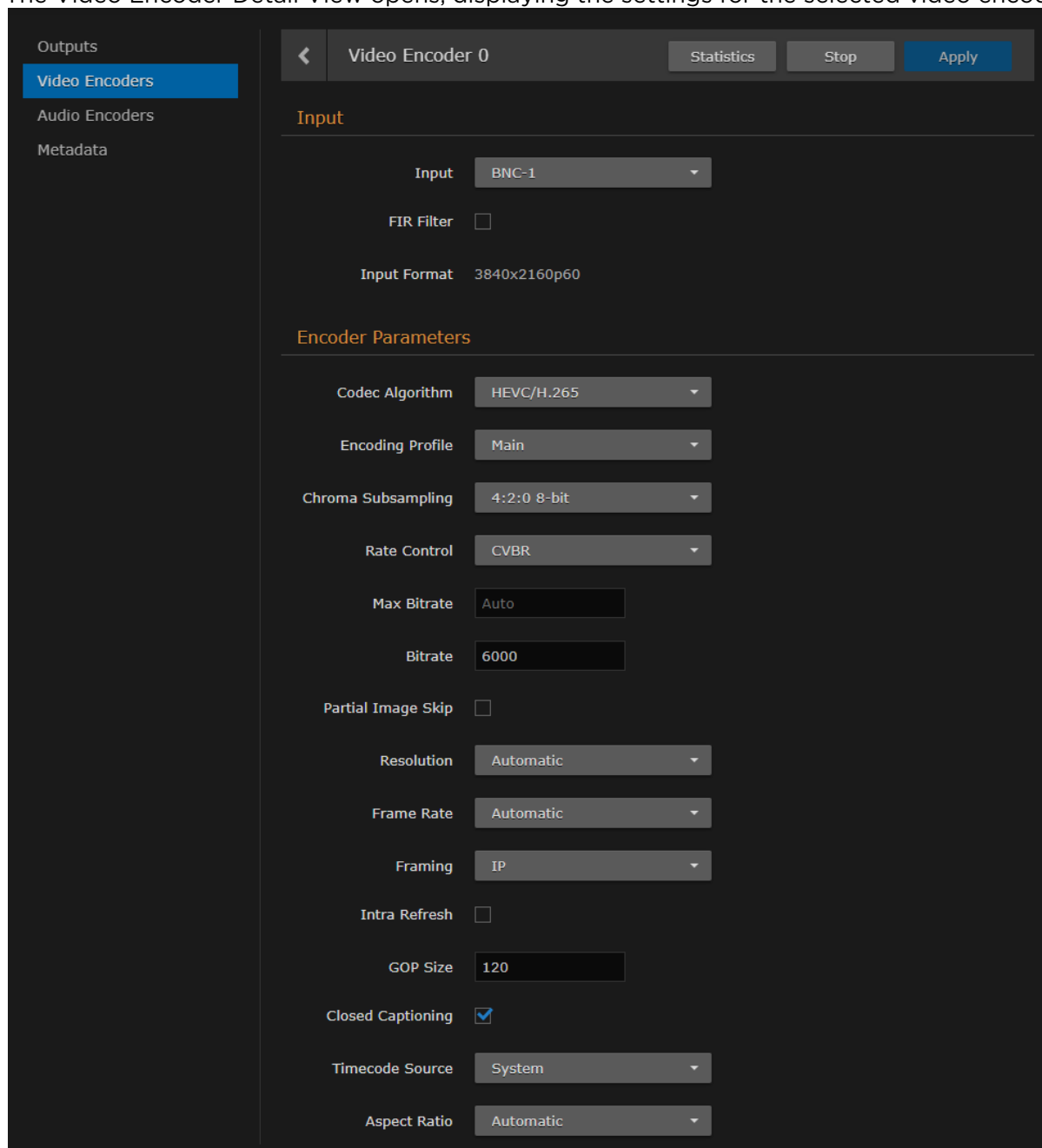
To configure an encoding instance:

1. Click **Video Encoders** on the sidebar.
   The Video Encoders List View opens.
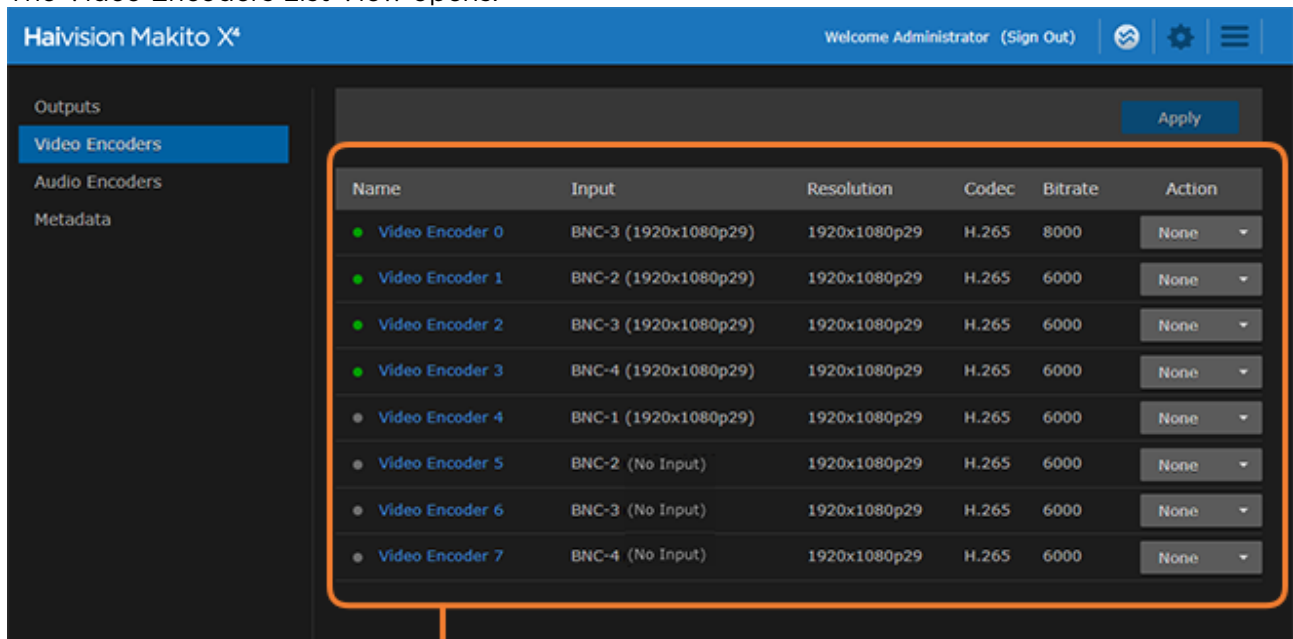
Video Encoders List View/
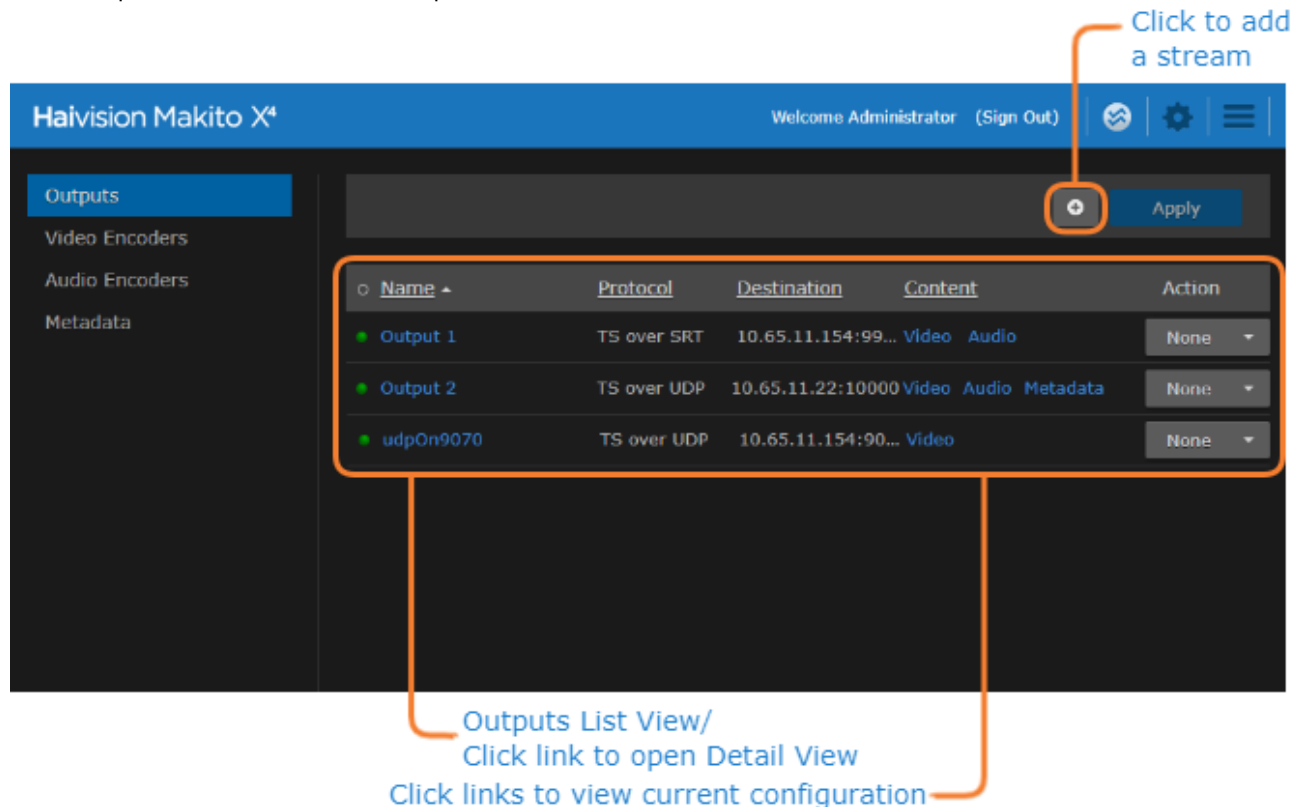Click link to open Detail View

2. Click a link in the table to select the encoder.
   The Video Encoder Detail View opens, displaying the settings for the selected video encoder.

3. To configure the encoder, select or enter the new value(s) in the appropriate fields
   (see Configuring Video Encoders in the User's Guide).
4. Click **Start**, and then click **Apply**.

To configure an output stream:

1. Click **Outputs** on the sidebar.
   The Output Streams List View opens.

Click to add a stream

Haivision Makito X⁴
Welcome Administrator (Sign Out)

Outputs					
Video Encoders					
Audio Encoders					
Metadata					

Apply

Name ▲	Protocol	Destination	Content	Action
● Output 1	TS over SRT	10.65.11.154:99...	Video Audio	None ▼
● Output 2	TS over UDP	10.65.11.22:10000	Video Audio Metadata	None ▼
● udpOn9070	TS over UDP	10.65.11.154:90...	Video	None ▼

Outputs List View/
Click link to open Detail View
Click links to view current configuration

2. To add an output stream, click the ⊕ **Add** button.
   The New Stream page opens.
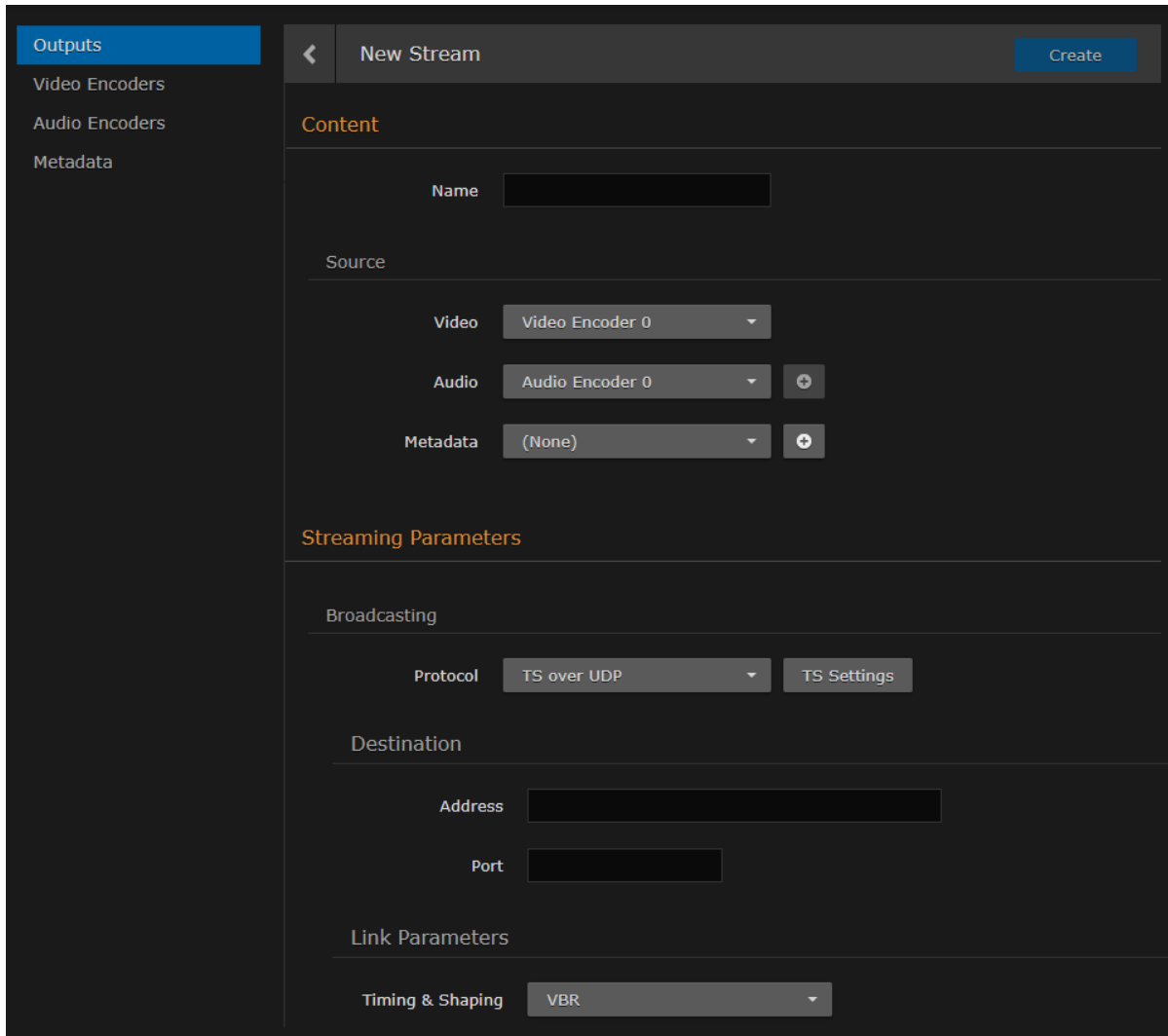
3. Under Content, type a Name for the stream, and under Source, select the encoder you started in **step 4** (above).

4. Under Broadcasting, select **TS over UDP** for the Protocol.

5. Under Destination, type in a valid multicast Address (e.g., `239.192.2.3`) and Port number (e.g., `2000`).

> ⓘ **Note**
>
> The Multicast address range is from `224.0.0.0` to `239.255.255.255` . Multicast addresses from `224.0.0.0` to `224.0.0.255` are reserved for multicast maintenance protocols and should not be used by streaming sessions. We recommend that you use a multicast address from the Organization-Local scope (`239.192.0.0/14`).

6. To add metadata to the stream, select the Metadata source, and (optionally) select the encapsulation type (Data Carriage).
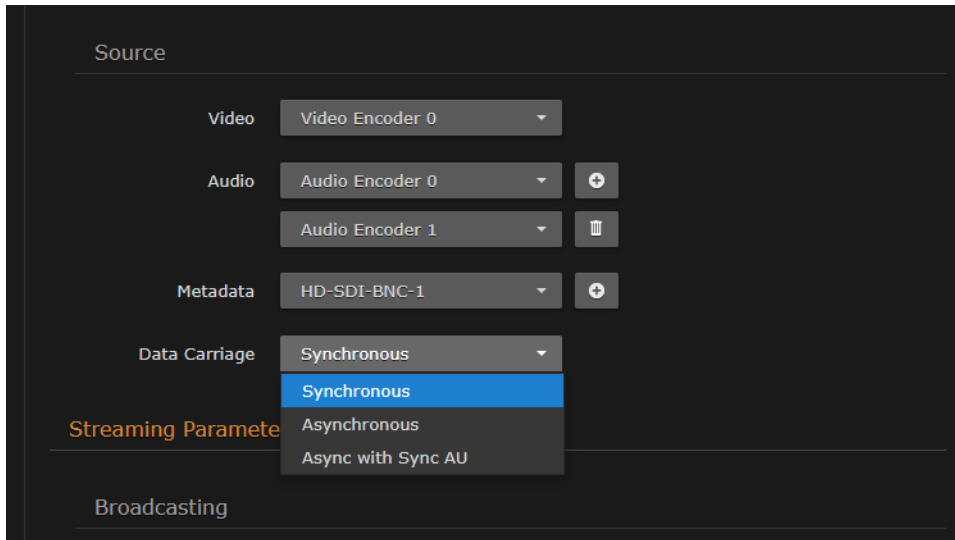
7. To apply your changes and start streaming, click **Apply**.

> **ⓘ Note**
>
> The changes will take effect immediately but will be lost after a reboot. For information on saving configuration settings, refer to Saving and Loading Presets in the User's Guide.

Viewing the Test Stream

- General Guidelines
- Streaming to VLC Player

General Guidelines

1. Make sure your decoding device (or software) supports MPEG Transport Stream format.
2. Turn the device on and connect it to a display (if applicable), or open your video player software (e.g., VLC).
3. Make sure you are on the same network segment as the encoder.
4. Tune your decoding device or software to the multicast address of the test stream coming from the encoder.

Streaming to VLC Player

The following steps show how to validate a video streaming setup using VLC as a video decoder. VLC can be operated on a Windows or Linux machine. The following example uses a Windows machine but all the steps can easily be executed on a Linux machine.

> **ⓘ Note**
>
> Unless otherwise specified, references to the "Makito X Series" or "Makito X" can be taken to include the Makito X, Makito X4, and Makito X1 family of encoders and decoders.

First, configure the encoder. See Setting Up a Test Stream **(in the** Makito X4 Rugged Encoder Installation Guide**).**

Then set up VLC to decode the stream (as shown in the following procedure). This will validate your setup.

1. Connect the PC with VLC on the same network as the Makito X Series Encoder. Note the IP address of the PC.
2. On the Serial connector or through an SSH connection, create a stream from the Makito X encoder to the PC.

   For example: `stream create addr={IP of the pc with VLC} port=2000 videosrc=0`
3. Once the stream is created, you can validate that the encoder has started encoding by executing either of the following commands:

   `"stream all get table"` or `"videnc all get table"`
4. On the PC, open VLC and under the "Media" tab, select *"Open Network Stream...".*
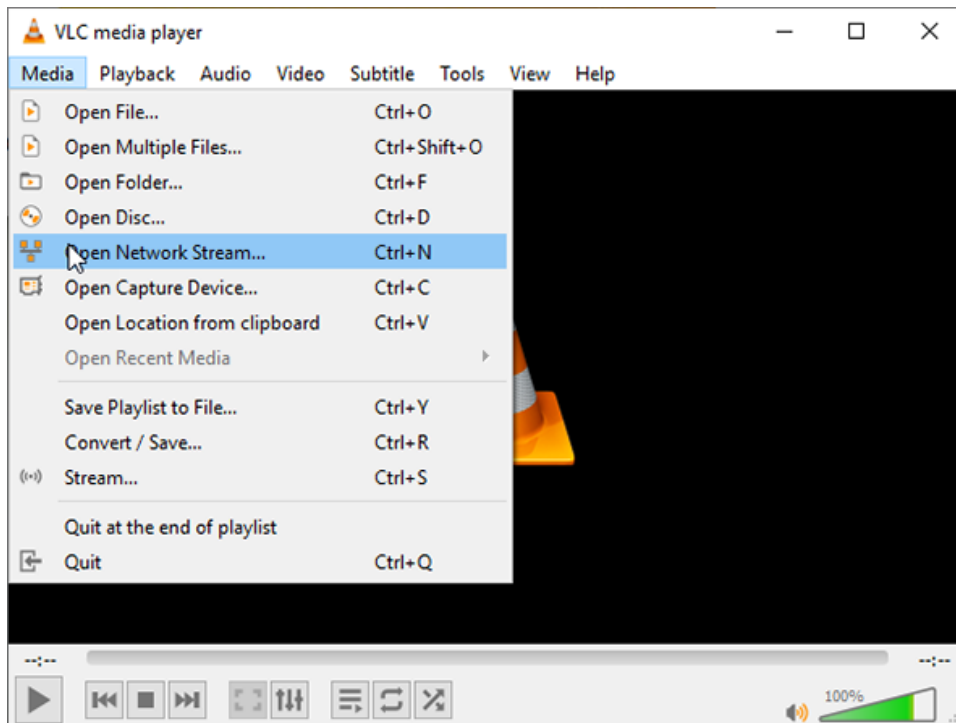
5. Under *"Please enter a network URL:"*, enter `"udp://@:2000"` and click **Play**.

   The stream should start within seconds. In case of failure, replace the "@" by the actual IP address of the PC.
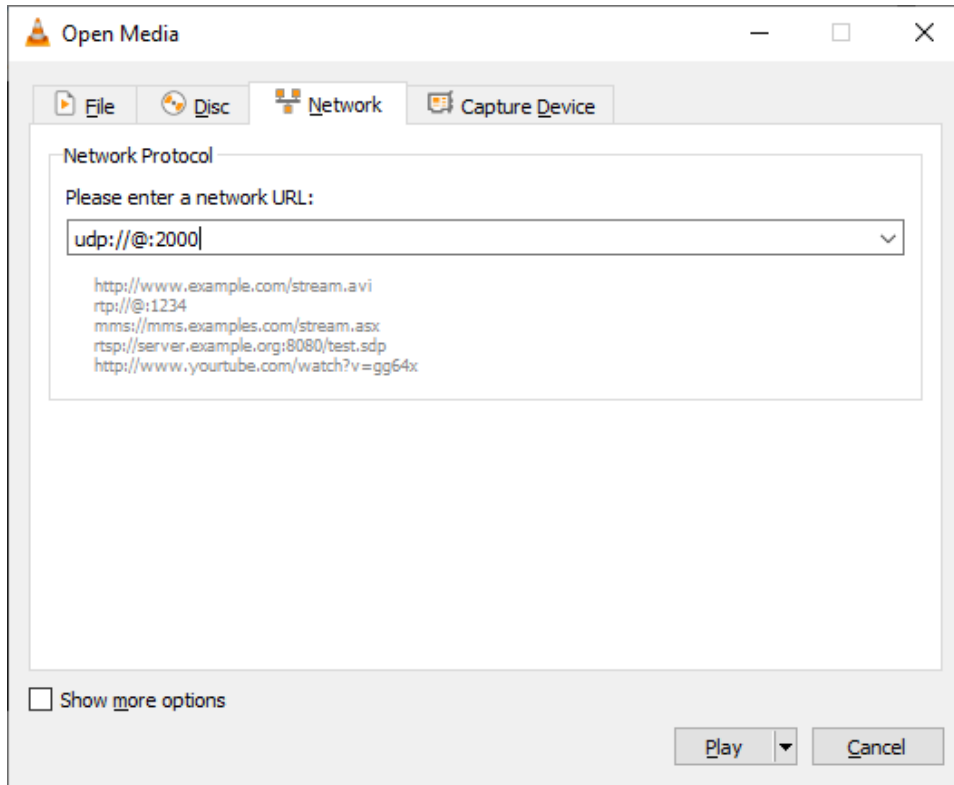
6. Repeat Steps #2 and #3 to create a stream from HD Video Encoder 2. The only difference is on the Serial or SSH connection.

    Enter the following command: `#stream create addr={IP of the pc with VLC} port=2200 videosrc=2`

> ⚠ **Note**
>
> When changing the video input resolution on the encoder, you may need to re-initialize VLC to show the stream.

Makito X4 Rugged Encoder Pinouts

This section contains the pinout descriptions for the Makito X4 Rugged Video Encoder. This information is intended to be used in conjunction with Haivision drawing no. TIID-057 (Makito 4K R Appliance RevA).

Topics Discussed

- Enclosure Front Panel
- Enclosure Back Panel
- Power Entry Connector
- Analog Audio/Serial Input Connector
- Ethernet Connector
- Video Input Connectors

Enclosure Front Panel

The Makito X4 Rugged enclosure provides four (4) rugged connectors for connecting the encoder's Video inputs, located on the front panel.

Connectors

Connector	Description	Number of Contacts
Video Input Connectors	4X Coax BNC Jack Amphenol P/N 31-70551-12G	1 per coax

> ⓘ **Important**
>
> Only SD1 can support input up to 6/12G-SDI.
> The remaining inputs (SDI2, SDI3 and SDI4) support up to 3G-SDI or CVBS.

Enclosure Back Panel

The Makito X4 Rugged enclosure provides rugged connectors for connecting the encoder's Audio, Serial, and Power inputs, as well as the Network interface, located on the back panel. There is one LED that indicates the power encoding status.

Connectors   LED Status Indicator

Connectors

Connector	Description	Number of Contacts
Power Entry Connector	DC IN +28V Power Connector Hirose P/N LF10WBRB – 4P	4
Analog Audio/Serial Input Connector	Hirose P/N LF13WBRB – 20S	20
Ethernet Connector	2X Hirose P/N LF10WBRB – 12S	12

> **Note**
>
> Hirose Cable Assemblies: Cabling must be done using the Hirose LF Series Connector Termination and Assembly Instructions.

Connectors   **LED Status Indicator**

LED Status Indicator

Function	Description	Indication
POWER	Off	No power
	Green fast blinking	Reset button is pressed for less than four seconds. If the Reset button is not pressed, there is a power fault.
	Green slow blinking	Booting/Initialization
	Green solid	Booting/Initialization sequence is complete (No fault/OK).
	Red fast blinking	Reset button is pressed for more than four seconds (Factory Reset enabled).
	Red slow blinking	Reset button is released after the Red fast blinking state (executing Factory Reset).

Power Entry Connector

Power Entry Connector		
	On Unit	**Mating Connector**
Manufacturer	**Hirose**	**Hirose**
Connector Type	DC IN +28V Power Connector	DC IN +28V Power Connector
Part Number	LF10WBRB-4P	LF10WBP-4S or LF10WBP-4S(31)

Power Entry Connector Pinout	
Contact #	**Description**
1	+28V DC IN
2	GND
3	N/C
4	N/C
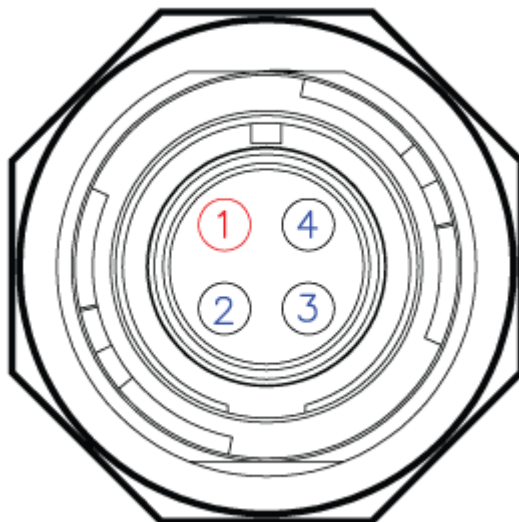
For the connector and cable, see Powering up the X4 Rugged Encoder.

Analog Audio/Serial Input Connector

The Makito X4 Rugged analog audio/serial interface provides two (2) mono audio input signals and one mono audio output (for talkback, future use). The talkback output impedance is 75 Ω (Ohms). The signal level is 1 Vrms (or 2.2 dBu) (single ended).

The audio input channels support 48-kHz sample rates with 16-bit PCM data. The audio input channels support up to Vrms (or 2.2 dBu) (single ended) inputs. The input impedance of the audio input channels is 33 kOhms.

The analog audio/serial interface also provides four (4) serial signals and one serial ground. The serial connector supports RS-232 and RS-422 operation.

Analog Audio/Serial Connector		
	On Unit	**Mating Connector**
Manufacturer	Hirose	Hirose
Connector Type	Audio/Serial Connector	Audio/Serial Connector
Part Number	LF13WBRB-20S	LF13WBP-20P
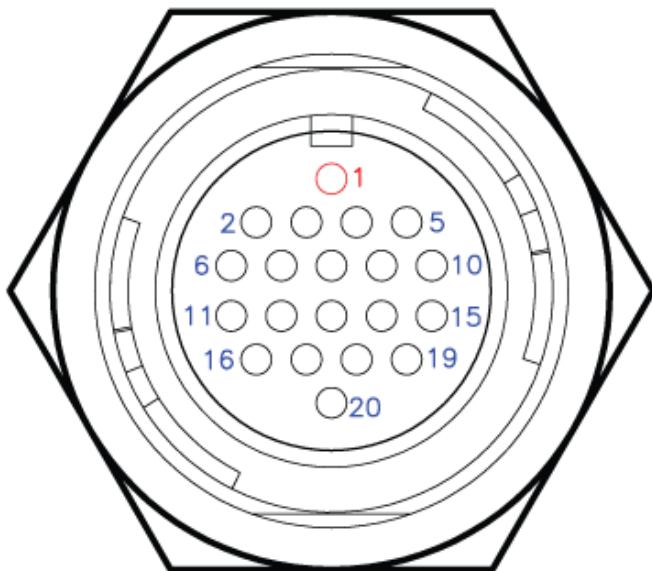
Analog Audio/Serial Connector Pinout			
Contact #	**Description**		
SERIAL (DTE)			
	*as shown on Wiring Diagram	**RS-232 Connections**	**RS-485/422 Connections**
1	RXD-A	Rx	Rx+
2	RXD-B	N/C	Rx-
3	TXD-Z	Tx	Tx-
4	TXD-Y	N/C	Tx+
5	N/C		
6	N/C		
7	SERIAL GND		
8	N/C		
9	FACTORY RESET SIGNAL		
10	FACTORY RESET GND		
AUDIO			
11	AUDIO OUT CHANNEL (for talkback, future use)		
12	AUDIO OUT CHANNEL GND (for talkback, future use)		
13	AUDIO IN CHANNEL 2 (unbalanced only)		
14	AUDIO IN CHANNEL 2 GND (unbalanced only)		
15	N/C		
16	N/C		
17	AUDIO IN CHANNEL 1 (unbalanced only)		
18	AUDIO IN CHANNEL 1 GND (unbalanced only)		
19	N/C		
20	N/C		

Audio/Serial Wiring Diagram
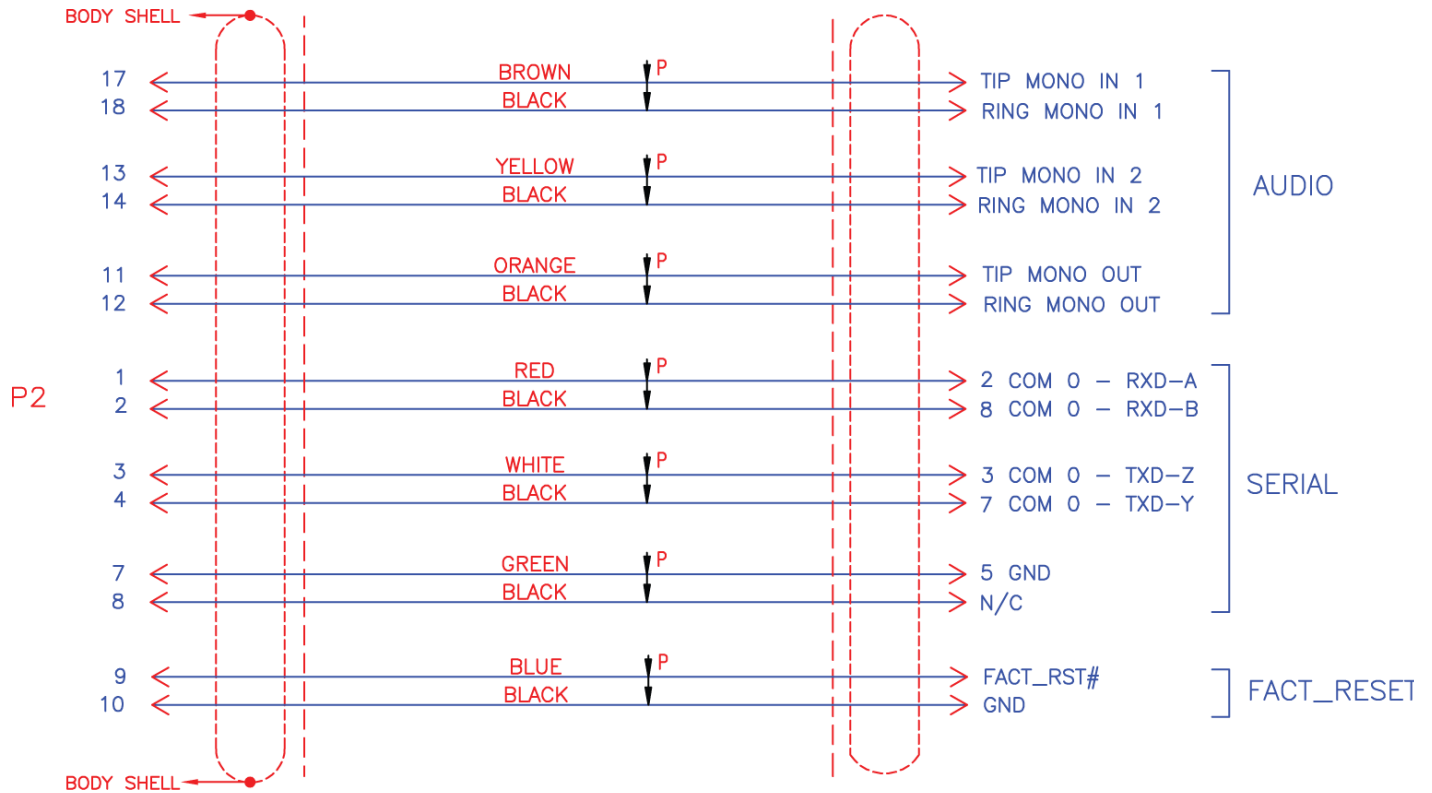
For the connector and cable, see **Step #5** in Connecting the X4 Rugged Encoder to the Network and Audio/Video Sources.

> 🛈 **Note**
>
> The System Reset button (RST# signal) provides two options:
> - If you press and hold the button for less than 4 seconds, the system resets and loads the last saved configuration. If no configuration was previously saved, the default settings prevail.
> - If you press and hold the button for more than 4 seconds, the module performs a complete factory reset. It clears all of the previously configured settings, including IP, streams and encoder configurations.
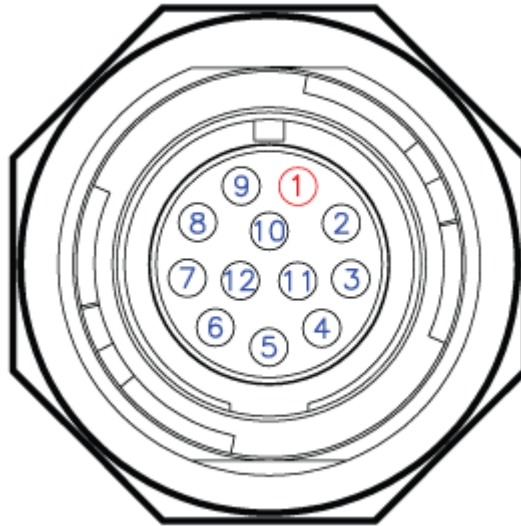
Ethernet Connector

The Makito X4 Rugged video encoder allows for connectivity with two 10/100/1000 Gigabit Ethernet ports over CAT-5 unshielded twisted pair per IEEE 802.3ab. The naming convention is per IEEE STD 802.3. These ports are designated as Network 1 and Network 2.

Network Connector		
	On Unit	**Mating Connector**
Manufacturer	Hirose	Hirose
Connector Type	Network Connector	Network Connector
Part Number	LF10WBRB-12S	LF10WBP-12P or LF10WBP-12P(31)

Ethernet

Network Connector Pinout	
Contact #	**Description**
1	ETH A+
2	ETH A-
3	ETH B+
4	ETH B-
5	ETH C-
6	ETH C+
7	ETH D-
8	ETH D+

Ethernet Wiring Diagram
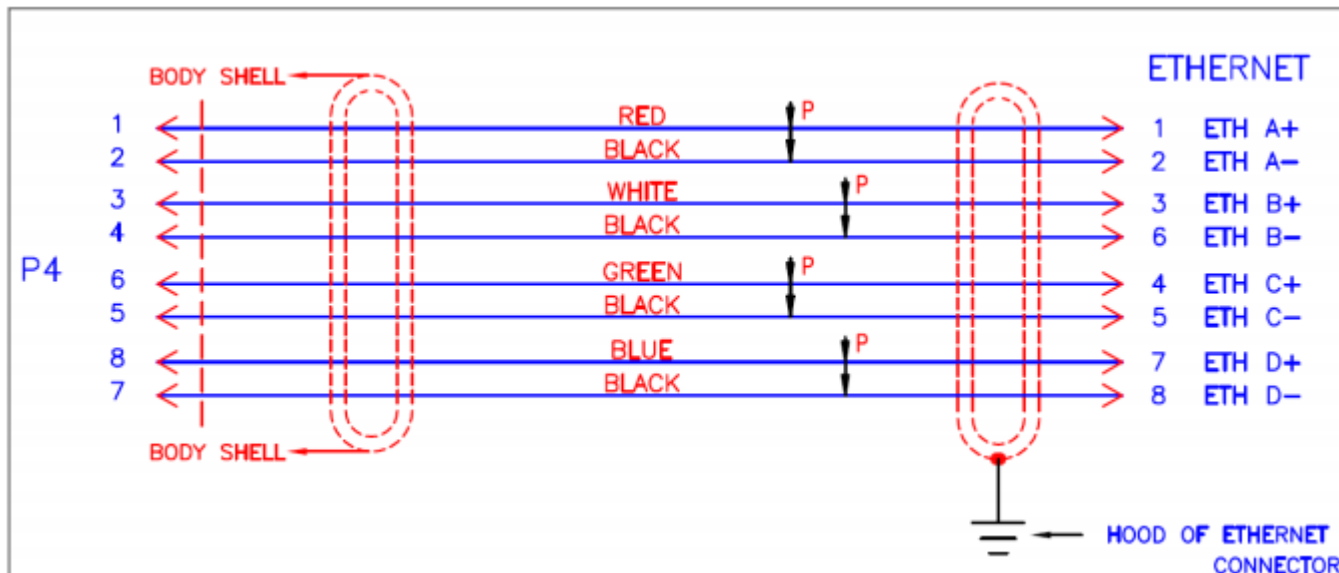
For the connector and cable, see **Step #2** in Connecting the X4 Rugged Encoder to the Network and Audio/Video Sources.

Video Input Connectors

The Makito X4 Rugged video encoder supports four (4) video inputs. The port marked SDI1 can support input up to 6/12G-SDI. The ports marked CVBS/SDI support up to 3G-SDI or analog video (NTSC/PAL).

- SDI is governed by SMPTE 259M (SD-SDI), 292M (HD-SDI) and 424M (3G-SDI) standards. Each coaxial pin is 75ohm impedance (3-GHz bandwidth).
- Composite video allows for NTSC and PAL input signals among others.

The requirements for external cable assemblies are as follows (assuming the customer wants to avoid water immersion on them):

BNC Coaxial Cable Assemblies

The cable assemblies must be waterproof. We recommend using waterproof compression type BNC connectors for better reliability and mechanical properties. We suggest use of a connector such as the Belden p/n FSNS6BNCU with a cable retention force of 40 lbs. per SCTE IPS SP401.

The input impedance must be 75 Ohms.

> ⚠ **Note**
>
> **We recommend that you keep the protective cap on any unused video connectors.**

Makito X4 Rugged Technical Specifications

Abbreviations and Definitions

Abbreviation	Definition
EMC	Electromagnetic Compatibility
ESD	Electro Static Discharge
GBE	Gigabit Ethernet per IEEE 802.3ab (same as 1000BASE-T)
GPIO	General Purpose Input/Output
HDA	High Definition Audio (Intel standard)
I2C	Two-wire Serial Interface
NC	No Connect
PCB	Printed Circuit Board
p/n	Part Number
SCD	Source Controlled Drawing / Source Controlled Document
SDI	Serial Data Interface (governed by SMPTE standards)
SKU	Stock Keeping Unit
TBD	To be determined
USB	Universal Serial Bus

References

For additional information, please refer to the following documents:

- Makito 4K Rugged External Cable Connections (TIID-057)
- Makito X4 Rugged Video Encoder Data Sheet
- Makito X4 Encoder User's Guide
- SMPTE 259M (SD-SDI), 292M (HD-SDI) and 424M (3G-SDI)
- IEEE 802.3-2012 (Ethernet)

Makito X4 Rugged-Specific Specifications

> **ⓘ Note**
>
> Please refer to the Makito X4 encoder Technical Specifications for the general specifications. The following additional specifications apply only to the Makito X4 Rugged encoder.

Makito X4 Rugged-Specific Specifications	
Video Interfaces	Multiple-format Quad BNC Input: • 1 channel Rugged BNC video input supporting up to 12G-SDI • 3 channel Rugged BNC video inputs supporting up to 3G-SDI or CVBS (Composite NTSC/PAL/PAL-M) analog video
Video Capture	• Up to 3840x2160p60 (UHD) input resolutions support (one encode core) • 4 x up to 1920x1080p60 input resolutions (4 encode cores) • 4 x up to 1080p30/720p60 inputs resolutions (8 encode cores). • CVBS capture on the 3 ports which do not support 6/12G-SDI
Audio Interfaces	Unbalanced Stereo Analog Audio Input (future use)
	Embedded Audio: • SD-SDI SMPTE 272M • HD/3D-SDI SMPTE 299M
Metadata Input	KLV or CoT over serial RS-232/422
Standards Compliance	• MIL-STD-810G • MIL-STD-461G • MIL-STD-1275E • MIL-STD-704F • RTCA-DO-160
Management Interfaces	Command line over SSH/Telnet/RS-232

Physical Characteristics

The table below describes some basic characteristics of the Makito X4 Rugged Encoder. For complete specifications, please refer to the data sheet available from the Haivision Web site.

Makito X4 Rugged Encoder (#S-MX4E-R-SDI4-ISR)	
Dimensions	66mm H x 146.2mm W x 185.7mm D (2.675″ H x 5.755″ W x 7.31″ D)
Weight	1.93 kg (4.25 1bs.)
Material	Aluminum 6061 T651 per SAE AMS-QQ-A-250/11
Finish	External: Black anodized, as per MIL-A-8625F, Type 2, Class 2
Power	28 VDC Nominal, 25W
Temperature	Operating: -40°C to 71°C (-40°F to 160°F) Non-operating: -45°C to 85°C (-49°F to 185°F)
Relative Humidity	0-100% condensing
IP rating	IP67 Dust tight with water immersion up to 1 meter depth for 30 minutes. ⚠ **Caution** The IP67 rating only applies when the connectors are mated. Otherwise the usage of dust cap connectors (provided by Haivision, shown in the following figures) is required.

⚠ **Caution**

If you have questions regarding the suitability of the Makito X4 Rugged in your operating environment, please contact Haivision Technical Support.

Product Numbers

Makito X4 Rugged Encoder

S-MX4E-R-SDI4-ISR-UHD	Makito X4 Rugged 4K UHD Video Encoder with four inputs; up to 3840x2160p60; 8x AVC/H.264 or HEVC/H.265 encoding engines; with KLV Metadata
S-MX4E-R-SDI4-ISR	Makito X4 Rugged HD Video Encoder with four inputs; up to 1920x1080p60; 8x AVC/H.264 or HEVC/H.265 encoding engines; with KLV Metadata
S-MX4E-R-ISR-DK	Makito X4 Rugged SDI UHD Encoder Appliance Evaluation Kit, PSU and terminated break-out cable set (4 cables for bench testing). Rugged mating connectors to commercial grade connectors and bench power supply +24 VDC / 40 W with mating rugged power connector from 90-240 VA

Accessory Product Numbers

CA-MX4E-R-DK	Makito X4 Rugged Appliance terminated break-out cable set (4 cables for bench testing) from rugged mating connectors to commercial grade connectors and bench power supply +24 VDC / 40 W with mating power connector from 90-240 VAC
CA-MX4E-R-TERM	084H067-701G (External Power Cable Assembly, qty 1) 084H067-703G (External Ethernet Cable Assembly, qty 2) 084H074-702G (External Audio/Serial Cable Assembly, qty 1) Makito X4 Rugged Appliance terminated break-out cable set (4 cables for bench testing) from rugged mating connectors to commercial grade connectors
CA-MX4E-R-CONN	210-110-004G (Power Connector, qty 1) 210-110-012G (Ethernet Connector, qty 2) 210-113-020G (Audio/Serial Connector, qty 1) Makito X4 Rugged Appliance connector set (4 rugged mating connectors & pins)
P-MX4E-R-PS	750-014-014G Makito X4 Rugged Appliance bench power supply +24 VDC / 40 W with mating power connector from 90-240 VAC

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