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# Hi5-3D

## HD-SDI Multiplexer to HDMI 1.4a and SDI Video and Audio Converter



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# Installation and Operation Guide

Because it matters.

**AJA**<sup>®</sup>  
VIDEO SYSTEMS

## Introduction

The Hi5-3D is a 3D video multiplexer that combines two 3G or HD-SDI Inputs into various multiplexed 3D formats for output on HDMI 1.4a and HD-SDI. Non-3D input (SD-SDI, HD-SDI or 3G) at either input will be passed to the HDMI output.

**Note:** support for 3G and frame-packing are not present in version 1—these features will be introduced in future firmware releases.

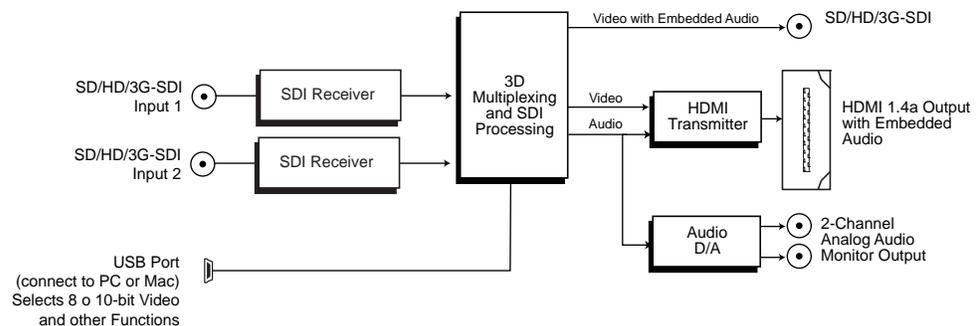
The HDMI 1.4a output supports EDID transactions that allow automatic 2D/3D configuration per the HDMI monitor's capabilities. Input SDI 2 will be frame synchronized to input SDI 1 in 3D Modes.

Embedded SDI input audio is embedded in both the HDMI and SDI outputs. 2 channel RCA audio output is also supported with user control of channel selection. The Hi5-3D supports AJA's Mini-Config application for user configuration and firmware download.

## Features

- HD-SDI to HDMI 1.4a with additional SDI output
- Non-3D SD/HD-SDI passed to HDMI output
- 10-bit HDMI 1.4a support including 3D and embedded audio
- Additional 2 Channel RCA jack audio output
- Setup via Dipswitch or PC/Mac using USB port and supplied USB cable (USB configuration software application supplied on CD)
- Uses 5-20V power (supply sold separately)
- 5 year warranty

## Block Diagram



**Hi5-3D Converter, Simplified Block Diagram**

## 3D Modes Supported

The Hi5-3D supports, depending on the video format, “side-by-side,” “top-bottom,” and “frame-packing” 3D modes (note: frame-packing is not in version 1—this will be introduced in a future firmware release). The “side-by-side” and “top-bottom” modes involve compressing, either horizontally or vertically, each input for combining into a single video stream at the same rate of the inputs.

The “frame-packing” mode stacks two full resolution inputs into a “tall” frame (at twice the clock and line rates). When selected, “frame-packing” can only be used with 23.98/24Hz input frame rates.

Each input, in addition to 3D processing, can be flipped either horizontally, vertically, or both. This control is provided by 4 switches that can be engaged in any combination—or by use of the supplied AJA Mini Config software (Mac/PC).

## Format Support

The Hi5-3D works with both 2D and 3D inputs. When in the 2D mode, the input is simply passed to the output unmodified—or flipped (via dipswitch or Mini Config software selection). In the 3D mode, the Hi5-3D supports the required 3D modes as defined by the CEA for HDMI 1.4a televisions.

### CEA Required 3D modes:

2xSDI	1.5gb	720p50/59.94/60	T/B
2xSDI	1.5gb	1080p23.98/24	T/B, FP
2xSDI	1.5gb	1080psf23.98/24	T/B, FP
2xSDI	1.5gb	1080i50/59.94	S/S

### Notes:

- “psf” inputs are converted to “p” for HDMI and SDI output.
- The SDI output can support S/S and T/B formats only.
- Future software versions may add other frame rates.
- “FP” (frame-packing) is not present in version 1 software but will be introduced in a later firmware update.

## I/O Connections



**Note:** support for 3G is not in version 1 —this will be a feature in a future firmware release.

### Hi5-3D Converter

## Installation

Typically, Hi5-3D installation consists of the following steps:

1. Ensure the Hi5-3D is disconnected from power.
2. Connect video equipment to the converter BNCs and HDMI connector.
3. Connect audio equipment to RCA connectors (optional)
4. Apply +5 to 20VDC power to the converter (AJA power supply model DWP or DWP-U).
5. The Hi5-3D will now run using the default factory settings. If you wish to alter the factory settings, you'll need to install the AJA Mini Config software (supplied on CD) on a computer, attach the Hi5-3D via USB to the computer, and then make your changes. This process is detailed on the following pages.

## User Controls

The Hi5-3D can be used right out of the box for many applications since it is designed to recognize inputs and perform standard actions automatically by default. However you can also manually configure the Hi5-3D using a supplied software application for PCs and Macs called "Mini Config" or by setting dipswitches via a cutout on the back of the Hi5-3D.

One of the dipswitches is a "Local/Remote" switch. When in the "Local" mode, the remaining dipswitches support a subset of the user controls. When in the "Remote" mode, the normal Mini-Converter non-volatile registers control the unit (as last set).

## Using Mini Config

### Installing Mini Config on a Mac

To install the application on a Mac, simply insert the CD supplied with the Mini-Converter into the computer, drag the “AJA Mini Config” application for your platform (Mac or PC) to your desktop or an applications folder.

**Note:** Macintosh computers must be Intel-based (G5, G4 and earlier models will not work with Mini Config).



AJA MiniConfig

### Installing Mini Config on a PC



To install the application on a Windows PC, simply insert the CD supplied with the Mini-Converter into the computer, locate the “MiniInstaller” application, and then double-click it.

A Setup Wizard will guide you through the installation. Just click Next to begin.

Answer all questions in the subsequent dialogues; when you’re done, you will be able to locate the Mini Config application in the AJA folder in the Programs listing.

### Running Mini Config

Connect a Hi5-3D Mini-Converter to the PC or Mac via the supplied USB cable. Connect power to the Mini-Converter (DWP or DWP-U recommended).



**Note:** On a Mac, when the Mini-Converter is connected to the USB port, you may see an alert like that shown following. If you do, press Cancel—this alert can be ignored.

To run Mini Config on a PC, find the AJA Mini Config in the program list and locate the AJA Mini Config application.



To run Mini Config on a Mac, double-click the Applications folder and locate the AJA Mini Config application. Double-click the AJA Mini Config application to launch it.

Once AJA Mini Config is running (PC or Mac), it looks pretty much the same, regardless of the platform.

A *File* menu at the top of the Mini Config application menu bar allows you to *Save* the current state of the Mini-Converter—with all the settings you've made—to a file for later recall. This allows you to set up the converter for different applications, storing each (with *Save*) to a unique name for easy recall later—using the *Open* menu item. A *Revert to Factory Settings* menu item similarly allows you to change the settings back to AJA's factory defaults. An *Edit* menu allows you to cut and paste values to/from fields, just as in other applications.

## Operating Mini Config

When the application is running, you'll see a simple graphical interface for viewing settings and updating software. This user interface consists of an information area at the top that shows the available Mini-Converters attached to the computer via USB (in this case your Hi5-3D), with a graphical rendering of the selected Mini-Converter showing all the BNCs and connectors and their current state.

Colored text by connectors provides an indication of signal type and what the Hi5-3D is doing. Text in blue shows the values automatically selected, while text in black shows values that have been manually selected. Text in red shows that Hi5-3D is not detecting a signal or cannot negotiate with the attached device (even if can't detect an output device, it still shows the signal it is outputting).

**Note:** configuration settings in red will change based on the attached output device as well as input signals. For improved accuracy and reliability, you should configure the Mini-Converter only when the target output device is attached and input signals are supplied at the inputs.

Screens are virtually the same on both PC and Mac, with subtle differences that reflect the general look of the platform environment.

Mini Config can manage multiple AJA Mini-Converters connected via USB—even when they are of differing types. However it only connects to one at a time. You can choose which Mini-Converter you wish to control using the pulldown menu in the upper right hand corner.

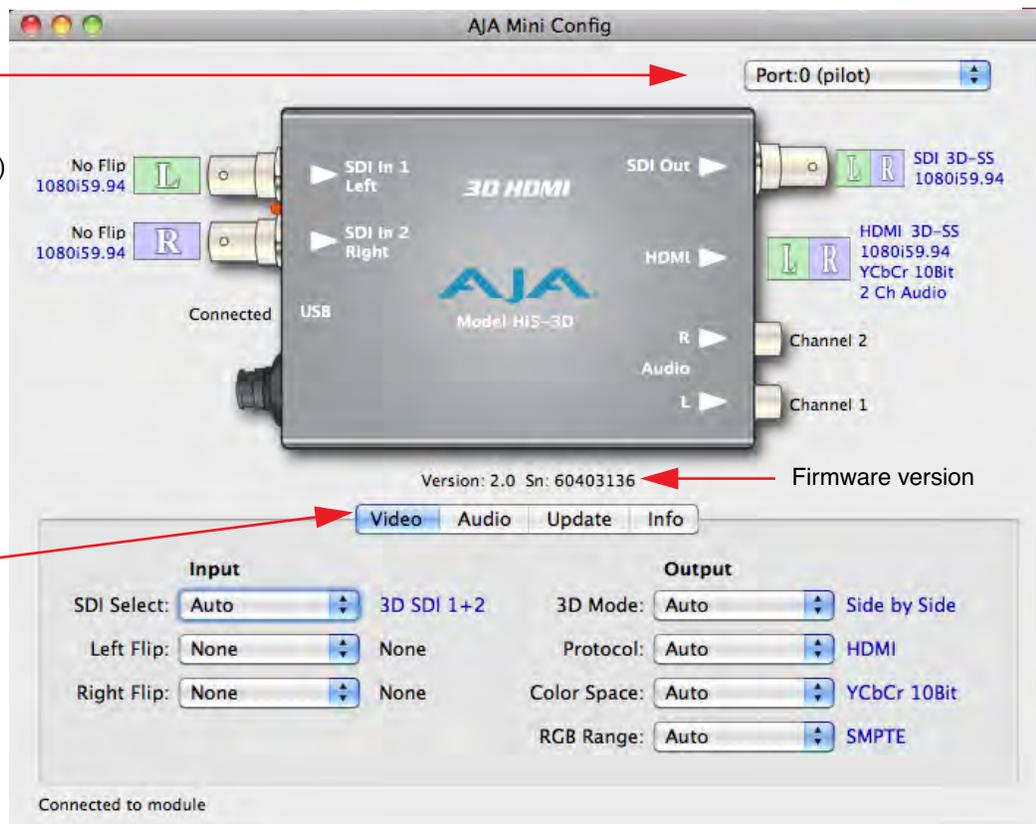
If you want to configure and update multiple Mini-Converters in parallel, you can do it by running multiple instances of the Mini Config application and have each control a different Mini-Converter.

Select a USB port and an attached Mini-Converter (name in parentheses)

Each connector is labelled with the signals currently detected or manually selected.  
Blue = Auto  
Black = Manual selection  
Red = No Signal or signal output since device not detected

Tabbed screens

Message Showing Status



### Mini Config, Video Screen

The name of each Mini-Converter found can be seen in the menu pulldown at the top right hand side of the screen (in the example above, it shows "Port: 0 (pilot)". This allows you to select a desired Mini-Converter when there are more than one. Selecting a Mini-Converter with this dropdown menu causes this application to connect to the selected converter. The type of Mini-Converter and serial number will be shown in the graphic and text below it.

The Mini-Converter graphic shows Left and Right eye assignments iconically next to the BNC and HDMI connectors. An "L" or "R" by itself means only left eye or right eye, respectively. An "LR" together means the signal is a combined left eye/right eye multiplexed signal. How the signal is multiplexed is defined in the text next to it as listed in the CEA Modes Table that follows (last column in table is the mode):

2xSDI	1.5gb	720p50/59.94/60	3D-TB
2xSDI	1.5gb	1080p23.98/24	3D-TB-FP
2xSDI	1.5gb	1080psf23.98/24	3D-TB-FP
2xSDI	1.5gb	1080i50/59.94	3D-SS

Key: TB=Top/Bottom, FP=Frame-packing, and SS=Side-by-Side  
(note: "FP" or frame-packing is not in version 1—this will be introduced in a future firmware release)

A status field at the bottom of the screen shows whether you are connected and communicating with the Mini-Converter shown using Mini-Config.

When configuring the Hi5-3D Mini-Converter, select it from the top pulldown, view the current settings and change any values. Making a change communicates that new value to the Mini-Converter's non-volatile memory.

## Tabbed Screens

The Tabs delineate groups of controls for each type of task to be performed.

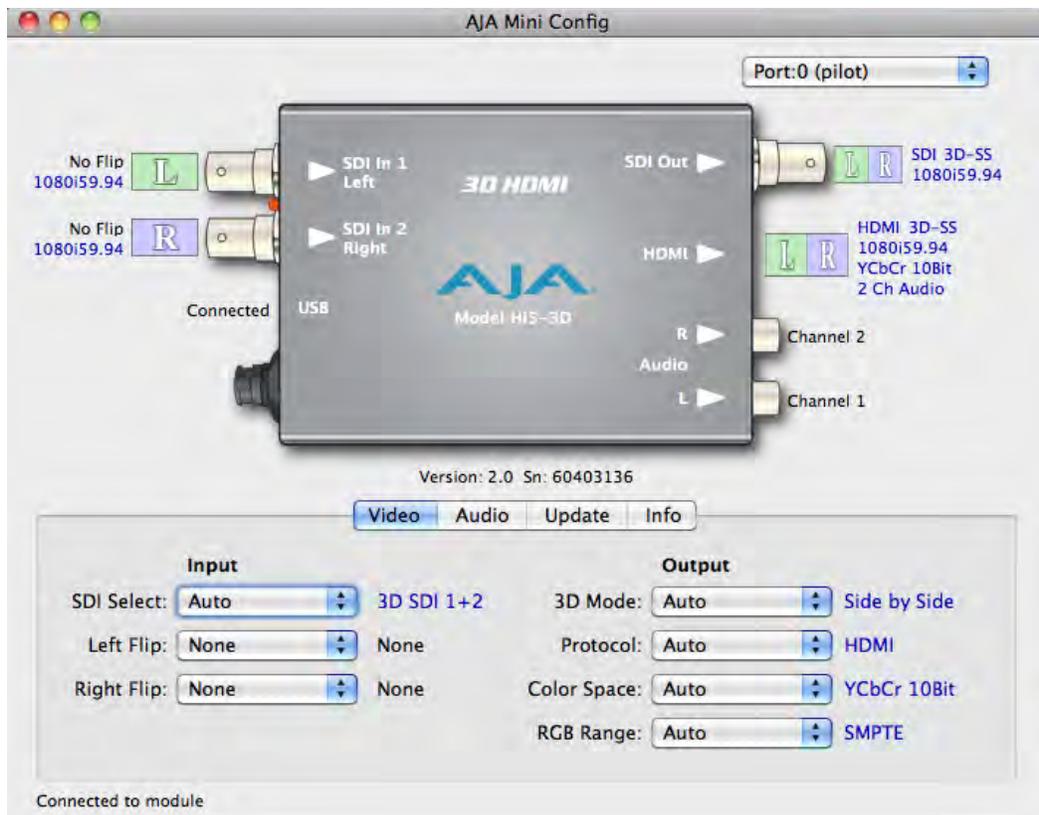


### Mini Config, Tabbed Screens

Click on any of the tabbed buttons (Video/Audio/Update/Info) and the screen below will change to match. Each of these screens are described on the following pages.

## Video Tab Screen

The Video Screen is where you can configure Hi5-3D video inputs and outputs. Pulldown menu settings are described following the screen graphic.



### Mini Config, Video Screen

SDI Select—use to manually select a specific SDI input (1 and/or 2) or select automatic mode.

Auto: directs the Hi5-3D to automatically select the input based on the signals detected at the two SDI Input BNCs.

SDI 1: manually select the signal present at SDI Input 1.

SDI 2: manually select the signal present at SDI Input 2.

3D SDI 1+2: manually select the signals present at SDI Inputs 1 and 2 as a 3D two input stream (right/left channels respectively).

Left Flip—use to select how the left eye channel input will be flipped (if any).

None: no flipping; the signal is unaltered.

Horizontal: left eye channel is flipped horizontally.

Vertical: left eye channel is flipped vertically.

Horiz/Vert: left eye channel is flipped horizontally and vertically.

Right Flip—use to select how the right eye channel input will be flipped (if any).

None: no flipping; the signal is unaltered.

Horizontal: right eye channel is flipped horizontally.

Vertical: right eye channel is flipped vertically.

Horiz/Vert: right eye channel is flipped horizontally and vertically.

3D Mode—use to select the type of CEA 3D mode:

Auto: lets the Hi5-3D automatically select a 3D mode based on the HDMI 1.4a device it is connected and negotiating with (blue text shows what it chooses).

Side by Side: select left/right eye channels are compressed and placed side by side.

Top Bottom: select left/right eye channels are compressed and placed one on top of the other

Frame Packed: select left/right eye channels into a single full-resolution—but tall—frame, at twice the clock and line rates. When selected, “frame-packing” can only be used with 23.98/24Hz input frame rates (note: frame-packing is not in version 1—this will be introduced in a future firmware release).

Protocol—use to select the signal protocol used for the HDMI output connector.

Auto: lets the Hi5-3D automatically select a protocol based on the device it is connected and negotiating with at the HDMI connector (blue text shows what it chooses).

HDMI: selects HDMI signal protocols.

DVI: selects DVI signal protocols (note: an HDMI to DVI adapter should be used when connecting DVI devices).

Color Space—use to select type of RGB or YCbCr colorspace. The choices are:

Auto: lets the Hi5-3D automatically select a protocol based on the device it is connected and negotiating with.

RGB 8Bit

RGB 10Bit

YCbCr 10Bit

RGB Range—use to select type of RGB color range, when RGB has been selected as the color space. Choices are:

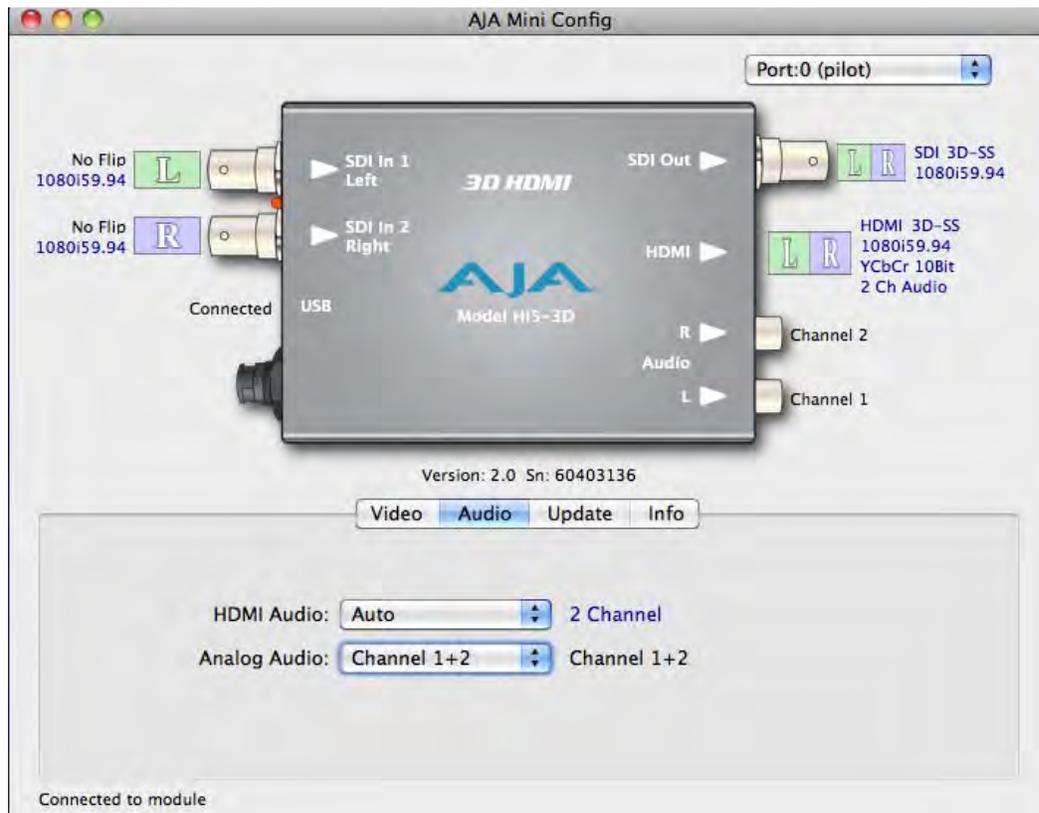
Auto: lets the Hi5-3D automatically select a protocol based on the device it is connected and negotiating with.

SMPTE

Full Range

## Audio Tab Screen

The Audio Screen is where you can configure Hi5-3D digital and analog audio settings. Pulldown menu settings are described following the screen graphic.



### Mini Config, Audio Screen

**HDMI Audio**—use to select how many SDI channels are passed to the HDMI connector and which channel pairs are selected. Choices are:

**Auto:** lets the Hi5-3D automatically select an HDMI audio output configuration based on it communicating with the attached HDMI device and determining its configuration.

**2 Channel:** output 2 channels from the SDI stream to two channels on the HDMI output connector. Which 2 channels are selected mirrors the Analog Audio setting (below).

**8 Channel:** output SDI channels 1 through 8 to the HDMI output connector.

**Analog Audio**—use to select the channel pair that will be output to the Analog RCA connectors (L/R).

**Channel 1+2:** output channels 1 & 2 from the SDI stream to the two Analog Audio RCA connectors (L/R).

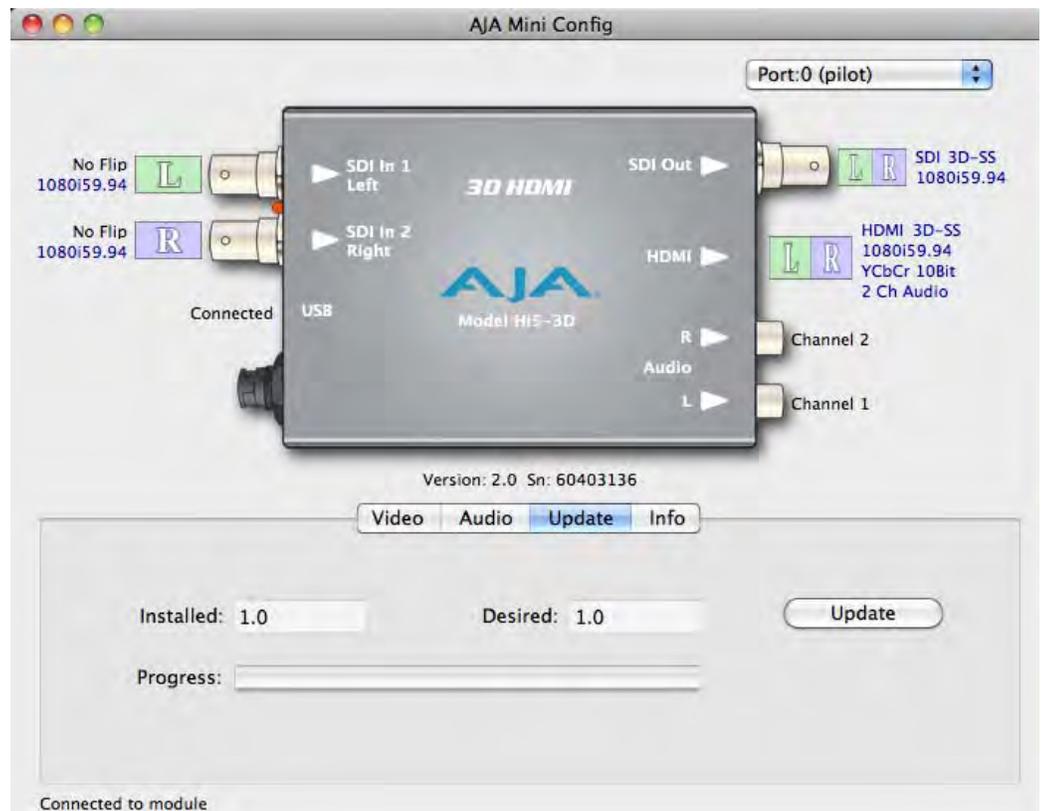
**Channel 3+4:** output channels 3 & 4 from the SDI stream to the two Analog Audio RCA connectors (L/R).

**Channel 5+6:** output channels 5 & 6 from the SDI stream to the two Analog Audio RCA connectors (L/R).

**Channel 7+8:** output channels 7 & 8 from the SDI stream to the two Analog Audio RCA connectors (L/R).

## Update Tab Screen

Use this Update screen to view the software version currently installed on the Hi5-3D or install new software.



### Mini Config, Update Screen

**Note:** When discussing Mini-Converters, “Firmware” is software that will be stored in the Mini-Converter’s non-volatile memory and used when it is powered up. This is something different than the Mini Config application software. The version numbers shown in the Update screen refer only to the firmware.

The following fields and control are present in this screen:

**Installed**—this field shows the version of the Hi5-3D firmware currently installed.

**Desired**—this field shows the version of firmware embedded in the Mini-Config application which you can install into the Mini-Converter by clicking the *Update* button.

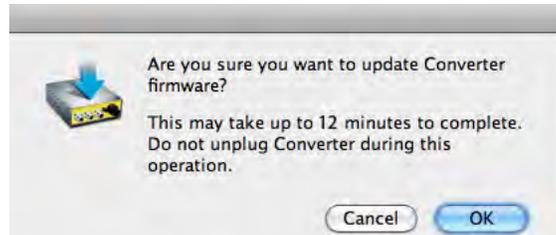
**Update**—this button initiates a software update operation loading the “Desired” version of firmware into the Mini-Converter’s non-volatile memory.

**Progress**—this indicator bar shows the progress of software being installed.

### Software Update Procedure

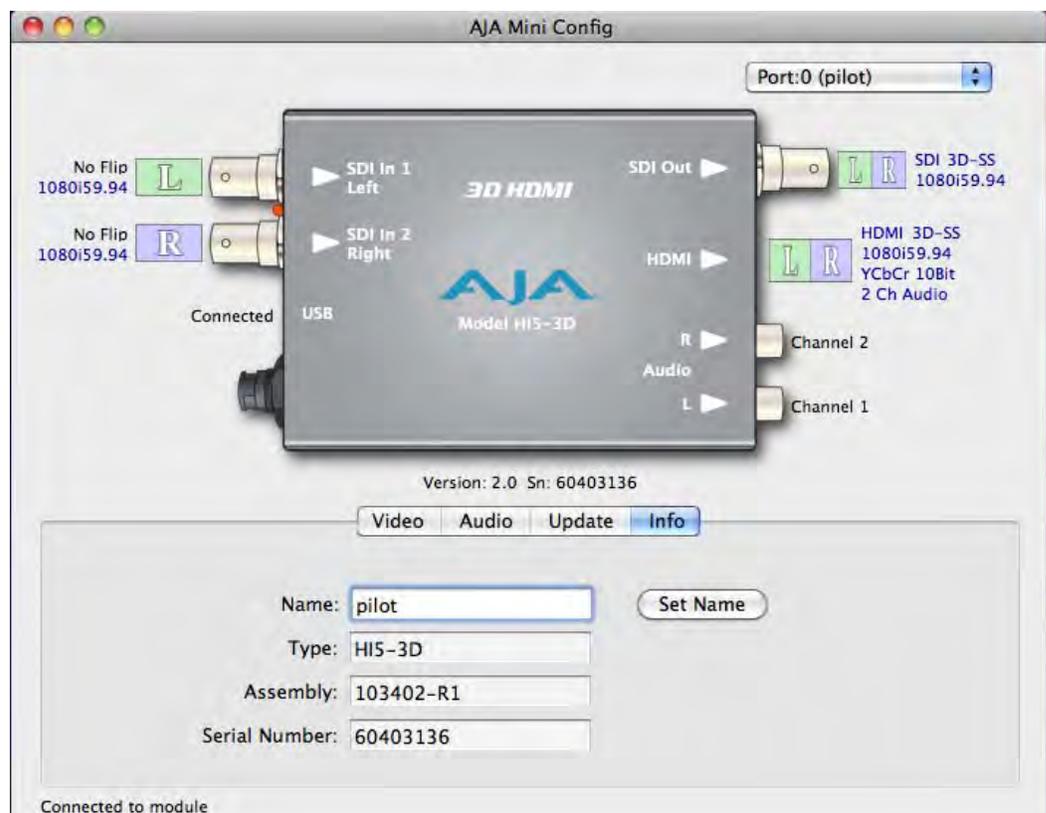
1. Check the AJA website for new Mini-Config software for your Mini-Converter. If new software is found, download it and uncompress the file archive (zip). Here is the URL to use when checking:  
*<http://www.aja.com/support/converters/converters-mini-rackmount.php>*
2. Connect the Mini-Converter to a Mac or PC via a USB port on the computer and run the new Mini-Config software just downloaded.
3. Click on the Update tab screen.

4. Check the Installed version level against the Desired version level. If the Desired is newer, then click the *Update* button to download the new firmware to the Mini-Converter; progress will be shown via the “Progress” thermometer bar. When you click Update, Mini Config will provide a dialog asking you to confirm that you really want to update the firmware (see below).



## Info Tab Screen

This screen provides basic information about the Mini-Converter. This information is mostly useful when calling AJA Support for service or technical support.



### Mini Config, Info Screen

**Name**—this field allows you to give your Mini-Converter a name. This may be useful if you have several Mini-Converters attached to a Mac/PC via USB so you can distinguish one of them easily (especially if they’re the same model). In the example show previously, the Hi5-3D has been named “pilot.” To change the value, type in a new name and click the “Set Name” button.

**Type**—this is the factory set model name of the Mini-Converter (Hi5-3D).

**Assembly**—this is the factory assembly number.

**Serial Number**—this is the factory set unique serial number of your Hi5-3D. If you ever call AJA Support for service, you may be asked for this number.

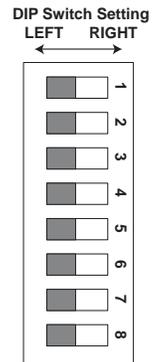
## Using Dipswitches to Control the Hi5-3D

In addition to the Mini-Config application discussed earlier, you can also control the unit via an 8-switch DIP, accessible through a cut-out in the bottom of the unit.

The exact function of each DIP switch and what it controls is described on the following pages.

**Switch 1 (CONTROL)—This switch determines whether the Hi5-3D is configured via dipswitch or Mini-Config software**

LOCAL (LEFT)	REMOTE (RIGHT)
When in "Local" mode, the remaining dipswitches will support a subset of the user controls	When in the "Remote" mode, the normal Mini-Config non-volatile registers (as last set), control the unit



**Switch 2 (H FLIP LT)—Controls Horizontal Flip of Left Eye Input**

OFF (LEFT)	ON (RIGHT)
The left eye input is not flipped horizontally	The left eye input is flipped horizontally

**Switch 3 (V FLIP LT)—Controls Vertical Flip of Left Eye Input**

OFF (LEFT)	ON (RIGHT)
The left eye input is not flipped vertically	The left eye input is flipped vertically

**Switch 4 (H FLIP RT)—Controls Horizontal Flip of Right Eye Input**

OFF (LEFT)	ON (RIGHT)
The right eye input is not flipped horizontally	The right eye input is flipped horizontally

**Switch 5 (V FLIP RT)—Controls Vertical Flip of Right Eye Input**

OFF (LEFT)	ON (RIGHT)
The right eye input is not flipped vertically	The right eye input is flipped vertically

**3D Mode Selection** Switches 6 and 7 are used together to form a 2-digit binary value. Switch 6 is the least significant digit and Switch 7 is the most significant digit.

**Switch 6 (S1)—3D Mode select - bit0 “S1”**

OFF (LEFT)	ON (RIGHT)
Set to 0	Set to 1

**Switch 7 (S2)—3D Mode select - bit1 “S2”**

OFF (LEFT)	ON (RIGHT)
Set to 0	Set to 1

**3D Modes Selected by Switches 6 and 7**

Selection	S2 (Switch 7)	S1 (Switch 6)
Auto	0	0
S/S (force side-by-side)	0	1
T/B (force top/bottom)	1	0
FP (force frame packing)	1	1

(note: “FP” (frame-packing) is not supported in version 1—this will be introduced in a future firmware release)

**Switch 8 (AUX)—Not Used**

## Specifications

Item	Specification
Input Formats	525i, 625i, 720p 50/59.94/60, 1080i 50/59.94/60, 1080p 23.98/24/25 1080psf 23.98/24
Video Inputs	SD/HD-SDI (auto-selected), SMPTE-292/296/424, 2x BNC 1 SDI for left eye input (10-bit) 1 SDI for right eye input (10-bit) <b>Note:</b> support for 3G-SDI is not in version 1 — this will be a feature in a future firmware release.
Output	Video: • 10-bit HDMI v1.4a, HD, 1080p50/60 • 1 SDI output, 10-bit Audio: • HDMI embedded audio, 2 or 8 channels • SDI embedded audio • 2 RCA-style analog outputs at -10dBV (nominal), User assignable channels
HDCP	The Hi5-3D does not encode the HDMI output with HDCP encryption. By definition, HD-SDI inputs to the Hi5-3D are unencrypted. The HDMI specification requires HDMI monitors to support unencrypted inputs.
User Controls	USB port used with supplied cable and MiniConfig software application to configure device via PC/Mac
Size	5.8" x 3.1" x 1 (147mm x 79mm x 25mm)
Power	+5-20 VDC regulated, 5 watts Requires Power Supply (AJA power supply model DWP or DWP-U recommended)