

# FS1-X

## Quick Start Guide



## Overview

Matching up and synchronizing disparate video and audio formats is a critical part of any broadcast, mobile or post-production environment. Within its compact 1RU chassis, the FS1-X integrates an amazing array of video and audio connectivity and processing. The FS1-X simultaneously works with 3G/HD/SD-SDI 10-bit broadcast quality video and incorporates embedded audio, AES, MADI, and analog audio. Utilizing AJA's remarkable conversion algorithms, FS1-X supports up, down and cross-conversion between SD and HD signals for the highest quality output possible. An internal 224x224 audio matrix also allows full routing of MADI and all audio coming from SDI, fiber, AES, HDMI and analog sources for an incredible amount of audio processing capability in a single box.

### Frame Rate Conversion Option

The factory-installed motion adaptive Frame Rate Converter (FRC) option enables high quality conversions between different frame rate families for virtually unlimited international standards support. The three video frame rate families are:

- 59.94/29.97/23.98
- 50/25
- 24

The standard FS1-X (without FRC) can also perform conversions, but only between frame rates that are within the same frame rate family, using add/drop frames.

### Two Video Processors

The FS1-X is equipped with two Video Processors. Video Processor 1 is fully featured with frame sync, proc amp, color correction, and other processing, and is able to receive the FRC option. Video Processor 2 has a frame sync and can provide sidebar or letterbox video to Video Processor 2, but does not otherwise perform any video processing.

### Two Operating Modes

The FS1-X has two modes of operation: 1 Channel mode and 2 Channel mode.

1 Channel mode is available when the FRC option is present and enabled. In this mode, the full range of frame rate conversions are available using Video Processor 1. Video Processor 2 is disabled in this mode.

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2 Channel mode is available when the FRC is absent or has been disabled. In 2 Channel mode frame rate conversions within the same frame rate family are supported on Video Processor 1, and Video Processor 2 is also available for use.

**FSX-1 Control** The FS1-X front panel buttons and knobs control menus in the display, allowing you to fully configure the system. Front panel LEDs report important system statuses. The FS1-X also has an internal web server that allows remote monitoring and control of parameter setting via an Ethernet 10/100/1000 network-attached computer running a web-browser. Firmware updates are also performed from the web browser.

## Quick Start Guide Objectives

The FS1-X can be extremely simple to use, because of its ability to detect incoming signal formats and automatically apply the correct video processing for the selected output format. However, the FS1-X is also extremely powerful and can be flexibly configured to perform a wide variety of tasks.

This Quick Start Guide is designed to help you get your FS1-X up and running for the first time, and confirm it is operating properly. It also provides step-by-step instructions that demonstrate a few FS1-X signal processing examples.

**Stand Alone Tests**

- ["First Power Up"](#)
- ["Internal Test Signals to All Outputs"](#)

**Computer Setup**

- ["FS1-X Network Setup"](#)

**Processing Examples**

- ["SD to Sidebar HD over Matte"](#)
- ["HD to Letterbox SD over Video"](#)
- ["Conversion Across Frame Rate Families"](#)

For additional information, please see the *FS1-X Installation and Operation Guide* available on the AJA website and on the supplied DVD.

## Installation Summary

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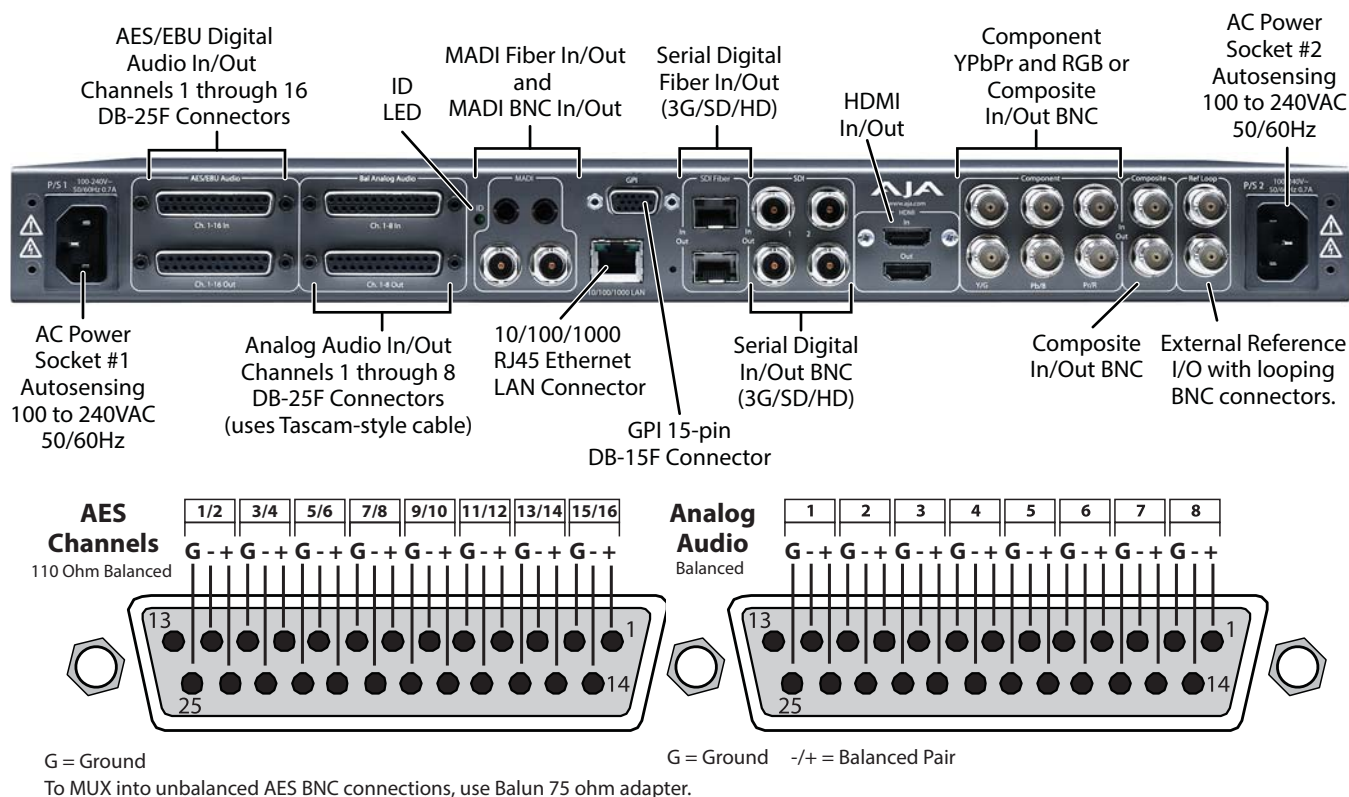
1. Unpack the shipping box, inspect and inventory the contents, and read the late-breaking news sheet, if any.
2. Install any optional AJA Fiber I/O modules by sliding them into the Fiber slots in the back. Use only AJA modules.

**NOTE:** The ["Stand Alone Tests" on page 3](#) can be performed with the FS1-X sitting on a bench to test system operation before physically installing the unit.

3. Mount the physical chassis: front rack, rear rack, or deskmount—1 RU x 17.5 inches (44.45 cm) x 16 inches (40.65 cm). Do not block air flow through the side vents.
4. Make signal I/O connections to the FS1-X back panel as shown in [Figure 1 on page 3](#).
5. Connect one or two power cords to the FS1-X and mains AC (100-240 VAC, 50/60 Hz, 55 Watts). For redundancy, use both cords and connect them to separate branch circuits. The FS1-X power supply is autosensing and adjusts to the available power.
6. Connect your computer to the FS1-X using a CAT5 Ethernet cable to the FS1-X RJ45 10/100/1000 Ethernet LAN connector. You can connect directly or via a network device such as a switch, hub, bridge, etc. The FS1-X automatically senses and adjusts to either a straight-through or crossover cable.

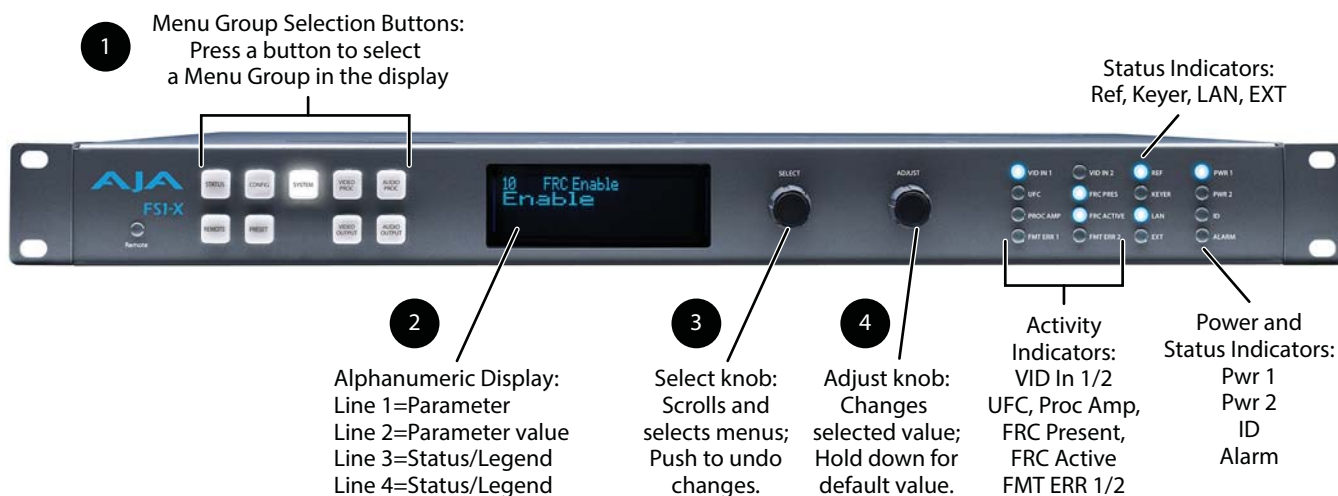
**NOTE:** See ["FS1-X Network Setup" on page 5](#) for more detailed computer configuration instructions.

**Figure 1. FS1-X Rear Panel**



## Stand Alone Tests

The stand alone tests can be performed without a computer, using the FS1-X front panel controls and rear connections.



The following procedures assume the FS1-X is at factory defaults (taken from a newly opened box). If not set to defaults, the FS1-X may behave differently.

## First Power Up

The following workflow powers up the FS1-X and demonstrates some example alarms.

- Setup**
- Ensure the FS1-X is completely disconnected (all video, audio, network, and power connector ports are empty).

- Procedure**
1. Connect both FS1-X power cords to mains AC and allow time for the unit to boot up. Observe the front panel LEDs.
    - If the FRC PRES LED lights blue, your FS1-X is equipped with the FRC option and is able to operate in either 1 Channel or 2 Channel Mode. If this LED is off, your unit can only operate in 2 Channel mode.
    - The ALARM LED will light red, indicating an alarm condition, and the REF LED will be off. By default the F1-X is configured to operate genlocked to an external reference signal.
  2. Press the front panel *STATUS* button, then turn the *SELECT* knob to view various Status menus.
    - The Status menus will report No Input for the Video Processor video inputs (the ports are disconnected), and the *GEN* (Genlock) parameter will report *Ref* (configured for external reference) but will also report *No Input* or *No Ref*.

| Vid 1 Format Status screen |       |          | Vid 1 Format Alarm Status screen |       |        |
|----------------------------|-------|----------|----------------------------------|-------|--------|
| IN1                        | SDI 1 | No Input | IN1                              | SDI 1 | OK     |
| BKGD                       | Black |          | BKGD                             | Black |        |
| GEN                        | Ref   | No Input | GEN                              | Ref   | No Ref |
| OUT1                       |       | 525i59   | OUT1                             |       | 525i59 |

3. Connect a 525i color black reference signal to one of the FS1-X Ref Loop BNCs.
  - The front panel ALARM LED will go off and the REF LED will light blue, indicating no alarm exists and the FS1-X is genlocked to an external reference signal.
  - The Status menu *GEN* parameters will report *Ref* and indicate the format of the incoming reference signal or *OK*.

| Vid 1 Format Status screen |       |          | Vid 1 Format Alarm Status screen |       |        |
|----------------------------|-------|----------|----------------------------------|-------|--------|
| IN1                        | SDI 1 | No Input | IN1                              | SDI 1 | OK     |
| BKGD                       | Black |          | BKGD                             | Black |        |
| GEN                        | Ref   | 525i59   | GEN                              | Ref   | OK     |
| OUT1                       |       | 525i59   | OUT1                             |       | 525i59 |

**NOTE:** If you connect a 625i25 frame rate color black reference signal, the alarm condition above persists because the default FS1-X output frame rate setting is 29.97/59.94. To clear this alarm when using 625i25 reference, press the *SYSTEM* button, turn the *SELECT* knob to 9 Output Frame Rates, and turn the *ADJUST* knob to choose 50/25.

4. Disconnect one of the power cords, leaving the other attached.
  - The ALARM LED will light red, and the PWR LED of the power supply with the removed cord will turn off.
5. Reconnect the power cable. The ALARM LED will turn off and the PWR LED will light.

This workflow confirms the FS1-X powers up successfully and reports reference and power supply alarms.

**NOTE:** FS1-X Reference, Power Supply, and Video Format alarms can be disabled, if desired,

## Internal Test Signals to All Outputs

This workflow generates bars and tone and sends them to all the FS1-X outputs. This example uses the HDMI output connector for convenient monitoring, but any output can be used for that purpose. In the following procedures, where the terms *select* and *adjust* are used, turn the front panel *SELECT* and *ADJUST* knobs.

- Setup**
- Connect the FS1-X HDMI output connector to an HDMI display equipped with audio monitoring using a standard HDMI cable.

- Procedure**
1. Press the *VIDEO PROC* button.
    - Select 3 *Vid 1 Output Mode*, and adjust to *Test Pattern*.
    - Select 21 *Vid 1 Test Pattern* and adjust to 75% Bars.
  2. Press the *VIDEO OUTPUT* button.
    - Select 1.2 *SDI2 Video Out* and adjust to *Vid 1*.
    - Select 2.2 *Fiber2 Video Out* and adjust to *Vid 1*.
    - Select 3 *HDMI Video Out* and adjust to *Vid 1*.
  3. Press the *AUDIO OUTPUT* button.
    - Select 11 *Global Audio Out* and adjust to *Sig Gen 1KHz*.

You should now be able to see and hear the test signals on the HDMI display, and on any other devices connected to the FS1-X outputs.

This workflow confirms the FS1-X generates and outputs video and audio.

## FS1-X Network Setup

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The following instructions summarize ways to configure the FS1-X to communicate with a computer directly or over a network.

### Networking Using DHCP or Default Static IP

The FS1-X factory default configuration automatically looks for a DHCP server to issue an IP address. If your network includes a DHCP server, plug the FS1-X into the network and connect with the FS1-X as follows:

1. Press the *CONFIG* button.
2. Turn the *SELECT* knob to navigate to config parameter 2.2. Note on a piece of paper the DHCP-supplied IP address shown.
3. With your laptop or desktop computer connected to the same LAN as the FS1-X and DHCP enabled, type the IP address you noted into the browser address field and press *Enter*. You should now see the FS1-X's browser *Status* screen.

If the FS1-X cannot get an address from the network DHCP server, the FS1-X will automatically use a preset factory static IP address of 192.168.0.2. You can access the FS1-X using the default static address as follows:

1. Set your computer's IP address to whatever address you prefer.
2. Set the computer's Subnet mask to 255.255.255.0 (most PCs default to the proper netmask when the address is set).
3. Set the gateway address, if used, to match the FS1-X default: 192.168.0.1.  
Alternatively, change the FS1-X gateway address to match your gateway:
  - A. Press *CONFIG*, turn *SELECT* to 2.4 *Default Gateway*, push and then turn *ADJUST* to change the first group of digits.

- B. Turn *SELECT* to advance to the next set of numbers, and turn *ADJUST* to set these numbers.
- C. Continue using *SELECT* and *ADJUST* to set the full address.
- D. When finished, push *ADJUST* momentarily to save the address.
4. Run a browser on the computer and type "192.168.0.2" (the factory static IP address). You should now see the FS1-X's browser status screen.

## Networking the FS1-X Using Your Own Static IP

If you don't want to use DHCP or the default static IP address, you can set your own static IP address:

1. Select the *CONFIG* button and use the *SELECT* knob to navigate to parameter 2.1 *IP CONFIG*. Use the *ADJUST* knob to select *Static*.
2. Turn *SELECT* to navigate to parameter 2.2 *IP ADDRESS*. The display shows the default static IP address: 192.168.0.2.
3. Change the IP address as follows.
  - A. Push the *ADJUST* knob momentarily so that the first octet (set of numbers) blinks, and then turn *ADJUST* to change the numbers.
  - B. Turn *SELECT* to advance to the next set of numbers, and turn *ADJUST* to set these numbers.
  - C. Continue using *SELECT* and *ADJUST* to set the full address.
  - D. When finished, push *ADJUST* momentarily to save the address.
4. Turn *SELECT* to advance to 2.3 *Subnet Mask*. Use the *SELECT* and *ADJUST* knobs as in the previous step to set the desired subnet mask.
5. Turn *SELECT* to advance to 2.4 *Default Gateway*. Use the *SELECT* and *ADJUST* knobs as in the previous step to set the desired gateway address.
6. Run a browser on the computer and type in the IP address you set for the FS1-X. You should now see the FS1-X's *Status* screen.

## Web Browser Menu Summary

[Figure 2 on page 7](#) summarize web browser menu operation. The settings generally correspond to the front panel display parameters, providing you two methods of controlling the FS1-X. To see the equivalent front panel display parameter number, hover the cursor over a setting.

### Drop Down Parameter Operation

Most FS1-X parameters available on the browser are selected from a drop-down list. The currently active parameter is displayed. Click on the down arrow symbol next to the parameter to display the list and select an alternative value. The FS1-X will immediately operate with the new setting.

### Slider Operation

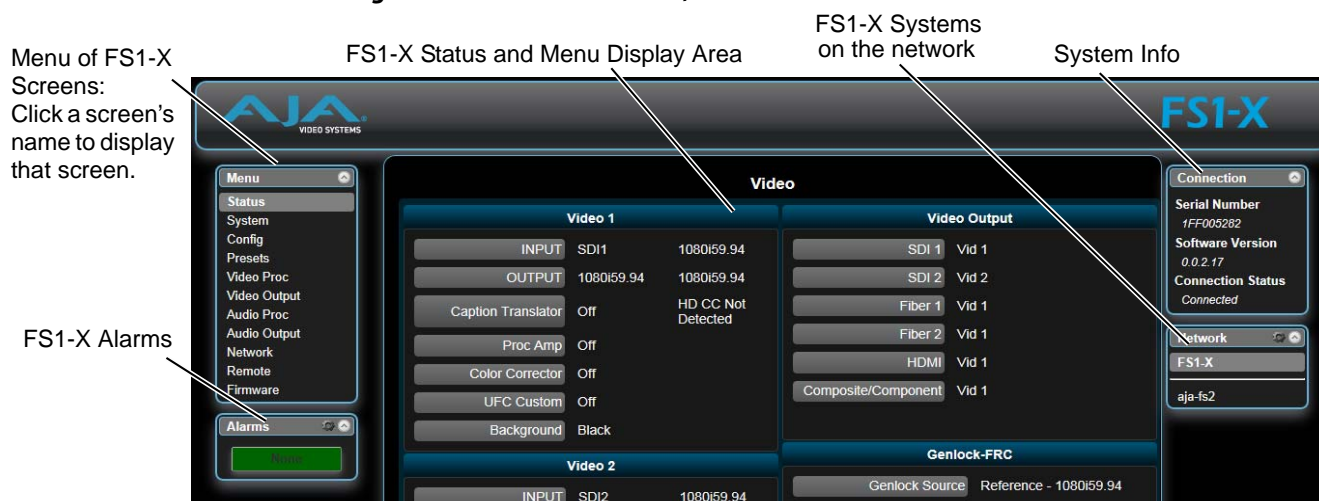
Some screens contain slider controls for setting values. To set a value, you can click on a slider to select it and then use the mouse to drag the slider to the position you desire. For fine tuning, while the slider is selected (highlighted by a blue border), use the keyboard left and right arrow keys to change the value one unit at a time. After setting a slider's position, click on the page's background area (blue highlight turns off) to ensure the change is confirmed and saved.

### Sub-Menus

Some parameters, when activated, open sub-menus. The sub-menus are a lighter gray color and have a collapse/expand button on the parent selection. This lets you collapse the sub-menus to make it easier to configure the system. The collapsed setting only stays in effect until the user reconnects or refreshes the browser.



**Figure 2. FS1-X Web Interface, Main Status Screen**



## FS1-X Processing Examples

In the following procedures, your exact actions depend on which FS1-X interface you are using. Where the terms *MENU NAME*, *select* and *adjust* are used:

- On the front panel interface, press the indicated Menu Group Selection button and then turn the *SELECT* and *ADJUST* knobs to choose the parameter and change the setting. The Front Panel menu numbers are included in the procedures.
- On the web browser interface, use your mouse to select the name of the Menu Screen and then choose the parameter and setting using the drop down list or slider. Menu numbers are not present on the FS1-X web pages.

### SD to Sidebar HD over Matte

The following workflow demonstrates converting an SD SDI input to an HD SDI output with a matte sidebar background. If the input, reference, and output signal formats are all in the same frame rate family, this processing can be performed with or without the FRC option. This example uses a 525i59.94 input and generates a 1080i59.94 output.

- Setup**
- Ensure the FS1-X is receiving a valid reference signal.
  - Connect a 525i59.94 SD SDI signal to the SDI1 input on the rear of the FS1-X. Once connected the FS1-X front panel VID IN 1 LED will light.
  - Connect the FS1-X HDMI output connector to a compatible HDMI display.
  - Connect the FS1-X SDI1 video output connector to a compatible monitor.

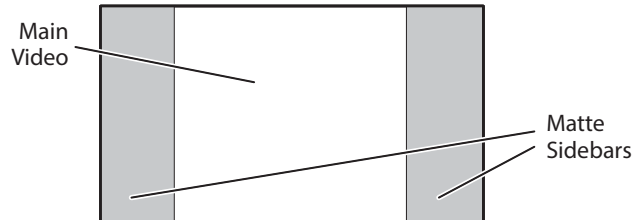
**NOTE:** The FS1-X factory default setting routes the output of Video Processor 1 to the SDI1, Fiber 1, HDMI, and Analog Video output connectors. All these outputs are active simultaneously.

- Procedure**
1. **SYSTEM** menu:
    - Select 8 *Genlock Source*, and adjust to *Reference*.
    - Select 9 *Output Frame Rates*, and adjust to 59.94/23.98.
  2. **VIDEO OUTPUT** menu:
    - Select 1.1 *SDI 1 Video Out*, and adjust to *Video Proc 1*.
    - Select 3 *HDMI Video Out* and adjust to *Video Proc 1*.

3. *VIDEO PROC* menu:

- Select *1.1 Video Input*, and adjust to *SDI 1*.
- Select *2 Video Output Format*, and adjust to *1080i59.94*.
- Select *3 Vid 1 Output Mode* and adjust to *Normal*.
- Select *6 Background Fill* and adjust to *Matte*.
- Select *7 Upconvert Mode* and adjust to *4x3 Pillar*.

You should now see the processed sidebar image on the SDI and HDMI monitors.



- Select *11.3 Matte Hue* and adjust to different degree settings. You should see the sidebar color hue change as you adjust.

This workflow confirms the FS1-X upconverts incoming video with matting.

## HD to Letterbox SD over Video

The following workflow recalls the FS1-X to factory preset, downconverts a 1080i SDI input to 525i SDI letterbox, keys the letterbox over a second 525i SDI video input, and displays the result on the FS1-X Composite video output. This processing requires 2 Channel mode.

### Setup

- Connect a 1080i59.94 HD SDI signal to the SDI1 input on the rear of the FS1-X. This signal will be downconverted and letterboxed.
- Connect a 525i59.94 SD SDI signal to the SDI2 input on the rear of the FS1-X. This signal will be the background.
- Ensure the FS1-X is receiving a valid reference signal compatible with the SDI2 input.
- Connect the FS1-X Composite video output to an analog video monitor.

### Procedure

1. *PRESET* menu:

- Select *1.0 Factory Preset* and recall that preset.
  - Front panel interface: Push in the *ADJUST* knob momentarily.
  - Web page interface: Select *Factory Preset Recall*.

This recall sets the following default values for this procedure:

- *SYSTEM 1.1 Vid 1 Input* is set to *SDI 1*
- *SYSTEM 1.2 Vid 2 Input* is set to *SDI 2*
- *SYSTEM 3 Vid 1 Output Mode* is set to *Normal*
- *VIDEO OUTPUT 4 Analog* is set to *Vid 1*.

2. If the FRC option is present, go to the *SYSTEM* menu:

- Select *10 FRC Enable* and adjust to *Disable* (this sets 2 Channel mode). This menu is not available on FS1-X units lacking the FRC option.

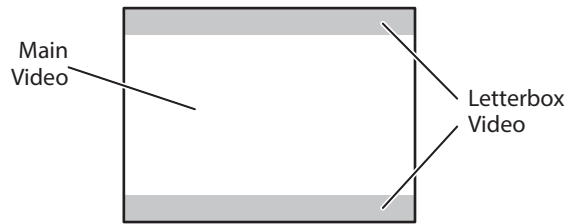
3. *VIDEO PROC* menu:

- Select *2 Video Output Format*, and adjust to *525i59.94*.
- Select *6 Background Fill*, and adjust to *Vid 2*.



- Select *8 Downconvert Mode*, and adjust to *Letterbox*.

**NOTE:** The *H and V Output Timing* settings of both *Video Processor 1* and *2* must also be identical. The factory *Preset* recalls *0* values.



This workflow confirms the FS1-X downconverts incoming video to letterbox, and can key over another incoming video signal.

## Conversion Across Frame Rate Families

The following workflow converts a 1080i59.94 SDI input to 1080i50 SDI output, using the optional FRC. This processing requires 1 Channel mode operation. In this example frame rate conversion with and without the FRC option is demonstrated.

### Setup

- Ensure the FRC is installed. The front panel FRC PRES LED must be lighted blue. The FS1-X Status web page *FRC Option* setting must read *Present*. The web page may also report *Disabled*, which is the FRC's normal state when it is not actively converting video.
- Ensure the FS1-X is using a valid reference. For this example, if an external reference signal is used for genlock it must be 50 Hz to match the frame rate converted output. Alternatively the FS1-X can be set to *Free Run*.
- Connect a 1080i59.94 HD SDI signal to the SDI1 input on the rear of the FS1-X. This signal must be moving video (not a static test pattern) to properly demonstrate frame rate conversion.
- Connect the FS1-X SDI1 video output connector to a compatible monitor.

### Procedure

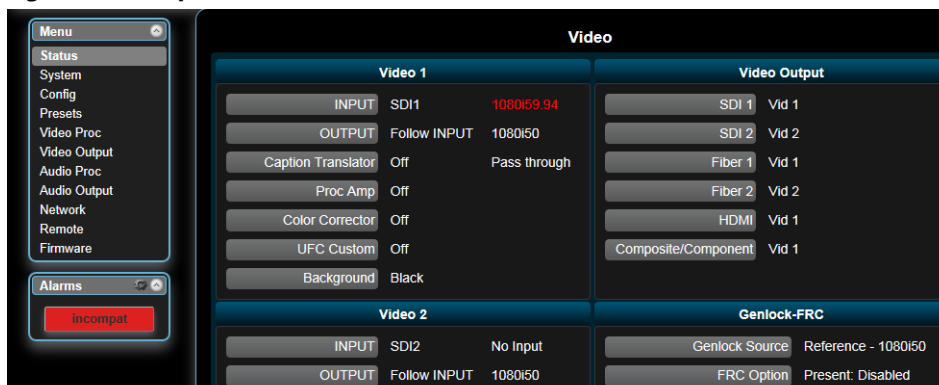
1. SYSTEM menu:
  - Select *8 Genlock Source*.
    - If your external genlock signal is 50 Hz, adjust to *Reference*.
    - Otherwise select *Free Run*.
  - Select *9 Output Frame Rates*, and adjust to *50/25*.
  - Select *10 FRC Enable* and adjust to *Enable* (this sets 1 Channel mode). The FRC ACTIVE LED will light blue because it is converting 59.94 Hz video to 50 Hz.
2. Observe the monitor. Motion will be completely smooth without momentary jumps or discontinuities, and the FS1-X will not report any alarms.

To demonstrate non FRC operation and alarms, do the following:

3. SYSTEM menu:
  - Select *10 FRC Enable* and adjust to *Disable*. The FRC ACTIVE LED will go off and the ALARM LED will light red, because this conversion requires the FRC. FS1-X status reporting will be as shown below:

| Vid 1 Format Status screen |       |            | Vid 1 Format Alarm Status screen |       |          |
|----------------------------|-------|------------|----------------------------------|-------|----------|
| IN1                        | SDI 1 | 1080i59.94 | IN1                              | SDI 1 | incompat |
| BKGD                       | Black |            | BKGD                             | Black | OK       |
| GEN                        | Ref   | 1080i50    | GEN                              | Ref   | OK       |
| OUT1                       |       | 1080i50    | OUT1                             |       | 1080i50  |

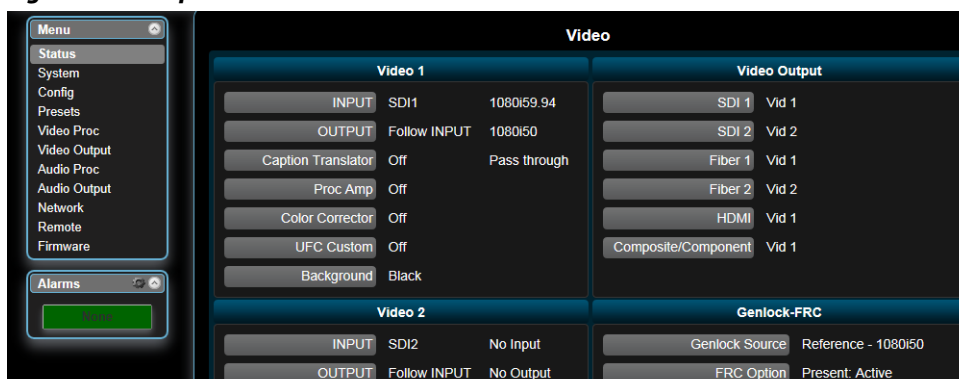
**Figure 3. FRC Option Present and Disabled Alarm Condition**



- Observe the monitor. Motion will have momentary jumps, because the FS1-X is converting with add/drop frames instead of using the FRC.
- SYSTEM menu:
  - Select *10 FRC Enable* and adjust to *Enable* (this restores FRC operation).

| Vid 1 Format Status screen (same) |       |            | Vid 1 Format Alarm Status screen |       |         |
|-----------------------------------|-------|------------|----------------------------------|-------|---------|
| IN1                               | SDI 1 | 1080i59.94 | IN1                              | SDI 1 | OK      |
| BKGD                              | Black |            | BKGD                             | Black | OK      |
| GEN                               | Ref   | 1080i50    | GEN                              | Ref   | OK      |
| OUT1                              |       | 1080i50    | OUT1                             |       | 1080i50 |

**Figure 4. FRC Option Present and Active with No Alarm**



This workflow confirms an FS1-X equipped with the FRC option can frame rate convert between frame rate families.