Haivision

Makito™ XCR Encoder
Installation Guide v2.1

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Makito™ XCR Encoder Installation Guide

This Installation Guide provides the steps required to install and configure the Makito XCR H.264 Video Encoder to stream to your compatible decoding device. Please refer to the Makito X User's Guide or the online help (available from the Web Interface) for detailed information.

NOTE We recommend that you familiarize yourself with this Installation Guide before installing your Makito XCR.

The Makito XCR is a compact and ruggedized military-grade appliance designed for deployment in Intelligence, Surveillance, and Reconnaissance (ISR) environments. The Makito XCR combines the low latency and performance of Haivision's Makito X encoder in a ruggedized form-factor with full KLV/CoT metadata support. It can support two or four input video channels: in four channel mode, each channel can support up to 1080p30, and in two channel mode, each channel can support up to 1080p60. The number of input video channels can be configured from the command line (see "Switching the XCR Personality from Dual to Quad Channel" on page 14). The Makito XCR can simultaneously output two H.264 streams, each at different bit rates per video input. Scaling and frame rate settings can be adjusted on-the-fly.

Applications

Designed for integration on both manned and unmanned platforms, including aerial, naval, and ground vehicles, the Makito XCR 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-704F, MIL-STD 1275E and MIL-STD 461F.
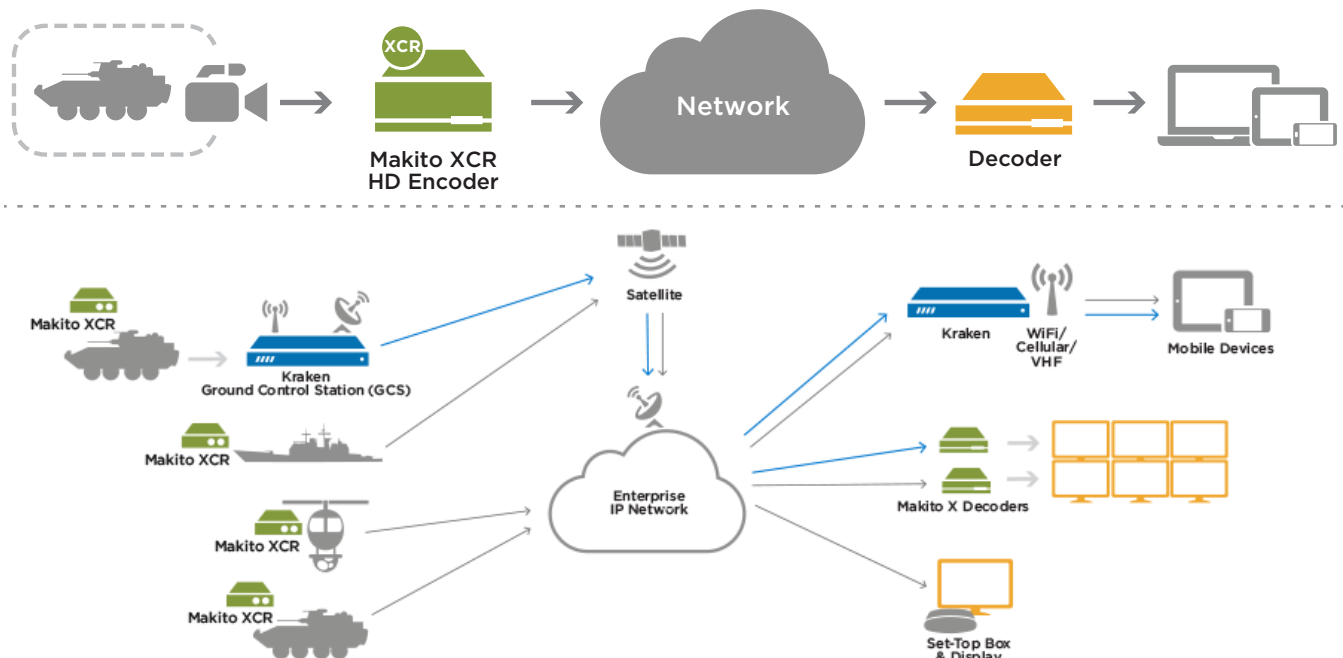
Before You Begin

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 Makito XCR box, you may need to have the following items available:

   • Four #8-32 or M4 screws for mounting (not included)

   • Haivision cabling kits (see "Accessory Product Numbers" on page 33), or your own custom cables (see "Appendix A: Makito XCR Encoder Pinouts" on page 19)

   • A laptop with Web browser, Telnet client, and video player (e.g., VLC)

3. In order to be able to view the output from the Makito XCR, make sure you have a decoding device or video player that is able to support the UDP Transport Stream format.

NOTE If the Makito XCR 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 encoder has been set up and is demonstrated to be operating normally, you can then move it to the remote location.

CAUTION Before installing the Makito XCR, please refer to the section on "Safety Guidelines" in the Makito X User's Guide. 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.*

NOTE While the Makito XCR has a real-time clock (RTC), it has no RTC battery. In the event of a power loss, the system date and time settings are lost. For any application with a requirement for standalone synchronized system timing (or derived time codes), an NTP server should be used to provide time and date synchronization. Refer to the Makito X User's Guide for details.

However, the Makito XCR is equipped with a supercapacitor (with a 30-minute charge time) that will keep time for approximately 3 weeks.

Installing the Makito XCR

1. Position the appliance against a solid base.

> ⚠️ **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).

4 Mounting holes for fastening unit with screws
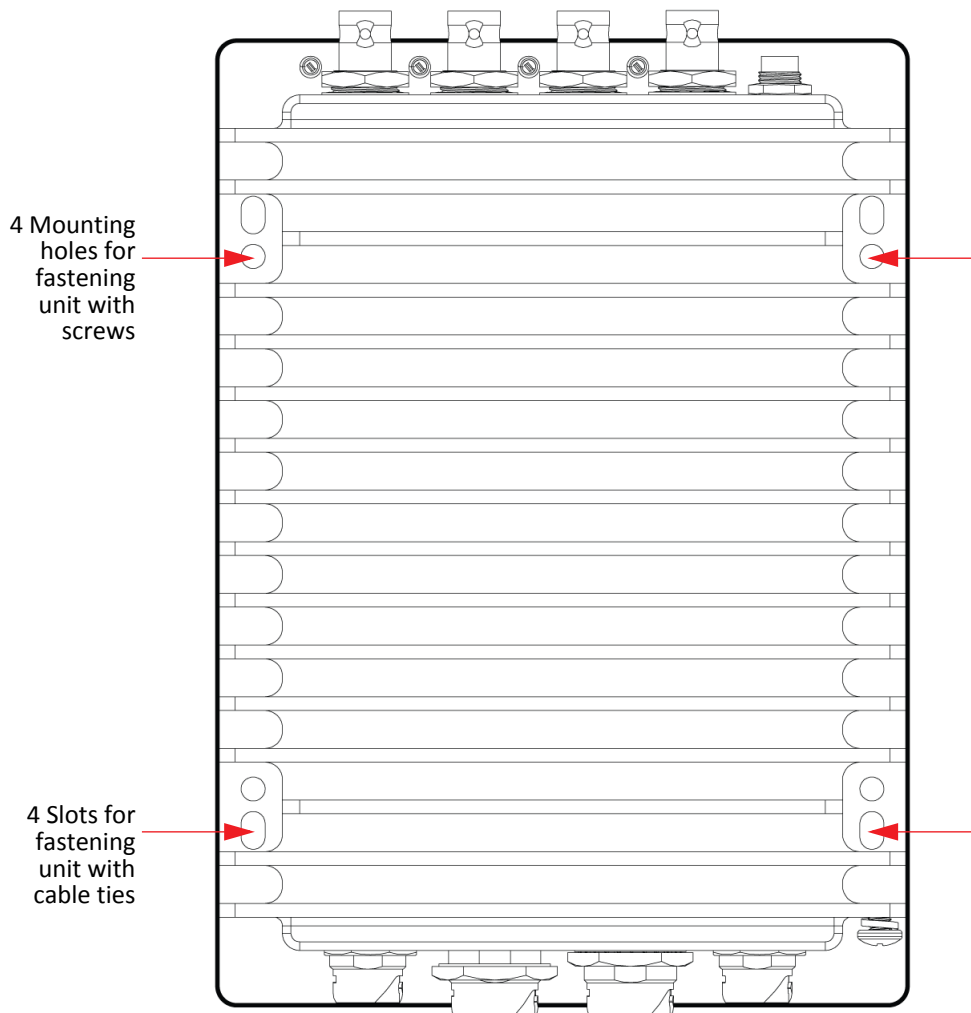
4 Slots for fastening unit with cable ties

Figure 1: Makito XCR Top View

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.

3. Fasten a grounding wire (10 AWG minimum) to the grounding lug using the nut and lock washer provided.
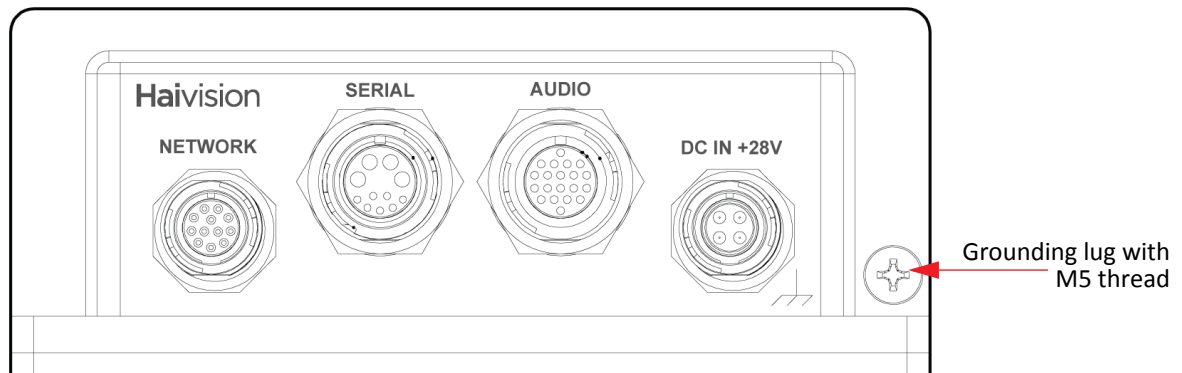
Figure 2: Makito XCR Rear View showing Grounding lug
(as well as Network, Serial, Audio & Power connectors)

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

Connecting the Makito XCR to the Network and Audio/Video Sources

ℹ️ NOTE For pinout information, see "Appendix A: Makito XCR Encoder Pinouts". Connector drawings, kitting and terminated cabling drawings are available upon request. Contact Haivision Technical Support.

To order connectors or cables, see "Appendix B: Technical Specifications" for accessory product numbers.

1. Remove the protective caps from the Makito XCR's connectors.

2. Connect the Makito XCR's **Network** port to the IP network using the **Ethernet cable**:

RJ-45

I/O connector for network communications (stream output; Web interface)
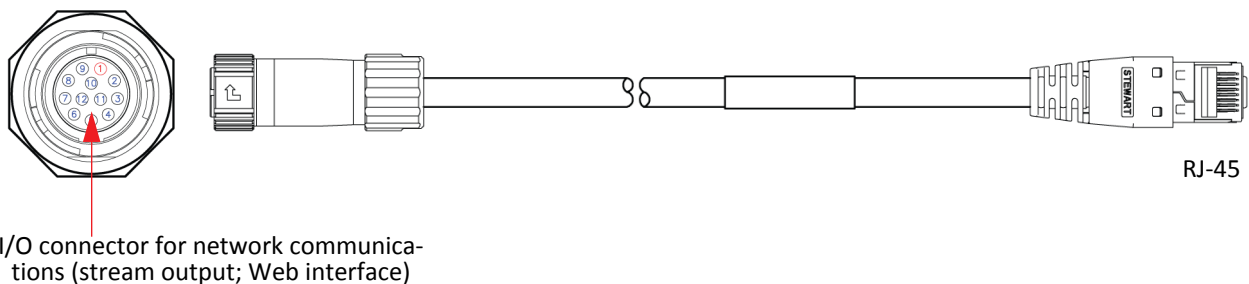
For pinout information, see "Ethernet Connector" on page 28.

3. Connect one or more of the Makito XCR's **Video** ports to your video source(s), referring to the image below. The BNC connector(s) are used for Composite (CVBS), SD-SDI (Serial Digital Interface) and HD-SDI video input signals. It is also a 3G-SDI capable interface supporting 1080p 50/60 fps video @ 3Gbps.

Figure 3: Makito XCR Front View showing LEDs and connectors for Video Inputs (including Metadata)

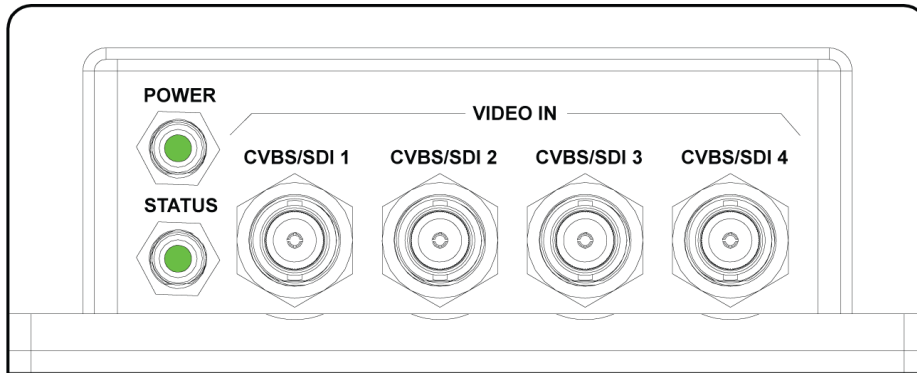ℹ **NOTE** The Makito XCR supports two video inputs @ up to 1080p50/59.94/60, or four video inputs @ up to 1080p25/29.97/30. The number of input video channels supported can be changed using the `personality` CLI command. See "Switching the XCR Personality from Dual to Quad Channel" on page 14.

For pinout information, see "Video Input Connectors" on page 30.

4. (Optional) Connect the Makito XCR's **Serial** port to a metadata source or to the serial port of a computer using the **serial breakout cable** (shown following).

Serial connector

Serial DB9
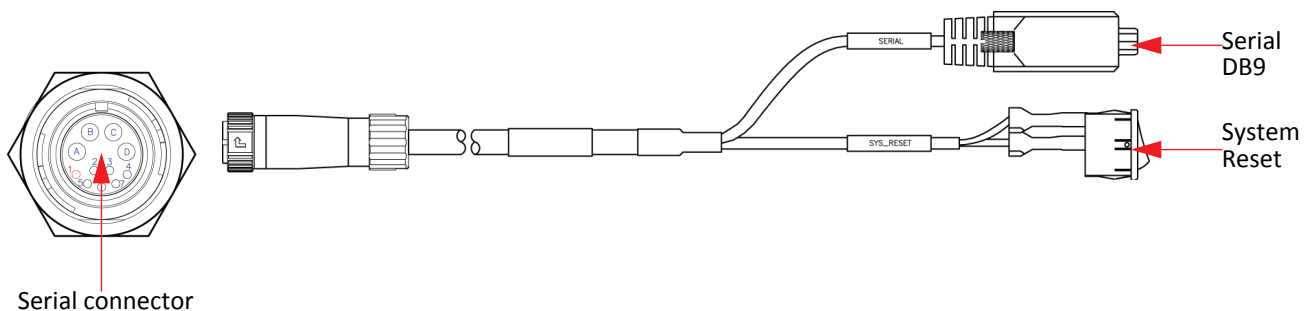
System Reset

ℹ **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 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.

For pinout information, see "Serial Connector" on page 22.

5. Connect the Makito XCR's **Audio** connector to your audio source(s) using the **audio breakout cable**.

Audio connector

Mono_IN_1
Mono_IN_2
Mono_IN_3 (future use)
Mono_IN_4 (future use)
Talkback (future use)
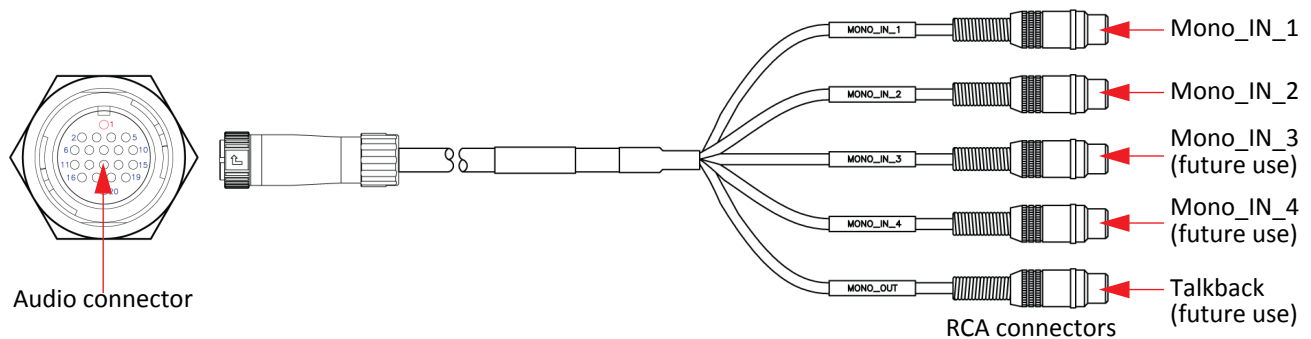
RCA connectors

For pinout information, see "Analog Audio Input Connector" on page 25.

> **NOTE** The Makito XCR with software version 2.1.1 or later supports two (2) input channels of analog audio.

Powering up the Makito XCR

There is no power switch on the Makito XCR appliance. The power is automatically on when the unit is plugged in.

> **CAUTION** The power cord is used as the main disconnect device. Ensure that the socket-outlet is located/installed near the equipment and is easily accessible.
> **ATTENTION** *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.*

1. Insert the 4-pin connector of the **power cable** into the power input jack (**DC IN**) at the rear of the encoder.

Power connector
DC IN +28V
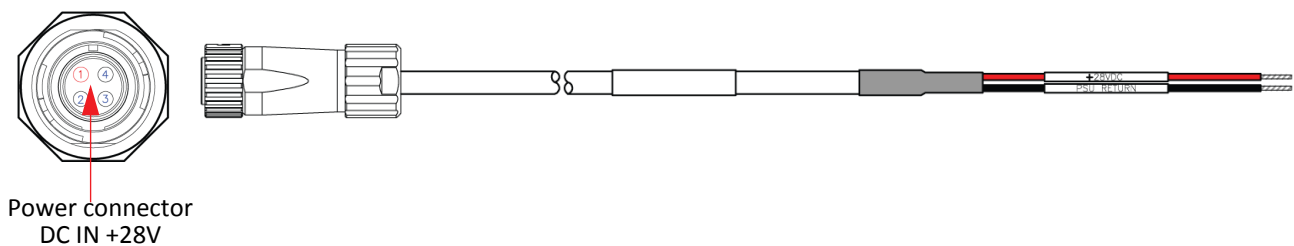
Make sure the connector is properly inserted and locked to avoid intermittent power problems.

For pinout information, see "Power Entry Connector" on page 21.

2. Connect the power cable to a 28V power source (the P-292E-XCR-PS-AC PSU can be used to convert from 120V AC to +24V DC). To order, see "Appendix B: Technical Specifications".

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 Makito XCR 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 the Makito X User's Guide.

Modifying the Makito XCR's IP Address

If you haven't changed the factory presets, and if not specified elsewhere in the shipment, the encoder's IP address is set by default to: `10.5.1.2`. To be able to log in to the Makito X Web interface, your computer has to 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.

TIP After you change the Makito XCR encoder's IP address, we recommend that you document it some-where, and label the chassis.

1. If you have not already done so, power up the Makito XCR.

2. The Makito XCR comes pre-configured with the following settings:

IP Address*	Subnet Mask	Gateway
10.5.1.2	255.255.0.0	10.5.0.1

3. Open a Web browser, type the IP Address for the Makito XCR into the URL address bar, and press Enter.

4. Log in to the Makito X Web Interface, using the following default administrative username and password:
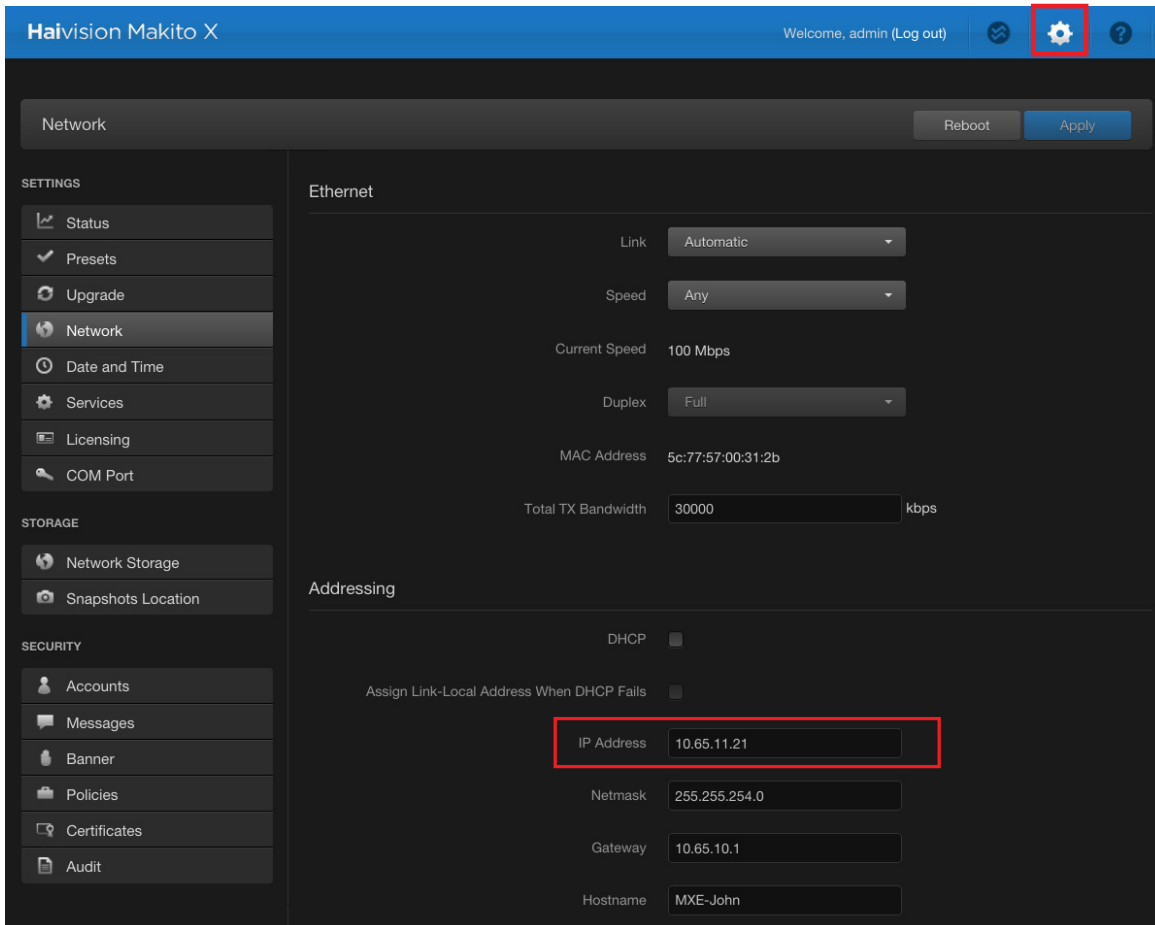
Admin Username	Password*
admin	manager

* Be sure to change the default password.
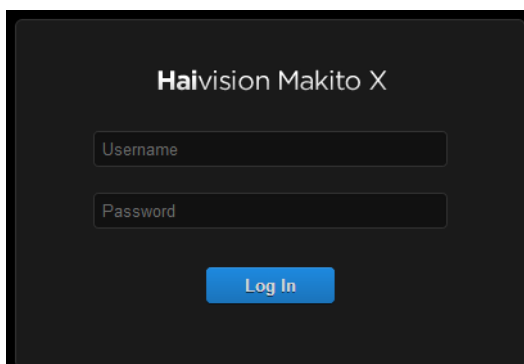
NOTE While the Web interface is most commonly used to control the Makito XCR, a Command Line Inter-face (CLI) is accessible via Telnet or SSH. For more information, please refer to the Makito X User's Guide.

5.   Select the ADMINISTRATION icon from the toolbar, and then select NETWORK (under SETTINGS).

6.   Type in the new IP address. If required, select or enter other new value(s) in the appropriate field(s).

7.   To apply your changes, click Apply, and then click Reboot. (You must reboot the system for the changes to take effect.)

NOTE Remember to change your computer network settings to be on the same network segment as the Makito XCR.

Switching the XCR Personality from Dual to Quad Channel

The Makito XCR encoder can support two or four input video channels: in four channel mode, each channel can support up to 1080p30, and in two channel mode, each channel can support up to 1080p60.

The `personality` CLI command provides a means to change the number of input video channels supported. For example, you may need to switch from four-channel (X4R) to the two-channel variant (X2R) because the X4R does *not* accept 1080p60 signals.

2 channel (X2R) = 4 video encoders and maximum 1080p60 input video support
4 channel (X4R) = 8 video encoders and maximum 1080p30 input video support

TIP You can tell whether the encoder has been set to the two-channel or four-channel variant by checking the Web interface Video Encoder page: If the Encoder list has 8 H.264 encoders, it's the X4R (as shown in Step #3 on page 15), whereas if it shows 4 H.264 encoders, it's the X2R.

The change of personality takes effect after the next reboot of the unit. This command may only be used by an administrator. XR personalities do not change due to a factory reset.

To set the encoder personality:

1. Open a serial, telnet or SSH session to the encoder.

2. At the login prompt, type your username and password.

3. At the command prompt, type in the following command:

   `personality set <TYPE>`

   Where TYPE is either X2R or X4R.

   For example:

|	
`# personality set X4R`	Sets the personality to X4R.
`# personality get`	Shows the following results: `Current Personality: X4R`

4. Reboot or power-cycle the encoder.

   For more information, please refer to the Makito X User's Guide.

Setting Up a Test Stream

Setting up a test stream requires that you have an active video source connected to the Makito XCR. 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, please refer to Chapter 4 of the Makito X User's Guide.

1. If you have not already done so, power up the Makito XCR.

2. Open a Web browser, type the IP Address* for the Makito XCR into the URL address bar, and press Enter.

   * The IP address of your computer must be in the same subnet (see "Modifying the Makito XCR's IP Address" on page 12).

3. Click the ⊗ STREAMING icon on the toolbar, and then click VIDEO ENCODERS from the sidebar menu.
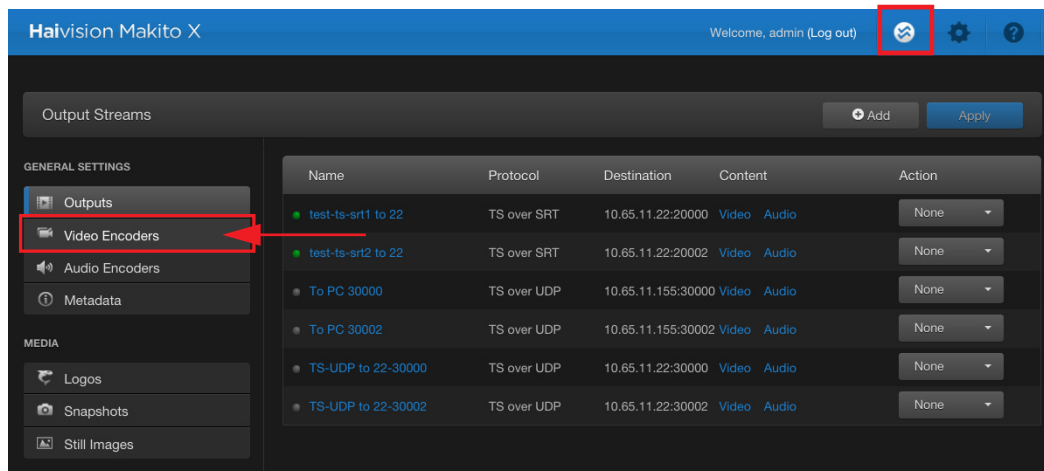
The Video Encoders List View opens, as shown in the following example.
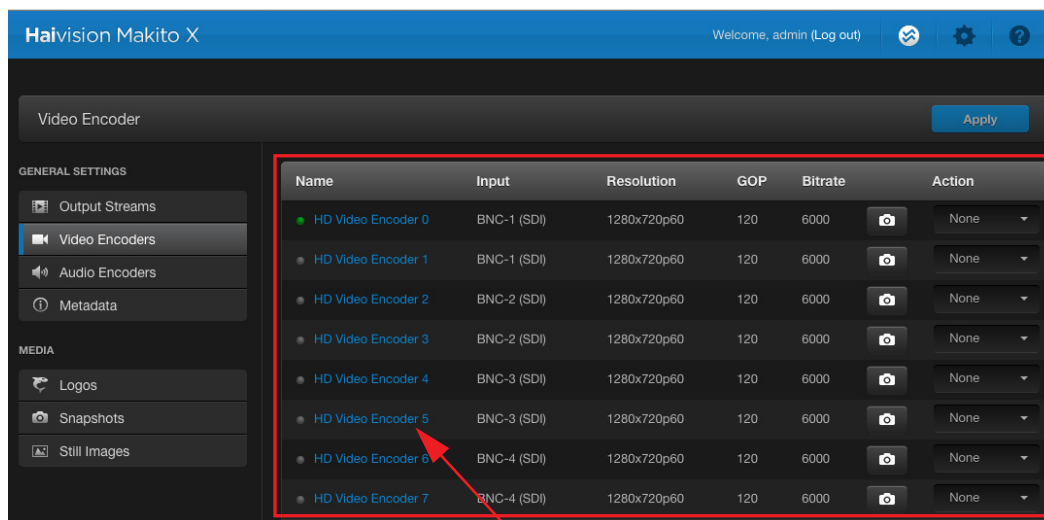
Click link to open Detail View

4. From the Video Encoders List View, click a link in the table to select the encoder.

The Video Encoder Detail View opens, displaying the settings for the selected video encoder (see following example).
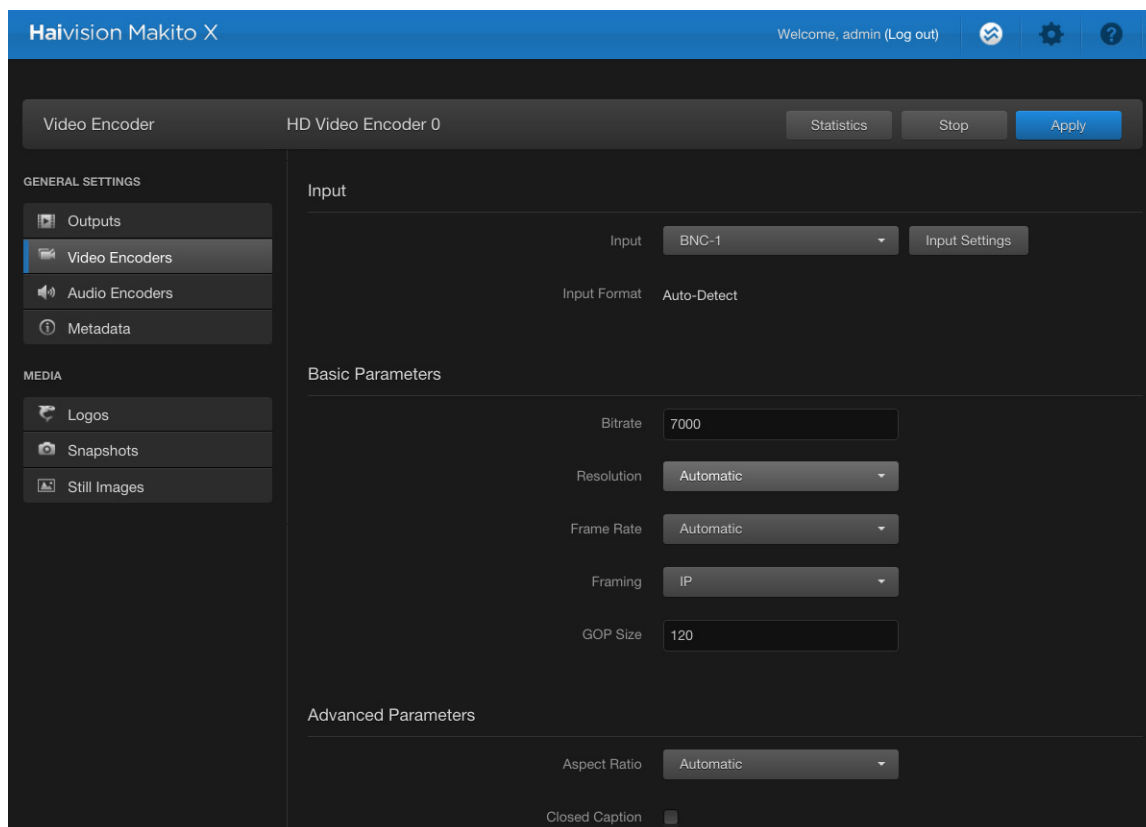
5. Select or enter the new value(s) in the appropriate field(s).

6. Click Start, and then click Apply.

7. Click the 🗾 STREAMING icon on the toolbar, and then click OUTPUTS from the sidebar menu.

    The Output Streams List View opens, as shown in the following example.
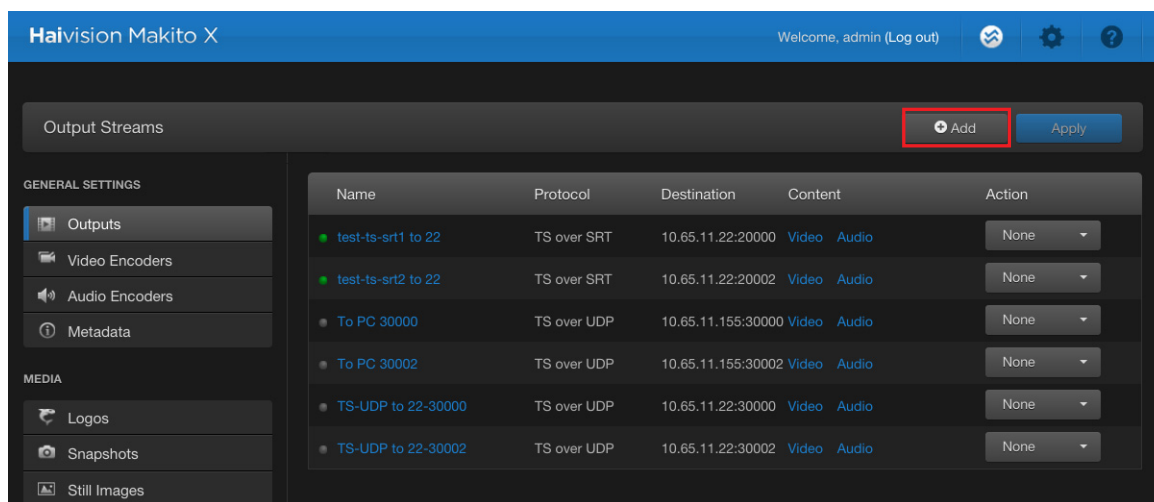
8. To add an output stream, click Add.

The Output Streams Detail View opens (as shown in the following example for a new stream).

9. Type a Name for the stream and select **TS over UDP** for the Protocol.

10. In the Source section, select the encoder you started in step 6. from the **Video** menu.

11. In the Destination section, 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`).

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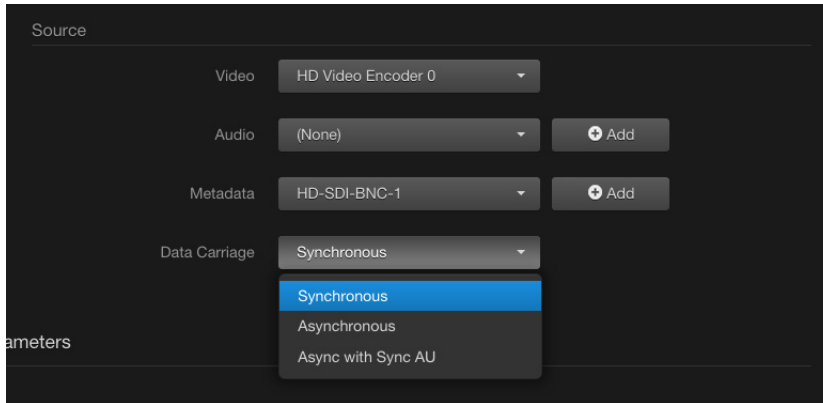
13. To apply your changes and start streaming, click Apply.

The changes will take effect immediately *but will be lost after a reboot.* For information on saving configuration settings, please refer to the "Saving and Loading Presets" section of the Makito X User's Guide.
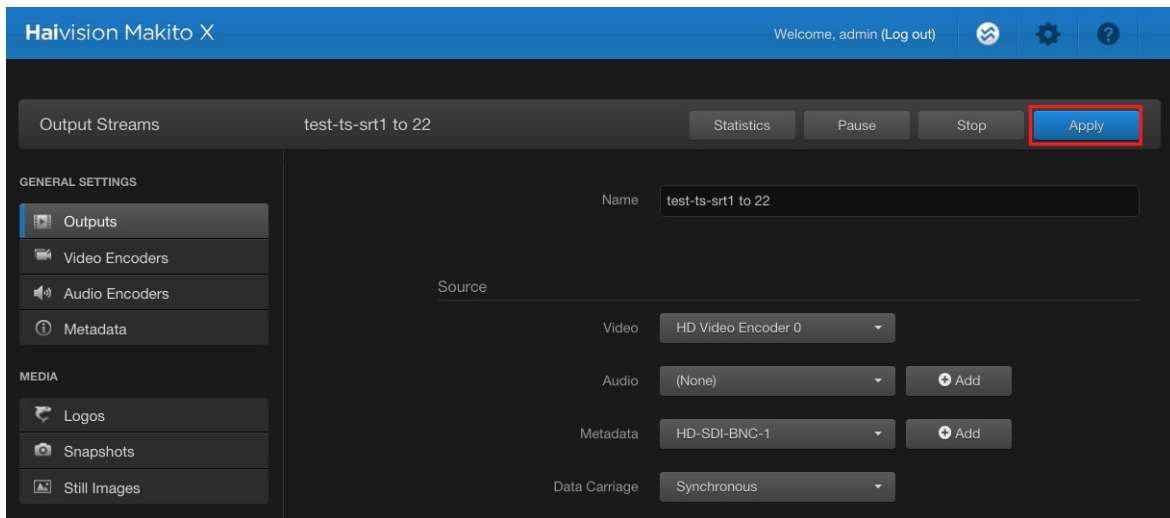
Viewing the Test Stream

1. Make sure your decoding device (or software) is compatible with the UDP 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 Makito XCR, and

4. Tune your decoding device or software to the multicast address of the test stream coming from the Makito XCR.

Appendix A: Makito XCR Encoder Pinouts

This appendix contains the pinout descriptions for the Makito XCR H.264 Video Encoder. This information is intended to be used in conjunction with Haivision drawing no. TIID-051 (Makito XCR Enclosure External Cable Connections).

Enclosure Front and Rear Panels

The Makito XCR enclosure provides rugged connectors for connecting the encoder's Video, Audio, Serial, and Power inputs, as well as the Network interface.
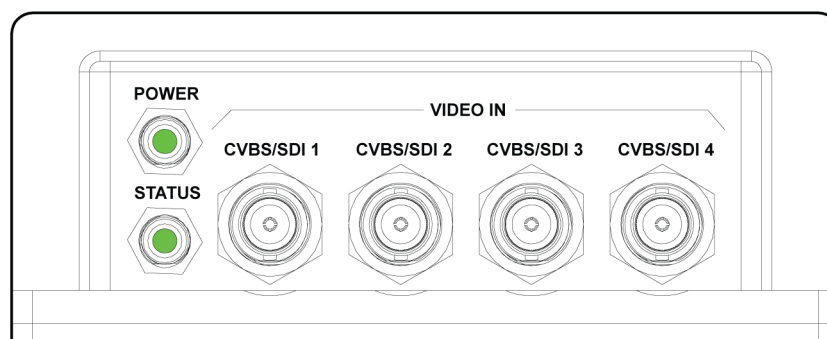
Figure 4: Makito XCR Front View showing LEDs and Video Inputs
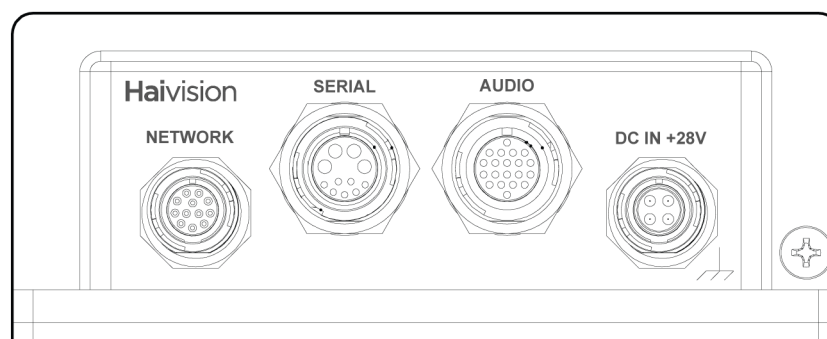
Figure 5: Makito XCR Rear View showing Network, Serial, Audio & Power connectors

List of Connectors (on unit)		
Connector	Description	Number of Contacts
Rear View		
Ethernet Connector	Hirose P/N LF10WBRB	12
Serial Connector	Hirose P/N LF13WBRB	11
Analog Audio Input Connector	Hirose P/N LF13WBRB	20

List of Connectors (on unit)		
Connector	Description	Number of Contacts
Power Entry Connector	DC IN +28V Power Connector Hirose P/N LF10WBRB	4
Front View		
Video Input Connectors	4X Coax BNC Jack Amphenol P/N 112235-12	1 per coax

List of LED Indicators (located Front of unit)		
LED	Description	Indication
LED1	Power Status	GREEN when power is ON
LED2	Video Encoder Status	Bi-color (GREEN or RED)

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

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

Power Entry Connector Pinout	
Contact #	Description
1	+28V DC IN
2	GND
3	N/C
4	N/C
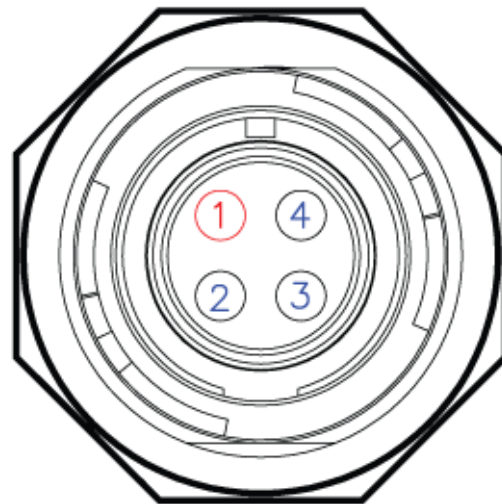
Figure 6: Power Connector Pin Locations

For the connector and cable, see "Powering up the Makito XCR".

Serial Connector

Serial Connector		
	On Unit	Mating Connector
Manufacturer	Hirose	Hirose
Connector Type	Serial Connector	Serial Connector
Part Number	LF13WBRB – 11S	LF13WBP – 11P

Serial Connector Pinout	
Contact #	Description
1	COM 0 – RXD-
2	GND
3	COM 0 – RXD+
4	COM 0 – TXD-
5	N/C
6	COM 0 – TXD+
7	N/C
A	GND
B	SYS_RESET
C	GND
D	N/C
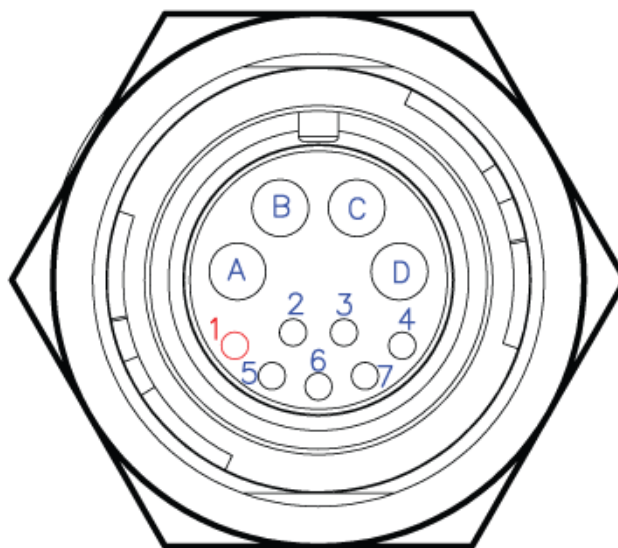
Figure 7: Serial Connector – System Reset Pin Locations

For the connector and cable, see Step #4 on page 10 (in "Connecting the Makito XCR to the Network and Audio/Video Sources").

NOTE For RS-232, use pins 2, 3 and 5. For RS-422, use pins 2,8 and pins 3,7.
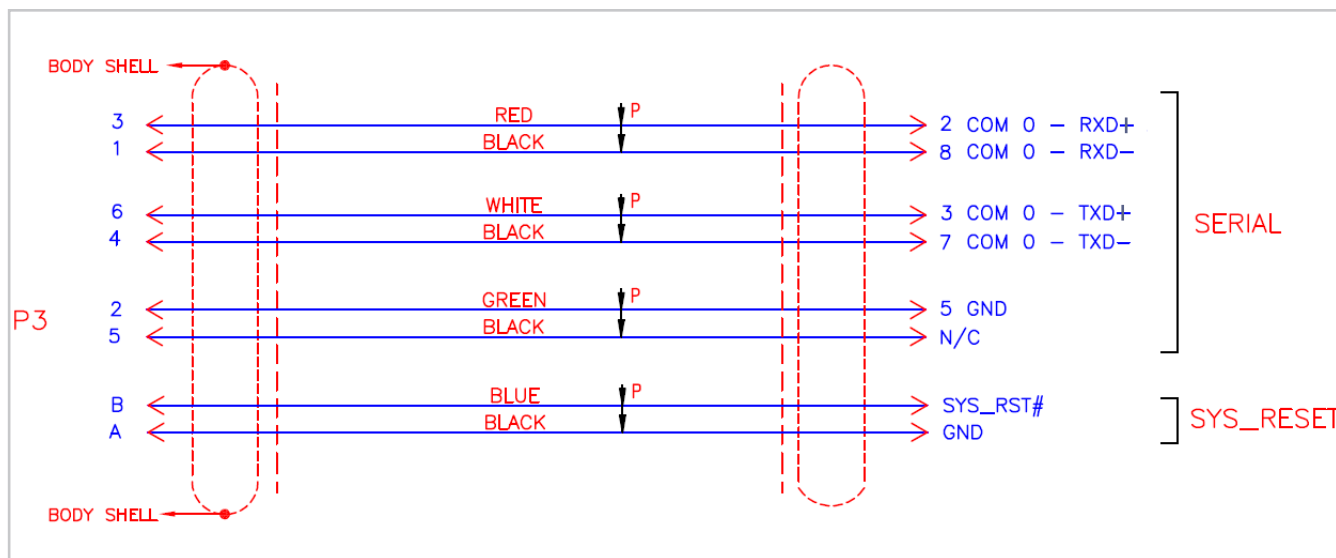
Figure 8: Serial Connector Pinout Diagram

RS-232 Serial Interface

Makito XCR video encoder can be managed through a RS-232 serial interface, one commonly used for configuration making use of the Command Line Interface (CLI).

[OK???]The serial port uses a DSub-9 connector which has the following pinout:

Pin #	Signal RS-232	Signal RS-422
1	N/C	N/C
2	Received Data	Received Data +
3	Transmitted Data	Transmitted Data +
4	N/C	N/C
5	GND	N/C
6	N/C	N/C
7	N/C	Transmitted Data -
8	N/C	Received Data -
9	N/C	N/C

Reset Button

A System Reset button (RST# signal) can be asserted to ground to provide the user with two options.

- If RST is asserted for 0s < t < 4s duration, the system resets and loads the last saved configuration. If no configuration was previously saved, the default settings prevail.

- For assertion of t > 4s, the module performs a complete factory reset. It clears all of the previously configured settings, including IP, streams and encoder configuration.

Analog Audio Input Connector

The analog audio interface consists of four (4) mono inputs and one mono output (for talkback). This interface complies with the Intel High Definition Audio (HDA) specification. The Makito XCR with software version 2.1.1 or later supports two (2) input channels of analog audio.

The audio input channels support 48-kHz sample rates with 16-bit PCM data.

The audio input channels support up to 4.15Vpp (single ended) inputs. The input signal level is configurable from 2 to 8 dBu, with a default value of 6 dBu. The maximum input level of 8 dBu translates to a maximum value of 5.50Vpp.

Analog Audio Connector		
	On Unit	Mating Connector
Manufacturer	Hirose	Hirose
Connector Type	Audio Connector	Audio Connector
Part Number	LF13WBRB – 20S	LF13WBP – 20P

Analog Audio Connector Pinout	
Contact #	Description
1	GND
2	AUDIO OUT (for talkback, future use)
3	GND
4	AUDIO IN CHANNEL 2
5	GND
6	AUDIO IN CHANNEL 1
7	GND
8	AUDIO IN CHANNEL 4 (future use)
9	GND
10	AUDIO IN CHANNEL 3 (future use)
11	N/C
12	N/C
13	N/C
14	N/C

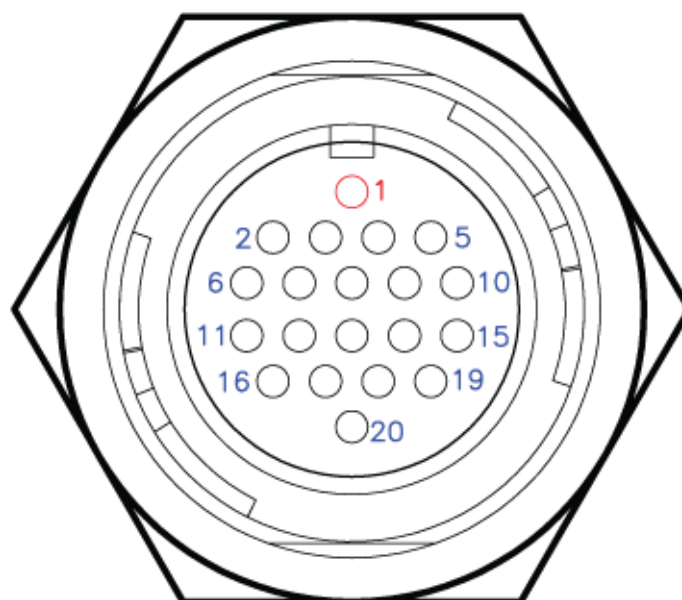| Analog Audio Connector Pinout	
Contact #	Description
15	N/C
16	N/C
17	N/C
18	N/C
19	N/C
20	N/C

Figure 9: Audio Input Pin Locations

For the connector and cable, see Step #5 on page 11 (in "Connecting the Makito XCR to the Network and Audio/Video Sources").
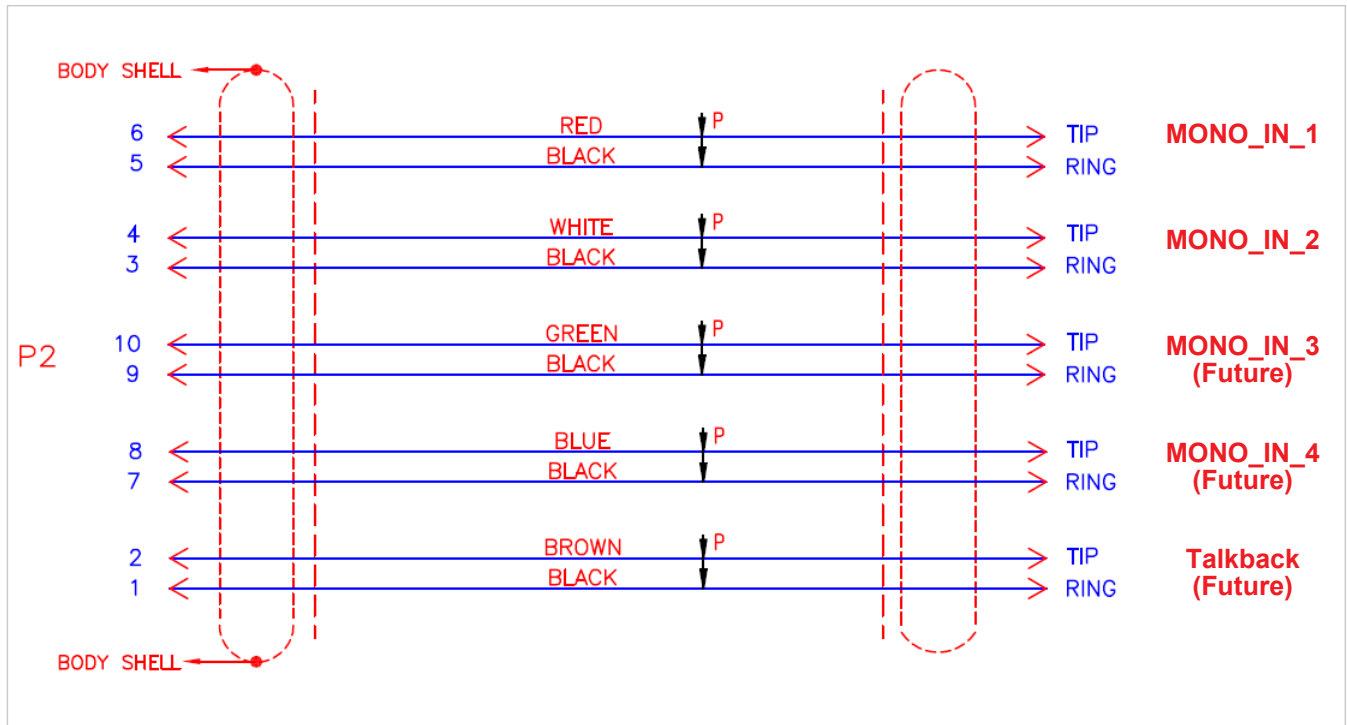
Figure 10: Audio Connector Pinout Diagram

Ethernet Connector

Network Connector		
	On Unit	Mating Connector
Manufacturer	Hirose	Hirose
Connector Type	Network Connector	Network Connector
Part Number	LF10WBRB – 12S	LF10WBP – 12P

GBE0 — Ethernet

The Makito XCR video encoder allows for connectivity with one 10/100/1000 Gigabit Ethernet port over CAT-5 unshielded twisted pair per IEEE 802.3ab. The naming convention is per IEEE STD 802.3. This port is designated as GBE0.

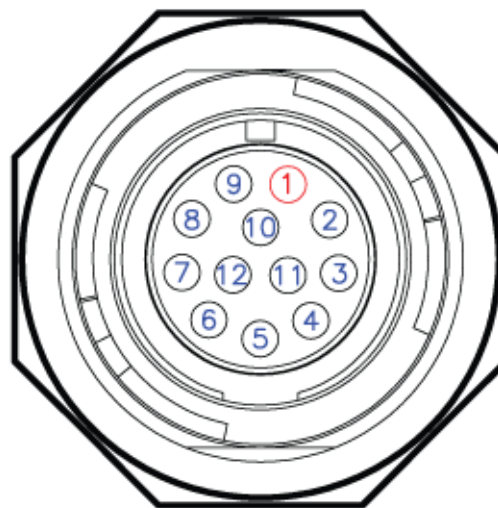| Network Connector Pinout	
Contact #	Description
1	ETH A+
2	ETH A-
3	ETH B+
4	ETH B-
5	ETH C+
6	ETH C-
7	ETH D+
8	ETH D-

Figure 11: Ethernet GBE0 Pin Locations

For the connector and cable, see Step #2 on page 9 (in "Connecting the Makito XCR to the Network and Audio/Video Sources").
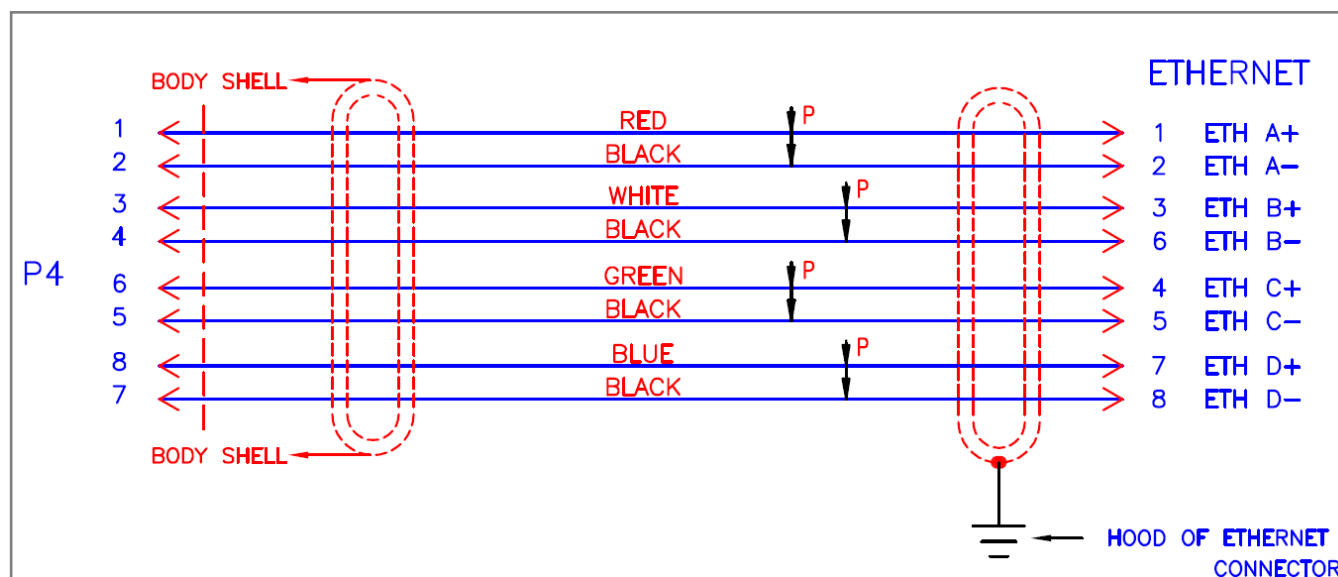
Figure 12: Ethernet Connector Pinout Diagram

Video Input Connectors

The Makito XCR video encoder allows up to four (4) SDI / Composite video inputs, both signals sharing the contact pin.

- SDI is governed by SMPTE 259M (SD-SDI), 292M (HD-SDI) and 424M (3G-SDI) standards. Each coaxial pin is 75-ohm impedance (3-GHz bandwidth).

- Composite video allows for NTSC and PAL input signals among others.

Refer to the product specification for complete details.
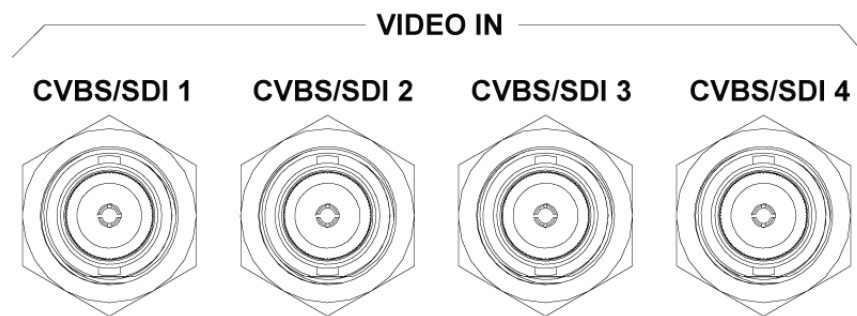
Figure 13: Video Input Connectors

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.

Appendix B: Technical Specifications

Abbreviations and Definitions

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 XCR External Cable Connections (TIID-051)
- Makito XCR Data Sheet
- Makito X User's Guide
- SMPTE 259M (SD-SDI), 292M (HD-SDI) and 424M (3G-SDI)
- IEEE 802.3-2012 (Ethernet)
- High Definition Audio (HDA) codec specification (Rev.1.0a), Intel

Makito XCR Installation Guide
Physical Characteristics

Physical Characteristics

Dimensions	51mm H x 127mm W x 185mm D (2.0" H x 5.0" W x 7.3" D)
Material	Aluminum 6061 T651 per SAE AMS-QQ-A-250/11
Weight	2.65 lbs. / 1.25 kg
Finish	External: Black anodized, as per MIL-A-8625F, Type 2, Class 2
Temperature	Operating: -40° to 71°C (-40º to 160ºF) Non-operating: -45º to 85ºC (-49º to 185ºF)
Relative Humidity	0-100% condensing
IP Rating	IP67, dust tight with water immersion up to 1 meter depth for 30 minutes.

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

Power Supply Unit Characteristics

Input Voltage	20 VDC to 33 VDC 25 W (max)	Storage Temperature	-51° to 85° C
Input Protection	Reverse polarity protection	Working Temperature	-40° to 71° C

Product Numbers

S-292E-XCR	Quad channel HD-SDI Makito X Compact Ruggedized Encoder with black anodized finish (no metadata)
S-292E-XCR-KLV	Quad channel HD-SDI Makito X Compact Ruggedized Encoder with black anodized finish and metadata support
S-292E-XCR-DK	Quad channel HD-SDI Makito X Compact Ruggedized Encoder with metadata support, cabling set and power supply for bench testing

Accessory Product Numbers

`CA-292E-XCR-CONN`	Rugged connector set (power, Ethernet, serial, audio)
`CA-292E-XCR-TERM`	Commercial break-out connectors terminated cable set (Ethernet = RJ45, serial=DB9, 4-input audio, power) with rugged connectors
`P-292E-XCR-PS-AC`	Power supply for the XCR unit — 120/240 AC to +24V DC with locking connector
`CA-292E-XCR-DK`	Terminated cabling and PSU kit for Makito XCR Encoder

For More Information

Contact Haivision Technical Support via our Support Portal on our website at: http://www.haivision.com/support-portal-home

Or you may use the phone numbers or email addresses listed below:

North America:	Toll Free:	1.877.224.5445 (option 4)
International:	Tel:	1-514-334-5445 (option 4)
	Fax:	1-514-334-0088
Technical Support email:	tickets@haivision.com	
Product Information email:	info@haivision.com	

You may download the latest software, Release Notes and other relevant documentation through our Download Center at: http://www.haivision.com/download-center/

Waste Electrical and Electronic Equipment (WEEE) Disposal

Haivision is compliant with the European Union (EU) WEEE Directive. For recovery and recycling information, please visit our website at:
http://www.haivision.com/environment