Crown I-Tech HD Plugin for Q-SYS

User Guide

v 1.0.6.1

Contents

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)

HiQnet and Q-SYS

The Harman proprietary communications protocol, 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.

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)

NetSetter is a standalone networking utility that aids in discovering and managing networking-related parameters of Harman devices. It can allow firmware updating, 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.

The **Crown Q-SYS Plugin** integrates the monitoring of the Harman HiQnet protocol and extends it into the Q-SYS system and allows Crown devices to connect to the Q-SYS platform.

Networking with HiQnet

It is recommended that users stay away from large daisy-chain network topologies with HiQnet devices.

It is also recommended for I-Tech to be configured with static IP addresses for network and communication stability.

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.

TCP/IP Port Configuration

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.

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 v9.2 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.

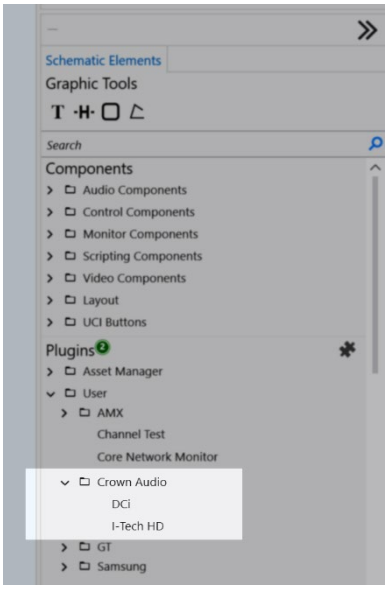
I-Tech Amplifiers are designed to only support a limited number of TCP connections. Use only one plugin instance for each amplifier.

Installation

Double-click the FILENAME.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.

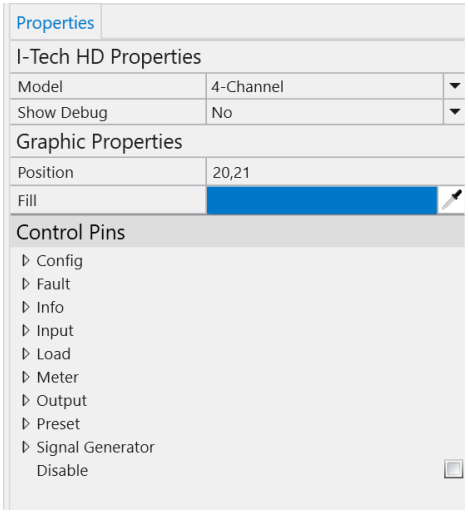
Running the Plugin

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. 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



Model

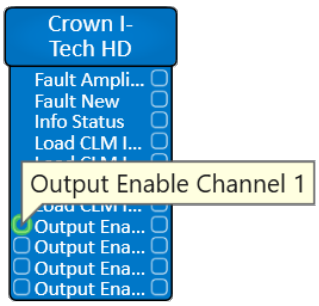
You must set the plugin to control a 2-channel or a 4-channel amplifier in the Properties area. Use the correct mode for the following models:

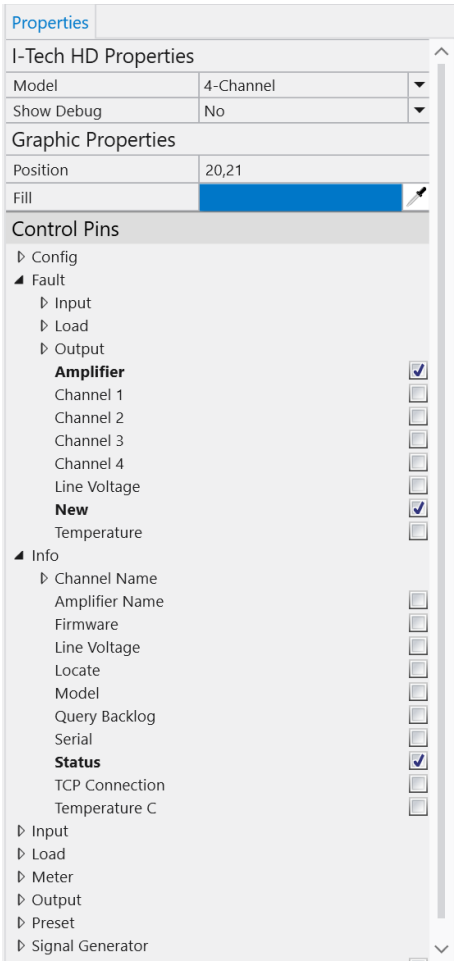
- 4-Channel
  - I-Tech 4x3500
- 2-Channel
  - I-Tech 5000HD
  - I-Tech 9000HD
  - I-Tech 12000HD

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**
  - Fault
    - Input
      - Clip is Fault
        - Channel 1
        - Channel 2
        - Channel 3
        - Channel 4
      - High Priority Absent it 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
  - 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
  - Locate
  - Model
  - Query Backlog
  - Serial
  - Status
  - TCP Connection
  - Temperature C

- **Input**
  - Active Source
    - Channel 1
    - Channel 2
    - Channel 3
    - Channel 4
  - AES Detect*
  - AES PLL*
  - Analog Detect
  - Clip
  - Cobranet Detect*
  - High Priority Active
  - High Priority Detect
  - High Priority Source
  - Medium Priority Active
  - Medium Priority Detect
  - Medium Priority Source
  - Low Priority Active
  - Low Priority Detect
  - Low Priority Source

- **Load**
  - CLM
    - Enable
      - Channel 1
      - Channel 2
      - Channel 3
      - Channel 4
    - Impedance
    - Impedance Minimum
    - Impedance Maximum
    - Impedance Status
  - PTLM**
    - Crossover Bypass
    - Current
    - Current Maximum
    - Current Minimum
    - Detector Gain
    - Enable
    - Status
    - Generator Mute

- Generator Level

- **Meter**
  - Input
    - Channel 1
    - Channel 2
    - Channel 3
    - Channel 4
    - Enable Fast Meters
  - Output

- **Output**
  - Auto Standby
    - Channel 1
    - Channel 2
    - Channel 3
    - Channel 4
  - Bridged
  - Clip
  - Enable
  - Gain
  - Limit
  - Mute
  - Not Ready
  - Standby

- **Preset**
  - Active
  - Select
  - Go
  - Recall 1
  - …
  - Recall 50

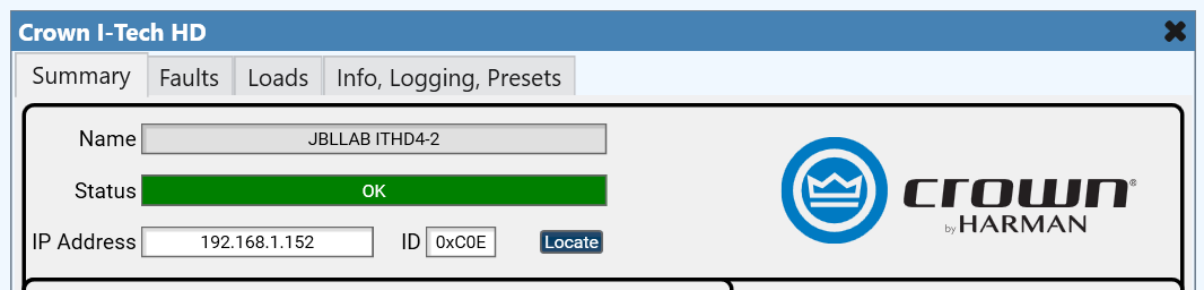
- **Signal Generator**
  - Enable
  - Frequency
  - Gain
  - Mode

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

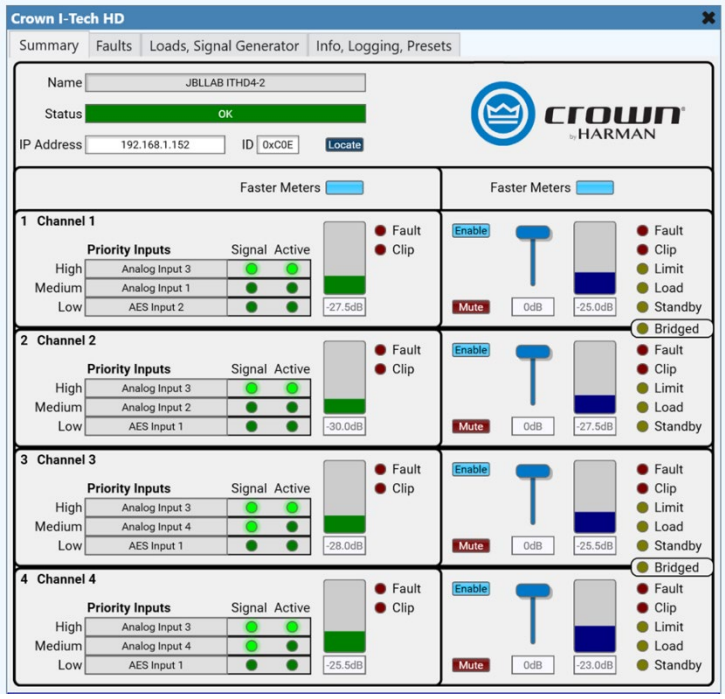
Status – The current status of this amplifier, aggregated from all available information. It uses standard Q-SYS status colors and values.

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.

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

Summary Tab

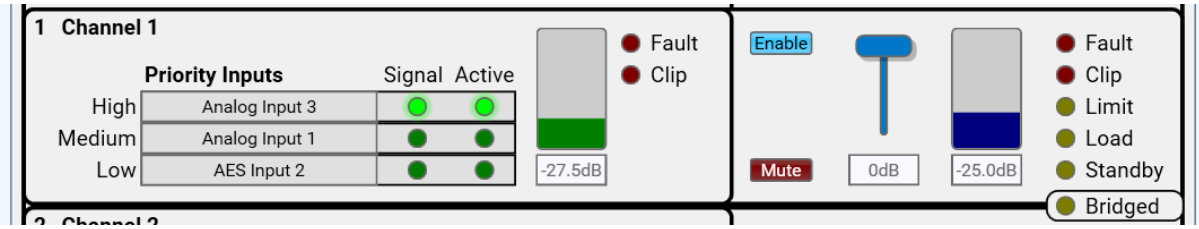


The Summary Tab provides a high-level overview of the critical input and output information. This tab offers most of the vital information sought after from a QSys plugin.

Common Controls:

Faster Meters – Toggle between standard and fast meter updates. By default, the meter data is polled once per polling cycle. Enabling this toggle will poll for meter data one time for every duration specified in the polling rate in the info tab with other amp data.
This will substantially increase the amplifier traffic and, depending on your use case, can cause issues related to network traffic.

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's 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 using the Faster Meters button above.

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.

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 using the Faster Meters button above.

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.

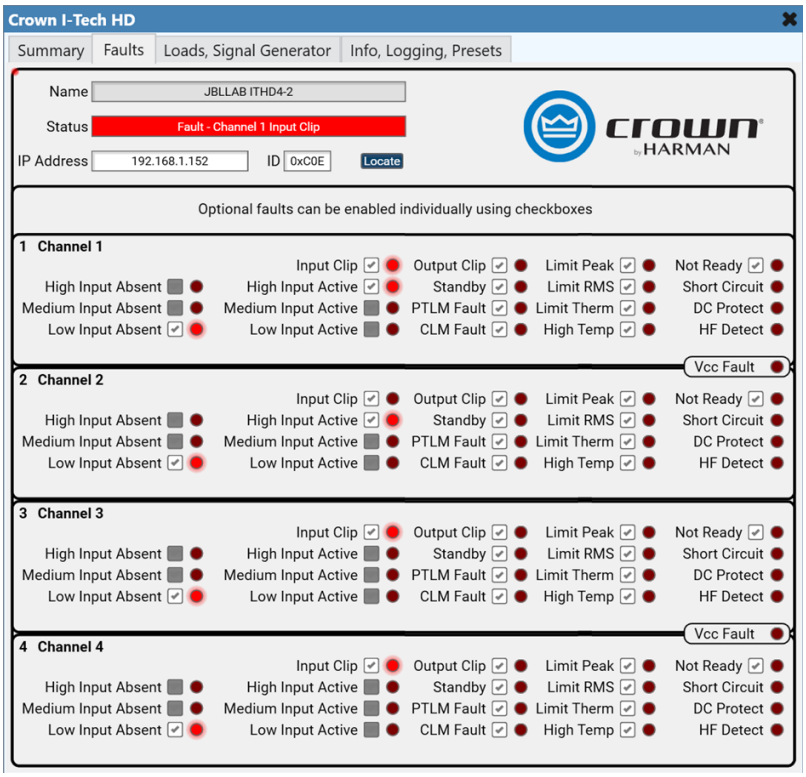
Output Limit – Lights if the output is being limited.

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.

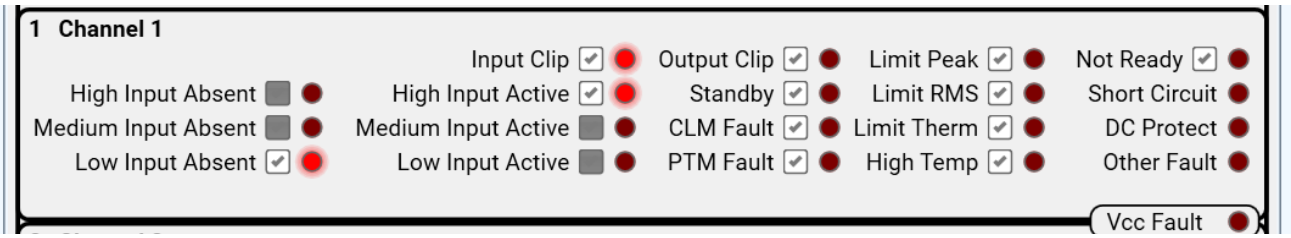
Bridged – Lights if a pair of channels are bridged.

Faults Tab:



The plugin monitors a range of possible faults and aggregates the selected faults to 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:



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.

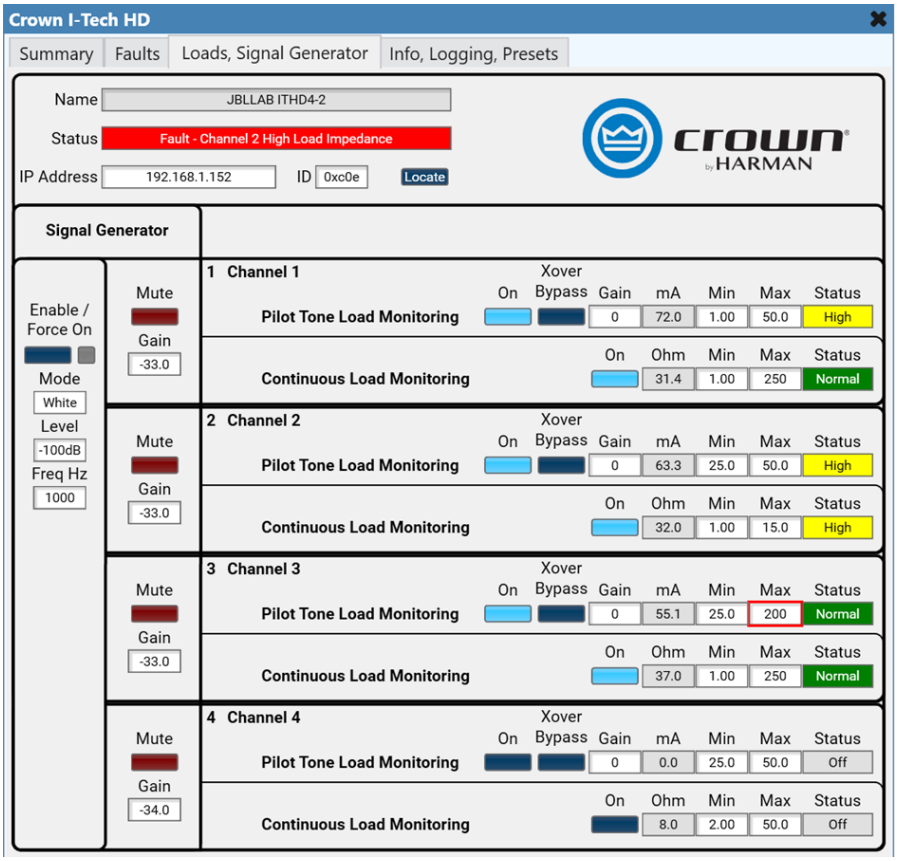
Short Circuit: Toggles on when the amplifier senses a short on the selected channel.

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

Other Fault: Toggles on when the amp 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:



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: Switches the signal generator on and off.

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.

This feature is not recommended for all systems 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.

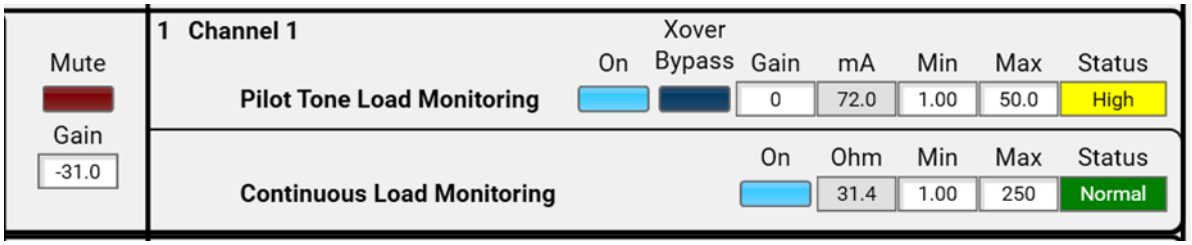
Note: If you are using Performance Manager, you will need to restore the Q-SYS setting after passing through the Test mode. This mode is designed to reset the generator to use pink noise and will control the generator level and enable as part of the Performance Manager workflow.

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:



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

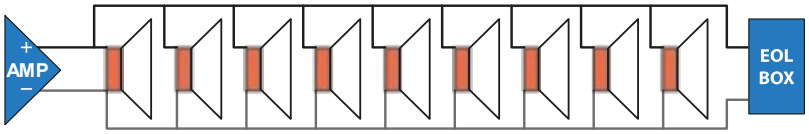
Output Load Monitoring

Each channel has two types of load monitoring, Pilot Tone Load Monitoting and Continuous Load Monitoring.

Pilot Tone Load Monitoring (4x3500 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, and 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 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 On: Enables Continuous Load Monitoring. Note that CLM will only operate if there is a sufficient output level.

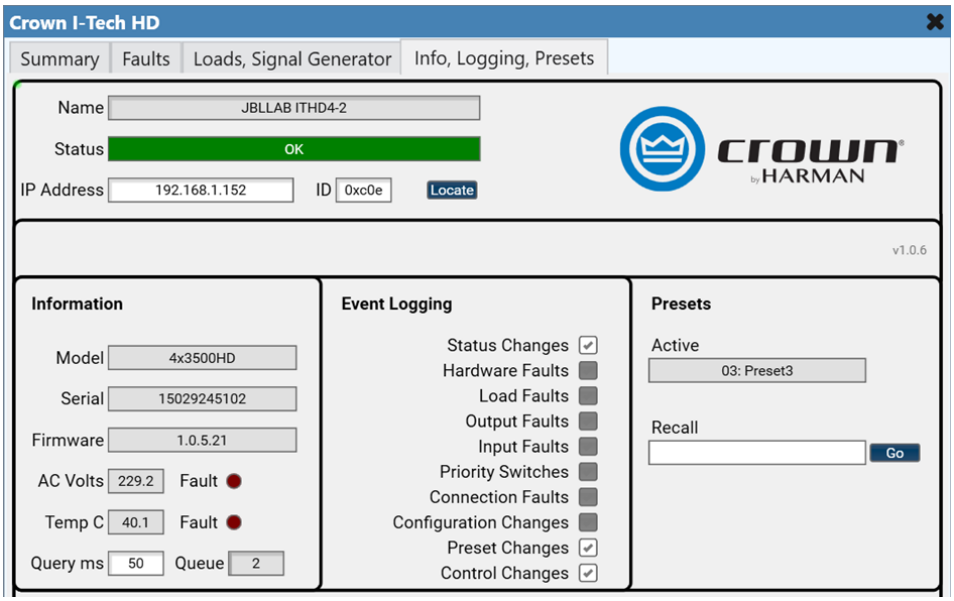
CLM Ohm: The current measured impedance of the load, or the last value if no current reading is available.

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.

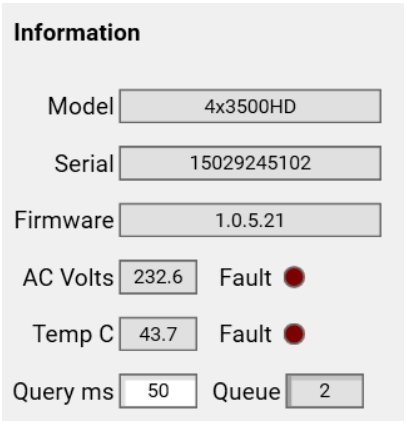
Info, Logging, and Presets Tab:



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

Common Controls:

Information:



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.

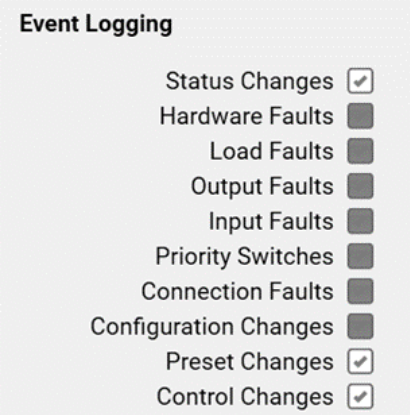
Temperature Fault: Light when amplifier temperature exceeds the allowed threshold.

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 fast meters increases this effect. 100ms is recommended.

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.

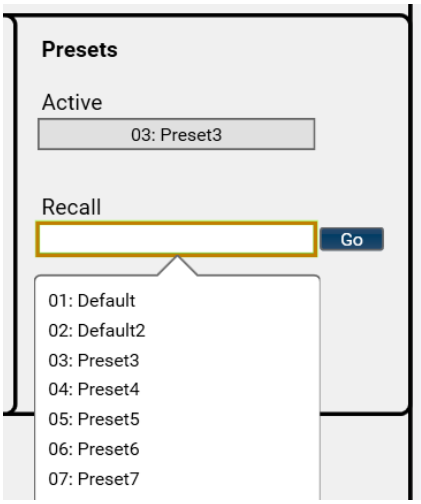
Event Logging:



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.

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

Lowest Priority

- Amplifier Missing (Offline)
- 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

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			
	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		