



Crown I-Tech HD Plugin for Q-SYS User Guide

v 1.3.2



Contents

Introduction	3
Compatibility	3
Relationship with Audio Architect and Performance Manager	3
HiQnet and Q-SYS Networking	4
Q-SYS System Notes	4
Installation	5
Updating the Plugin	5
Using the Plugin	6
Adding the I-Tech Plugin to your schematic	6
Running the Plugin	6
Plugin Features:	6
Properties	6
Main Plugin Window	10
Summary Tab	11
Faults Tab:	13
Loads, Signal Generator Tab:	15
Info, Logging, and Presets Tab:	19
Fault Priorities	21
Reported Fault Aggregation	22

Introduction

The Crown I-Tech HD Q-SYS plugin brings the Crown I-Tech HD amplifiers to the Q-SYS control ecosystem. The plugin was designed to bring the supervision of the Crown I-Tech HD platform to Q-SYS. Metering, fault monitoring, output load monitoring, preset recall, and other high-level functions are available for integration into larger integrated systems.

The plugin will always read its state from the amplifier. It cannot be configured offline and have the settings sent to the amplifier.

Compatibility

The Crown I-Tech HD Q-SYS Plugin supports the following models.

- I-Tech 4x3500HD
- I-Tech 5000HD
- I-Tech 9000HD
- I-Tech 12000HD

The features of each amplifier will be reflected in the plugin and may differ slightly from each other. For example, the 2-channel I-Tech models do not support the pilot tone load monitoring feature.

Additional information on the I-Tech series amplifiers can be found on the Crown website.

(https://www.crownaudio.com/en/product_families/i-tech-hd-series)

Relationship with Audio Architect and Performance Manager

Audio Architect or Performance Manager should be used for the configuration and setup of all I-Tech Devices.

Where possible, plugin controls exactly match those in Audio Architect. Toggling a mute in the plugin will be reflected in Audio Architect and vice versa.

A few controls are unique to the plugin, including Pilot Tone Load Monitoring for the I-Tech 4x3500HD and some indicators that are derived from amplifier parameters where there is no direct value available.

Audio Architect is a Harman software platform that supports the connection, configuration, and control of Harman devices. It is optimized for the professional installed sound market and offers automatic grouping and workflows that make configuring and managing large groups of equipment simple and easy.

Download Audio Architect from the Harman Audio Architect website

(https://audioarchitect.harmanpro.com/en-US/audio-architect-HiQnet_software)

Performance Manager is the JBL software solution designed for performance sound systems used in the touring and live audio market. It has tools to quickly connect, configure and optimize large-scale line arrays and touring sound systems. It can be used as part of the Audio architect workflow or standalone.

Download Performance Manager from the JBL Performance Manager website here:

(<https://jblpro.com/products/performance-manager>)



Warning: The Plugin is designed to work with the latest crown amplifier firmware, before using the plugin please download the latest version of Audio Architect or Performance Manager and connect to the I-Tech amplifiers to check if the amplifiers are running the latest firmware.

NetSetter is a standalone networking utility that aids in discovering and managing networking-related parameters of Harman devices. It can allow re-addressing, and network configuration of Harman HiQnet devices, regardless of the subnet configuration.

NetSetter is included in the installation of Audio Architect and Performance Manager.

HiQnet and Q-SYS Networking

The Crown Q-SYS Plugin integrates the monitoring of the Harman HiQnet protocol (Harman proprietary communications protocol) and extends it into the Q-SYS system and allows Crown devices to connect to the Q-SYS platform. HiQnet operates over standard TCP/IP network and is compatible with Q-Lan traffic. To communicate with the Core, the Core and the I-Tech devices need to be the same network, designed to support TCP traffic between them.

Networking advice and recommendations

- It is recommended that users stay away from large daisy-chain network topologies with HiQnet devices.
- It is recommended for I-Tech to be configured with static IP addresses for network and communication stability.
- It is recommended that HiQnet traffic does share the same network as Dante traffic, where HiQnet and Dante are on the same network they should be separated by VLANs.
- It is easy to accidentally duplicate IP addresses within multiple instances of the plugin. Use caution when globally copy and pasting settings as the IP address will get copied and pasted along with other parameters.
- If specific ports need to be allowed in your IT infrastructure, HiQnet uses port 3804 to communicate between the Harman devices and the Q-SYS Core.



Warning: I-Tech Amplifiers are designed to only support a limited number of TCP connections. Use only one plugin instance for each amplifier. Running Q-SYS and Performance Manager or Audio Architect simultaneously will lead to issues if the polling rate is set too high.

Q-SYS System Notes

The provided plugin documentation assumes you have a working knowledge of the Q-SYS system and Q-SYS Designer.

The plugin is designed to work with Q-SYS Designer v9.4.8 and above. The latest version of Q-SYS Designer can be downloaded from QSC.

(<https://www.qsc.com/resources/software-and-firmware/q-sys-designer-software/>)

The plugin is designed to take advantage of the capabilities enabled with the Scripting Engine functionality of the cores. You may need to purchase this license for your cores for an additional cost from QSC.

Most of the parameters and functions in the plugin can work in emulation mode without a Q-SYS Core attached.

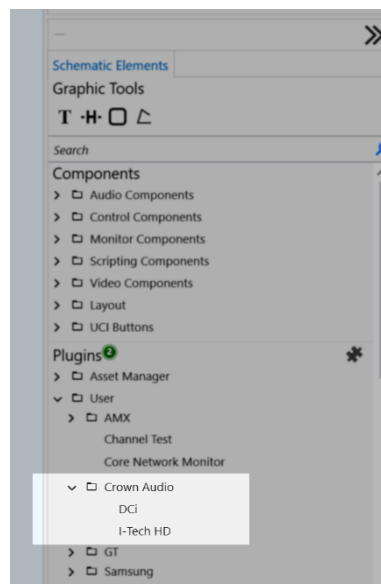
Installation

Double-click the Crown I-Tech.qplug file from the downloaded .zip directory and click Yes in the confirmation dialog to install the plugin.



If you prefer, you can also move the file directly to the Q-SYS directory in your \Documents\QSC\Q-SYS Designer\Plugins folder.

On the next launch of Q-SYS designer, you will see the plugin in the Schematic Elements pane under Plugins, User, Crown Audio.



Updating the Plugin

When you are updating the version of the plugin, follow the same steps as above. If an error appears, you may need to manually delete the old plugin and place the new one in the \Documents\QSC\Q-SYS Designer\Plugins folder.

Using the Plugin

Adding the I-Tech Plugin to your schematic

Add a plugin to your design file by dragging it from the Schematic Elements menu onto your workspace. You can add as many copies of the plugin as you need. If you prefer, you can copy and paste plugins between files and within your design. Be aware, if you have populated the IP address and HiQnet address, this will also get copied, and it may cause problems associated with redundant TCP connections.

Running the Plugin

After configuring the plugin, connect it to the amplifier by entering emulate mode or saving it to the core and running.

To connect the plugin to the amplifier, you must first enter the IP address AND the HiQnet address (unless HiQnet ID Auto has been enabled, in which case you just need to enter the IP address). Once the correct IP and HiQnet address are entered, the plugin will search the network, connect, and begin to display the device state.

Plugin Features:

Properties

Properties	
I-Tech HD Properties	
Model	4-Channel
In Meter Refresh Rate	Normal
Out Meter Refresh Rate	Normal
Show Debug	No
Graphic Properties	
Position	20,21
Fill	Blue
Control Pins	
▸ Config	
▸ Fault	
▸ Info	
▸ Input	
▸ Load	
▸ Meter	
▸ Output	
▸ Preset	
▸ Signal Generator	
Disable	

Model

You must set the plugin to control a 2-channel or a 4-channel amplifier in the Properties area. Use the correct mode for the following models:

- 4-Channel
 - I-Tech 4x3500HD
- 2-Channel
 - I-Tech 5000HD
 - I-Tech 9000HD
 - I-Tech 12000HD

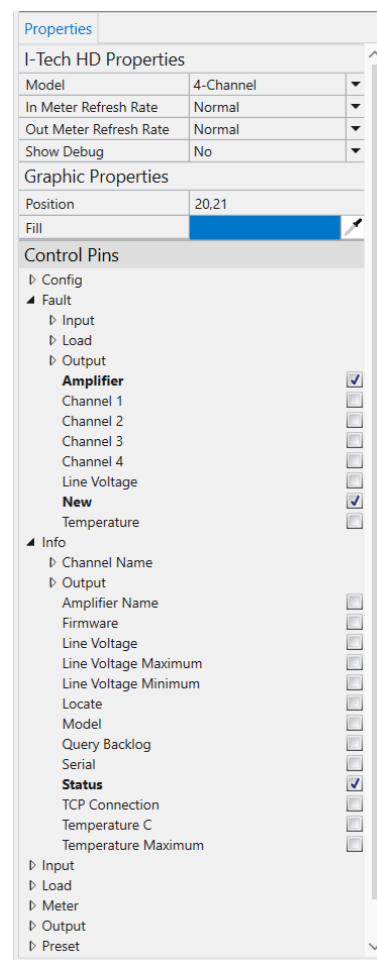
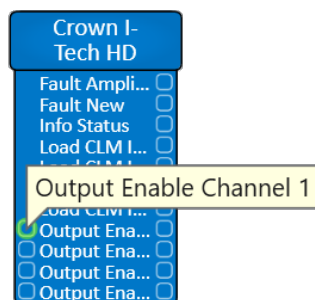
Meter Refresh Rate - Normal or Fast

Separate controls are provided for both the Input (In) and Output (Out) Meters. Normal by default, selecting Fast will substantially increase the amplifier traffic across your network, if a higher refresh rate on meters is not necessary for your use case then do not set to Fast.

Control Pins

Control Pins will provide the information I/O required to drive logic outside of the plugin. They are arranged by category and correspond to controls and logic in the plugin. Check the box next to the controls that you want to appear below the plugin object.

Note: There are more variables available as exposed pins than are shown in the plugin's user interface. Some include raw input detection, direct preset triggers, or "new fault" indicators.



Available Control Pins:

▼ Config

▼ Delays

Feet

Meters

Read only

Seconds

▼ Fault

▼ Input

▼ Clip Is Fault

Channel 1

Channel 2

Channel 3

Channel 4

▶ High Priority Absent Is Fault

▶ High Priority Active Is Fault

▶ Medium Priority Absent Is Fault

▶ Medium Priority Active Is Fault

▶ Low Priority Absent Is Fault

▶ Low Priority Active Is Fault

▼ Load

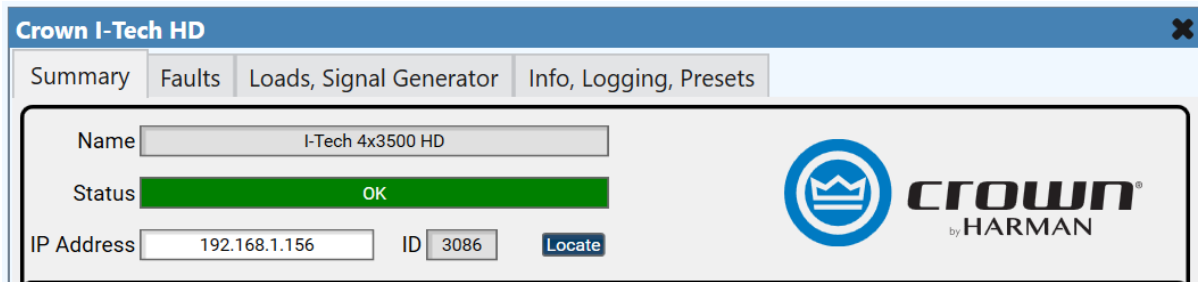
- ▶ CLM Abnormal Is Fault
 - ▶ PTLM Abnormal Is Fault
 - ▼ Output
 - ▶ Clip Is Fault
 - ▶ Limit Peak Is Fault
 - ▶ Limit RMS Is Fault
 - ▶ Limit Thermal Is Fault
 - ▶ Not Ready Is Fault
 - ▶ Standby Is Fault
 - ▶ Temperature High Is Fault
 - ▼ Log
 - ▶ Configuration Changes
 - ▶ Connection Faults
 - ▶ Control Changes
 - ▶ Hardware Faults
 - ▶ Input Faults
 - ▶ Input Priority Changes
 - ▶ Load Faults
 - ▶ Output Faults
 - ▶ Preset Changes
 - ▶ Status Changes
 - ▶ HiQnet ID
 - ▶ HiQnet ID Auto
 - ▶ IP Address
 - ▶ Query Interval (ms)
-
- ▼ Fault
 - ▼ Input
 - ▼ Clip
 - Channel 1
 - Channel 2
 - Channel 3
 - Channel 4
 - ▶ High Priority Absent
 - ▶ High Priority Active
 - ▶ Medium Priority Absent
 - ▶ Medium Priority Active
 - ▶ Low Priority Absent
 - ▶ Low Priority Active
 - Channel 1
 - Channel 2
 - Channel 3
 - Channel 4
 - ▼ Load
 - ▶ CLM Abnormal
 - ▶ PTLM Abnormal
 - Channel 1
 - Channel 2
 - Channel 3
 - Channel 4
- ▼ Output
- ▶ Clip
- ▶ DC Protect
- ▶ Limit
- ▶ Limit Peak
- ▶ Limit RMS
- ▶ Limit Thermal
- ▶ Not Ready
- ▶ Other Fault
- ▶ Short Circuit
- ▶ Standby
- ▶ Temperature High
- ▶ Vcc Rails
- Channel 1
- Channel 2
- Channel 3
- Channel 4
- ▼ Amplifier
 - Channel 1
 - Channel 2
 - Channel 3
 - Channel 4
 - Line Voltage
 - New Fault
 - Temperature
-
- ▼ Info
 - ▼ Channel Name
 - Channel 1
 - Channel 2
 - Channel 3
 - Channel 4
 - Amplifier Name
 - Firmware
 - Line Voltage
 - Line Voltage Maximum
 - Line Voltage Minimum
 - Locate
 - Model
 - Query Backlog
 - Serial
 - Status
 - TCP Connection
 - Temperature C
 - Temperature Maximum
 - ▼ Input
 - ▼ Active Source
 - Channel 1
 - Channel 2
 - Channel 3

Channel 4	▶ Enable
▶ AES Detect*	▶ Status
▶ AES PLL*	▶ Generator Mute
▶ Analog Detect	▶ Generator Level
▶ Clip	
▶ Cobranet Detect*	
▼ Delay	▼ Meter
Down X	▼ Input
Enable X	Channel 1
Feet X	Channel 2
Metres X	Channel 3
Seconds X	Channel 4
Text X	▶ Output
Up X	
▶ High Priority Active	▼ Output
▶ High Priority Detect	▼ Auto Standby
▶ High Priority Source	Channel 1
▶ Medium Priority Active	Channel 2
▶ Medium Priority Detect	Channel 3
▶ Medium Priority Source	Channel 4
▶ Low Priority Active	▶ Bridged
▶ Low Priority Detect	▶ Clip
▶ Low Priority Source	▶ Enable
	▶ Gain
	▶ Limit
	▶ Mute
	▶ Not Ready
	▶ Standby
▼ Load	
▼ CLM	
▼ Enable	
Channel 1	
Channel 2	
Channel 3	
Channel 4	
▶ Impedance	
▶ Impedance Maximum	
▶ Impedance Minimum	
▶ Impedance Status	
▼ PTLM**	
▶ Crossover Bypass	
▶ Current	
▶ Current Maximum	
▶ Current Minimum	
▶ Detector Gain	
	▼ Preset
	Active
	Select
	Go
	Recall 1
	...
	Recall 50
	▼ Signal Generator
	Enable
	Frequency
	Gain
	Mode
	Disable*

* These pins are available as pins but not directly shown in the plugin.

** The control pins are identical for the 2 and 4 channel amps except for the Tone Based Load Monitoring pins, as this feature is only on the 4-channel amplifier.

Main Plugin Window



The main plugin window contains tabbed pages located across the top.

Common Header:

Name: This is the amplifier's name, set in Audio Architect or Performance Manager

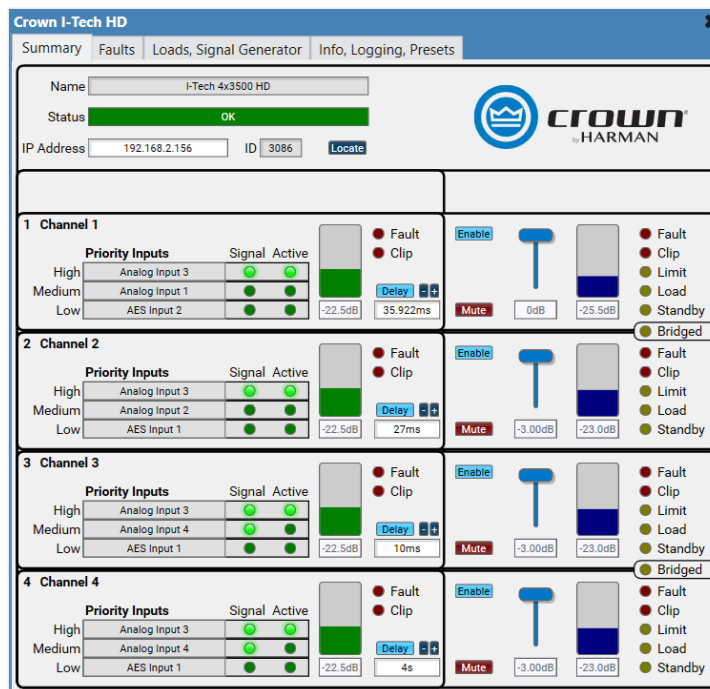
Status: The current status of this amplifier is aggregated from all available information. It uses standard Q-SYS status colours and values.

IP Address: The IP Address of the amplifier. This field is required for communication.

ID: The HiQnet address of the amplifier. This field is required for communication and may be entered in decimal format (like 12345) or hex (like 0xABC). Use HiQnet NetSetter to find and set the amplifier's address. This may be set automatically if the "HiQnet ID Auto" option is set. In this mode, the ID field is greyed-out

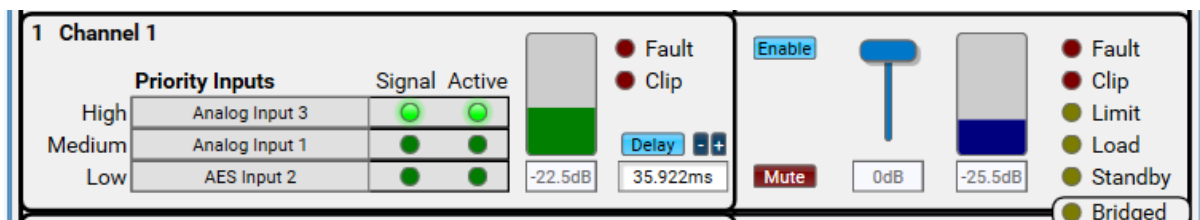
Locate: Press to flash the amplifier's front panel lights. Press again to stop.

Summary Tab



The Summary Tab provides a high-level overview of the critical input and output information. This tab offers most of the vital information sought after from a Q-SYS plugin.

For each channel:



Channel Name: This is the channel's name stored in the amplifier, configured using Audio Architect or Performance Manager. It starts with a default and overwrites when the plugin connects to the amplifier for the first time.

Priority Inputs: These are the hardware inputs mapped to each priority for each channel. They are defined in Audio Architect, along with their levels and detection thresholds. The highest detected priority input is automatically set as active and routed to the output.

Signal: These indicators light up green if a priority input is detected.

Active: One of these indicators lights up green to show which priority input is routed through it. If no input is detected, nothing is routed, and none of the three lights up.

Input Meter: Shows the routed signal level.

Usually updated once per complete query cycle but can be made faster by changing the In Meter Refresh Rate (Properties) to Fast.

Input Fault: Lights if there is any problem with this channel's input.

Faults are configured on the next page and can include missing input signals, active input signals, or clipping.

Input Clip: Lights if the routed input is clipping.

Delay Enable: Enables the input delay.

Delay +/- Increment/Decrement the delay value. The delay can be set as read only in the Plugin Properties.

Delay Text: Displays the input delay in either Seconds, Feet or Meters, values can also be typed in.

Output Enable: Enables this channel of the amplifier.

If not enabled, the output stage is effectively switched off.

Mute: For this channel's output.

Fader: For this amplifier channel's DSP output.

Output Meter: Shows the output signal level.

Usually updated once per complete query cycle but can be made faster by changing the Out Meter Refresh Rate (Properties) to Fast.

Output Fault: Lights if there is any problem with this output channel.

Faults are configured on the next page and can include many different indicators.

Output Clip: Lights if the output is clipping.

Output Limit: Lights if the output is being limited.

Output Load: Lights if there is a problem with this channel's load, as configured on the Loads page.

Output Standby: Lights if this output channel is in standby.

Bridged: Lights if a pair of channels are bridged.

Faults Tab:

Crown I-Tech HD

Summary | **Faults** | Loads, Signal Generator | Info, Logging, Presets

Name: I-Tech 4x3500 HD

Status: **Fault - Channel 1 Input Clip**

IP Address: 192.168.1.156 ID: 3086 [Locate](#)

Optional faults can be enabled individually using checkboxes

1 Channel 1

Input Clip ☒ ☐ Output Clip ☒ ☐ Limit Peak ☒ ☐ Not Ready ☒ ☐

High Input Absent ☐ ☐ High Input Active ☒ ☐ Standby ☒ ☐ Limit RMS ☒ ☐ Short Circuit ☐ ☐

Medium Input Absent ☐ ☐ Medium Input Active ☐ ☐ PTLM Fault ☒ ☐ Limit Therm ☒ ☐ DC Protect ☐ ☐

Low Input Absent ☒ ☐ Low Input Active ☐ ☐ CLM Fault ☒ ☐ High Temp ☒ ☐ HF Detect ☐ ☐

2 Channel 2

Input Clip ☒ ☐ Output Clip ☒ ☐ Limit Peak ☒ ☐ Not Ready ☒ ☐

High Input Absent ☐ ☐ High Input Active ☒ ☐ Standby ☒ ☐ Limit RMS ☒ ☐ Short Circuit ☐ ☐

Medium Input Absent ☐ ☐ Medium Input Active ☐ ☐ PTLM Fault ☒ ☐ Limit Therm ☒ ☐ DC Protect ☐ ☐

Low Input Absent ☒ ☐ Low Input Active ☐ ☐ CLM Fault ☒ ☐ High Temp ☒ ☐ HF Detect ☐ ☐

3 Channel 3

Input Clip ☒ ☐ Output Clip ☒ ☐ Limit Peak ☒ ☐ Not Ready ☒ ☐

High Input Absent ☐ ☐ High Input Active ☐ ☐ Standby ☒ ☐ Limit RMS ☒ ☐ Short Circuit ☐ ☐

Medium Input Absent ☐ ☐ Medium Input Active ☐ ☐ PTLM Fault ☒ ☐ Limit Therm ☒ ☐ DC Protect ☐ ☐

Low Input Absent ☒ ☐ Low Input Active ☐ ☐ CLM Fault ☒ ☐ High Temp ☒ ☐ HF Detect ☐ ☐

4 Channel 4

Input Clip ☒ ☐ Output Clip ☒ ☐ Limit Peak ☒ ☐ Not Ready ☒ ☐

High Input Absent ☐ ☐ High Input Active ☐ ☐ Standby ☒ ☐ Limit RMS ☒ ☐ Short Circuit ☐ ☐

Medium Input Absent ☐ ☐ Medium Input Active ☐ ☐ PTLM Fault ☒ ☐ Limit Therm ☒ ☐ DC Protect ☐ ☐

Low Input Absent ☒ ☐ Low Input Active ☐ ☐ CLM Fault ☒ ☐ High Temp ☒ ☐ HF Detect ☐ ☐

Vcc Fault ☐ ☐

The plugin monitors a range of possible faults and aggregates the selected faults to the master fault for a given input, output, or fault type. All parameters on this tab are monitored constantly. Disabling a fault check box doesn't stop it from being monitored and displayed on other pages. It prevents the state from being considered as a fault. For example, output limiting is constantly monitored and displayed on the summary page, but it is only shown as a fault and passed to the header's status field if enabled here. The LEDs next to the fault type's checkbox will illuminate if the box is checked AND the error occurs.

For Each Channel:

1 Channel 1

Input Clip ☒ ☐ Output Clip ☒ ☐ Limit Peak ☒ ☐ Not Ready ☒ ☐

High Input Absent ☐ ☐ High Input Active ☒ ☐ Standby ☒ ☐ Limit RMS ☒ ☐ Short Circuit ☐ ☐

Medium Input Absent ☐ ☐ Medium Input Active ☐ ☐ PTLM Fault ☒ ☐ Limit Therm ☒ ☐ DC Protect ☐ ☐

Low Input Absent ☒ ☐ Low Input Active ☐ ☐ CLM Fault ☒ ☐ High Temp ☒ ☐ HF Detect ☐ ☐

Vcc Fault ☐ ☐

High, Medium, and Low Input Absent: Toggles on when the Input Source Selector has an input assigned and the signal drops below the threshold specified in Audio Architect or Performance Manager.

This is useful, especially coupled with additional logic, for monitoring an input pilot tone or knowing if a source drops out.

High, Medium, and Low Input Active: Toggles on when the Input Source Selector activates the respective input.

This is useful for getting a notification if an amplifier has fallen back to a lower-priority input.

Input Clip: Toggles on when the active input is clipping.

Output Clip: Toggles on when the output signal is clipping.

Standby: Toggles on when the amp is on standby.

CLM Fault: Toggles on when Continuous Load Monitoring is enabled on the Load Tab AND the detected load is either above the set high threshold or below the set low threshold.

PTLM Fault: Toggles on when Pilot Tone Load Monitoring is enabled on the Load Tab AND the detected load is either above the set high threshold or below the set low threshold.

Limit Peak: Toggles on when the peak limiter is active in LevelMAX. This activates at any level of limiting.

Limit RMS: Toggles on when the RMS limiter is active in LevelMAX. This activates at any level of limiting.

Limit Therm: Toggles on when the thermal limiter is active in LevelMAX. This activates at any level of limiting.

High Temp: Toggles on when the amplifier temperature is above the set threshold on the info tab.

Not Ready: Toggles on when the amplifier channel is either in standby or is disabled.

Short Circuit: Toggles on when the amplifier senses a short on the selected channel.

DC Protect: Toggles on when the amplifier channel falls into a DC protect state.

Other Fault: Toggles on when the amplifier goes into a fault state for other reasons than listed above.

VCC Fault: Toggles on when there is a power supply voltage or current fault.

Loads, Signal Generator Tab:

Crown I-Tech HD

SummaryFaultsLoads, Signal GeneratorInfo, Logging, Presets

NameI-Tech 4x3500 HD

StatusOK

IP Address192.168.1.156ID3086Locate

Signal Generator

Enable / Force On

Mute

Gain

Mode

White

Level

-100dB

Freq Hz

1000

1 Channel 1

Xover

On

Bypass

Gain

mA

Min

Max

Status

Pilot Tone Load Monitoring

0

72.0

1.00

50.0

High

Continuous Load Monitoring

31.4

1.00

250

Normal

2 Channel 2

Xover

On

Bypass

Gain

mA

Min

Max

Status

Pilot Tone Load Monitoring

0

63.3

25.0

50.0

High

Continuous Load Monitoring

32.0

1.00

15.0

High

3 Channel 3

Xover

On

Bypass

Gain

mA

Min

Max

Status

Pilot Tone Load Monitoring

0

55.1

25.0

200

Normal

Continuous Load Monitoring

37.0

1.00

250

Normal

4 Channel 4

Xover

On

Bypass

Gain

mA

Min

Max

Status

Pilot Tone Load Monitoring

0

0.0

25.0

50.0

Off

Continuous Load Monitoring

8.0

2.00

50.0

Off

The Loads tab offers controls for monitoring the output loads attached to the amplifier.

Common Controls:

Signal Generator

There is one signal generator per amplifier. It injects its signal on the input side of the DSP chain and passes through the DSP.

Enable / Force On

Mode

Sine

Level

0dB

Freq Hz

20000


Enable: Switches the signal generator on and off.



Caution should be used when using this feature as a constant tone can damage speakers and cause unnecessary heat, wear and tear. As an alternative to leaving the generator on constantly, the generator enable can be exposed as a control pin. A system-level, logic-based timer can enable the generator for a period and duration that delivers the required results without leaving the generator constantly.

Force On: Automatically turns on the generator if the generator gets disabled elsewhere.

By design, I-Tech automatically turns off its signal generator on reboot. Checking this box will enable logic in the plugin to enable the generator if the amplifier or other software turns off or resets the generator.

 **Note:** If you are using Performance Manager, you will need to restore the Q-SYS setting after passing through the Test mode. This mode is designed to reset the generator to use pink noise and will control the generator level and enable as part of the Performance Manager workflow.

Mode: Choose from White Noise, Pink Noise, or Sine Wave.


Gain: Anything from -100 dB to +20 dB. Be careful!

Frequency: From 20 Hz to 20,000Hz.

For Each Channel:

1 Channel 1		Xover						
Mute	Gain	On	Bypass	Gain	mA	Min	Max	Status
<input type="checkbox"/>	-31.0	<input type="checkbox"/>	<input type="checkbox"/>	0	72.0	1.00	50.0	High
				On	Ohm	Min	Max	Status
		<input type="checkbox"/>		31.4	1.00	250		Normal

The signal generator can be routed to each output channel with individual mute and level controls.

 **Caution** should be used as very high levels can overload an amplifier output channel and cause it to shut down to protect itself or damage transducers.

Mute: This will mute the generator in the input matrix for each channel.

Gain is the input matrix gain control for each channel's signal generator input.

Output Load Monitoring

Each channel has two types of load monitoring, Pilot Tone Load Monitoring (PTLM) and Continuous Load Monitoring (CLM).

Pilot Tone Load Monitoring (PTLM) (4x3500HD only) uses a carefully configured 20 kHz tone and measures the current drawn by the load to detect variations from a tested and commissioned system.

In some life safety applications, it is required to monitor the integrity of the emergency signal path from the source to the speaker line. Pilot tone detection allows Crown amplifiers to monitor the speaker line for open and closed circuits using an end of line termination, as shown in figure 1 below.

The idea behind 20 kHz pilot tone load monitoring (PTLM) is to generate an inaudible 20kHz sinewave and pass it through the entire signal path. The 20 kHz pilot tone current is then monitored at the output of the amplifier. When the current falls outside of manually defined thresholds, an open or short circuit condition is reported via the network.

If the correct pilot tone current is present, one can be confident that the signal path to and from the amplifier is physically connected and not opened or shorted. This feature was implemented as a solution that would meet international life safety standards such as EN 50849:2017 or BS 5839 Part 8.

Example EOL Box Installation Schematic



Requirements

20kHz Pilot Tone - This should be generated externally and mixed with other audio in the signal path or generated using the internal generator. Audio, before being mixed, must be low pass filtered at 18 kHz using a 3rd order -18 dB/oct (or greater) Butterworth filter. This corner frequency can be set higher if a higher-order filter is used. The filter frequency should not be higher than 19 kHz. The resulting 20 kHz current can be measured by the amplifier and should remain relatively constant. If audio is allowed into the 20 kHz band, it will cause the 20 kHz Pilot tone current measurements to jump around, generating nuisance fault conditions.

Most JBL presets include a 16 kHz low pass filter. In most cases, the X-Over Bypass control will need to be enabled to allow the DSP to pass 20 kHz to the output. The LPF included in the factory presets is meant to improve efficiency and save energy inside the amplifier by reducing the amount of inaudible energy that the amplifier could produce, it also serves to protect drivers from unnecessary heat, wear, and tear. The HF content must be monitored and managed. Implementing a HF cut in the input EQ can help to ensure program material does not damage the driver or interfere with the stability of the measurement.

End Of Line (EOL) Box - The EOL box is used as an “End of Line” termination in audio systems using pilot tone detection. The end of line box is required to be installed at the end of each speaker line to tune the speaker line to react to the 20 kHz pilot tone appropriately. The termination should be placed at the furthest end of the loudspeaker line. Multiple EOL boxes can be used in the case of branched speaker lines. It is recommended, however, to keep the number of EOL boxes to a minimum.

Transducer Load – Some Transducers can produce a reliable result without an EOL box. Tolerances may need to be accounted for to allow for temperature effects.


Setup

If using an external 20 kHz generator, apply a 20 kHz tone into the input of the amplifier in the range of -40 dBu to -36 dBu.

The Enable button next to each channel must be turned on.

If using the LPF in the amplifier’s built-in crossover, the Crossover Bypass button should be turned On, so the crossover does not interfere with the 20 kHz signal.

If using the amplifier’s built-in tone generator, enable the Signal Generator, configure it for a 20 kHz sinewave, raise the master level to 0 dB, then raise the individual channel levels to an acceptable level. With an EOL box, it is recommended that the pilot tone current be in the range of 50 mA to 150 mA. The detector gain is used to adjust this.

 **Note:** Great care should be taken when adjusting the 20 kHz tone. Crown amplifiers are capable of producing a lot of power at 20 kHz. More than a few hundred mA of 20 kHz current can damage the EOL box and produce large amounts of heat and additional stress to the amplifier and drivers.

The Upper and Lower limit thresholds should be set where the open and short conditions can be detected, generally within about 5mA from the stable state. Based on physical system testing, these limits should be adjusted per channel as no two circuits are exactly the same. If simply checking for shorts and opens, increase the threshold range to +/- 20mA from the stable state.

[Pilot Tone Load Monitoring Controls:](#)

PTLM On: Enables the Pilot Tone Load Monitoring feature and logic

PTLM Crossover Bypass: Turning this on allows the crossover and speaker output EQ to pass 20 kHz into the detector. This feature will be enabled in most cases as 20 kHz should be allowed to pass either from the input or the internal generator to the detector without being filtered out.

PTLM Detector Gain: Use to adjust the sensitivity of the pilot tone detector.

PTLM mA: The reported current measured by the PTLM circuit.


PTLM Min: The definable minimum current expected for the load, below which a fault is shown.

PTLM Max: The definable maximum current expected for this load, above which a fault is shown.

PTLM Status: The status of PTLM for this channel. Off, Normal, Low, or High.

[Continuous Load Monitoring](#) (CLM) calculates the average output load impedance from the voltage the amplifier provides at its output and the current the load is drawing. CLM can work whenever there is a sufficient signal to provide meaningful values. As the impedance is calculated based on the signal provided to the load, and the impedance of the load is frequency-dependent, the content of the signal will influence the result.

CLM Enable: Enables Continuous Load Monitoring.

 **Note:** CLM will only operate if there is a sufficient output level.

CLM Ohm: The current measured impedance of the load, or the last value if no current reading is available.

CLM Min: The definable minimum permitted impedance for this channel, below which a fault will be shown.

CLM Max: The definable maximum permitted impedance for this channel, above which a fault will be shown.

CLM Status: The reported status of CLM on this channel. Off, Normal, Low, or High.

Info, Logging, and Presets Tab:

The screenshot shows the 'Crown I-Tech HD' web interface with the 'Info, Logging, Presets' tab selected. The interface includes a top navigation bar with tabs for 'Summary', 'Faults', 'Loads, Signal Generator', and 'Info, Logging, Presets'. Below the navigation bar, there is a header section with the following fields: 'Name' (I-Tech 4x3500 HD), 'Status' (OK), 'IP Address' (192.168.2.156), 'ID' (3086), and a 'Locate' button. The Crown logo and 'by HARMAN' text are also present. Below the header, the interface is divided into three main sections: 'Information', 'Event Logging', and 'Presets'. The 'Information' section displays fields for 'Model' (4x3500HD), 'Serial' (15100380152), 'Firmware' (1.0.5.21), 'AC Volts' (229.5) with a 'Fault' indicator, 'Temp C' (42.3) with a 'Fault' indicator, and 'Query ms' (150) and 'Queue' (1). The 'Event Logging' section lists various event types with checkboxes: 'Status Changes' (checked), 'Hardware Faults', 'Load Faults', 'Output Faults', 'Input Faults', 'Priority Switches', 'Connection Faults', 'Configuration Changes', 'Preset Changes' (checked), and 'Control Changes' (checked). The 'Presets' section includes an 'Active' preset (03: Preset3), a 'Recall' field (03: Preset3) with a 'Go' button, and a 'Settings' section with checkboxes for 'Delays in s' (checked), 'ft', 'm', 'Delays read-only', and 'HiQnet ID Auto' (checked). The version number 'v1.3.2' is displayed in the bottom right corner of the interface.

This tab shows all amplifier information, Event logging to Q-SYS, and Preset information.

Common Controls:

Information:

The close-up shows the 'Information' section of the web interface. It contains the following fields: 'Model' (4x3500HD), 'Serial' (15100380152), 'Firmware' (1.0.5.21), 'AC Volts' (229.2) with a 'Fault' indicator, 'Temp C' (42.6) with a 'Fault' indicator, and 'Query ms' (150) and 'Queue' (1).

Version: The plugin version number is shown just under the Crown logo.

Model: Reported amplifier Model.

Serial: Reported amplifier serial number.

Firmware: Firmware version reported by the amplifier.

AC Volts: Reported mains voltage in volts.

AC Volts Fault: Lights when mains power state is reported faulty, i.e., outside allowed limits.

Temperature: The current power supply temperature in degrees Celsius.

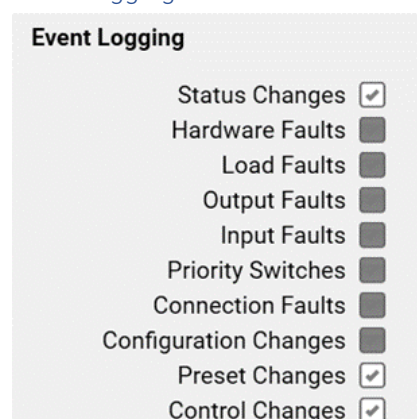
Temperature Fault: Light when amplifier temperature exceeds the allowed threshold.

Query ms: The plugin polls (queries) the amplifier over a TCP connection. Parameters vary by amplifier model and channels, e.g., an I-Tech 4x3500HD plugin polls over 200 parameters. After each set of queries, the plugin display is updated. The "Query ms" control defines the time allowed for each query to be processed by Q-SYS and the amplifier. If it's too large, it takes a long time for changes to show on in Q-SYS. If it's too small, there won't be enough time for all queries to be processed, and you will miss changes, or the amplifier may go offline occasionally. Be aware that enabling a Fast meter refresh rate increases this effect.

Note: The query cycle is a rolling snapshot taken of the amplifier, and therefore, it is not a live indication. Brief events like an occasionally clipping channel will only have a few of those clipping events captured by the cycle.

Queue: Reports the number of queries currently being processed by the amplifier. If this is off the scale, then there's something wrong. Most likely, the amplifier is offline, or it is being polled too quickly.

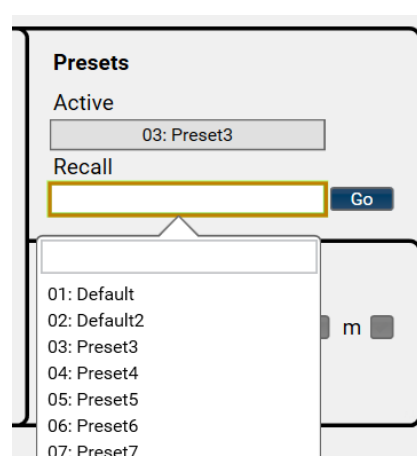
Event Logging:



The middle section lets you decide what goes into the Q-SYS Event Log.

Enable any, all, or none of these to write valuable messages to the Q-SYS Event Log. Disabling an item won't stop it from being monitored; it just won't appear in the event log.

Presets:



This section enables preset recall.

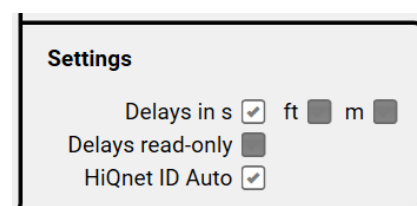
Active Preset: The current preset, as reported by the amplifier.

Recall Preset: The drop-down list shows all 50 presets. Select a preset, then click "Go" to trigger the recall of the selected preset.

All 50 presets have individual pins available.

Use Audio Architect or Performance to manage and configure presets.

Settings:



Delays in: Delays (Input) can either be selected in s (seconds), ft (feet) or m (meters)

Delays read-only: Enabled by default, make the delay value read only by the plugin.

HiQnet ID Auto: If selected, the HiQnet value will be auto-populated when the correct IP address of the amplifier is entered.

Fault Priorities

If there are multiple faults, the Status control will display only one fault. Listed below is the order of faults, from highest priority to lowest.

Optional faults are only included if they are selected as faults on the Faults tab. For example, an input clip will not show as a fault unless the relevant “Input Clip” checkbox is selected.

Highest Priority	Amplifier Missing (Offline)
	Model Mismatch
	Amplifier Missing (No Replies)
	PSU Vcc Rails Fault
	Output Short Circuit
	Output DC Protect
	Output Not Ready
	Output In Standby
	Input Clip
	Output Clip
	Output Limit
	Low Load Impedance
	High Load Impedance
	High PTLM Current
	Low PTLM Current
	High Priority Input Active
	Medium Priority Input Active
	Low Priority Input Active
	Low Priority Input Missing
	Medium Priority Input Missing
	High Priority Input Missing
	AC Voltage Fault
	PSU Temperature High
	Channel Temperature High
Lowest Priority	Model Mismatch (minor)
	HiQnet ID Mismatch

For the same fault on multiple channels, the lowest-numbered channel is shown.

Reported Fault Aggregation

Individual faults are aggregated into summary faults using logic in the plugin. Most logic faults appear in the GUI, and all logic faults are found on the plugin's output pins.

Optional faults are only included if they are selected as faults on the Faults tab. For example, an input clip will not show as a fault unless the relevant "Input Clip" checkbox is selected.

Any Fault	Missing (Offline)	Timeout		
		TCP Disconnected		
	AC Voltage Fault			
	PSU Temperature High			
	HiQnet ID Mismatch			
	Model Mismatch			
	Channel Fault	Input Fault	Input Clip	
			Low Priority Input Absent	
			Medium Priority Input Absent	
			High Priority Input Absent	
			Low Priority Input Active	
			Medium Priority Input Active	
			High Priority Input Active	
		Output Fault	Output Clip	
			Output Limit	Limit RMS
				Limit Peak
				Limit Thermal
			Output Short Circuit	
			Output DC Protect	
			Output HF Detect	
			Output Not Ready	
			Output Standby	
		Hardware Fault	Vcc Rails Fault	
		Load Fault	CLM Fault	Load Impedance High
				Load Impedance Low
			PTLM Fault	Pilot Tone Current High
				Pilot Tone Current Low
		Temperature High		