Installation and Operation Manual

Selenio™ 6800+
SFS6803+/OP+SFS+

Audio/video Frame Synchronizer and Processing Amplifiers

Edition F

June 2016

Publication Information

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Preface

Manual Information

Purpose

This manual details the features, installation, operation, maintenance, and specifications for the SFS6803**+** and OP**+**SFS**+** audio/video frame synchronizers and processing amplifiers.

Audience

This manual is written for engineers, technicians, and operators responsible for installation, setup, maintenance, and/or operation of the SFS6803**+** and OP**+**SFS**+** audio/video frame synchronizers and processing amplifiers.

Revision History

Edition	Date	Comments
A	April 2009	Initial release
B	June 2009	Addition of AFD parameters
C	September 2010	Addition of level-B support and SFS6803+BD and OP+SFS+BD hardware
D	January 2012	Addition of analog audio options
E	April 2013	Update signal flow diagram and add parameters from firmware version 1.10
F	June 2016	Additional product information: • Features Summary (on page 16) • Ordering Information (on page 17)

Writing Conventions

To enhance your understanding, the authors of this manual have adhered to the following text conventions:

Term or Convention	Description
Bold	Indicates dialog boxes, property sheets, fields, buttons, check boxes, list boxes, combo boxes, menus, submenus, windows, lists, and selection names

Term or Convention	Description
Italics	Indicates E-mail addresses, the names of books or publications, and the first instances of new terms and specialized words that need emphasis
CAPS	Indicates a specific key on the keyboard, such as ENTER, TAB, CTRL, ALT, or DELETE
Code	Indicates variables or command-line entries, such as a DOS entry or something you type into a field
>	Indicates the direction of navigation through a hierarchy of menus and windows
hyperlink	Indicates a jump to another location within the electronic document or elsewhere
Internet address	Indicates a jump to a website or URL
	Indicates important information that helps to avoid and troubleshoot problems

Obtaining Documents

Product support documents can be viewed or downloaded from our website. Alternatively, contact your Customer Service representative to request a document.

Unpacking/Shipping Information

Unpacking a Product

This product was carefully inspected, tested, and calibrated before shipment to ensure years of stable and trouble-free service.

1. Check equipment for any visible damage that may have occurred during transit.
2. Confirm that you have received all items listed on the packing list.
3. Contact your dealer if any item on the packing list is missing.
4. Contact the carrier if any item is damaged.
5. Remove all packaging material from the product and its associated components before you install the unit.

Keep at least one set of original packaging, in the event that you need to return a product for servicing.

Product Servicing

Except for firmware upgrades, SFS6803**+** and OP**+**SFS**+** modules are not designed for field servicing. All hardware upgrades, modifications, or repairs require you to return the modules to the Customer Service center.

Returning a Product

In the unlikely event that your product fails to operate properly, please contact Customer Service to obtain a Return Authorization (RA) number, and then send the unit back for servicing.

Keep at least one set of original packaging in the event that a product needs to be returned for service. If the original package is not available, you can supply your own packaging as long as it meets the following criteria:

- The packaging must be able to withstand the product's weight.
- The product must be held rigid within the packaging.
- There must be at least 2 in. (5 cm) of space between the product and the container.
- The corners of the product must be protected.

Ship products back to us for servicing prepaid and, if possible, in the original packaging material. If the product is still within the warranty period, we will return the product prepaid after servicing.

References

ANSI/SMPTE 259M-1997

10-Bit 4:2:2 Component and 4fsc NTSC Composite Digital Signals–Serial Digital Interface

ITU-R BT.601-5

Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-Screen 16:9 Aspect Ratios

SMPTE 292M-1999

Bit-Serial Digital Interface for High-Definition Television Systems

ITU-R BT.709-4

Parameter Values for the HDTV Standards for Production and International Programme Exchange

SMPTE 291M-1998

Ancillary Data Packet and Space Formatting

SMPTE RP 184-1996

Specification of Jitter in Bit-Serial Digital Systems

ANSI/SMPTE 276M-1995

Transmission of AES/EBU Digital Audio Signal Over Coaxial Cable

AES3-2003

AES Recommended Practice for Digital Audio Engineering–Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data

TIA/EIA-232-E 1991

Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

EIA/TIA-422-B 1994

Electrical Characteristics of Balanced Voltage Digital Interface Circuits

EIA RS-485 1983

Standard for Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multipoint Systems

SMPTE 346-M 2000

Time Division Multiplexing Video Signals and Generic Data over High-Definition Interface

SMPTE 346-M 2000

Video Payload Identification for Digital Interfaces

SMPTE 424-M 2005 (Proposed)

3Gb/s Signal/Data Serial Interface

SMPTE 425-M 2005 (Proposed)

3Gb/s Signal/Data Serial Interface–Source Image Format Mapping

47 Code of Federal Regulations

Part 15 FCC rules—Radio Frequency Devices

SMPTE 346-M 2000

EMC emission requirements applies to professional audio, video, audio-visual and entertainment lighting control apparatus

SMPTE 346-M 2000

EMC immunity requirements applies to professional audio, video, audio-visual and entertainment lighting control apparatus

SMPTE 346-M 2000

Specifications for the fiber optic connector type SC/PC

SMPTE 346-M 2000

Specifications for the fiber optic connector type ST/PC terminated to a type BFOC/2,5

SMPTE 346-M 2000

Specifications for the fiber optic connector type FC/PC

Safety Standards and Compliances

See Laser Safety (on page 113) to find the safety standards and compliances for this OPTO**+** series product. A 6800**+** series safety manual is shipped with every *6800+ Frame Installation and Operation Manual* and can be downloaded from our website. Alternatively, contact your Customer Service representative for a copy of this safety manual.

Restriction on Hazardous Substances (RoHS) Compliance

Directive 2002/95/EC—commonly known as the European Union (EU) Restriction on Hazardous Substances (RoHS)—sets limits on the use of certain substances found in electrical and electronic equipment. The intent of this legislation is to reduce the amount of hazardous chemicals that may leach out of landfill sites or otherwise contaminate the environment during end-of-life recycling. The Directive, which took effect on July 1, 2006, refers to the following hazardous substances:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent Chromium (Cr-V1)
- Polybrominated Biphenyls (PBB)
- Polybrominated Diphenyl Ethers (PBDE)

According to this EU Directive, all products sold in the European Union will be fully RoHS-compliant and "lead-free." (See our website for more information on dates and deadlines for compliance.) Spare parts supplied for the repair and upgrade of equipment sold before July 1, 2006 are exempt from the legislation. Equipment that complies with the EU directive will be marked with a RoHS-compliant emblem, as shown below.

RoHS
Compliant

Figure 1: RoHS Compliance Emblem

Waste from Electrical and Electronic Equipment (WEEE) Compliance

The European Union (EU) Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE) deals with the collection, treatment, recovery, and recycling of electrical and electronic waste products. The objective of the WEEE Directive is to assign the responsibility for the disposal of

associated hazardous waste to either the producers or users of these products. As of August 13, 2005, the producers or users of these products were required to recycle electrical and electronic equipment at end of its useful life, and may not dispose of the equipment in landfills or by using other unapproved methods. (Some EU member states may have different deadlines.)

In accordance with this EU Directive, companies selling electric or electronic devices in the EU will affix labels indicating that such products must be properly recycled. (See our website for more information on dates and deadlines for compliance.) Contact your local Sales representative for information on returning these products for recycling. Equipment that complies with the EU directive will be marked with a WEEE-compliant emblem, as shown below.
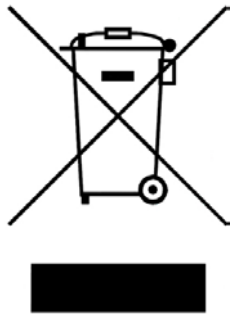
Figure 2: WEEE Compliance Emblem

Safety Terms and Symbols in this Manual

This product manual uses the following safety terms and symbols to identify certain conditions or practices. See Laser Safety (on page 113) and the *FR6802+ Safety Instructions and Standards Manual* for more information.

WARNING

Statements identifying conditions or practices that may result in personal injury or loss of life. High voltage is present.

CAUTION

Statements identifying conditions or practices that can result in damage to the equipment or other property.

Introduction

Product Description

The SFS6803**+** and OP**+**SFS**+** are audio/video frame synchronizers and processing amplifiers with SD-SDI digital video input and one genlock reference video input, and four synchronized and processed SD-SDI outputs with embedded audio.The OP**+**SFS**+**(C)xxD module has an optional hardware submodule that provides output over fiber in 1 of 17 wavelengths, and the optional submodule on the OP**+**SFS**+**R**+**D receives a fiber input in 1 of 17 wavelengths. These modules provide full video and embedded audio synchronization to a local station reference signal and allow for clean processing of all signals. The modules support embedding, de-embedding, and passing of Dolby E™ metadata, and picture and sound control through integrated processing amplifiers.

All versions of SFS6803**+** and OP**+**SFS**+** provide video hot switch and I/O delay signals for separate downstream audio tracking modules.

The basic SFS6803**+** and OP**+**SFS**+** provide SD-SDI video and audio synchronization and delay, and there are optional upgrades to 1.5G HD-SDI and 3G HD-SDI, including dual-link. Other optional upgrades add four and eight channels of AES input and output audio to the module, and add analog inputs or outputs.

Each SFS6803**+** or OP**+**SFS**+** package includes a module-specific breakout cable with unbalanced (coaxial) audio connectors that expands the number of available connections beyond what would fit on a standard two-slot back connector. It includes an RS-232/RS-422 serial connector to embed or de-embed metadata. Balanced AES outputs are supported with SFS6803**+**BD, OP**+**SFS**+**BD, or external baluns.

SFS6803**+** and OP**+**SFS**+** can be operated locally (using card-edge controls); or operated and monitored remotely with control software applications such as CCS Navigator™, HTTP web browser, or third-party SNMP-based control applications, or CCS-compliant remote control panels such as NUCLEUS. The module is QSEE™-compliant, so you can monitor a thumbnail when it is installed in an Ethernet-equipped FR6802**+**QXF or FR6822**+** frame.

The SFS6803**+** and OP**+**SFS**+** back connector requires two frame slots within an FR6802**+**XF, FR6822**+**, or FR6802**+**QXF frame. The SFS6803**+**AI**+**T, OP**+**SFS**+**AI**+**T, SFS6803**+**AO**+**T, and OP**+**SFS**+**AO**+**T require three slots within the same frames. There is no backward compatibility provided for use with 6800/7000 series frames or FR6802**+**DM frames. SFS6803**+** and OP**+**SFS**+** must be installed in a frame with fans.

Main Features

All versions of SFS6803**+** and OP**+**SFS**+** include the following features:

- Inputs
  - One serial digital SMPTE 259M SDI input
  - Genlock (composite or Tri-Level sync)
  - DARS input (unbalanced, balanced compatible with SFS6803**+**BD, OP**+**SFS**+**BD, or external balun)
- Outputs

- ▪ Four synchronized serial digital SMPTE 259M SDI processed outputs
- ▪ One DATA I/O signal for tracking audio processing
- One RS-232/RS-422 serial connector to embed/de-embed metadata
- AFD/WSS/VI detector and inserter
- Seamless sound functionality
- V-fading of the output audio on source audio change
- 10-bit video processing in standard definition 525/625 video standards
- Up to 50 frames of SD-SDI video delay
- Auto-detect or user-forced input video standard with HD/SD-SDI auto sensing
- Automatic cable equalization
- VANC and HANC sample passing
- Clean handling of hot switch on input
- Audio tracking and hot switching information provided to other modules
- Pass, black, grey, and freeze loss of video modes
- Video processing amplifier with luminance gain/offset and chrominance gain/offset controls
- 16-, 20-, or 24-bit audio processing
- Shadowed/restored parameter settings when switching video standards
- Card-edge control and monitoring
- Serial and Ethernet remote control and monitoring
- Video and audio test signal generators

Optional Features

OP**+**SFS**+**R**+**D has an optional fiber receiver.

OP**+**SFS**+**(C)xxD has an optional fiber transmitter.

SFS68OPT-AE S4 adds four balanced or unbalanced AES inputs and four balanced or unbalanced AES outputs.

SFS68OPT-AE S8 adds eight balanced or unbalanced AES inputs and eight balanced or unbalanced AES outputs.

The SFS68OPT-HD upgrade option adds the following features:

- The serial digital SMPTE 259M SDI input becomes a serial digital SMPTE 292M/SMPTE 259M SDI input
- The four synchronized serial digital SMPTE 259M SDI processed outputs become synchronized serial digital SMPTE 292M/SMPTE 259M SDI processed outputs
- Adds 10-bit video processing with the following video standards/frame rates:
  - ▪ 1080psf (progressive segmented frame), 23.98/24 Hz
  - ▪ 1080i (interlaced), 50/59.94/60 Hz
  - ▪ 1080p (progressive), 23.98/24/25/29.97/30 Hz
  - ▪ 720p (progressive), 50/59.94/60 Hz
- Up to 9 frames of HD video delay in Sync mode; 11 frames in Delay mode

The SFS68OPT-3G or SFS68OPT-HD-3G upgrade option adds 10-bit video processing with 1080p (progressive) video standard at 50/59.94/60 Hz frame rates as per SMPTE 424M and dual-link as per SMPTE 372M.

- 3 Gb/s Level A and Level B (dual link SMPTE372) support (data and audio embed/de-embed is fixed on link A)

Hardware Module Types

The following table describes the different versions of the product.

SFS6803+ and OP+SFS+ Modules

Module Name	Description
SFS6803+ and OP+SFS+	Standard SFS6803+ or OP+SFS+ module that requires an external balun for balanced audio
SFS6803+BD and OP+SFS+BD	SFS6800+ or OP+SFS+ module with submodule providing balanced audio
SFS6803+AI+T and OP+SFS+AI+T	SFS6803+ or OP+SFS+ module with submodule providing eight mono or four stereo analog audio inputs
SFS6803+AO+T and OP+SFS+AO+T	SFS6803+ or OP+SFS+ module with submodule providing eight mono or four stereo analog audio outputs

Optical Module Types

The following table describes the different versions of the OP+SFS+(C)xxD product. The table after that describes the different versions of the OP+SFS+R+D product. The basic module outputs through an SC/PC connector.

OP+SFS+(C)xxD Modules

Module Name	Description
OP+SFS+13D and OP+SFS+AI+13T	Fiber transmitter set at 1310 nm
OP+SFS+(C)xxD and OP+SFS+AI+CxxT	Fiber transmitter set at CWDM wavelength of 1xx0 nm

OP+SFS+R+D Modules

Module Name	Description
OP+SFS+R+D and OP+SFS+AO+HI+R+T	Standard-sensitivity (PIN) wideband fiber receiver
OP+SFS+HI+R+D and OP+SFS+AO+HI+R+T	High-sensitivity (APD) wideband fiber receiver

Hardware Options

All OP**+**SFS**+**R**+**D and OP**+**SFS**+**(C)xxD modules are shipped with standard SC/PC fibre connectors. Other connectors are available (see below).

Available Connectors

Item	Description
OP**+**OPT**+**SC	SC/PC fiber optic connectors (standard)
OP**+**OPT**+**ST	ST/PC fiber optic connectors (optional)
OP**+**OPT**+**FC	FC/PC fiber optic connectors (optional)

Features Summary

		SFS6803+D	OP+SFS+	SFS6803+BD	SFS6803+AI+	OP+SFS+AI+	SFS6803+AO+	OP+SFS+AO
SELENIO 6800+ SDI Frame Syncs	SD-SDI, embedded audio	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	HD-SDI, embedded audio	Option	Yes	Yes	Yes	Yes	Yes	Yes
	3G-SDI, embedded audio	Option	Option	Option	Option	Option	Option	Option
	AES unbalanced audio	Option	Option	Option	Option	Option	Option	Option
	AES balanced audio	NA	NA	Yes	NA	NA	NA	NA
	Analog audio input	NA	NA	NA	Yes	Yes	NA	NA
	Analog audio output	NA	NA	NA	NA	NA	Yes	Yes
Fiber Versions	Fiber transmitter	NA	Yes	NA	NA	Yes	NA	Yes
	Fiber receiver	NA	Yes	NA	NA	Yes	NA	Yes
OP+OPT+SC	SC/PC connector	NA	Yes	NA	NA	Yes	NA	Yes

Optical Fiber Options

		SFS6803+D	OP+SFS+	SFS6803+BD	SFS6803+AI+	OP+SFS+AI+	SFS6803+AO+	OP+SFS+AO
OP+OPT+FC	FC connector option	NA	Option	NA	NA	Option	NA	Option
OP+OPT+ST	ST connector option	NA	Option	NA	NA	Option	NA	Option

Software License Options

SFS68OPT-HD	adds HD-SDI	Yes	NA	NA	NA	NA	NA	NA
SFS68OPT-HD-3G	adds 3G-SDI	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SFS68OPT-3G	adds HD-SDI and 3G-SDI	Yes	NA	NA	NA	NA	NA	NA
SFS68OPT-AES4	adds 4 unbalanced AES	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SFS68OPT-AES8	adds 8 unbalanced AES	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Audio Interfaces

	Breakout cable for unbalanced included	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Breakout cable for balanced included	No	No	No	No	No	No	No
	Mating connector for analog audio included	No	No	No	Yes	Yes	Yes	Yes

Ordering Information

SFS6803+D	SD-SDI A/V frame synch and processing amplifier, HD & 3G ready (with appropriate software key), includes double-slot backmodule and breakout cable, QSEE-compliant
SFS6803+BD	HD-SDI A/V frame synch and processing amplifier, HD & 3G-capable (with appropriate software key), includes double-slot back module with balanced I/O, QSEE-compliant. No breakout cable provided by Imagine Communications
SFS6803+AI+T	HD/SD-SDI A/V frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs. Includes triple-slot backmodule and breakout cable, QSEE-compliant
SFS6803+AO+T	HD/SD-SDI A/V frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio outputs. Includes triple-slot backmodule and breakout cable, QSEE-compliant

Fiber Versions

OP+SFS+13D	SFS6803+ with fiber output option (1310nm wavelength, SC connector)
OP+SFS+C27D	SFS6803+ with fiber output option (1271nm, CWDM wavelength, SC connector)
OP+SFS+C29D	SFS6803+ with fiber output option (1291nm, CWDM wavelength, SC connector)
OP+SFS+C31D	SFS6803+ with fiber output option (1311nm, CWDM wavelength, SC connector)
OP+SFS+C33D	SFS6803+ with fiber output option (1331nm, CWDM wavelength, SC connector)
OP+SFS+C35D	SFS6803+ with fiber output option (1351nm, CWDM wavelength, SC connector)
OP+SFS+C37D	SFS6803+ with fiber output option (1371nm, CWDM wavelength, SC connector)
OP+SFS+C43D	SFS6803+ with fiber output option (1431nm, CWDM wavelength, SC connector)

OP+SFS+C45D	SFS6803+ with fiber output option (1451nm, CWDM wavelength, SC connector)
OP+SFS+C47D	SFS6803+ with fiber output option (1471nm, CWDM wavelength, SC connector)
OP+SFS+C49D	SFS6803+ with fiber output option (1491nm, CWDM wavelength, SC connector)
OP+SFS+C51D	SFS6803+ with fiber output option (1511nm, CWDM wavelength, SC connector)
OP+SFS+C53D	SFS6803+ with fiber output option (1531nm, CWDM wavelength, SC connector)
OP+SFS+C55D	SFS6803+ with fiber output option (1551nm, CWDM wavelength, SC connector)
OP+SFS+C57D	SFS6803+ with fiber output option (1571nm, CWDM wavelength, SC connector)
OP+SFS+C59D	SFS6803+ with fiber output option (1591nm, CWDM wavelength, SC connector)
OP+SFS+C61D	SFS6803+ with fiber output option (1611nm, CWDM wavelength, SC connector)
OP+SFS+R+D	SFS6803+ with fiber input option (PIN receiver, SC connector)
OP+SFS+AI+13T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on 1310nm
OP+SFS+AI+C27T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1270nm
OP+SFS+AI+C29T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1290nm
OP+SFS+AI+C31T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1310nm
OP+SFS+AI+C33T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1330nm
OP+SFS+AI+C35T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1350nm
OP+SFS+AI+C37T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1370nm
OP+SFS+AI+C43T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1430nm
OP+SFS+AI+C45T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1450nm
OP+SFS+AI+C47T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1470nm

OP+SFS+AI+C49T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1490nm
OP+SFS+AI+C51T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1510nm
OP+SFS+AI+C53T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1530nm
OP+SFS+AI+C55T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1550nm
OP+SFS+AI+C57T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1570nm
OP+SFS+AI+C59T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1590nm
OP+SFS+AI+C61T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio inputs, includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Tx on CWDM 1610nm
OP+SFS+AO+R+T	HD/SD-SDI A/V optical frame sync and processing amplifier, 3G ready (with appropriate software key), 8 discrete Analog Audio outputs,includes triple-slot backmodule and breakout cable, QSEE-compliant, Fiber Rx

Software License Options

SFS68OPT-3G	Optional firmware upgrade for SFS6800+ and SFS6803+ to provide 3Gbps and 1.5Gbps HD capability
SFS68OPT-HD	Optional firmware upgrade for SFS6800+ and SFS6803+ to provide 1.5Gbps HD capability
SFS68OPT-HD-3G	Optional softkey for field upgrade of SFS6800+ and SFS6803+ from 1.5Gbps to 3Gbps capability
SFS68OPT-AES4	Optional software key upgrade for SFS6803+ to provide four discrete AES inputs and outputs
SFS68OPT-AES8	Optional software key upgrade for SFS6803+ to provide eight discrete AES inputs and outputs

Fiber Options

OP+OPT+FC	OPTO+ FC connector option for OPTO+ fiber modules
OP+OPT+SC	OPTO+ SC standard default connector for OPTO+ fiber modules, no charge
OP+OPT+ST	OPTO+ ST connector option for OPTO+ fiber modules

Breakout Cable

6800+OPT+16CAPM	Audio breakout cable for SFS/HMX/HDX6803+ and OP+SFS/HMX/HDX series modules

Module Descriptions

SFS6803**+** and OP**+**SFS**+** hardware versions have minor variances in their specifications, which are listed in Specifications (on page 101)

To determine which specifications apply to your module, see Reading Software and Hardware Versions (on page 63).

Front Module

The following figure is a generic top-front view of a typical 6800**+** module and shows the general location of standard LEDs, controls, and jumpers. The number of control and monitoring LEDs on 6800**+** modules varies.
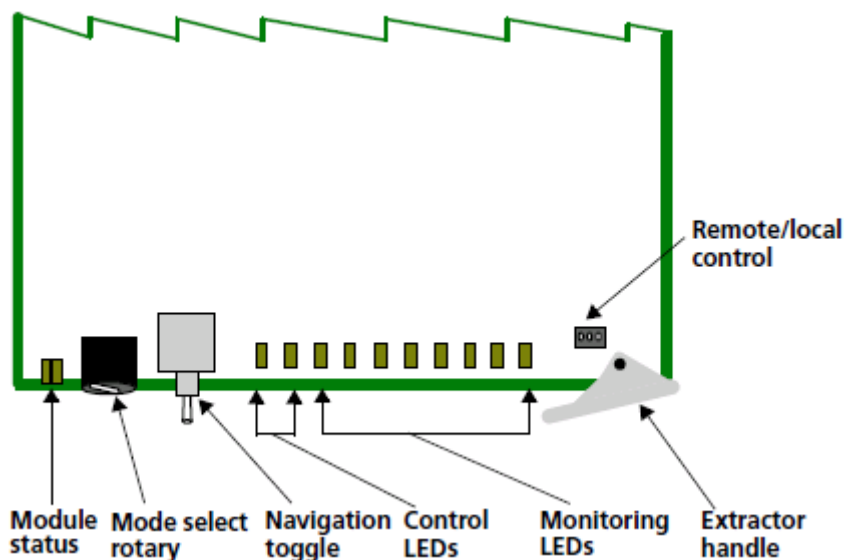

**Figure 3: Typical 6800**+ **Module**

The following table briefly describes generic 6800**+** LEDs, switches, and jumpers. See Operation (on page 43) for more information on specific SFS6803**+** and OP**+**SFS**+** module controls, LEDs, and jumpers.

Generic 6800+ **Module Features**

| Feature	Description
Module status LEDs	Various color and lighting combinations of these LEDs indicate the module state. See Module Status LEDs (on page 98) for more information.

Feature	Description
Mode select rotary switch	This switch selects between various control and feedback parameters.
Navigation toggle switch	This switch navigates up and down through the available control parameters: • **Down**: Moves down through the parameters • **Up**: Moves up through the parameters
Control LEDs	Various lighting combinations of these control LEDs (sometimes referred to as "Bank Select LEDs") indicate which bank is currently selected. See Changing Parameter Settings Using Card-Edge Controls (on page 62) for more information.
Monitoring LEDs	Each 6800**+** module has a number of LEDs assigned to indicate varying states/functions. See Monitoring LEDs (on page 97) for a description of these LEDs.
Local/remote control jumper	• **Local**: This jumper setting locks out external control panels and allows card-edge control only; limits the functionality of remote software applications to monitoring • **Remote**: This jumper setting allows remote or local (card-edge) configuration, operation, and monitoring of the SFS6803**+** and OP**+**SFS**+** (this is the default setting)

Back Connectors
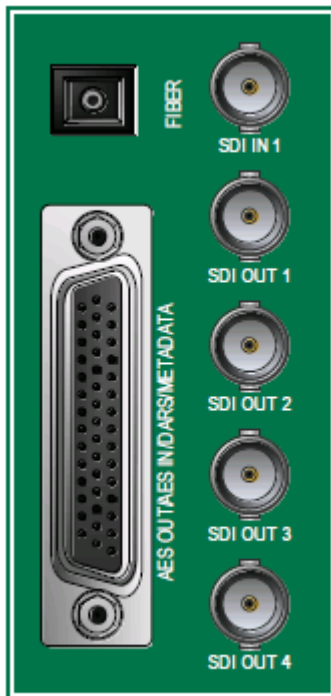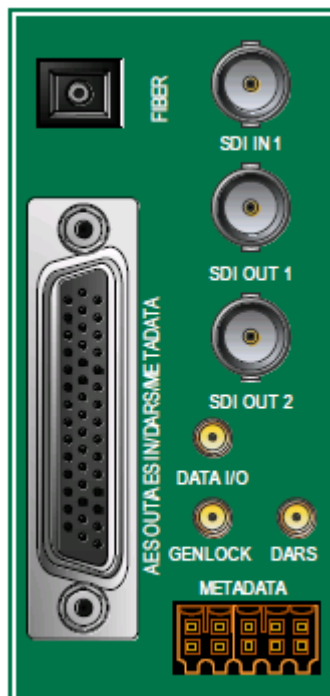
SFS6803+ and OP+SFS+   SFS6803+BD and OP+SFS+BD

Figure 4: Standard SFS6803+ and OP+SFS+ Back Connectors

SFS6803+AI+T and
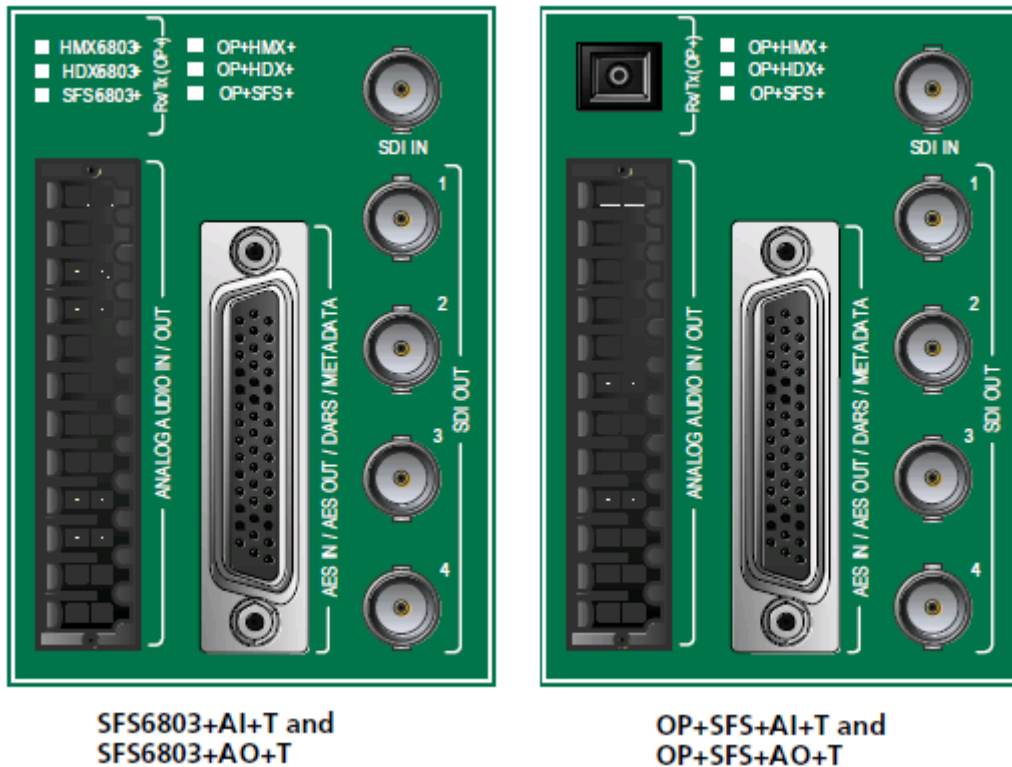SFS6803+AO+T

OP+SFS+AI+T and
OP+SFS+AO+T

Figure 5: SFS6803+ and OP+SFS+ Back Connectors With Analog Audio

To maintain optimal output video signal integrity, terminate unused output video and DATA I/O BNCs with 75Ω terminators.

Breakout Cables and Pinouts

The following cables and pinouts are associated with the SFS6803**+** and OP**+**SFS**+** products:

- Unbalanced Breakout Cable for SFS6803+D (on page 22)
- Pinouts for 44-Pin Connector for SFS6803+BD (on page 25)
- RS-422/232 Cable (on page 26)
- Metadata Connector for SFS6803+BD (on page 27)
- Weidmuller Connector for Analog Audio (on page 28)

Unbalanced Breakout Cable for SFS6803+D

The standard SFS6803**+** and OP**+**SFS**+** ship with an unbalanced breakout cable, pictured in the following figure. For information on ordering cables, see Available Product Packages.

If you need to make your own breakout cable, pinouts are listed in the the following sections.
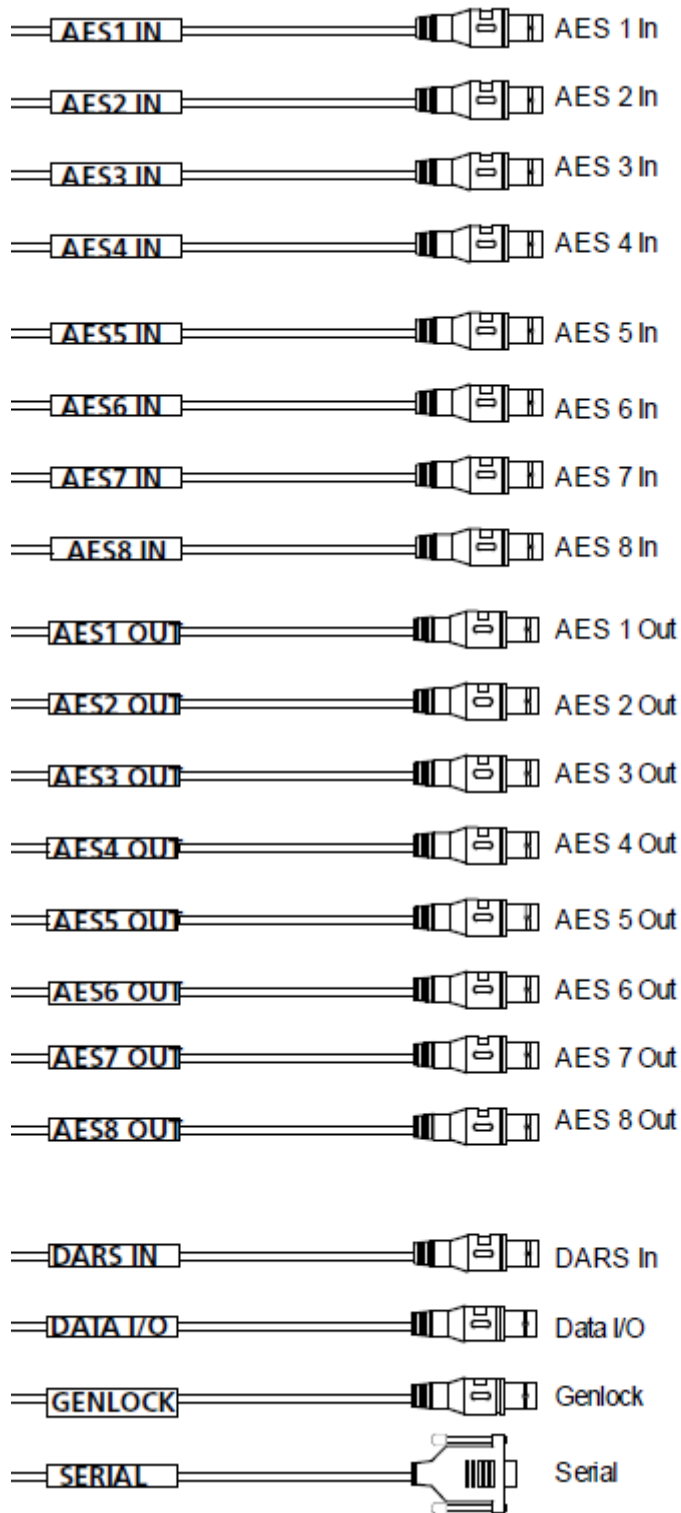

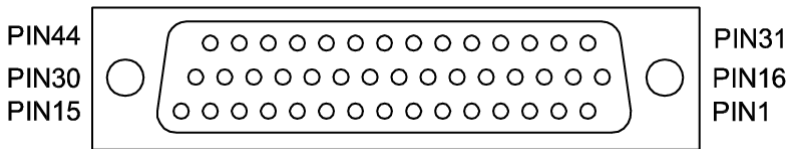**Figure 6: SFS6803+ and OP+SFS+ Breakout Cable for SFS6803+D**

Figure 7: Pin Numbers for 44-Pin Connector for SFS6803+D

Pinouts for 44-pin Connector for SSFS6803+D Modules

Pin No. on DB-44M	Connection Type	Description	Wire Label	External Cable Color	BNC Color
1	BNC	GENLOCK	GENLOCK	Black	Black
2	BNC GND	GENLOCK GND	GENLOCK	Black	Black
3	BNC GND	AES OUT 7 GND	AES OUT 7	Blue	Blue
4	BNC	AES IN 4	AES IN 4	White	White
5	BNC GND	AES IN 4 GND	AES IN 4	White	White
6	BNC	AES IN 3	AES IN 3	White	White
7	BNC GND	AES IN 3 GND	AES IN 3	White	White
8	BNC	DATA IO	DATA IO	Yellow	Yellow
9	BNC GND	DATA IO GND	DATA IO	Yellow	Yellow
10	BNC	AES OUT 2	AES OUT 2	Blue	Blue
11	BNC GND	AES OUT 2 GND	AES OUT 2	Blue	Blue
12	BNC	AES OUT 1	AES OUT 1	Blue	Blue
13	BNC GND	AES OUT 1 GND	AES OUT 1	Blue	Blue
14	BNC GND	AES IN 7 GND	AES IN 7	White	White
15	BNC	AES IN 7	AES IN 7	White	White
16	Not Connected				
17					
18	BNC	AES OUT 7	AES OUT 7	Blue	Blue
19	BNC	DARS IN 1	DARS IN 1	Yellow	Black
20	BNC GND	DARS IN 1 GND	DARS IN 1	Yellow	Black
21	BNC	AES IN 2	AES IN 2	White	White
22	BNC GND	AES OUT 3 GND	AES OUT 3	Blue	Blue
23	BNC	AES OUT 3	AES OUT 3	Blue	Blue
24	BNC GND	AES OUT 6 GND	AES OUT 6	Blue	Blue
25	162A10019X (DB9.5)	RS232_GND (DB9)	SERIAL	Black	N/A
25	BNC GND	AES OUT 4 GND	AES OUT 4	Blue	Blue
26	BNC	AES OUT 4	AES OUT 4	Blue	Blue

Pin No. on DB-44M	Connection Type	Description	Wire Label	External Cable Color	BNC Color
27	BNC GND	AES OUT 5 GND	AES OUT 5	Blue	Blue
28	BNC	AES IN 8	AES IN 8	White	White
29	BNC GND	AES IN 8 GND	AES IN 8	White	White
30	BNC GND	AES IN 5 GND	AES IN 5	White	White
31	162A10019X (DB9.3)	BALANCED SERIAL IN- (DB9)	SERIAL	Red	N/A
32	162A10019X (DB9.8)	BALANCED SERIAL IN+ (DB9)	SERIAL	Yellow	N/A
33	BNC GND	AES OUT 8 GND	AES OUT 8	Blue	Blue
34	BNC	AES OUT 8	AES OUT 8	Blue	Blue
35	162A10019X (DB9.1)	RS422_FR_GND (DB9)	SERIAL	Black	N/A
35	BNC GND	AES IN 2 GND	AES IN 2	White	White
36	BNC	AES IN 1	AES IN 1	White	White
37	162A10019X (DB9.9)	RS422_FR_GND (DB9)	SERIAL	Black	N/A
37	BNC GND	AES IN 1 GND	AES IN 1	White	White
38	BNC	AES OUT 6	AES OUT 6	Blue	Blue
39	162A10019X (DB9.7)	BALANCED SERIAL OUT- (DB9)	SERIAL	Blue	N/A
40	162A10019X (DB9.2)	BALANCED SERIAL OUT+ (DB9)	SERIAL	Green	N/A
41	BNC	AES OUT 5	AES OUT 5	Blue	Blue
42	BNC GND	AES IN 6 GND	AES IN 6	White	White
43	BNC	AES IN 6	AES IN 6	White	White
44	BNC	AES IN 5	AES IN 5	White	White

Pinouts for 44-Pin Connector for SFS6803+BD

If your module is a SFS6803+BD or OP+SFS+BD module, you need to make a cable to suit your facility's needs. Pinouts are provided below.

Pin No. on DB-44M	Connection Type	Pin No. on DB-44M	Connection Type
1	RX-	23	AES_OUT6+
2	AES_OUT7-	24	AES_OUT6-
3	AES_OUT7+	25	AES_OUT3+

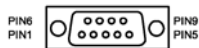| Pin No. on DB-44M	Connection Type	Pin No. on DB-44M	Connection Type
4	TX-	26	AES_IN8+
5	TX+	27	AES_OUT2+
6	GND	28	AES_IN7+
7	GND	29	AES_IN7-
8	GND	30	AES_IN5-
9	GND	31	AES_IN4+
10	GND	32	AES_IN4-
11	AES_IN6+	33	AES_OUT8+
12	AES_IN6-	34	AES_OUT8-
13	AES_OUT1+	35	AES_OUT5-
14	AES_OUT1-	36	AES_IN3-
15	AES_IN5+	37	AES_IN1+
16	RX+	38	AES_IN1-
17	DARS_IN2+	39	AES_OUT3-
18	DARS_IN2-	40	AES_IN8-
19	AES_IN2+	41	AES_OUT2-
20	AES_IN2-	42	AES_OUT4+
21	AES_OUT5+	43	AES_OUT4-
22	AES_IN3+	44	GND

RS-422/232 Cable

Figure 8: Pin Numbers for RS-422/232 Female Connector

Pin Assignment of DB-9 Connector (Female) in RS-422 Format

Pin No.	Signal	Comments
1	FG	Frame Ground
9	FG	Frame Ground
5	FG	Frame Ground
2	TA (Tx-)	Transmitted Data -
7	TB (Tx+)	Transmitted Data +

Pin No.	Signal	Comments
8	RA (Rx-)	Received Data -
3	RB (Rx+)	Received Data +
4	Not connected	
6		

Pin Assignment of DB-9 Connector (Female) in RS-232 Format

Pin No.	Signal	Comments
1	FG	Frame Ground
9	FG	Frame Ground
5	FG	Frame Ground
2	Tx	Transmitted Data
7	Not connected	
8		
3	Rx	Received Data
4	Not connected	
6		

Metadata Connector for SFS6803+BD

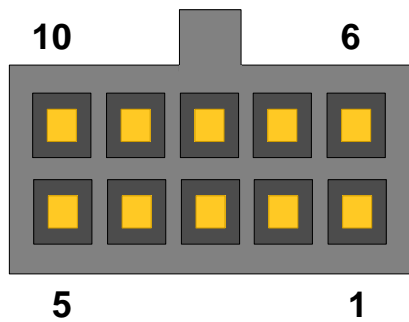The metadata connector cable (provided) has the following connections:

Figure 9: Metadata Connector Pinouts

Metadata Pinouts for RS-422 Format

Pin Number	Signal	Comments
1	RB (Rx+)	Received Data +
2	RA (Rx-)	Received Data -
3	FG	Frame Ground
4	TB (Tx+)	Transmitted Data +
5	TA (Tx-)	Transmitted Data -

6	FG	Frame Ground
7	FG	Frame Ground
8	FG	Frame Ground
9	FG	Frame Ground
10	FG	Frame Ground

Metadata Pinouts for RS-232 Format

Pin Number	Signal	Comments
1	Rx	Received Data
2	Not connected	
3	FG	Frame Ground
4	Not connected	
5	Tx	Transmitted Data
6	FG	Frame Ground
7	FG	Frame Ground
8	FG	Frame Ground
9	FG	Frame Ground
10	FG	Frame Ground

Weidmuller Connector for Analog Audio

The SFS6803+AI+T, OP+SFS+AI+T, SFS6803+AO+T, and OP+SFS+AO+T back modules have an additional connector. It has has the following connections:


Figure 10: Analog Audio Connector Pinouts

Analog Audio Pinouts

Pin Number	Signal	Pin Number	Signal	Comments
1	CH1A+	13	CH1A-	In or Out 1
2	CH1B+	14	CH1B-	
3	GND	15	GND	
4	CH2A+	16	CH2A-	In or Out 2
5	CH2B+	17	CH2B-	
6	GND	18	GND	
7	CH3A+	19	CH3A-	In or Out 3
8	CH3B+	20	CH3B-	
9	GND	21	GND	
10	CH4A+	22	CH4A-	In or Out 4
11	CH4B+	23	CH4B-	
12	GND	24	GND	

If your module is an SFS6803**+**AI**+**T or OP**+**SFS**+**AI**+**T, then the connections will be analog audio inputs. If your module is an SFS6803**+**AO**+**T or OP**+**SFS**+**AO**+**T, then the connections will be outputs.

Signal Flow

1.5G HD-SDI in and out are only available if your module has the optional SFS68OPT-HD license key. 3G HD-SDI in and out are only available if your module has the optional SFS68OPT-HD-3G or SFS68OPT-3G license key.
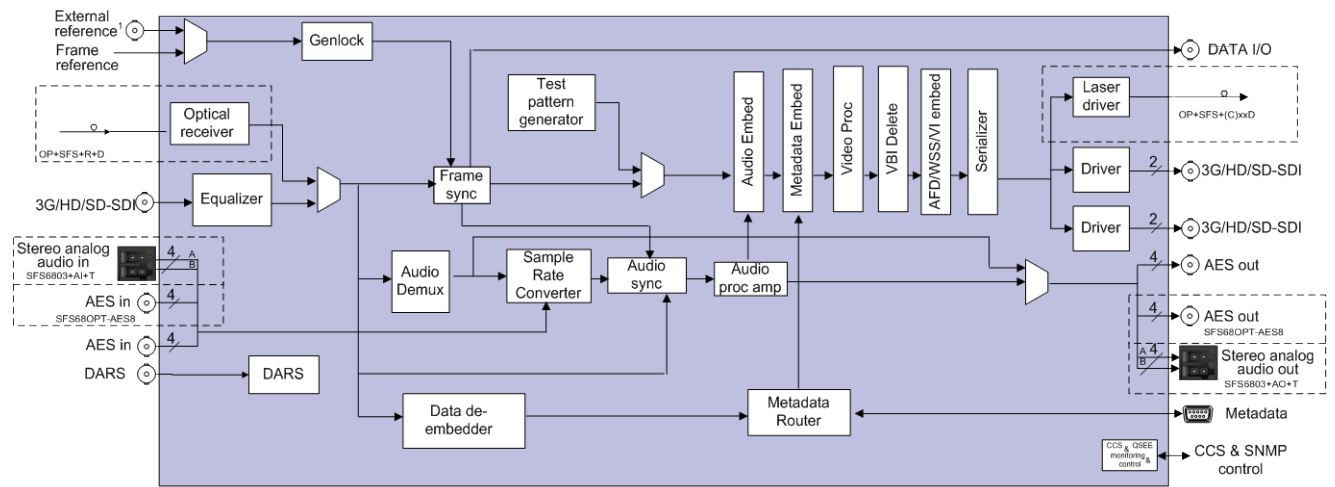
Figure 11: SFS6803+ and OP+SFS+ Signal Flow Diagram

Installation

Unpacking the Module

Before you install modules, perform the following:

- Check the equipment for any visible damage that may have occurred during transit.
- Confirm receipt of all items on the packing list. See Checking the Packing List (on page 31) for more information.

  Contact your Customer Service representative if parts are missing or damaged.

- Remove the anti-static shipping pouch, if present, and all other packaging material.
- Retain the original packaging materials for possible re-use.

See Unpacking/Shipping Information (on page 8) for information about returning a product for servicing.

Unless explicitly stated, all references to SFS6803+ and OP+SFS+ also pertain to other versions of the product.

Checking the Packing List

Available Product Packages

Ordered Product	Content Description
SFS6803+D	• One SFS6803+ front module • One SFS6803+ double-slot back connector • One 6800+OPT+16CAPM breakout cable with unbalanced audio connectors
OP+SFS+R+D	• One OP+SFS+R+D front module • One SFS6803+ double-slot back connector • One 6800+OPT+16CAPM breakout cable with unbalanced audio connectors
OP+SFS+(C)xxD	• One OP+SFS+(C)xxD front module • One SFS6803+ double-slot back connector with optical transmitter • One 6800+OPT+16CAPM breakout cable with unbalanced audio connectors
SFS6803+BD	• One SFS6803+BD front module • One SFS6803+BD double-slot back connector Note: Customers must provide a cable for use with the 44-pin connector on SFS6803+BD. Pinouts are listed in Pinouts for 44-Pin Connector for SFS6803+BD (on page 25).
OP+SFS+R+BD	• One OP+SFS+R+D front module • One SFS6803+BD double-slot back connector Note: Customers must provide a cable for use with the 44-pin connector on

Ordered Product	Content Description
	OP+SFS+BD. Pinouts are listed in Pinouts for 44-Pin Connector for SFS6803+BD (on page 25).
OP+SFS+(C)xxBD	• One OP+SFS+(C)xxD front module • One SFS6803+BD double-slot back connector with optical transmitter
6800+OPT+16CAPM	One breakout cable with unbalanced audio connectors
SFS6803+AI+T_	• SFS6803+ front module with submodule providing eight mono or four stereo analog audio inputs • One SFS6803+ triple-slot back connector
SFS6803+AO+T	• OP+SFS+ front module with submodule providing eight mono or four stereo analog audio outputs • One SFS6803+ triple-slot back connector
OP+SFS+AI+T	• SFS6803+ front module with submodule providing eight mono or four stereo analog audio inputs • One SFS6803+ triple-slot back connector
OP+SFS+AO+T	• OP+SFS+ front module with submodule providing eight mono or four stereo analog audio outputs • One SFS6803+ triple-slot back connector

Choosing Upgrade Options

Basic SFS6803+ and OP+SFS+ modules have one SD-SDI input and four SD-SDI outputs with embedded audio. The following firmware upgrades are available:

Available License Key Upgrades

Ordered Product	Content Description
SFS68OPT-HD	Adds 1.5G HD-SDI functionality to the SD-SDI input and outputs
SFS68OPT-AES4	Adds four discrete AES inputs and outputs
SFS68OPT-AES8	Adds eight discrete AES inputs and outputs
SFS68OPT-3G	Adds 3G HD-SDI (including Level B) and 1.5G HD-SDI functionality to an SD-SDI module
SFS68OPT-HD-3G	Adds 3G HD-SDI (including Level B) functionality to a module that already has SD-SDI and 1.5G HD-SDI

To purchase additional license keys, contact your Sales representative. To activate a license key, see Adding a License Key (on page 44).

Selecting an External Balun

If you are not using SFS6803**+**BD or OP**+**SFS**+**BD, for balanced audio you will need external baluns. The following baluns from Neutrik or equivalent are recommended for the unbalanced to balanced AES conversion:

- NADITBNC-F: Female chassis XLR 110Ω input - female BNC 75Ω output
  http://www.neutrik.com/fl/en/audio/210_309314683/NADITBNC-F_detail.aspx
- NADITBNC-M: Female BNC 75Ω input - male chassis XLR 110Ω output
  http://www.neutrik.com/fl/en/audio/210_2044239418/NADITBNC-M_detail.aspx
- NADITBNC-FX: Female cable end XLR 110Ω input - female BNC 75Ω output
  http://www.neutrik.com/fl/en/audio/210_1576769505/NADITBNC-FX_detail.aspx
- NADITBNC-MX: Female BNC 75Ω input - male cable end XLR 110Ω output
  http://www.neutrik.com/fl/en/audio/210_1923043515/NADITBNC-MX_detail.aspx

Setting Jumpers

SFS6803**+** and OP**+**SFS**+** modules have one jumper, CJ1, which sets the module for local or remote control. See Setting Jumper J3 for Local or Remote Control (on page 33).

In addition, the SFS6803**+**AI**+**T and OP**+**SFS**+**AI**+**T modules have eight impedance jumpers. See Setting Jumpers for 600W/Hi-Z Input Impedance Control (on page 34).

The SFS6803**+**AO**+**T and OP**+**SFS**+**AO**+**T modules have jumpers to determine the audio output level. See Jumper Settings for Analog Audio Output Level (on page 35).

Setting Jumper J3 for Local or Remote Control

SFS6803**+** and OP**+**SFS**+** modules have one jumper, CJ1, which sets the module for local or remote control.

You need to configure modules for local or remote operation prior to power-up. To change the configuration, first remove power from the module, reset the jumper, and then reapply power.

CJ1 jumper

Figure 12: Jumper Location

1. Locate jumper **J3** on the module (behind the mode select rotary switch).

    The preceding graphic shows the location of the **J3** jumper.

2. Place a jumper on pins 1 and 2 to set the module for **Remote** control, or pins 2 and 3 to set the module for **Local** control. See below.
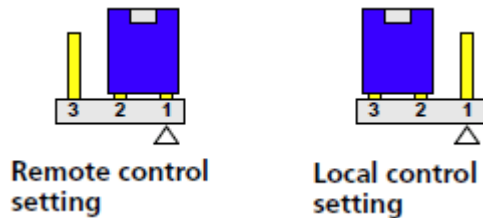

Figure 13: J3 Settings for Local and Remote Control

The white triangle near the jumper pins on the module indicates pin 1.

Setting Jumpers for 600W/Hi-Z Input Impedance Control

This procedure only applies to modules that have the analog audio input submodule: SFS6803**+AI+**T and OP**+SFS+AI+**T.

Follow this procedure to select an analog impedance of **600**Ω or **Hi-Z** on each channel:

1. Locate jumpers CH1A, CH1B, CH2A, CH2B, CH3A, CH3B, CH4A, and CH4B on the analog audio input module.

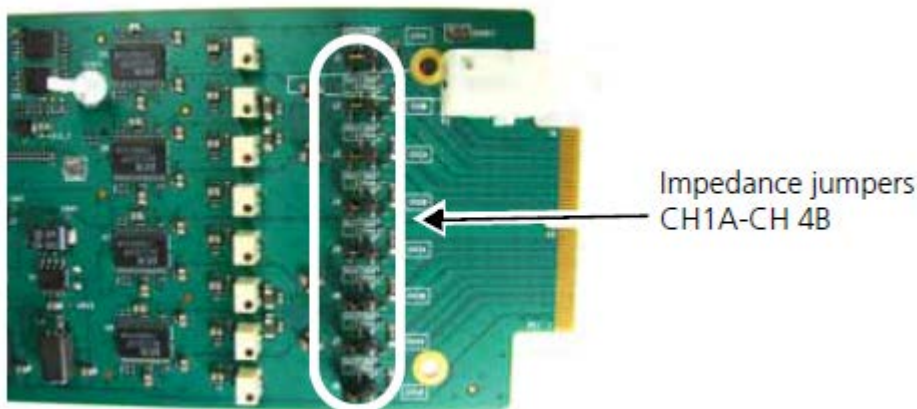   The following figure shows the location of these jumpers.

Figure 14: Impedance Jumpers on Analog Audio Input Submodule

2. Place a jumper on pins 1 and 2 to set the module for **600**Ω input, or pins 2 and 3 to set the module for Hi-Z analog impedance input, as shown below.
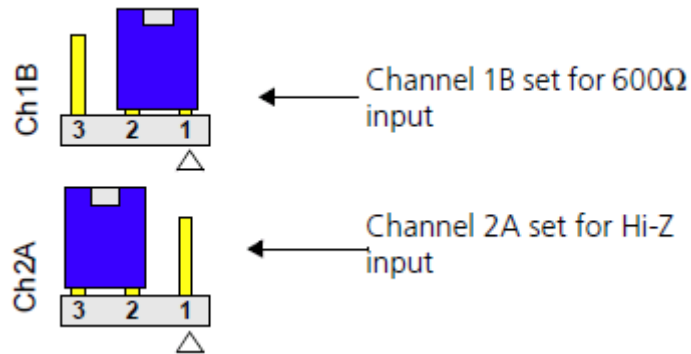
Do this for all eight channel jumpers.

Figure 15: Jumper Settings for 600W or Hi-Z Inputs

Jumper Settings for Analog Audio Output Level

This procedure only applies to modules that have the analog audio output submodule: SFS6803**+AO+**T and OP**+SFS+AO+**T.

Follow this procedure to select analog audio.

1. Locate jumpers CH1A, CH1B, CH2A, CH2B, CH3A, CH3B, CH4A, and CH4B on the analog audio module.

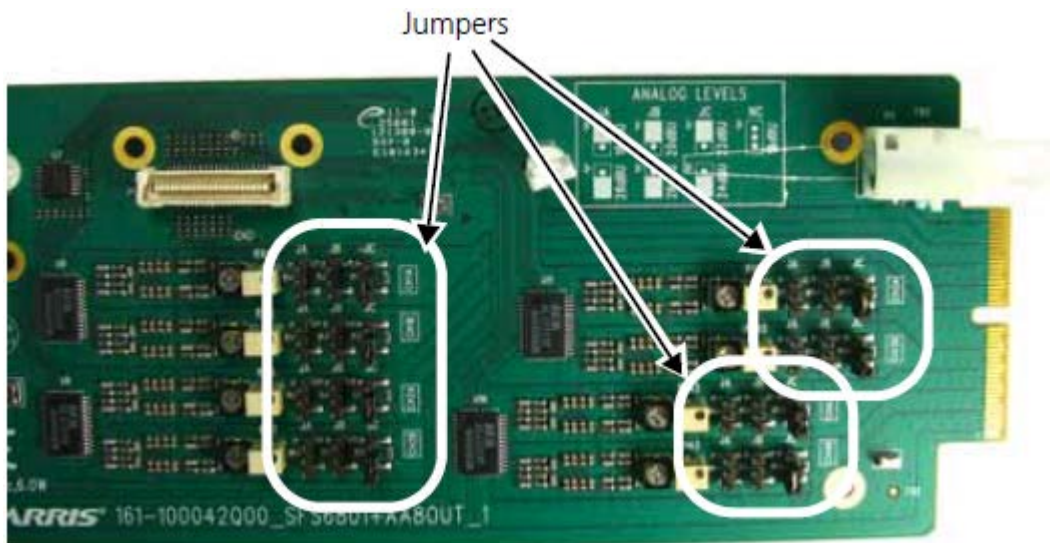   The following figure shows the location of these jumpers.

Figure 16: Audio Output Level Jumpers on Analog Audio Output Submodule

2. Place a jumper on the pins as listed in the following table.

    Do this for all eight channel jumpers.

Jumper Settings for Analog Audio Output Levels

Output Level (in dBu, 66 Ω output Impedance)	Jumper JA	Jumper JB	Jumper JC
16 dBu	Open	Open	Open
18 dBu	1 and 2	Open	Open
20 dBu	Open	1 and 2	Open
22 dBu	Open	Open	1 and 2
24 dBu	Open	Open	2 and 3
26 dBu	Open	2 and 3	Open
28 dBu	2 and 3	Open	Open

For each jumper, pin 1 is marked with a white triangle.

Maximum 6800+ Frame Power Ratings

The power consumption for the SFS6803**+** and OP**+**SFS**+** modules is 12 W.

The following table describes the maximum allowable power ratings for 6800**+** frames. Note the given maximums before ins talling any 6800**+** modules in your frame.

SFS6803**+** and OP**+**SFS**+** modules operate only in fan-cooled FR6802**+** and FR6822**+** frames, subject to the limitations shown below. These modules cannot be installed in 6800/7000 series frames.

To maintain proper temperatures, ensure that the front panel is closed at all times and that the fan module is fully operational.

Maximum Power Ratings for 6800+ **Frames**

6800+ Frame Type	Max. Frame Power Dissipation	Number of Usable Slots	Max. Power Dissipation Per Slot
FR6802**+**XF (frame with AC power supply)	120 W	20	6 W
FR6802**+**XF48 (frame with DC power supply)	105 W	20	5.25 W
FR6802**+**QXF frame (with AC or DC power supply)	120W	20	6 W
FR6822**+** frame (with AC or DC power supply)	120W	20	6 W

See the *6800**+** Frame Installation and Operation Manual* for information about installing and operating an FR6802**+**QXF, FR6822**+,** or FR6802+ frame and its components.

Note: Before installing this product, read the *6800**+** Series Safety Instructions and Standards Manual* shipped with every *6800**+** Frame Installation and Operation Manual* or downloadable from our website.

This safety manual contains important information about the safe installation and operation of 6800**+**
series products.

Installing 6800+ Modules

Required Frames and Back Connector Types

SFS6803**+** and OP**+**SFS**+** modules have double-width back connectors that can be installed in an
FR6802**+**XF, FR6822**+**, or FR6802**+**QXF frame. SFS6803**+** and OP**+**SFS**+** modules cannot be installed in an
FR6802**+**DM frame, a FR6800/7000 frame, or a frame without fans.

See your *6800**+** Frame Installation and Operation Manual* for details on installing back connectors in a
frame.

A FR6802**+**RM (Rear Support Extension Rails for 6800**+** series frames) option is recommended for the
SFS6803**+** and OP**+**SFS**+** modules. See your *6800**+** Frame Installation and Operation Manual* for
installation instructions.

Installing and Removing SFS6803+ Modules

These modules require no specialized installation or removal procedures. However, if installing both
front and rear modules, ensure that the back module is installed first before plugging in the front
module.

When removing both the front and rear modules, ensure that the front module is unplugged from the
frame first, before removing the rear module.

- See your *6800**+** Frame Installation and Operation Manual* for information about installing and
  operating a frame and its components.
- See the *6800**+** Safety Instructions and Standards Manual* for important information about safely
  installing your module.

Once you have installed your SFS6803**+** and OP**+**SFS**+** modules, you can connect them to the appropriate
input and outputs.

Installing OP+SFS+ Modules

Front and back modules in the OPTO**+** series have plastic caps that protect the fragile laser connections
from damage. **You must remove these protective covers before you install the back and front modules
(see below).**

In addition, all fiber optic connections must be inspected and cleaned before they are assembled.
Carefully follow the inspection and cleaning steps described in the next pages. Additional safety
information appears in the appendix.

**Note: Ensure that you remove the fiber optic protective covers from the front and back modules
before installation. Take care to avoid touching the fiber optic connections. Thoroughly clean the**

connections before installation. Remove power from the frame before installing or removing back modules.
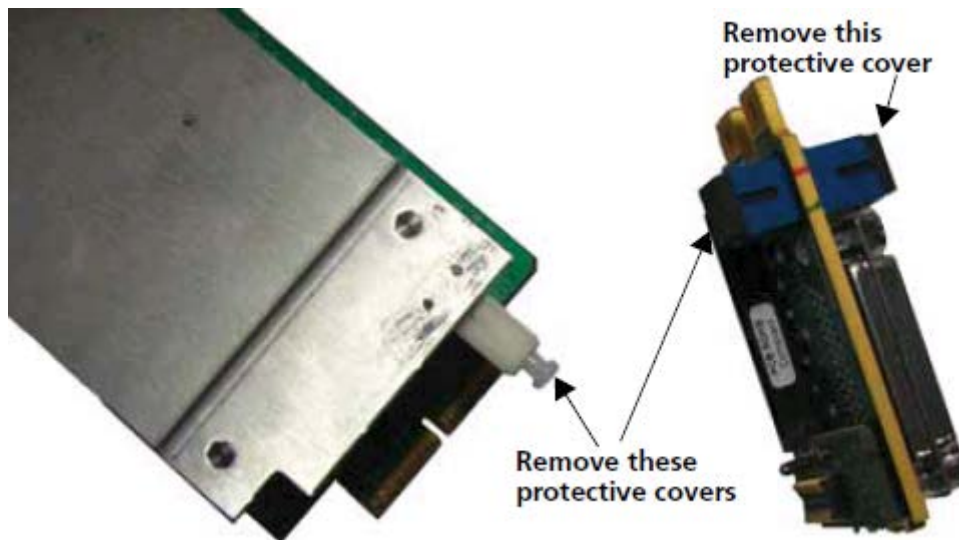

Figure 17: Protective Covers for Laser Connectors

Note: To prevent overload damage, ensure that you observe the following:

For best results, do not install high-sensitivity (APD) optical receivers on multimode fiber. Due to its dispersion characteristics, multimode fiber is typically limited to shorter distance applications with very little signal attenuation. The resulting power levels may damage the receiver.

Before connecting any standard-sensitivity (PIN) or high-sensitivity (APD) optical receiver to a fiber network, ensure the power level is tested to fall within the published specifications of the receiver. Failure to verify optical power before connection will void the warranty.

To ensure error-free operation, the input power must be less than -7 dBm.

Back Module Installation

Follow these steps to install the back module into an FR6802**+**XF, FR6802**+**XF48, FR6822**+**, or FR6802**+**QXF frame:

1. Remove a blank back plate from the frame.

    Do not discard the blank back plates. They may be needed for future configurations.

2. On the side of the back module that inserts into the front module, remove the inner protective cap from the fiber connection (see below).

    Microscopic dust or other contaminants can seriously impair or disable a fiber optic network. Observe strict cleaning procedures. Do not touch the end of the fiber.

3. Follow the inspection and cleaning procedure that begins on page xviii (see "Inspecting and Cleaning Fiber Optic Connections" on page 40).

4. If it is already installed, remove the front module from the slot.

5. Install the new back module by inserting the bottom lip into the required frame slot, and then screwing it into place.

    Ensure that the EMI gaskets on the right side of the back module remain in place during the installation. The EMI gaskets fit tightly.

6. Apply the adhesive label to the back module if it is supplied separately.

Front Module Installation

Follow these steps to install the front module:

1. Pull out the finger-release screws on the right and left side of the front panel of the frame, and then open it.

2. Locate the front module slot that corresponds with the matching back module.

3. Gently remove the outer and inner protective caps from the laser connections. (See Back Module Installation (on page 38).)

    Microscopic dust or other contaminants can seriously impair or disable a fiber optic network. Observe strict cleaning procedures. Do not touch the end of the fiber.

4. Follow the instructions in Inspecting and Cleaning Fiber Optic Connections (on page 40).

5. Ensure that your front module matches with a corresponding back module of the same name.

6. Slide the module into the guides in the frame.

7. When the module edge is flush with the guide, close the extractor handle.

    The module is properly seated when its edge is flush with the guide edge and the extractor handle closes.

8. Close the front panel to ensure proper frame ventilation.

To prevent overheating, keep the front panel closed and all back module plate slots covered during operation.

Removing OP+SFS+ Modules

The removal steps provided here are similar to those outlined in your **6800+** Frame Installation and Operation Manual. Refer to that manual for detailed information about installing and operating the frame and its components.

Front Module

Follow these steps to remove a front module from a frame:

1. Pull out the finger-release screws on the right and left side of the front panel of the frame, and then open the front panel.

2. Grasp the extractor handle on the installed module, and then pull the module out of its slot. Use the handle as a lever.

3. Close the front panel to ensure proper frame ventilation.

Back Module

Follow these steps to remove a back module from a frame:

1. Remove the front module, as described above.

2. Unscrew the top of the corresponding back module, and then tip it towards you.

3. Pull the bottom lip of the back module from its slot.

4. Reinstall a new or blank back plate in the empty slot to ensure proper frame ventilation.

5. Reinstall the front module.

Inspecting and Cleaning Fiber Optic Connections

Small amounts of microscopic dust or other contaminants can seriously impair or disable a fiber optic network. To ensure that your network operates reliably, you must carefully inspect and clean each connection when installing OPTO**+** products.

The following table lists some typical contaminants of a fiber optic connection. The inspection and cleaning procedure begins in Inspection and Cleaning Procedure (on page 41).

Typical Contaminants

Contaminant	Comments
Dust particle, 1 micron	Can block up to 1% of the light transmission, creating a loss of 0.05 dB
Dust particle, 9 microns	Although microscopic, the particle can completely block the fiber core
Human hair	Typically 50 to 75 microns in diameter
Oil	Frequently caused by touching
Film residues	Can accumulate from vapors or smoke
Powdery coatings	Can be left behind after water or other solvents evaporate

Important Points

Before you begin cleaning, always inspect the fiber connections.

- Inspect and clean both fiber ends every time you make a connection.
- Keep a protective cap on unplugged fiber connectors.
- Do not touch the end of a fiber.
- Store unused protective caps in a clean resealable container, located nearby for easy access.
- Do not reuse cleaning tissues or swabs.
- Do not allow alcohol or another wet cleaning agent to dry on a fiber end.
- Never touch the dispenser tip of an alcohol bottle or any clean portion of a tissue or swab.
- Use care when handling the fiber; do not twist or pull.
- Keep your cleaning fluids away from open flame or spark.

The following figure describes the acceptable limits of defects in a fiber connection.
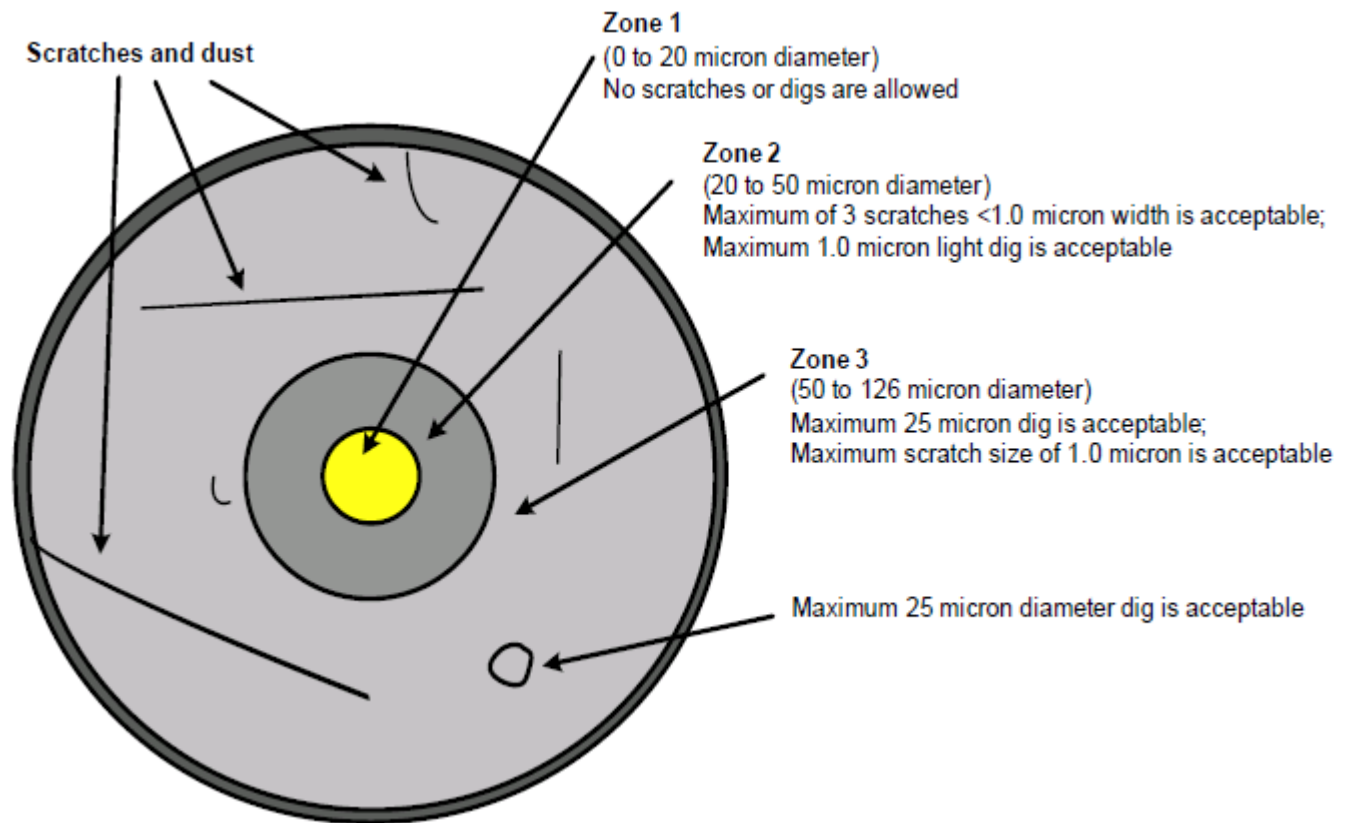

Figure 18: Fiber Optic Cross Section

Inspection and Cleaning Procedure

Inspection

: Eye damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at an energized fiber end.

To inspect and clean the fibers, follow these steps:

1. Ensure the fiber is not "live."
2. Inspect the fiber endface with a fiberscope.
3. If the fiber endface is clean, return to Back Module Installation (on page 38) and Front Module Installation (on page 39).

     If the connector is dirty, proceed to the dry cleaning instructions below.

Dry Cleaning

If you are using cartridge or pocket-style dry cleaning tools, follow the manufacturer's directions. If you are using lint-free wipes, follow these steps:

1. Fold the lint-free wipe four to eight times into a square, taking care to avoid touching the cleaning surface of the wipe.

2. Lightly wipe the fiber tip in the central portion of the lint-free wipe.

    Do not scrub the fiber. Excessive rubbing will leave scratches.

3. Repeat the wiping action on another clean section of the wipe or a new wipe.

4. Inspect the connector again with the fiberscope.

5. If the connection is clean, return to Back Module Installation (on page 38) and Front Module Installation (on page 39).

    If the connector is still dirty, proceed to the wet cleaning instructions.

Wet Cleaning

Using 99% isopropyl alcohol and lint-free wipes, follow these steps to wet clean the fiber:

1. Fold the wipe into a square, about four to eight layers thick.

2. Moisten one section of the lint-free wipe with one drop of 99% alcohol, ensuring that a portion of the wipe remains dry.

3. Lightly wipe the fiber end in the alcohol-moistened portion of the lint-free wipe.

4. Immediately repeat the wiping action on the dry section of the wipe, removing any residual alcohol.

5. Inspect the fiber endface again, and if necessary, repeat the wet cleaning with another clean section of the lint-free wipe.

    Do not scrub the fiber. Excessive rubbing will leave scratches.

6. Dry clean any remaining residue, and then inspect the connector again.

7. If the contamination persists, repeat the dry and wet cleaning procedure until the endface is clean.

    If the fiber end still remains dirty after repeated cleaning attempts, call Customer Service for further instructions.

    If the fiber end is clean, return to .Back Module Installation (on page 38) and Front Module Installation (on page 39).

Upgrading Module Firmware

This module's firmware can be updated using CCS Pilot, CoPilot, or Navigator version 3.1.1 or higher, or the HTTP software upgrade tool. In order to perform these upgrades, your frame must be equipped with a 6800**+**ETH module. See your frame manual for more information.

Operation

Operating Notes

When you set the control parameters on the SFS6803**+** and OP**+**SFS**+**, observe the following:

- If you make changes to certain parameters, other related parameters may also be affected. See Cross-Functional Parameter Changes (on page 58) for more information.
- When you change a parameter, the effect is immediate. However, the module requires up to 30 seconds to save the latest change. After 30 seconds, the new settings are saved and will be restored if the module loses power and must be restarted.

Unless explicitly stated, all references to SFS6803**+** and OP**+**SFS**+** also pertain to SFS6803**+**BD and OP**+**SFS**+**BD.

Q-SEE Compliant Thumbnails

When installed in an FR6822**+** or FR6802**+**QXF frame that also contains a 6800**+**ETH resource module, SFS6803**+** and OP**+**SFS**+** module control windows have an extra **Streaming** tab in CCS Pilot and Navigator (version 3.2.1 or later). There you can view output video from the module.

In addition, video from the SFS6803**+** and OP**+**SFS**+**, displayed at up to three frames per second, can be displayed on the 6800**+**ETH's control page, and (for CCS Navigator only) on **Graphical Navigation** pages.

SFS6803**+** and OP**+**SFS**+** modules all show a SFS6803**+** label in Navigator.

Thumbnail streaming is not supported for the following video standards:

- 1080i 60
- 720p 60
- 1080p 24/25/29.97/30
- 1080psf 23.98/24
- 1080p 50/59.94/60

Activating SFS6803+ and OP+SFS+ Functions

The following sections provide information about the SFS6803**+** and OP**+**SFS**+** special functions:

- Adding a License Key (on page 44)
- Fast Video Switch (on page 44)
- Audio Test Tones (on page 44)
- Group (1-4) Deembedding Control (on page 45)

- Audio Embedding Errors (on page 49)
- Input Audio Rate (With the AES Option Only) (on page 51)
- Video Frame Synchronization (on page 51)
- Audio Synchronization (on page 53)
- Audio Path (on page 53)
- Seamless Sound Function (on page 54)
- Test Pattern Generator (on page 56)
- Dolby-E Automatic Header Alignment (on page 56)
- Passing Dolby-E Audio (on page 57)
- Audio Delay Ranges (on page 57)
- External Audio Processing Delay (on page 57)
- Maintaining Audio/Video Alignment (on page 57)
- AFD/WSS/VI Detection and Insertion (on page 58)

Adding a License Key

For assistance with a license key, or to purchase a license key, please contact your Sales representative.

To enter a license key to activate AES audio (4 or 8 inputs and outputs), 1.5G HD video, and/or 3G HD video, your CCS software must be in Control mode.

1. Select the SFS6803**+** module in the **Navigation** pane, right click, and then select **Control** to open the module's **Control** window.

2. Select the **Parameters** tab.

3. Select **General** in the tree view, and then type your license key in the **License Key** field.

   SFS6803**+** and OP**+**SFS**+** modules appear as SFS6803**+** modules in Navigator.

4. (AES4 and AES8 options only): After entering the license key, wait 30 seconds for the module to save the settings, then remove and reinsert the module.

   This allows additional alarms to become visible.

   If your license key is valid, the **Installed Options** field displays the features that are activated on the module, which in this case is **HD**, **3G**, **AES4**, or **AES8**.

Fast Video Switch

When input video is switched between two sources while both sources are within vertical blanking, use the **Fast Switch** parameter to enable fast video switching between the sources. In this mode, output video is not frozen when both sources are within the vertical blanking area when the switch takes place.

Audio Test Tones

The followint table describes the frequency and levels of each audio output test tone, availabl e as a selection from each of the **Output Ch** (**1–16**) **Source Select** and **Audio Procamp AES (1A-8B) Out Source** parameters (see Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65)).

Audio Test Tones

Test Tone	Frequency	Level
Test Tone 1	400 Hz	-18 dBFS
Test Tone 2	1 kHz	-18 dBFS
Test Tone 3	2 kHz	-18 dBFS
Test Tone 4	4 kHz	-18 dBFS
EBU R68	1kHz	-18.06 dBFS
SMPTE RP155	1kHz	-20 dBFS

Group (1-4) Deembedding Control

The following table describes options for the **Group (1–4) Deembedding Control** parameter (see Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65)).

Deembedding Control Options

Item	Description
Repeat	Upon detection of a de-embedding error, the de-embedder repeats the last good AES sample.
Mute	Upon detection of a de-embedding error, the de-embedder mutes the current outgoing AES sample.

Audio Embedding Modes

The audio embedder component in the SFS6803**+** and OP**+**SFS**+** is composed of several smaller subcomponent blocks:

- One ancillary data stripper (ADS)
- Four audio embedding subcomponents

The first subcomponent is an ancillary data stripper (ADS). This block removes all ancillary data packets in the input SDI stream, prior to embedding.

Following the ADS block are four separate audio-embedding subcomponents. Each subcomponent has the ability to operate on only one audio group, either appending or overwriting a predetermined group onto the SDI stream.

The audio embedding modes are **Audio Group** (**1–4**) **Embedding Mode** parameters (see Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65)). The following table briefly describes the **Append**, **OverWrt**, and **Auto** options available from each of the embedding modes.

Embedding Mode Options

Options	Description
Append	Attempts to insert the audio data and control packets immediately following the last existing audio data/control packet in the horizontal ancillary region (see Append Embedding (on page 46))
OverWrt	Attempts to overwrite existing audio data and control packets of the same group number with the new audio data (see Overwrite Embedding (on page 48))
Auto	Attempts first to overwrite existing audio data and control packets of the same audio group number; failing that, it appends the new audio data and control packets immediately following the last existing audio data/control packet (refer to the **Group** (1–4) **Present** parameters to determine what audio groups are already present in the incoming SDI signal)

Append Embedding

When you select Append embedding, the SFS6803**+** and OP**+**SFS**+** attempt to insert the audio data and control packets immediately following the last existing data/control packet in the horizontal ancillary data space (ADS). Append embedding is only valid if the audio group to be embedded does not already exist.

The following figure shows how append embedding appears in the ancillary data space when there is no previous audio or other data.

Figure 19: In Append Embedding Mode, Adding Group 1 When No Other Data is Present

When auxiliary data exists in the ancillary data space, appended audio appears following that data, as shown below.
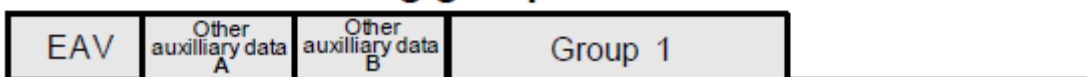
Figure 20: In Append Embedding Mode, Adding Group 1 When Auxiliary Data is Present

If you attempt to insert audio into Group 1 when Group 1 audio data already exists in the ancillary data space, an error is returned, as shown below.

ADS before embedding

| EAV | Pre-existing Group 1 |

ADS after attempting to embed group 1

| EAV | Pre-existing Group 1 |

Result: Error is returned

Figure 21: Append Embedding Mode When Adding Group 1 and a Group 1 Already Exists

If you insert Group 2 audio when there is pre-existing Group 1 audio in the ancillary data space and no Group 2 audio, the Group 2 audio is inserted following the Group 1 audio, as shown below.

ADS before embedding

| EAV | Group 1 |

ADS after embedding group 2

| EAV | Group 1 | Group 2 |
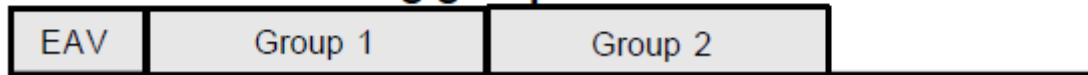
Figure 22: Append Embedding Mode, Adding Group 2 Following Group 1

If you insert Group 1 audio when there is pre-existing Group 2 audio in the ancillary data space and no Group 1 audio, the Group 1 audio is inserted following the Group 2 audio, as shown below.

ADS before embedding

| EAV | Group 2 |

ADS after embedding group 1

| EAV | Group 2 | Group 1 |
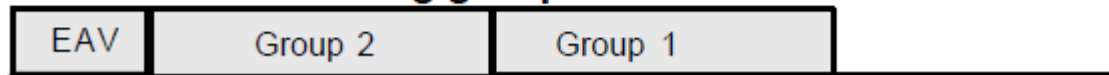
Figure 23: Append Embedding Mode, Adding Group 2 Following Group 1

An audio group cannot be divided. In Append embedding, the audio group is always added following the last block in the ADS. If there is not enough room to append the audio group following the last block of auxiliary data or audio in the ADS, the attempt results in an error, as shown below.

Figure 24: Append Embedding Mode Returns Error When Auxiliary Data Exists in all Audio Groups

Overwrite Embedding

When you select Overwrite embedding, the module attempts to overwrite any existing audio data and control packets of the same group number with the new audio data. This setting is valid only if the audio group to be embedded already exists. If the new sample distribution does not exactly match the existing audio data packet sample distribution, the embedder marks some audio data packets for deletion (DID word is set to 180h).

To avoid sample distribution issues, activate the **ADS Clean** feature (see ADS Clean Parameter (on page 59)).

When you attempt Overwrite embedding and there is no previous audio (as shown below), it returns an error because there is nothing to overwrite.

Figure 25: Overwrite Embedding Mode When There is No Pre-existing Audio

The following figure shows how overwrite embedding appears in the ancillary data space when there is auxiliary data where Group 1 should be inserted.

ADS before embedding

| EAV | other auxilliary data A | other auxilliary data B | |

ADS after attempting to embed group 1

| EAV | other auxilliary data A | other auxilliary data B | |

Result: Error is returned

Figure 26: Overwrite Embedding Mode When There is Auxiliary Data on Group 1

The following figure shows how overwrite embedding appears in the ancillary data space when there is pre-existing Group 1 audio. This operation is successful.

ADS before embedding

| EAV | Pre-existing Group1 | |

ADS after embedding group 1 (with overwrite group specified as Group 1)

| EAV | Group 1 | |

Figure 27: Overwrite Embedding Mode When There is Group 1 Audio in the Group 1 Space

Audio Embedding Errors

The following table describes **Group (1–4) Append Embedding Error** and **Group (1–4) Overwrite Embed Error** audio embedding errors (also see Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65)).

Audio Embedding Error Descriptions

Error	Description
Group (1–4) Append Embedding Error	This error occurs if the embedder is set to **Append** mode for a particular audio group, but that audio group already exists in the incoming SDI signal. In this case, the embedder does not embed another audio data and control packet of the same audio group, as this results in incorrect audio sample distribution.
Group (1–4) Overwrite Embed Error	This error occurs if the embedder is set to **Overwrite** mode for a particular audio group, but that audio group does not exist in the incoming SDI signal.

To avoid embedding errors, follow these guidelines:

- Set the embedding mode to **Auto**.

  If the group is present, it will be overwritten; if it is not present, it will be appended. The overwrite and append errors are actually warnings that the operation is not being performed.

- In SD-SDI mode, do not overwrite embedded groups of 20-bit audio samples with groups of 24-bit audio samples.

  The required extended data packet information appended to that group may overwrite a pre-existing audio group. For 24-bit audio embedding, use the **ADS Clean** feature provided.

Mono Channel Audio Embedding

To embed audio on a channel-by-channel (mono) basis, preserving some embedded audio channels while replacing others from external AES sources, follow these steps:

1. Configure the input audio routing path (Input > Audio > Routing) by selecting audio pair sources to the individual audio sample rate converters.

   By default, SRCs 1-8 are assigned to the 8 deembedded audio sources *(DMX Grp1 Ch1/2, DMX Grp1 Ch3/4, DMX Grp2 Ch1/2,* etc.) and SRCs 9-16 are assigned to the external AES audio sources (*AES1a/1b, AES2a/2b*, etc.).

2. Configure the output audio routing path (Output > Audio Source Select > Embedded Audio) by selecting sources to each mono embedded audio output channel.

   Each SRC (*SRC1a, SRC1b, SRC2a,* etc.) can be selected to any output embedded audio channel, allowing for any input-to-output audio configuration.

3. Remove or preserve existing embedded audio with the **ADS Clean** parameter (Processing > Audio).

4. Use the **Audio Group (1-4) Embedding Mode** parameters (Processing > Audio > Embedding) to select the desired audio group embedding mode for each audio group.

   - In **Auto** mode, non-existing audio groups are appended and existing audio groups are overwritten.
   - In **Overwrite** mode, the original audio is preserved using the settings in step 2.
   - In **Off** mode, audio groups are untouched unless the **ADS Clean** parameter is enabled.

Example: Replacing Audio Channel 1 in Group 1 Only

To replace *only* embedded audio channel 1 in group 1 with audio from external AES 1A source, follow these steps:

1. Leave the input audio routing path at the default configuration (SRCs 1-8 from deembedded audio, SRCs 9-16 from external AES audio).

2. Route the output audio sources as follows (Output > Audio Source Select > Embedded Audio):

   Output Emb Ch 1 Source Select: SRC9a

   Output Emb Ch 2 Source Select: SRC1b

   Output Emb Ch 3 Source Select: SRC2a

   Output Emb Ch 4 Source Select: SRC2b

3. Preserve existing embedded audio by setting the **ADS Clean** parameter (Processing > Audio) to **No**.

4. Set the audio group embedding mode (Processing > Audio > Embedding):

   Audio Group 1 Embedding Mode: Auto

> **Audio Group 2 Embedding Mode**: **Off**
> (incoming audio group 2 will be preserved)
>
> **Audio Group 3 Embedding Mode**: **Off**
> (incoming audio group 3 will be preserved)
>
> **Audio Group 4 Embedding Mode**: **Off**
> (incoming audio group 4 will be preserved)

Audio V-Fade

To enable a smooth deembedded audio V-fade transition when switching video sources, make the following settings:

- Set the **Audio V-Fade** parameter to **Enable**.
- Set the **Audio LOV Output Mode** parameter to **Mute**.
- Set the **ADS Clean** parameter to **Yes**.

AES outputs in this mode are not AES11 alignment compliant and are not aligned with video.

For proper operation in this mode, set the user delay parameters for all audio channels (Processing > Audio > Delay) to the same value.

Input Audio Rate (With the AES Option Only)

Audio input parameters are available with the SFS68OPT-AES4 and SFS68OPT-AES8 license keys. To purchase optional license keys, contact your Sales representative.

When embedding audio in PCM mode (**Audio Ch** [**1–16**] **Format** = **PCM** or **Audio Ch** [**1–16**] **Format** = **Auto** and **Audio Ch** [**1–16**] **Format Feedback** = **PCM**), the input audio sample rate may be from 32 kHz to 108 kHz. This input audio is sample rate converted to 48 kHz prior to embedding in the video signal; as well, the embedder indicates 48 kHz in the "Rate" word of the audio control packet for each embedded audio group.

When embedding audio in Non-PCM mode (**Audio Ch** [**1–16**] **Format** = **Non-PCM** or **Audio Ch** [**1–16**] **Format** = **Auto** and **Audio Ch** [**1–16**] **Format Feedback** = **Non-PCM**), the input audio sample rate must be 48 kHz, and it must be frequency locked to the source video. In this scenario, the sample rate conversion function is bypassed and the embedder indicates 48 kHz in the "Rate" word of the audio control packet for each embedded audio group.

Video Frame Synchronization

The frame synchronizer offers two modes of operation: Delay mode and Synchronizer (Sync) mode. These modes can be chosen using the **Frame Sync Mode** parameter.

- In Delay mode, the output video is synchronized to the input video.
- In Sync mode, the output video is synchronized to the reference video. The reference standard you can use depends on the Output Video Standard you have set, as outlined below.

Any other combination of reference and output standard triggers a **Mismatched Output/Ref Standards** alarm.

Supported Reference and Output Video Standard Combinations in Sync Mode

Reference Standard	Output Video Standard	
525i 59.94	• 1080i 59.94 • 1080p 59.94 • 1080p 29.97	• 720p 59.94 • 525i 59.94
625i 50	• 1080i 50 • 1080i 50(295M) • 1080p 50	• 1080p 25 • 720p 50 • 625i 50
720p 60 1080p 60	• 720p 60 • 1080p 60	
720p 59.94 1080p 59.94	• 720p 59.94 • 1080p 59.94	
720p 50 1080p 50	• 720p 50 • 1080p 50	
1080i 60 1080p 30	• 1080i 60 • 1080p 60	• 1080p 30 • 720p 60
1080i 59.94 1080p 29.97	• 1080i 59.94 • 1080p 29.97 • 1080p 59.94	• 720p 59.94 • 525i 59.94
1080i 50 1080p 25	• 1080i 50 • 1080i 50(295M) • 1080p 50	• 1080p 25 • 720p 50 • 625i 50
1080p 24 1080psf 24	• 1080p 24 • 1080psf 24	
1080p 23.98 1080psf 23.98	• 1080p 23.98 • 1080psf 23.98	

In both Sync mode and Delay mode, SFS6803**+** and OP**+**SFS**+** provide several controls to manipulate the output video signal:

• Horizontal timing

• Vertic al timing

• Adjustable frame delay

• Options to determine the output video behavior on loss of input video, including pass, black, grey, and freeze

• Manually freeze output video on first or second field (interlaced standards), or on the whole frame (all standards)

SFS6803**+** and OP**+**SFS**+** will not freeze video and still provide glitch free switching between two video sources under the following conditions:
• When two video sources are locked to each other
• When a switch happened in the vertical blanking areas of both video sources

Audio Synchronization

By default, SFS6803**+** and OP**+**SFS**+** synchronize de-embedded or AES input audio with timing information from the video frame synchronizer prior to re-embedding the audio. (See Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65).)

If you deactivate the **Audio Track Video** parameter, you can output unsynchronized audio.

You can set the **Audio LOV Output Mode** parameter so that the audio is either passed or muted in the event of loss of video.

Audio Path

The output audio source selection consists of two sets of controls.

- Input Sample Rate Conversion (SRC) routing source selection
  - AES In (1A/1B to 8A/8B) (with AES options)
  - Demuxed audio (Group 1 ch 1/2 – Group 4 ch 3/4)
- Output Audio Source Selection for the embedded audio and output AES

  Each output embedded Audio channel and Audio procamp AES output can be assigned to one of the following sources:
  - SRC(1a to 16b)
  - In Pair (SRC1a+1b to SRC16a+16b) Sum
  - TstTone 400 Hz
  - TstTone 1 kHz
  - TstTone 2 kHz
  - TstTone 4 kHz
  - EBU R68
  - SMPTE RP155
  - SRC1a+2a
  - SRC1b+2b
  - SRC2b+3b
  - SRC2a+4a
  - SRC2b+4b

  You can reassign each of the 8 AES channels (with the AES8 option) to one of the following sources:
  - **Input Demuxed audio (Ch1/2 – Ch 15/16)**

    Input demux refers to audio deembedded prior to the frame synchronizer (the input to the module).
  - **Output Demuxed audio (Ch1/2 – Ch 15/16)**

The Output Demux options output audio deembedded after passing through the frame synchronizer. This can be used to synchronize Dolby-E without the need to decode-synchronize-re-encode.

▪ A corresponding Audio procamp AES output (**Audio procamp 1A/1B - 8A/8B to AES1-8**)

The Demuxed audio selection for AES outputs is provided for the minimum audio propagation delay purposes. This audio path also provides a direct output of the non-PCM audio such as Dolby if Frame Synchronizer is set to synchronizer mode. AES outputs in this mode are not AES11 compliant and are not aligned with video.

Seamless Sound Function

When used in conjunction with HMX6803**+** as a de-embedder and with HDX6803**+** as an embedder, the SFS6803**+** can provide an uninterrupted ("popless") embedding and de-embedding path for the discrete audio channels regardless of the presence or input switching of the video, as long as a constant video standard is maintained.

SFS6803+/OP+SFS+ connected to HDX6803+/OP+HDX+

SFS6803+/OP+SFS+ parameter settings (embedding module):

1. Set the **Seamless Sound Enable** parameter (Processing > Audio) to **Enable**.

2. Set the **Audio LOV Output Mode** to **Pass**.

   AES outputs in this mode are not AES11 alignment compliant and are not aligned with video.

3. If an audio group already exists and you want to replace it, set the **ADS Clean** parameter to **Yes** (Processing > Audio > Embedding).

   The **ADS Clean** parameter removes all audio groups from the video stream.

4. If an audio group already exists and you do not want to replace it, or if the audio group to be embedded does not exist, set the **ADS Clean** parameter to **No** (Processing > Audio > Embedding).

5. To set an audio group to be embedded in Append mode, set the **Audio Group 1-4 Embedding Mode** parameter to **Append** (Processing > Audio > Embedding).

6. For optional minimum propagation delay, set the **Frame Sync Bypass** parameter to **Yes** (Processing > Video > Synchronization).

HDX6803+/OP+HDX+ parameter settings (deembedding module):

1. Set the **Seamless Sound Enable** parameter (Processing > Audio) to **Enable**.

2. Set the **Audio LOV Output Mode** to **Pass**.

3. To set the AES output(s) to be sourced directly from the audio deembedder using the appropriate Demux Ch source, set the **Output AES 1-8 Source Select** parameters to **Demux Ch 1/2**, **Demux Ch 3/4**, etc. (Output > Audio Source Select > AES Audio).

4. For optional minimum propagation delay, set the **Video Delay Bypass** parameter to **Yes** (Processing > Video > Delay).

HMX6803+/OP+HMX+ connected to SFS6803+/OP+SFS+

HMX6803+/OP+HMX+ parameter settings (embedding module):

1. Set the **Seamless Sound Enable** parameter (Processing > Audio) to **Enable**.

2. Set the **Audio LOV Output Mode** to **Pass**.

3. If an audio group already exists and you want to replace it, set the **ADS Clean** parameter to **Yes** (Processing > Audio > Embedding).

   The **ADS Clean** parameter removes all audio groups from the video stream.

4. If an audio group already exists and you do not want to replace it, or if the audio group to be embedded does not exist, set the **ADS Clean** parameter to **No** (Processing > Audio > Embedding).

5. To embed an audio group in Append mode, set the **Audio Group 1-4 Embedding Mode** parameter to **Append** (Processing > Audio > Embedding).

6. For optional minimum propagation delay, set the **Video Delay Bypass** parameter to **Yes** (Processing > Video > Delay).

SFS6803+/OP+SFS+ parameter settings (deembedding module):

1. Set the **Seamless Sound Enable** parameter (Processing > Audio) to **Enable**.

2. Set the **Audio LOV Output Mode** to **Pass**.

3. To set the AES output(s) to be sourced directly from the audio deembedder using the appropriate Demux Ch source, set the **Output AES 1-8 Source Select parameter**(s) to **Demux Ch 1/2**, **Demux Ch 3/4**, etc. (Output > Audio Source Select > AES Audio).

4. For optional minimum propagation delay, set the **Frame Sync Bypass** parameter to **Yes** (Processing > Video > Synchronization).

SFS6803+/OP+SFS+ connected to SFS6803+/OP+SFS+

First SFS6803+/OP+SFS+ parameter settings (embedding module):

1. Set the **Seamless Sound Enable** parameter (Processing > Audio) to **Enable**.

2. Set the **Audio LOV Output Mode** to **Pass**.

   AES outputs in this mode are not AES11 alignment compliant and are not aligned with video.

3. If an audio group already exists and you want to replace it, set the **ADS Clean** parameter to **Yes** (Processing > Audio > Embedding).

   The **ADS Clean** parameter removes all audio groups from the video stream.

4. If an audio group already exists and you do not want to replace it, or if the audio group to be embedded does not exist set the **ADS Clean** parameter to **No** (Processing > Audio > Embedding).

5. To set an audio group to be embedded in Append mode, set the **Audio Group 1-4 Embedding Mode** parameter to **Append** (Processing > Audio > Embedding).

6. For optional minimum propagation delay, set the **Frame Sync Bypass** parameter to **Yes** (Processing > Video > Synchronization).

Second SFS6803+/OP+SFS+ parameter settings (deembedding module):

1. Set the **Seamless Sound Enable** parameter (Processing > Audio) to **Enable**.

2. Set the **Audio LOV Output Mode** to **Pass**.

3. To set the AES output(s) to be sourced directly from the audio deembedder using the appropriate Demux Ch source, set the **Output AES 1-8 Source Select** parameter to **Demux Ch 1/2**, **Demux Ch 3/4**, etc. (Output > Audio Source Select > AES Audio).

4. For optional minimum propagation delay, set the **Frame Sync Bypass** parameter to **Yes** (Processing > Video > Synchronization).

Test Pattern Generator

When the **Test Pattern Enable** parameter (listed in Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65)) is set to **On**, the video output displays one of the following options:

*   75% color Bars
*   Pathological
*   100% color Bars
*   EQ Pathological
*   PLL Pathological

Dolby-E Automatic Header Alignment

When you embed Dolby E audio, the module automatically adjusts input audio delay such that the Dolby E header resides on the line specified by the **Dolby E Start Line** parameter, with a tolerance of ±1 line. The following table shows the ranges and default values for the **Dolby E Start Line** parameter.

Dolby E Automatic Header Alignment by Video Standard

Video Standard	Range	Default
525	13–25	15
625	9–30	11
1080i/p/psf	15–54	19
720p	20–71	25

In order for Dolby-E automatic header alignment to operate correctly, the following conditions must be met:

*   The **Audio Track Video** parameter must be set to **No**.
*   If the Dolby-E source is from an AES signal and the **Frame Sync Mode** parameter is set to **Sync Mode**, the module must be locked to the same reference video source as the Dolby-E source (when **Genlock Video Locked** is **Yes**).
*   If the Dolby-E source is from an AES signal and the **Frame Sync Mode** parameter is set to **Delay Mode**, the input SDI must be frequency locked to the same reference source as the Dolby-E source.
*   If the Dolby-E source is from incoming embedded audio, **Frame Sync Mode** must be set to **Delay Mode**.

Passing Dolby-E Audio

With firmware version 1.3, SFS6803**+** can simultaneously pass embedded Dolby-E audio and synchronize PCM audio. To pass Dolby-E, use the following settings:

- Set the **Fast Switch** parameter to **Disable**.
- Disable the associated audio embedder (Audio Grp 1-4 Pair 1-2 Embed Control). For example, if Dolby-E is passing through group 1, pair 1, set the **Audio Group 1 Pair 1 Embed Control** parameter to **Disable**.
- Set the **ADS Clean** parameter to **No**.

Audio Delay Ranges

Depending on the amount of delay applied to the video stream, the available range for the audio delay parameters varies. The ranges are listed below.

Audio Delay Range Depending on the Amount of Video Delay

Condition	Parameters	Range
Video Delay greater than 31 frames	Input Audio Ch 1–16 Delay Input Audio AES 1A–8B Delay	**0** to 660.00 ms
Video Delay less than 32 frames	Input Audio Ch 1–16 Delay Input Audio AES 1A–8B Delay	**0** to 1320.00 ms

External Audio Processing Delay

Set the **External Audio Delay** parameter to the amount of processing delay incurred by external audio before it enters the SFS6803**+**. While external audio delay is not tr acked by the audio synchronizer, an equivalent amount of video delay is applied to the video path to realign the output video with the externally applied audio.

The **Actual Video Delay Used** parameter monitors the amount of additional video delay applied. This parameter is a sum of this compensating video delay plus any video delay applied using the **Video Delay** parameter, measured in frames.

Set the associated **SRC (1-16) Ext Audio Align** parameter to **On**. (To determine which SRC is the source of the externally processed audio, check the parameter settings within the **Input > Audio > Routing** menu.) This ensures the externally processed audio is realigned with output video once it is output from the module (embedded or AES output).

Maintaining Audio/Video Alignment

When you use Sample Rate Conversion with PCM Audio to change audio rates and provide audio synchronization with output video, this introduces a delay in the audio signal path.

To maintain an alignment between video and audio in **PCM** mode, set the **Audio/Video Align** parameter (Processing > Video > Delay) to **Yes**. This introduces a matching video delay and maintains audio/video alignment.

When using **Non-PCM** audio, or when sample rate converters are bypassed, set the **Audio/Video Align** parameter (Processing > Video > Delay) to **No** to avoid excessive video delay.

AFD/WSS/VI Detection and Insertion

AFD, WSS (625 only), and VI (526/625 only) embedded video metadata specify the active area to be displayed from a video input. These codes do not do any aspect ratio conversion themselves, but indicate how the video should appear to systems capable of interpreting the data.

- Seven input parameters (Input > AFD/VI/WSS De-embedder) on SFS6803**+** modules indicate the presence of AFD, WSS, and VI data when you determine the lines where this data is likely to appear, if present.
- The single processing parameter (**Out Aspect Ratio**, which appears at Processing > Video > AFD/VI/WSS) determines the options for the **AFD Select** and **VI Select** parameters.
- Fifteen output parameters (Output > AFD/VI/WSS Embedder) determine the line to embed AFD, WWS, and/or VI codes on, the code(s) to be embedded, and what happens when a code disappears from the input.

Cross-Functional Parameter Changes

When you configure certain parameters, you force a change in other associated parameters. The various conditions that affect parameter availability or settings are described in the following sections:

- Out Aspect Ratio (on page 58)
- ADS Clean Parameter (on page 59)
- Frame Sync Bypass Parameter (on page 59)
- Channel Word Length (on page 60)
- Parameter Availability Based on Operating Mode (on page 61)

Out Aspect Ratio

When the **Out Aspect Ratio** parameter (Processing > Video > AFD/VI/WSS) is set to 4:3, the **AFD Select** and **VI Select** parameters (Output > AFD/VI/WSS Embedder) have the following options:

- 16:9 top
- 14:9 top
- >16:9 in 4:3
- 4:3 full
- 16:9 l
- 14:9 l
- 4:3 a 14:9

- 16:9 l a 14:9
- 16:9 l a 4:3

When the **Out Aspect Ratio** parameter (Processing > Video > AFD/VI/WSS) is set to 16:9, the **AFD Select** and **VI Select** parameters (Output > AFD/VI/WSS Embedder) have the following options:

- 16:9 full
- 14:9 p
- >16:9 in 16:9
- 4:3 p
- 16:9 prtctd
- 4:3 p a 14:9
- 16:9 a 14:9
- 16:9 a 4:3

ADS Clean Parameter

Depending on the setting of the **ADS Clean** parameter (listed in Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65)), the **Audio Group** (**1–4**) **Embedding Mode** parameters have different options.

ADS Clean Parameter

ADS Clean State	Audio Group (1–4) Embedding Mode Options
Yes	- Off - Append
No	- Off - Append - OverWrt - Auto

Frame Sync Bypass Parameter

When the **Frame Sync Bypass** parameter is set to **Yes**, the following parameters are disabled:

- Test Pattern Select
- Test Pattern Enable
- Frame Sync Mode
- Force Freeze Type
- Force Freeze
- Loss of Video Output Mode
- Output Video Frozen
- Horizontal Phase
- Vertical Phase

- Video Delay
- Audio/Video Align
- Genlock Video Locked

When the **Frame Sync Bypass** parameter is set to **No**, these parameters are enabled.

PCM/Non-PCM Settings

If a channel's format is PCM, that channel's **Gain** and **Invert** parameters are activated. (The parameters are listed in Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65).)

The following table describes how the PCM format setting for Output Embedded Ch 1 affects the Gain and Invert options for embedded channel 1. Similar conditions apply to channels 2-16 and AES Outputs 1A–8B when their audio formats are changed.

The forced setting (center column) takes effect before the identified parameter (right column) becomes activated or deactivated.

Cross-Functional Parameters

Condition	Forced Setting	Enabled/Disabled Parameters
Audio Ch 1 Format = Non-PCM or Audio Ch 1 For mat = Auto and Audio Ch 1 Format Feedback = Non-PCM	• Audio Ch 1 Gain = 0 dB • Audio Ch 1 Invert = No	• Audio Ch 1 Gain = Disabled • Audio Ch 1 Invert = Disabled
Audio Ch 1 Format = PCM or Audio Ch 1 Format = Auto and Audio Ch 1 Format Feedback= PCM		• Audio Ch 1 Gain = Enabled • Audio Ch 1 Invert = Enabled

Channel Word Length

When the incoming video is 3G or 1.5G HD-SDI (and you have the appropriate license key for the video standard), the default value for all **Audio Ch XX-XX Word Length** parameters is 24 bits.

When the incoming video is SD-SDI, the default value is 20 bits. However, if at least one channel is set to 24 bits, the corresponding embedder enables 24 bits embedding.

The **Audio Channel Word Length** parameters are listed in Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65).

Parameter Availability Based on Operating Mode

This section only applies if you have upgraded a SFS6803**+** or OP**+**SFS**+** with the SFS68OPT-HD, SFS68OPT-3G, or SFS68OPT-HD-3G license key. To order a license key, contact your Sales representative. For information on enabling a license key, see Adding a License Key (on page 44).

Some parameters may or may not be available depending on whether the module is in HD or SD mode.

- The HD parameters apply when the **SDI Video Standard Set** parameter is set to one of the HD operating modes, or when it is set to Auto and **SDI IP Video Standard Feedback** is one of the HD operating modes.

- The SD parameters   apply when **SDI Video Standard Set** is set to either 525i 59.94 or 625i 50, or when it set to Auto and **SDI IP Video Standard Feedback** is 525i 59.94 or 625i 50.

Parameter Availability Based on Operating Mode

Condition	Available Parameters		Unavailable Parameters	
1080i/p/psf and 720p 3G or 1.5G HD Operating Mode	• Y CRC/Link B Error Counter • C CRC/Link B Error Counter • Y CRC/Link A Error Counter • C CRC/Link A Error Counter • CRC Error Counter Clear • Group 1-4 ECC Error	• Group 1-4 Active Channels • Group 1-4 Sampling Rate • Group 1-4 Channel 1-2 Delay • Group 1-4 Channel 3-4 Delay	• EDH Present • EDH Error Counter • EDH Error Counter Clear • VI Detect Line Fld1 • VI Detect Line Fld2 • VI AFD Present • VI Scan Present • Out Aspect Ratio • VI Control • VI Embed Line	• VI Select • SD Out VI with AFD • VI Output (AFD) • VI Output (Scan) • WSS Detect Line • WSS Present • WSS Control • WSS Embed Line • WSS Select • WSS Output
SDI 525i 59.94 Operating Mode	• EDH Present • EDH Error Counter • EDH Error Counter Clear • VI Detect Line Fld1 • VI Detect Line Fld2 • VI AFD Present • VI Scan Present	• Out Aspect Ratio • VI Control • VI Embed Line • VI Select • SD Out VI with AFD • VI Output (AFD) • VI Output (Scan)	• Y CRC/Link B Error Counter • C CRC/Link B Error Counter • Y CRC/Link A Error Counter • C CRC/Link A Error Counter • CRC Error Counter Clear • Group 1-4 ECC Error • Group 1-4 Active Channels	• Group 1-4 Sampling Rate • Group 1-4 Channel 1-2 Delay • Group 1-4 Channel 3-4 Delay • WSS Detect Line • WSS Present • WSS Control • WSS Embed Line • WSS Select • WSS Output

Condition	Available Parameters		Unavailable Parameters	
SDI 625i 50 Operating Mode	• EDH Present • EDH Error Counter • EDH Error Counter Clear • VI Detect Line Fld1 • VI Detect Line Fld2 • VI AFD Present • VI Scan Present • Out Aspect Ratio • VI Control • VI Embed Line	• VI Select • SD Out VI with AFD • VI Output (AFD) • VI Output (Scan) • WSS Detect Line • WSS Present • WSS Control • WSS Embed Line • WSS Select • WSS Output	• Y CRC/Link B Error Counter • C CRC/Link B Error Counter • Y CRC/Link A Error Counter • C CRC/Link A Error Counter • CRC Error Counter Clear • Group 1-4 ECC Error	• Group 1-4 Active Channels • Group 1-4 Sampling Rate • Group 1-4 Channel 1-2 Delay • Group 1-4 Channel 3-4 Delay

Changing Parameter Settings

You can change parameter settings at the card edge. You can change the parameter settings, view read-only parameters, view alarms, and adjust alarm settings using CCS software. See the following topics:

- Changing Parameter Settings Using Card-Edge Controls (on page)
- Changing Parameter Settings Using CCS Software (on page 64)

Changing Parameter Settings Using Card-Edge Controls

1. Rotate the hex switch (mode select rotary switch) to **0**.
2. Once the hex switch is set to "0," toggle the navigation switch up or down to select a bank.

   View the two control LEDs next to the navigation toggle switch to see which bank is currently selected. (See below.)

   See the parameter list to view the various banks, hex switch positions, and corresponding parameter options and values.

Selected Bank as Indicated by Control LEDs

Bank Number	LED 3	LED 2	LED 1	LED 0
0	Off	Off	Off	Off
1	Off	Off	Off	On
2	Off	Off	On	Off
3	Off	Off	On	On
4	Off	On	Off	Off
5	Off	On	Off	On
6	Off	On	On	Off
7	Off	On	On	On

Bank Number	LED 3	LED 2	LED 1	LED 0
8	On	Off	Off	Off
9	On	Off	Off	On
A (10)	On	Off	On	Off
B (11)	On	Off	On	On
C (12)	On	On	Off	Off
D (13)	On	On	Off	On
E (14)	On	On	On	Off
F (15)	On	On	On	On

3. Rotate the hex switch to the parameter number (1 to 9) or letter (A to F) of the option you want to set.

4. Toggle the navigation switch to select and set the value of the chosen parameter.

5. Do either of the following:

    ▪ Rotate the hex switch to another parameter number/letter in the current bank, and then repeat step 4.

    ▪ Rotate the hex switch to "0" again to select a different bank, and then repeat steps 3 and 4.

    Use an available 6800**+** software control option to aid in viewing, setting, and confirming the parameter value.

Recalling Factory Default Parameter Settings

SFS6803+ and OP+SFS+ Parameters describes all of the parameter settings for SFS6803**+** and OP**+**SFS**+** modules, including the original factory defaults. To return this module to its factory default settings, you can either reset each parameter individually or do a global recall following this procedure.

1. Rotate the hex switch to **0**.

2. Toggle the navigation switch to the bank number **0**.

3. Use the control LEDs to verify which bank you have selected, or use an available 6800**+** software control option (serial/local or Ethernet/remote) to aid in confirming your bank selection.

4. Rotate the hex switch to the global recall parameter **F**.

5. Toggle the navigation switch to **On**.

    Use an available 6800**+** software control option to aid in viewing, setting, and confirming the parameter value.

Reading Software and Hardware Versions

The current software version of your module can viewed using a HTTP browser, a CCS-enabled control panel, or a CCS software application, such as Pilot or Navigator. To determine the hardware version number for SFS6803**+** and OP**+**SFS**+** modules, follow these steps:

In CCS Navigator,

1. Discover the frame that contains the module, and save results of your discovery.

2. In the **Navigation** pane, right-click on the module and select **Configuration**.

3. In the **Configuration** dialog box, select the **Version** tab.

4. In the **Item Name** list, look at the **Hardware** menu item. If it is expandable and provides a version number, then the revised specifications apply to your module. If the **Hardware** menu item is non-expandable and provides no version information, then the original specifications apply.

In an internet browser,

1. Enter the IP address of the frame that contains the module.

2. In the **Navigation** pane, click on the module to expand its menu, and then select **Configuration** > **Version**.

If the **Hardware** item displays a version number, then the revised specifications apply to your module. If the **Hardware** menu item provides no version information, then the original specifications apply.

Changing Parameter Settings Using CCS Software

Before using CCS Navigator to change your module's parameter settings, you must discover the module. Discovery is the process by which CCS Navigator finds, and then connects to your module.

Identifying Your Module in CCS Software

Whether your module is a SFS6803**+** or an OP**+**SFS**+**, when you discover it in CCS Navigator, the module is identified as a SFS6803**+**.

If your module has an optional laser transmitter component (OP**+**SFS**+**(C)xxD), the **Laser Wavelength** parameter displays the wavelength. If the module does not have an optical component, the **Laser Wavelength** parameter displays **Not Installed**.

In addition, OP**+**SFS**+**(C)xxD has one additional alarm that standard SFS6803**+** modules do not. This alarm is **Laser Failed**.

Discovering Your Module Using CCS Software

To discover your module, your Navigator software must be in Build mode.

1. If the Discovery window is not open, click **Tools** > **Discovery** in the main menu.

    A **Discovery** window opens, most likely in the bottom left corner of the screen.

2. Click **Options**, and then click **Add**.

3. Enter the IP address of the frame that contains your module, the frame that contains your ICE6800**+** module, or the frame that contains a 6800**+**ETH module that provides access to your module.

4. Click **OK** to close the **Add Host** dialog box, and then **OK** again to close the **Discovery Options** dialog box.

5. Click **Start**.

    This triggers Navigator to run a discovery.

    When the discovery finishes, **Discovery Completed** is displayed in the **Discovery** pane.

6. Click **Save** to save the results of your discovery to the **Discovery** folder of the **Navigation** pane.

7. Switch to Control mode by selecting **Operational Mode** > **Control** from the main menu.

8. Double-click SFS6803**+** in the Navigation pane.

    The **Control** window opens displaying the module's controls.

You can now switch to Control mode by selecting **Operational Mode** > **Control** from the main menu. Double-click SFS6803**+** in the Navigation pane (OP**+**SFS**+** modules are referred to as SFS6803**+** in the Navigator pane). The **Control** dialog box opens displaying the module's controls.

Setting SFS6803+ and OP+SFS+ Remote Control Parameters

The following table lists all of the remote control parameters and options for the SFS6803+. To access these parameters, you can use CCS Navigator, an HTTP web browser, or a third-party SNMP-based control application (depending on your host frame's options). See your software user manual for more information. Note that rows in the table that contain a range of numbers in parentheses indicate that a series of numbered parameters contain that same function and range.

Legend

Bold option=Indicates that this is the default setting for the parameter.

Rows of the table that are in grey are read-only parameters.

All parameters clip unless otherwise indicated.

General

Parameter Name	Bank/ Switch	Function	Options or User Range
Serial Number		Displays the module's unique identifier	(string)
License Key		Activates options	String
Installed Options		Displays activated options	HD, AES4, AES8, 3G
Factory Recall	0, F	Recalls the factory default settings	• **No** • Yes
Global Audio Phase Reset		Resets the audio phase across all audio channels	• **No** • Yes
Laser Wavelength		Shows the wavelength of the laser submodule if the module is an OP**+**SFS**+**(C)xxD; otherwise, this parameter does not appear	String
Receiver Type		Shows the type of optical receiver installed	• PIN • APD
Product Information		Reports the full module name (for OP**+**SFS**+** modules only)	String

Serial Port

Parameter Name	Bank/ Switch	Function	Options or User Range
Metadata Interface Type	12, 8	Selects the metadata interface type	• RS-232 • **RS-422**

Input > SDI

Parameter Name	Bank/ Switch	Function	Options or User Range	
SDI Source Select	0, 2	Selects the source of the SDI signal (OP+SFS+R+D only)	• **Electrical** • Optical	
SDI Video Standard Set	0, 1	Selects the SDI video signal standard * Standards are available with the optional 1.5G and 3G HD licenses only. ** Standards are available with the optional 3G HD license only.	• **Auto** • 525i 59.94 • 625i 50 • 1080i 50 (295M)* • 1080i 60* • 1080i 59.94* • 1080i 50* • 1080p 30* • 1080p 29.97* • 1080p 25* • 1080p 24*	• 1080p 23.98* • 1080psf 24* • 1080psf 23.98* • 720p 60* • 720p 59.94* • 720p 50* • 1080p 60** • 1080p 59.94** • 1080p 50** • 1080p 60 DL** • 1080p 59.94 DL** • 1080p 50 DL**
SDI Electrical IP Pres		Reports the presence of the SDI input video signal	• No • Yes	
SDI Optical IP Pres		Reports the presence of the SDI input video signal (OP+SFS+R+D only)	• No • Yes	

Parameter Name	Bank/ Switch	Function	Options or User Range	
SDI Electrical IP Video Std Fb		Reports the detected SDI video signal standard	• Unknown • 1080p 25 • 720p 59.94 • 720p 60 • 1080p 23.98 • 1080p 24 • 1080p 29.97 • 1080p 30 • 1080i 50 • 1035i 59.94 • 1035i 60 • 1080i 50 (295M) • 1080i 59.94 • 1080i 60 • 525i 59.94	• 625i 50 • 720p 50 • 1080psf 23.98 • 1080psf 24 • 720p 29.97 • 720p 30 • 720p 25 • 720p 23.98 • 720p 24 • 1080p 50 • 1080p 59.94 • 1080p 60 • 1080p 50 DL • 1080p 59.94 DL • 1080p 60 DL
SDI Optical IP Video Std Fb		Reports the detected SDI video signal standard (OP+SFS+R+D only)	• Unknown • 1080p 25 • 720p 59.94 • 720p 60 • 1080p 23.98 • 1080p 24 • 1080p 29.97 • 1080p 30 • 1080i 50 • 1035i 59.94 • 1035i 60 • 1080i 50 (295M) • 1080i 59.94 • 1080i 60 • 525i 59.94	• 625i 50 • 720p 50 • 1080psf 23.98 • 1080psf 24 • 720p 29.97 • 720p 30 • 720p 25 • 720p 23.98 • 720p 24 • 1080p 50 • 1080p 59.94 • 1080p 60 • 1080p 50 DL • 1080p 59.94 DL • 1080p 60 DL
Y CRC (Link A/B in DL formats only) Error Counter		Reports the number of luminance CRC errors that have occurred	0 to 16777215	
C CRC (Link A/B in DL formats only) Error Counter		Reports the number of chrominance CRC errors that have occurred	0 to 16777215	

Parameter Name	Bank/ Switch	Function	Options or User Range
CRC Error Counter Clear	0, 4	Clears all CRC error counters	• **No** • Yes
EDH Error Counter		Reports the number of EDH errors that have occurred	0 to 32767
EDH Error Counter Clear	0, 5	Clears the EDH error counter	• **No** • Yes
EDH Present		Reports the presence of EDH in the input SDI signal	• No • Yes
525 VBI Duration		Reports if the VBI duration in 525i 59.94 is normal or short	• Normal (enables the **Fast Switch** parameter and restores its last setting) **Short** (sets **Fast Switch** to **Disable** and then makes **Fast Switch** unavailable)

Input Genlock/DARS

Parameter Name	Bank/ Switch	Function	Options or User Range
Genlock Input Source Select	0, 6	Selects the reference video input source	• Frame reference • **Card reference**
Genlock Video Present		Reports the presence of the reference video signal	• No • Yes
Genlock Video Locked		Reports the locked status of the reference video signal	• No • Yes

Parameter Name	Bank/Switch	Function	Options or User Range
Genlock Video Standard Feedback	0, B	Reports the detected reference video standard	• Unknown • 1080p 25 • 720p 59.94 • 720p 60 • 1080p 23.98 • 1080p 24 • 1080p 29.97 • 1080p 30 • 1080i 50 • 1035i 59.94 • 1035i 60 • 1080i 50 (295M) • 1080i 59.94 • 1080i 60 • 525i 59.94 • 625i 50 • 720p 50 • 1080psf 23.98 • 1080psf 24 • 720p 29.97 • 720p 30 • 720p 25 • 720p 23.98 • 720p 24 • 1080p 50 • 1080p 59.94 • 1080p 60
DARS Present		Reports the presence of the DARS reference signal	• No • Yes
DARS Locked to Video		Reports the locked status of the DARS input signal	• No • Yes
DARS Input Select		Selects the source of the DARS signal *Note:This parameter is only available with SFS6803+BD and OP+SFS+BD options.*	• **Unbalanced** • Balanced

Input > Audio > Analog (SFS6803+AI+T and OP+SFS+AI_+T only)

Parameter Name	Bank/Switch	Function	Options or User Range
Analog Audio Input CH (1A-4B) Level		Reports the dBFS operational level for the specified analog audio input channel	10 dBu - 28 dBu (**24 dBu**)

Input > Audio > AES

Parameter Name	Bank/Switch	Function	Options or User Range
Input AES (1–8) Present		Reports the presence of the specified AES input signal	• Yes • No

Input > Audio > Routing

Parameter Name	Bank/Switch	Function	Options or User Range
SRC(1–16) Input Select	0, 7 0, E 1, 1 1, 8	Selects the input audio source for the specified Channel's Sample Rate Converter	• **DMX Grp1 Ch1/2** (default for SRC 1) • **DMX Grp1 Ch3/4** (default for SRC 2) • **DMX Grp2 Ch1/2** (default for SRC 3) • **DMX Grp2 Ch3/4** (default for SRC 4) • **DMX Grp3 Ch1/2** (default for SRC 5) • **DMX Grp3 Ch3/4** (default for SRC 6) • **DMX Grp4 Ch1/2** (default for SRC 7) • **DMX Grp4 Ch3/4** (default for SRC 8) • **AES1a/1b** (default for SRC 9) • **AES2a/2b** (default for SRC 10) • **AES3a/3b** (default for SRC 11) • **AES4a/4b** (default for SRC 12) • **AES5a/5b** (default for SRC 13) • **AES6a/6b** (default for SRC 14) • **AES7a/7b** (default for SRC 15) • **AES8a/8b** (default for SRC 16) • Analog 1a/1b (SFS6803+AI+T and OP+SFS+AI+T only) • Analog 2a/2b (SFS6803+AI+T and OP+SFS+AI+T only) • Analog 3a/3b (SFS6803+AI+T and OP+SFS+AI+T only) Analog 4a/4b (SFS6803+AI+T and OP+SFS+AI+T only)

Input > Audio > V-bit

Parameter Name	Bank/ Switch	Function	Options or User Range
V-bit Mute Enable	4, C	Enables automatic muting of audio outputs when the V-bit is set *Note:Muting on a detected V-Bit applies to PCM audio channels only. Non-PCM audio channels will not be muted.*	• **No** • Yes
Aud Ch(1-32) (SRC1a-16b) V-bit Status		Reports the validity bit status of the specified audio channel	• Off • On

Input > Audio > Format

Parameter Name	Bank/ Switch	Function	Options or User Range
Aud Ch(1-32) (SRC1a-16b) Format	1, 9 3, A	Selects the AES format (Auto/PCM/Non-PCM) of the selected input audio channel	• **Auto** • PCM • Non-PCM

Input > Audio > Status

Parameter Name	Bank/ Switch	Function	Options or User Range
Dmx Ch (1–16) Status		Reports the current status of the specified deembedded audio channel	• Normal • Silence • Peak • Not Present
Input AES (1A–8B) Status		Reports the current status of the specified audio input channel	• Normal • Silence • Peak • Not Present
Input Analog Audio Ch (1A - 4B) Status		Reports the current status of the specified analog audio input channel (SFS6803+AI+T and OP+SFS+AI+T only)	• Normal • Silence • Peak • Not Present

Input > Audio > Embedded

Parameter Name	Bank/Switch	Function	Options or User Range
Group (1–4) present		Reports the presence of the specified audio group in the SDI signal	• No • Yes

Input > Audio > Embedded > Error Status

Parameter Name	Bank/Switch	Function	Options or User Range
Group (1–4) Checksum Error		Reports if a checksum error has occurred in the specified group's embedder	• No • Yes
Group (1–4) DBN Error		Reports if a data block number error has occurred in the specified group's embedder	• No • Yes
Group (1–4) Parity Error		Reports if a parity error has occurred in the specified de-embedder	• No • Yes
Group (1–4) ECC Error		Reports if an Error Correction Code error has occurred in the specified de-embedder	• No • Yes

Input > Audio > Embedded > Control Packet Status

Parameter Name	Bank/Switch	Function	Options or User Range	
Group (1–4) Active Channels		Reports the active channels from the control packet of the specified audio group	• None • CH1 • CH2 • CH12 • CH3 • CH13 • CH23 • CH123	• CH4 • CH14 • CH24 • CH34 • CH134 • CH234 • CH1234

Group (1–4) Sampling Rate		Reports the sampling rate from the control packet of the specified audio group	• 48.0 kHz • 44.1 kHz • 32.0 kHz • N/A • FreeRun
Group 1 Channel 1–2 Delay		Reports the delay, relative to video, of channel pair 1–2 in audio group 1	-699050.666 to +699050.645 msec
Group 1 Channel 3–4 Delay		Reports the delay, relative to video, of channel pair 3–4 in audio group 1	-699050.666 to +699050.645 msec
Group 2 Channel 1–2 Delay		Reports the delay, relative to video, of channel pair 1–2 in audio group 2	-699050.666 to +699050.645 msec
Group 2 Channel 3–4 Delay		Reports the delay, relative to video, of channel pair 3–4 in audio group 2	-699050.666 to +699050.645 msec
Group 3 Channel 1–2 Delay		Reports the delay, relative to video, of channel pair 1–2 in audio group 3	-699050.666 to +699050.645 msec
Group 3 Channel 3–4 Delay		Reports the delay, relative to video, of channel pair 3–4 in audio group 3	-699050.666 to +699050.645 msec
Group 4 Channel 1–2 Delay		Reports the delay, relative to video, of channel pair 1–2 in audio group 4	-699050.666 to +699050.645 msec
Group 4 Channel 3–4 Delay		Reports the delay, relative to video, of channel pair 3–4 in audio group 4	-699050.666 to +699050.645 msec

Input > Metadata

Parameter Name	Bank/ Switch	Function	Options or User Range
Embedded Metadata Present		Reports the presence of embedded metadata	• No • Yes
External Metadata Present		Reports the presence of external metadata	• No • Yes

Input > AFD/VI/WSS De-embedder

Parameter Name	Bank/ Switch	Function	Options or User Range	
AFD Present		Indicates the presence of AFD packets	• None • UNDEF • RSVD • 16:9 top • 14:9 top • >16:9 in 4:3 • 4:3 full • 16:9 l • 14:9 l • 4:3 a 14:9 • 16:9 l a 14:9	• 16:9 l a 4:3 • 16:9 full • 14:9 cntr • >16:9 in 16:9 • 16:9 full • 4:3 p • 16:9 prtctd • 14:9 p • 4:3 p a 14:9 • 16:9 a 14:9 • 16:9 a 4:3
VI Scan Present		Indicates the presence of VI packet scan part	• None • NO INFO • 525 4:3 • 625 4:3 • 525 16:9 • 625 16:9 • RSVD	

Parameter Name	Bank/ Switch	Function	Options or User Range	
VI AFD Present		Indicates the presence of VI packet AFD part	• None • UNDEF • RSVD • 16:9 top • 14:9 top • >16:9 in 4:3 • 4:3 full • 16:9 l • 14:9 l • 4:3 a 14:9 • 16:9 l a 14:9	• 16:9 l a 4:3 • 16:9 full • 14:9 cntr • >16:9 in 16:9 • 16:9 full • 4:3 p • 16:9 prtctd • 14:9 p • 4:3 p a 14:9 • 16:9 a 14:9 • 16:9 a 4:3
VI Detect Line Fld 1		Controls the video line number to detect VI packet embedded in field 1	• 12 to 19 *(525 Input)* (**14**) 8 to 22 *(625 Input)* (**11**)	
VI Detect Line Fld 2		Controls the video line number to detect VI packet embedded in field 2	• 275 to 282 *(525 Input)* (**277**) 321 to 335 *(625 Input)* (**324**)	
WSS Present		Indicates the presence of WSS packet (625 only)	• **None** • Full frame • 14:9 center • 14:9 top • 16:9 center • 16:9 top • >16:9 • Full a 14:9 • 16:9 Anamorphic	
WSS Detect Line		Controls the video line number to detect WSS packet embedded in field 1 (625 only)	8 to **23** ln	

Processing > Audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Audio Control Style		Switches between Mono and Stereo control styles	• **Mono** • Stereo
Fade Rate	7, 7	Controls the rate of fading when channels are swapped or muted	0.0 s to 10.0 s (**0.1 s**)
ADS Clean	12, A	Cleans the Ancillary Data Space prior to audio embedding	• **No** • Yes
Audio V-Fade	14, A	Disables audio V-fade (clean audio hotswitch)	• **Disable** • Enable
Seamless Sound Enable	14, 9	Enables seamless sound functionality	• **Disable** • Enable
Audio LOV Output Mode	12, 5	Selects the output audio mode when the input video is disrupted	• **Pass** • Mute

Processing > Audio > Sample Rate Conversion

Parameter Name	Bank/ Switch	Function	Options or User Range
SRC (1–16) Control	3, B 4, B	Controls insertion of the audio sample rate converter in the processing path	• **Auto** • Enable Bypass
SRC (1–16) Status		Reports the state of the specified sample rate converter	• Enabled • Bypassed

Processing > Audio > Deembedding

Parameter Name	Bank/ Switch	Function	Options or User Range
HD Inter Group Phase align		Provides audio phase alignment between deembedded audio groups for HD.	• Disable • **Enable**
Group (1–4) Deembedding Control	4, E 5, 2	Controls the audio option when the specified demuxed audio group is present with an error	• Mute • **Repeat**
DBN Error Reporting	5, 3	Controls handling of DBN (Data Block Number) error reporting	• **Alert** • Ignore

Processing > Audio > Delay

Parameter Name	Bank/ Switch	Function	Options or User Range
Delay Lock	5, 4	Couples fixed delay controls	• **No** • Yes
Aud Ch (1–2) (SRC1a–1b) Delay	5, 5 5, 6	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC1 Ext Audio Align		Provides audio-video alignment for SRC1 when externally processed	• **Off** • On
Aud Ch (3–4) (SRC2a–2b) Delay	5, 7 5, 8	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC2 Ext Audio Align		Provides audio-video alignment for SRC2 when externally processed	• **Off** • On
Aud Ch (5–6) (SRC3a–3b) Delay	5,9 5, A	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC3 Ext Audio Align		Provides audio-video alignment for SRC3 when externally processed	• **Off** • On
Aud Ch (7–8) (SRC4a–4b) Delay	5, B 5, C	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC4 Ext Audio Align		Provides audio-video alignment for SRC4 when externally processed	• **Off** • On
Aud Ch (9–10) (SRC5a–5b) Delay	5, D 5, E	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms

Parameter Name	Bank/ Switch	Function	Options or User Range
SRC5 Ext Audio Align		Provides audio-video alignment for SRC5 when externally processed	• **Off** • On
Aud Ch (11–12) (SRC6a–6b) Delay	5, F 6, 1	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC6 Ext Audio Align		Provides audio-video alignment for SRC6 when externally processed	• **Off** • On
Aud Ch (13–14) (SRC7a–7b) Delay	6, 2 6, 3	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC7 Ext Audio Align		Provides audio-video alignment for SRC7 when externally processed	• **Off** • On
Aud Ch (15–16) (SRC8a–8b) Delay	6, 4 6, 5	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC8 Ext Audio Align		Provides audio-video alignment for SRC8 when externally processed	• **Off** • On
Aud Ch (17–18) (SRC9a–9b) Delay	6, 6 6, 7	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC9 Ext Audio Align		Provides audio-video alignment for SRC9 when externally processed	• **Off** • On
Aud Ch (19–20) (SRC10a–10b) Delay	6, 8 6, 9	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC10 Ext Audio Align		Provides audio-video alignment for SRC10 when externally processed	• **Off** • On
Aud Ch (21–22) (SRC11a–11b) Delay	6, A 6, B	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC11 Ext Audio Align		Provides audio-video alignment for SRC11 when externally processed	• **Off** • On
Aud Ch (23–24) (SRC12a–12b) Delay	6, C 6, D	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC12 Ext Audio Align		Provides audio-video alignment for SRC12 when externally processed	• **Off** • On

Parameter Name	Bank/ Switch	Function	Options or User Range
Aud Ch (25–26) (SRC13a–13b) Delay	6, E 6, F	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC13 Ext Audio Align		Provides audio-video alignment for SRC13 when externally processed	• **Off** • On
Aud Ch (27–28) (SRC14a–14b) Delay	7, 1 7, 2	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC14 Ext Audio Align		Provides audio-video alignment for SRC14 when externally processed	• **Off** • On
Aud Ch (29–30) (SRC15a–15b) Delay	7, 3 7, 4	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC15 Ext Audio Align		Provides audio-video alignment for SRC15 when externally processed	• **Off** • On
Aud Ch (31–32) (SRC16a–16b) Delay	7, 5 7, 6	Adjusts delay for the specified audio channel	**0.000 ms** to 1320.000 ms
SRC16 Ext Audio Align		Provides audio-video alignment for SRC16 when externally processed	• **Off** • On

Processing > Audio > Input Gain

Parameter Name	Bank/ Switch	Function	Options or User Range
Aud Ch (1–8) (SRC1a–4b) Input Gain		Adjusts input gain for the specified audio channel	36.0 dB to 36.0 dB (**0.0 dB**)

Processing > Audio > Test Tones

Parameter Name	Bank/ Switch	Function	Options or User Range
Test Tone 400 Hz Level	7, 8	Sets the tone amplitude	-36.0 dBFS to 0.0 dBFS (-**18.0 dBFS**)
Test Tone 1 kHz Level	7, 9		
Test Tone 2 kHz Level	7, A		
Test Tone 4 kHz Level	7, B		

Processing > Audio > Output Gain

Parameter Name	Bank/ Switch	Function	Options or User Range
Gain Lock		Couples the gain controls	• **No** • Yes

Processing > Audio > Output Gain > Embedded Audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Output Emb Ch (1–16) Gain		Adjusts gain for the specified output embedded audio channel	-36.0 dB to 36.0 dB (**0.0 dB**)

Processing > Audio > Output Gain > AES Audio

Output AES (1A–8B) Gain		Adjusts gain for the specified output embedded audio channel	-36.0 dB to 36.0 dB (**0.0 dB**)

Processing > Audio > Output Gain > Analog Audio (SFS6803+AO+T and OP+SFS+AO+T only)

Output Analog Audio Lvl Offset		Applies attenuation to analog audio output levels	-6 dB to **0** dB
Output Analog Audio (1A–4B) Gain		Adjusts gain for the specified output analog audio channel	-30.0 dB to 36.0 dB (**0.0 dB**)

Processing > Audio > Invert

Parameter Name	Bank/ Switch	Function	Options or User Range
Output Emb Ch (1–16) Invert		Inverts the selected audio channel to correct for phase error	• **No** • Yes

Processing > Audio > Invert > AES Audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Output AES (1A–8B) Invert		Inverts the selected audio channel to correct for phase error	• **No** • Yes

Processing > Audio > Invert > Analog Audio (SFS6803+AO+T and OP+SFS+AO+T only)

Parameter Name	Bank/ Switch	Function	Options or User Range
Output Analog Audio (1A–4B) Invert		Inverts the selected audio channel to correct for phase error	• **No** • Yes

Processing > Audio > Mute

Parameter Name	Bank/ Switch	Function	Options or User Range
Master Mute	7, C	Enables muting for all output audio channels	• **Off** • On

Processing > Audio > Mute > Embedded Audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Output Emb Ch (1–16) Mute		Enables muting for the specified output embedded audio channel	• **Off** • On

Processing > Audio > Mute > AES Audio

Parameter Name	Bank/Switch	Function	Options or User Range
Output AES (1A–8B) Mute		Enables muting for the specified output audio channel	• **Off** • On

Processing > Audio > Mute > Analog Audio (SFS6803+AO+T and OP+SFS+AO+T only)

Parameter Name	Bank/Switch	Function	Options or User Range
Output Analog (1A–4B) Mute		Enables muting for the specified output audio channel	• **Off** • On

Processing > Audio > Synchronization

Parameter Name	Bank/Switch	Function	Options or User Range
Audio Tracking Mode	12, 3	Controls the speed at which audio will synchronize with video when video delay is changed	• **Slow** • Fast
Audio Track video	12, 4	Enables audio synchronization with the video frame synchronizer	• No • **Yes**

Processing > Audio > Embedding

Parameter Name	Bank/Switch	Function	Options or User Range
Dolby-E Start Line	12, 9	Specifies the starting video line of embedded Dolby bitstreams	• 15 to 54 (1080p, 1080i, and 1080psf formats) (**19**) • 20 to 71 (720p formats) (**25**) • 13 to 25 (525i 59.94 format) (**15**) 9 to 30 (625i 50 format) (**11**)
Audio Group (1–4) Embedding Mode	12, B 12, E	Selects the embedding mode for the specified audio group	• **Append** (when ADS Clean is set to On) • OverWrt **Auto** (when ADS Clean is set to Off)

Parameter Name	Bank/ Switch	Function	Options or User Range
Audio Group (1–4) Pair (1–2) Embed Control	14, E 15, 6	Enables embedding of the selected pair in the audio group	• Disable • **Enable**
Group 1 Append Embedding Error		Reports if an append embedding error has occurred in the group 1 embedder	• No • Yes
Group 1 Overwrite Embed Error		Reports if an overwrite embedding error has occurred in the group 1 embedder	• No • Yes
Group 2 Append Embedding Error		Reports if an append embedding error has occurred in the group 2 embedder	• No • Yes
Group 2 Overwrite Embed Error		Reports if an overwrite embedding error has occurred in the group 2 embedder	• No • Yes
Group 3 Append Embedding Error		Reports if an append embedding error has occurred in the group 3 embedder	• No • Yes
Group 3 Overwrite Embed Error		Reports if an overwrite embedding error has occurred in the group 3 embedder	• No • Yes
Group 4 Append Embedding Error		Reports if an append embedding error has occurred in the group 4 embedder	• No • Yes
Group 4 Overwrite Embed Error		Reports if an overwrite embedding error has occurred in the group 4 embedder	• No • Yes

Processing > Metadata

Parameter Name	Bank/ Switch	Function	Options or User Range
Metadata Embedding Enable	12, 6	Enables embedding of metadata	• **Disable** • Enable
Metadata Embedding DID		Selects the DID to use when embedding metadata	• **0x45** • 0x50
Metadata Embedding SDID		Selects the SDID to use when embedding metadata	**1** to 9
Metadata Embedding Line Number	12, 7	Controls the line to which metadata packets will be embedded *Note:1080i, 1080p, and 720p ranges apply with the optional 1.5G and 3G HD licenses only.*	• 9 to 41 (1080p) **(13)** • 9 to 25 (720p) **(13)** • 9 to 20 (1080i) **(13)** • 12 to 19 (525i 59.94) **(13)** 8 to 22 (625i 50) **(13)**

Processing > Video

Parameter Name	Bank/ Switch	Function	Options or User Range
Loss Of Video Output Mode	14, 2	Selects the output video mode when the input video is disrupted	• Pass • Black • **Freeze** • Grey

Processing > Video > Delay

Parameter Name	Bank/ Switch	Function	Options or User Range
Horizontal Phase	14, 3	Adjusts the horizontal timing *Note:1080i, 1080p, and 720p ranges apply with the optional 1.5G and 3G HD licenses only.*	• **0.000** us to 29.616 us (1080p 30, 1035i 60, 1035i 60) • **0.000** us to 14.808 us (1080p 60) • **0.000** us to 29.646 us (1080p 29, 1035i 29, 1080i 59) • **0.000** us to 14.823 us (1080p 59) • **0.000** us to 35.542 us (1080p 25, 1080i 50) • **0.000** us to 17.771 us (1080p 50) • **0.000** us to 37.024 us (1080p 24, 1080psf 24) • **0.000** us to 37.061 us (1080p 23.98, 1080psf 23.98) • **0.000** us to 31.987 us (1080i 50_295) • **0.000** us to 22.209 us (720p 60) • **0.000** us to 22.231 us (720p 59.94) • **0.000** us to 26.653 us (720p 50) • **0.000** us to 44.431 us (720p 30) • **0.000** us to 44.475 us (720p 29) • **0.000** us to 53.320 us (720p 25) • **0.000** us to 63.518 us (525i 59.94) • **0.000** us to 63.963 us (625i 50)
Vertical Phase	14, 4	Adjusts the vertical timing *Note:1080i, 1080p, and 720p ranges apply with the optional 1.5G and 3G HD licenses only.*	• **0**–1124 lines (1080p/I/psf) • **0**–1249 lines (1080i 50 SMPTE 295M) • **0**–749 lines (720p) • **0**–524 lines (525i 59.94) • **0**–624 lines (625i 50)
Video Delay	14, 5	Controls the amount of video delay in frames	• **0**–8 frames (HD sync mode) • **0**–10 frames (HD delay mode) • **0**–50 frames (SD)
Audio/Video Align	14, 6	Provides a fixed delay to the video processing path to compensate for audio processing delay	• No • **Yes**
Actual Video Delay Used		Reports the actual video delay in frames	**0 frm** to 100 frm

Parameter Name	Bank/ Switch	Function	Options or User Range
External Audio Delay		Represents the amount of audio processing delay external to the module	**0 ms** to 2000 ms

Processing > Video > Synchronization

Parameter Name	Bank/ Switch	Function	Options or User Range
Frame Sync Bypass	13, D	Bypasses control for the video frame synchronizer	• **No** • Yes
Frame Sync Mode	13, E	Selects the operational mode for the video frame synchronizer	• Delay mode • **Sync mode**
Force Freeze Type	13, F	Selects the type of forced video freeze	• **Field 1** (1080i/1035i/525i 59.94/625i 50/1080psf) • Field 2 • **Frame** (1080p/720p)
Force Freeze	14, 1	Forces the output video to freeze	• **Off** • On
Fast Switch	14, B	Enables a fast (freezeless) video switch when input video is switched between two sources while both are in vertical blanking	• **Disable** • Enable
Input Field Detect	14, C	Selects between using the V-bit or F-bit to detect an incoming field change	• **V-bit** • F-bit
Output Video Shift	14, D	Shifts output video for minimum delay when source video is locked to reference	• **Disable** • Enable

Processing > Video > ProcAmp

Parameter Name	Bank/ Switch	Function	Options or User Range
Video ProcAmp Enable	12, F	Enables the video processing amplifier	• No • **Yes**
Y Gain	13, 1	Adjusts gain for the Y channel	-3.0 to +3.0 dB (**0 dB**)
Cb Gain	13, 2	Adjusts gain to the Cb color difference component	-3.0 to +3.0 dB (**0 dB**)
Cr Gain	13, 3	Adjusts gain to the Cr color difference component	-3.0 to +3.0 dB (**0 dB**)
Y Offset	13, 4	Adjusts offset for the Y channel	±100.6 mV (**0 mV**)
Cb Offset	13, 5	Adjusts offset for the Cb channel	±100.6 mV (**0 mV**)
Cr Offset	13, 6	Adjusts offset for the Cr channel	±100.6 mV (**0 mV**)
White Clip Enable	13, 7	Controls level clipping according to the White Clip Level control	• **Disable** • Enable
White Clip Level	13, 8	Sets the white clip level	636.9 to 763.1 mV (**700 mV**)
Black Clip Enable	13, 9	Controls level clipping according to the Black Clip Level control	• **Disable** • Enable
Black Clip Level	13, A	Sets the black clip level	-47.9 to +47.9 mV (**0.0 mV**)
Hue	13, B	Adjusts the hue of the incoming digital video signal	-180 to +180° (**0°**)

Processing > Video > Test Pattern Generator

Parameter Name	Bank/Switch	Function	Options or User Range
Test Pattern Select	14, 7	Selects the test pattern to display	• **75% color Bars** • Pathological • 100% color Bars • EQ Pathological • PLL Pathological
Test Pattern Enable	14, 8	Enables the internal test pattern generator	• **Off** • On

Processing > Video > VBI

Parameter Name	Bank/Switch	Function	Options or User Range
VBI Control Type		Provides a master control for the VBI line processing	• **Individual** • Set All Pass • Set All Delete
VBI Line (746–750) Delete		Deletes to black the active video portion of the selected VBI line (720p output only)	• **Off** • On
VBI Line (1122–1123) Delete		Deletes to black the active video portion of the selected VBI line (1080p output only)	• **Off** • On
VBI Line (1124–1125) Delete		Deletes to black the active video portion of the selected VBI line (1080i/psf, 1080p output only)	• **Off** • On
VBI Line 6 Delete		Deletes to black the active video portion of the selected VBI line (625, 1080p, 720p output only)	• **Off** • On
VBI Line (7–9) Delete		Deletes to black the active video portion of the selected VBI line (625, 1080i/psf, 1080p, 720p output only)	• **Off** • On
VBI Line (10–20) Delete		Deletes to black the active video portion of the selected VBI line (all standards)	• **Off** • On
VBI Line (21–23) Delete		Deletes to black the active video portion of the selected VBI line (525, 625, 1080p, 720p output only)	• **Off** • On
VBI Line (24–25) Delete		Deletes to black the active video portion of the selected VBI line (1080p, 720p output only)	• **Off** • On

Parameter Name	Bank/ Switch	Function	Options or User Range
VBI Line (26–41)		Deletes to black the active video portion of the selected VBI line (1080p output only)	• **Off** • On
VBI Line (272–286) Delete		Deletes to black the active video portion of the selected VBI line (525 output only)	• **Off** • On
VBI Line (318–336) Delete		Deletes to black the active video portion of the selected VBI line (625 output only)	• **Off** • On
VBI Line (561–562) Delete		Deletes to black the active video portion of the selected VBI line (1080i output only)	• **Off** • On
VBI Line (569–583) Delete		Deletes to black the active video portion of the selected VBI line (1080i output only)	• **Off** • On

Processing > Video >AFD/VI/WSS

Parameter Name	Bank/ Switch	Function	Options or User Range
Out Aspect Ratio		Sets the aspect ratio of SD output in auto ARCing control (526/625 only)	• **4:3** • 16:9

Output > AES Interface

Parameter Name	Bank/ Switch	Function	Options or User Range
Output AES Interface Control	12, 2	Provides a master control for the AES output interface *Note:This parameter is not available with SFS6803+BD and OP+SFS+BD options.*	• **Individual Control** • Set All Unbalanced • Set All Balanced
Output AES (1–8) Interface	11, 9 12, 1	Selects the type of output (balanced/unbalanced) for the specified AES *Note:This parameter is not available with SFS6803+BD and OP+SFS+BD options.*	• **Unbalanced** Balanced

Output > Audio Word Length

Output > Audio Word Length > Embedded Audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Output Emb Ch 1/2 Wor d Length	7, D	Adjusts the sample resolution for the selected output audio channel pair	• **24 bits** (default for HD mode) • **20 bits** (default for SD mode) 16 bits
Output Emb Ch 3/4 Word Length	7, E		
Output Emb Ch 5/6 Word Length	7, F		
Output Emb Ch 7/8 Word Length	8, 1		
Output Emb Ch 9/10 Word Length	8, 2		
Output Emb Ch 11/12 Word Length	8, 3		
Output Emb Ch 13/14 Word Length	8, 4		
Output Emb Ch 15/16 Word Length	8, 5		

Output > Audio Word Length > AES Audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Output AES (1–8) Word Length	8, 6 8, D	Adjusts the sample resolution for the specified output audio AES	• **24 bits** • 20 bits • 16 bits

Output > Audio Source Select

Output > Audio Source Select > Embedded audio

Parameter Name	Bank/ Switch	Function	Options or User Range	
Output Emb Ch (1–16) Source Select	8, E 9, E	Selects the source for the specified output channel Default for each channel is the corresponding AES -- the default for Output Emb Ch 10 Source Select is SRC 5b *Note:The AES options appear if you have the AES option only.*	• **SRC1a** (default for Output Emb Ch 1 Source Select) • SRC8b • SRC1a+1b • SRC2a+2b • SRC3a+3b • SRC4a+4b • SRC5a+5b • SRC6a+6b • SRC7a+7b • SRC8a+8b • SRC9a • SRC16b • SRC9a+9b • SRC10a+10b	• SRC11a+11b • SRC12a+12b • SRC13a+13b • SRC14a+14b • SRC15a+15b • SRC16a+16b • Test Tone 400Hz • Test Tone 1kHz • Test Tone 2kHz • Test Tone 4kHz • Mute • EBU R68 • SMPTE RP155 • SRC1a+2a • SRC1b+2b • SRC2a+3a • SRC2b+3b • SRC2a+4a • SRC2b+4b

Output > Audio Source Select > AES audio

Parameter Name	Bank/ Switch	Function	Options or User Range	
Audio Procamp AES (1A-8B) Out Source	9, F 10, F	Selects the source for the specified AES audio procamp channel Default for each channel is the corresponding source	• SRC1a • SRC8b • SRC1a+1b • SRC2a+2b • SRC3a+3b • SRC4a+4b • SRC5a+5b • SRC6a+6b • SRC7a+7b • SRC8a+8b • **SRC9a** (default for Audio Procamp 1A Out Source) • SRC16b • SRC9a+9b • SRC10a+10b • SRC11a+11b	• SRC12a+12b • SRC13a+13b • SRC14a+14b • SRC15a+15b • SRC16a+16b • Test Tone 400Hz • Test Tone 1kHz • Test Tone 2kHz • Test Tone 4kHz • Mute • EBU R68 • SMPTE RP155 • SRC1a+2a • SRC1b+2b • SRC2a+3a • SRC2b+3b • SRC2a+4a • SRC2b+4b
Output AES (1–8) Source Select	11, 1 11, 8	Selects the source for the specified output AES	• **Aud Proc xA/xB** (where x is the specified Output AES) • Input Demux Ch 1/2 • Input Demux Ch 3/4 • Input Demux Ch 5/6 • Input Demux Ch 7/8 • Input Demux Ch 9/10 • Input Demux Ch 11/12 • Input Demux Ch 13/14 • Input Demux Ch 15/16 • Output Demux Ch 1/2 • Output Demux Ch 3/4 • Output Demux Ch 5/6 • Output Demux Ch 7/8 • Output Demux Ch 9/10 • Output Demux Ch 11/12 • Output Demux Ch 13/14 • Output Demux Ch 15/16	

Output > Audio Source Select > Analog Audio (SFS6803+AO+T and OP+SFS+AO+T only)

Parameter Name	Bank/ Switch	Function	Options or User Range	Parameter Name
Output Analog Aud Ch(1A-4B) Src Sel		Selects the source for the specified output analog audio channel Default for each channel is the corresponding source	• SRC1a • SRC8b • SRC1a+1b • SRC2a+2b • SRC3a+3b • SRC4a+4b • SRC5a+5b • SRC6a+6b • SRC7a+7b • SRC8a+8b • SRC9a • SRC16b • SRC9a+9b • SRC10a+10b	• SRC11a+11b • SRC12a+12b • SRC13a+13b • SRC14a+14b • SRC15a+15b • SRC16a+16b • Test Tone 400Hz • Test Tone 1kHz • Test Tone 2kHz • Test Tone 4kHz • Mute • EBU R68 • SMPTE RP155 • SRC1a+2a • SRC1b+2b • SRC2a+3a • SRC2b+3b • SRC2a+4a • SRC2b+4b

Output > Audio Format

Output > Audio Format > Embedded audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Output Emb Ch (1–16) Format Feedback		Reports the AES format (PCM/non-PCM) of specified output embedded audio channel	• PCM • Non-PCM • Unknown

Output > Audio Format > AES audio

Parameter Name	Bank/ Switch	Function	Options or User Range
Audio Procamp AES (1A–8B) Format Feedback		Reports the AES format (PCM/non-PCM) of specified AES output audio channel	• PCM • Non-PCM • Unknown

Output > Video Status

Parameter Name	Bank/ Switch	Function	Options or User Range
Output Video Frozen		Reports the output video frozen status	• No • Yes

Output > AFD / VI / WSS Embedder

Parameter Name	Bank/ Switch	Function	Options or User Range	
AFD Control		Controls the embedding of the AFD packet	• Remove • Insert Custom • **Pass** • Convert from VI (525/625 input only) • Convert from WSS (625 input only)	
AFD Embed Line		Controls the video line number where the AFD packet gets embedded to in field 1	• **12** to 19 *(Embed 525)* • **8** to 22 *(Embed 625)* • **9** to 20 *(Embed 1080i)* • **9** to 25 *(Embed 720p)* • **9** to 41 *(Embed 1080p)*	
AFD Select		Controls the AFD code that gets embedded	When **Out Aspect Ratio** is set to 4:3: • 16:9 top • 14:9 top • >16:9 in 4:3 • **4:3 full** • 16:9 l • 14:9 l • 4:3 a 14:9 • 16:9 l a 14:9 • 16:9 l a 4:3	When **Out Aspect Ratio** is set to 16:9: • **16:9 full** • 14:9 p • >16:9 in 16:9 • 4:3 p • 16:9 prtctd • 4:3 p a 14:9 • 16:9 a 14:9 • 16:9 a 4:3
AFD Output		Indicates current AFD output code	• None • 16:9 top • 14:9 top • >16:9 in 4:3 • 4:3 full • 16:9 l • 14:9 l • 4:3 a 14:9 • 16:9 l a 14:9	• 16:9 l a 4:3 • 16:9 full • 14:9 p • >16:9 in 16:9 • 4:3 p • 16:9 prtctd • 4:3 p a 14:9 • 16:9 a 14:9 • 16:9 a 4:3

Parameter Name	Bank/ Switch	Function	Options or User Range	
VI Control		Controls the embedding of the VI packet (526/625 only)	• Remove • Insert Custom • Convert from AFD • **Pass** • Convert from WSS (valid for 625 input only)	
VI Embed Line		Controls the video line number where the VI packet gets embedded to in field 1 (526/625 only)	• 12 to 19 *(Embed 525)* (**14**) • 8 to 22 *(Embed 625)* (**11**)	
VI Select		Controls the VI code that gets embedded (526/625 only)	When **Out Aspect Ratio** is set to 4:3: • 16:9 top • 14:9 top • >16:9 in 4:3 • **4:3 full** • 16:9 l • 14:9 l • 4:3 a 14:9 • 16:9 l a 14:9 • 16:9 l a 4:3	When **Out Aspect Ratio** is set to 16:9: • **16:9 full** • 14:9 p • >16:9 in 16:9 • 4:3 p • 16:9 prtctd • 4:3 p a 14:9 • 16:9 a 14:9 • 16:9 a 4:3
SD Out VI with AFD		Controls whether the VI output supports the AFD upper bits part	• **No** • Yes	
VI Output (AFD)		Indicates current VI output code AFD part (526/625 only)	• None • 16:9 top • 14:9 top • >16:9 in 4:3 • 4:3 full • 16:9 l • 14:9 l • 4:3 a 14:9 • 16:9 l a 14:9	• 16:9 l a 4:3 • 16:9 full • 14:9 p • >16:9 in 16:9 • 4:3 p • 16:9 prtctd • 4:3 p a 14:9 • 16:9 a 14:9 • 16:9 a 4:3
VI Output (Scan)		Indicates current VI output code Scan part (526/625 only)	• None • 525 4:3 • 625 4:3 • 525 16:9 • 625 16:9	

Parameter Name	Bank/ Switch	Function	Options or User Range
WSS Control		Controls the embedding of the WSS packet (625 only)	• Remove • Insert Custom • Convert from AFD • Convert from VI • **Pass**
WSS Embed Line		Controls the video line number where the WSS packet gets embedded to in field 1 (625 only)	• 8 to **23**
WSS Select		Controls the WSS code that gets embedded (625 only)	• **Full frame** • 14:9 center • 14:9 top • 16:9 center • 16:9 top • >16:9 center • Full a 14:9 • 16:9 Anamorphic
WSS Output		Indicates current WSS output code (625 only)	• **None** • Full frame • 14:9 center • 14:9 top • 16:9 center • 16:9 top • >16:9 center • Full a 14:9 • 16:9 Anamorphic
Custom On Loss		Controls whether to insert a custom code when the upstream code disappears in code bypass mode	• **No** • Yes

LEDs and Alarms

Monitoring LEDs

The SFS6803**+** and OP**+**SFS**+** have 11 monitoring LEDs that serve as quick monitoring references. The following figure shows the location of the monitoring LEDs on an SFS6803**+** or OP**+**SFS**+** module. The following table describes each LED in more detail.
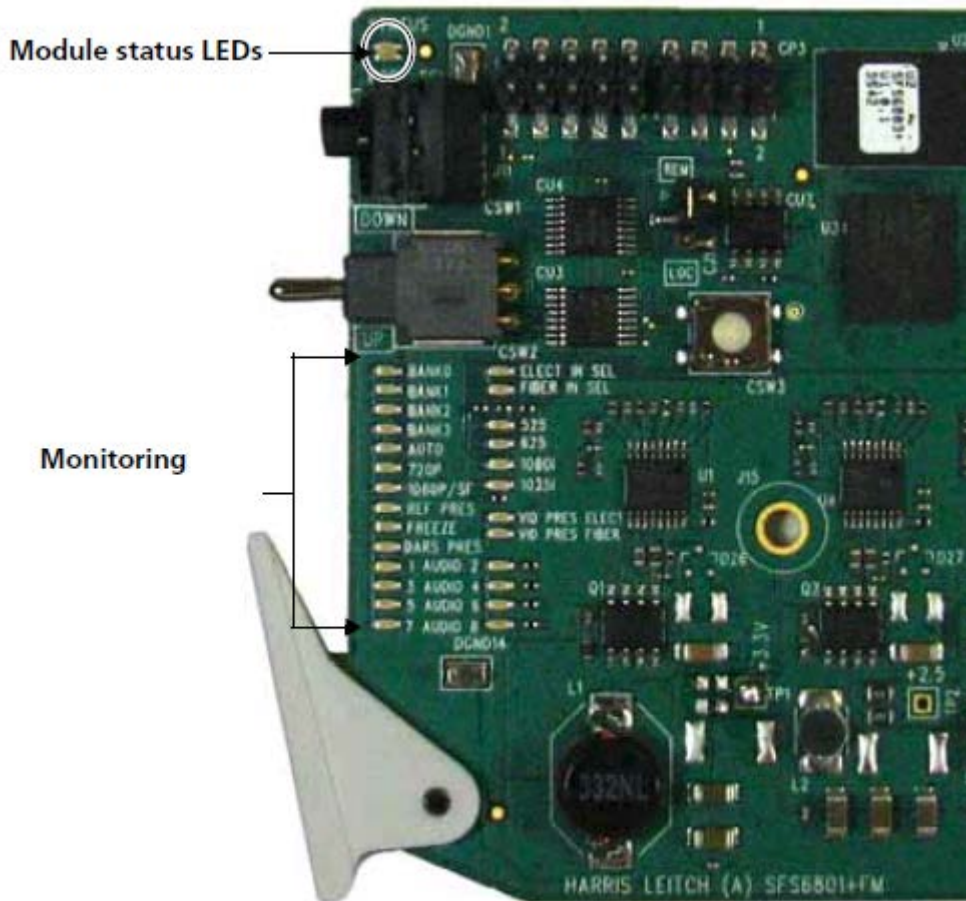
Figure 28: Location of SFS6803+ and OP+SFS+ LEDs

Monitoring LEDs

LED	Color Indicators	Meaning
Auto	Green	Auto detection of the SD-SDI input standard is active
720P	Green	Selected video standard is 720p
1035i	Green	Unused
1080p/sF	Green	Selected video standard is 1080p or 1080psf
1080I	Green	Selected video standard is 1080i

525	Green	Selected video standard is 525
625	Green	Selected video standard is 625
Vid Pres Elect	Green	Electrical input video is present
Vid Pres Fiber	Green	Fiber input video is present
Elect in sel	Green	Input video source is electrical
Fiber in sel	Green	Input video source is fiber
REF PRES	Green	Indicates presence of reference signal
FREEZE	Yellow	Indicates the output video is frozen
DARS Pres	Green	Indicates presence of DARS
AUDIO 1	Green	Indicates presence of AES audio on AES input 1
AUDIO 2	Green	Indicates presence of AES audio on AES input 2
AUDIO 3	Green	Indicates presence of AES audio on AES input 3
AUDIO 4	Green	Indicates presence of AES audio on AES input 4
AUDIO 5	Green	Indicates presence of AES audio on AES input 5
AUDIO 6	Green	Indicates presence of AES audio on AES input 6
AUDIO 7	Green	Indicates presence of AES audio on AES input 7
AUDIO 8	Green	Indicates presence of AES audio on AES input 8

Module Status LEDs

SFS6803**+** and OP**+SFS+** modules do not have any card-edge alarms. Instead, a module status LED on the corner of the module lights up if an error is detected. See Location of SFS6803+ and OP+SFS+ LEDs for the location of these LEDs, and below for a definition of the LED colors.

If the LED is flashing red, please contact your Customer Service representative.

Module Status LED Descriptions

LED Color Sequence	Meaning
Off	There is no power to the module; the module is not operational.
Green	There is power to the module; the module is operating properly.
Red	There is an alarm condition.
Flashing red	The module has detected a hardware/firmware fault.
Amber	The module is undergoing configuration.

Alarms

If a major or minor alarm is triggered within your SFS6803**+** or OP**+SFS+** module, the Status LED lights red.

Alarms are usually logged and monitored within available software control applications (for example, CCS Navigator). You can only differentiate between major and minor alarms within a software control application. See the appropriate software control user manual or online help for more information.

The following settings can be made for each alarm within Pilot or Navigator software.

Alarm Options

Alarm Option	Effect
Enable/Disable	This option toggles between Enabled and Disabled. If the alarm is **Enabled**, an alarm condition generates an alarm; but if it is **Disabled**, the alarm condition is ignored. By default, all alarms are disabled.
Alarm priority	This setting determines whether a triggered alarm is reported as major or minor. The range is 1–10. A priority of 6 or higher is a major alarm, and a priority of 5 or lower is a minor alarm
Trigger (s)	This option determines how long an alarm condition must exist (in seconds) before the alarm is triggered. If the alarm level is reached for less time than the **Trigger** duration, then the alarm will not trigger. Choose any duration from 0 to 7200 seconds (or 2 hours). If this option is set to 0 and the alarm condition exists for any period of time, the alarm is triggered.
Clear (s)	Determines the amount of time the alarm condition must be in abatement in order for the alarm to be turned off. Choose any duration from 0 to 7200 seconds (or 2 hours). If this option is set to 0 and the alarm condition ceases for any period of time, the alarm is cleared.
Ack	When an alarm is active, click this option to allow other users on the network to see that you have acknowledged the alarm.

The following table describes the specific alarms for the SFS6803**+** and OP**+**SFS**+**. You can only identify specific alarms using a software control application.

Alarm Definitions

Alarm Name	Alarm Option Default Settings		
	Priority	Trigger	Clear
Video Standard Mismatch	8	1 sec	2 sec
Unsupported Video Standard	8	1 sec	2 sec
Loss of Electrical SDI Input	9	1 sec	2 sec
Loss of Optical SDI Input	6	1 sec	2 sec
DMX Ch (1-16) Silent	1	30.0 s	0.0 s
DMX Ch (1–16) Peak	6	0.0 s	0.0 s
Input AES (1A-8B) Silent	1	30.0 s	0.0 s
Input AES (1A-8B) Peak	6	0.0 s	0.0 s
DMX Group(1–4) Checksum Error	1	2 sec	2 sec

Alarm Name	Alarm Option Default Settings		
	Priority	Trigger	Clear
DMX Group (1–4) DBN Error	1	2 sec	2 sec
DMX Group (1- 4) ECC Error	1	2 sec	2 sec
DMX Group (1–4) Parity Error	1	2 sec	2 sec
Embedded Audio Group (1–4) Missing	1	2 sec	2 sec
Loss of DARS Input (with AES option)	1	2 sec	2 sec
Loss of DARS Locked (with AES option)	1	2 sec	2 sec
Group (1–4) Append Embedding Error	6	1 sec	2 sec
Group (1–4) Overwrite Embedding Error	6	2 sec	2 sec
AES (1–8) In Missing (with AES option)	1	2 sec	2 sec
Output Video Frozen	1	2 sec	2 sec
Reference Video Missing	6	1 sec	2 sec
Reference Video Not Locked	6	1 sec	2 sec
Mismatched Output/Ref Standards	6	1 sec	2 sec
V-Bit Mute On	4	0.0 s	2.0 s
Master Mute On	5	0.0 s	2.0 s
Laser Failed (OP+SFS+(C)xxD modules only)	6 (Major)	1 sec	2 sec
Loss of AFD	5	0 sec	0 sec
Input Analog Audio (1A–4B) Peak (SFS6803+AI+T and OP+SFS+AI+T only)	1	1 sec	2 sec
Input Analog Audio (1A–4B) Silence (SFS6803+AI+T and OP+SFS+AI+T only)	1	1 sec	2 sec

Specifications

The following specifications appear in this chapter:

- Inputs (on page 101)
- Outputs (on page 103)
- Propagation Delay (on page 108)
- Power Consumption (on page 109)
- Start-Up Time (on page 109)

Specifications and designs are subject to change without notice.

Unless explicitly stated, all references to SFS6803+ and OP+SFS+ also pertain to SFS6803+BD and OP+SFS+BD.

Inputs

SDI Video Input

1.5G HD-SDI video input specifications apply only if you have a SFS68OPT-HD license key. 3G HD-SDI video input specifications only apply if you have installed a SFS68OPT-3G or SFS68OPT-HD-3G license key.

Item	3G HD-SD Specification	1.5G HD-SDI Specification	SD-SDI Specification
Number	1	1	1
Standard	1080p (SMPTE 424M) 1080p DL (SMPTE 372M)	• 1080i/p (SMPTE 274M) • 720p (SMPTE 296M)	SMPTE 259M-C, 270 Mbps, 525/625 component
Connector	BNC (IEC169-8)	BNC (IEC169-8)	BNC (IEC169-8)
Impedance	75Ω	75Ω	75Ω
Frame rate	1080p: 50, 59.94, 60 Hz	• 1080p: 23.98, 24, 25, 29.97, 30 Hz • 1080psf: 23.98, 24 Hz • 1080i: 50, 59.94, 60 Hz • 720p: 50, 59.94, 60 Hz	• 525: 59.94 Hz • 625: 50 Hz
Return loss	• > 15 dB from 5 MHz to 1485 MHz • >10dB from 1485 MHz to 2970 MHz	> 15 dB from 5 MHz to 1485 MHz	> 15 dB up to 270 MHz

Item	3G HD-SD Specification	1.5G HD-SDI Specification	SD-SDI Specification
Equalization	• Original modules: Adaptive cable equalization for up to 230 ft (70 m) (typical) of Belden 1694A coaxial cable • Revised modules and hardware revision 1.01: Adaptive cable equalization for up to 459 ft (140 m) (typical) of Belden 1694A coaxial cable	• Original modules: Adaptive cable equalization for up to 492 ft (150 m) (typical) of Belden 1694A coaxial cable • Revised modules and hardware revision 1.01: Adaptive cable equalization for up to 656 ft (200 m) (typical) of Belden 1694A coaxial cable	Adaptive cable equalization for up to 984 ft (300 m) (typical) of Belden 8281 coaxial cable

AES/DARS Input (AES-Enabled Modules Only)

Item	Balanced/DARS Specification (With SFS6803+BD, OP+SFS+BD, or External Balun)	Unbalanced/DARS Specification
Standard	AES 3	AES 3, SMPTE 276M
Connector	44-pin connector; or 3-pin connector, female XLR with external balun	BNC (IEC 169-8)
Sensitivity	<200 mV	<100 mV
Impedance	110Ω ± 20% (0.1 to 6 MHz)	75Ω
Return loss	N/A	> 25 dB, 0.1 to 6 MHz
Common mode rejection	0 V to 7 V (0 kHz to 20 kHz)	N/A
Input audio rate	32 kHz to 108 kHz (DARS 48 kHz only)	32 kHz to 108 kHz (DARS 48 kHz only)
Maximum input signal	10 V pk-to-pk	n/a
Bits	16, 20, or 24	16, 20, or 24
Channel status and user bit	Maintained, but professional mode, 48 kHz. See Appendix A for full details.	

Analog Audio Input (SFS6800+AI+T and OP+SFS+AI+T Only)

Item	Specification
Number of inputs	8 mono channels
Connector	Weidmuller 24-pin locking header-socket pair
Input audio level	28 dBu to 12 dBu for 0 dBFs (adjustable in 1 dB increments)
Input impedance	High-Impedance or 600Ω, jumper selectable

Item	Specification
CMRR	> 80 dB at 60 Hz, typical
Linearity	< ±0.5 dB (to -100 dBFS)
Frequency response	< ±0.05 dB (20 Hz to 20 kHz), typical
THD	> 100 dB (at -1 dBFS, 20 Hz to 20 kHz), typical
SNR	> 100 dB

Outputs

SDI Video Output

1.5G HD-SDI video output specifications only apply if you have a SFS68OPT-HD license key. 3G HD-SDI video output specifications only apply if you have installed a SFS68OPT-3G or SFS68OPT-HD-3G license key.

Item	3G HD-SDI Specification	1.5G HD-SDI Specification	SD-SDI Specification
Number	4 synchronized	4 synchronized	4 synchronized
Standard	1080p (SMPTE 424M) 1080p DL (SMPTE 372M)	• 1080i (SMPTE 274M) • 720p (SMPTE 296M) SMPTE 292M with SMPTE 299M embedded audio	SMPTE 259M-C, 270 Mb/s, 525/625 component
Frame rate	1080p: 50, 59.94, 60 Hz	• 1080i: 50, 59.94, 60 • 1080p: 23.98 (p/psf), 24 (p/psf), 25, 29.97, 30 Hz • 720p: 50, 59.94, 60 Hz	525, 625
Connector	BNC (IEC169-8)	BNC (IEC 169-8)	BNC (IEC 169-8)
Impedance	75Ω	75Ω	75Ω
Return loss	• > 15 dB from 5 MHz to 1485 MHz • >10 dB from 1485 MHz to 2970 MHz	> 15 dB from 5 MHz to 1485 MHz	> 15 dB up to 270 MHz
Signal level	800 mV ± 10%	800 mV ± 10%	800 mV ± 10%
D.C. offset	0.0 V ± 0.5 V	0.0 V ± 0.5 V	0.0 V ± 0.5 V
Rise and fall time	< 135 ps	< 270 ps, within 100 ps of each other	0.4–1.5 ns
Overshoot	< 10% of amplitude	< 10% of amplitude	< 10% of amplitude

Item	3G HD-SDI Specification	1.5G HD-SDI Specification	SD-SDI Specification
Jitter	• >100kHz: < 0.3 UI (101 ps) pk-to-pk • >10 Hz: < 2.0 UI (675 ps) pk-to-pk	• >100 kHz: < 0.2 UI (135 ps) pk-to-pk • >10 Hz: < 1 UI (675 ps) pk-to-pk	< 0.2 UI (740 ps) pk-to-pk
Delay	Up to 8 frames less 2 lines	Up to 8 frames less 2 lines	Up to 50 frames
Frame synchronizer lock range	At least ± 45 ppm	At least ± 45 ppm	At least ± 45 ppm

AES Audio Outputs (AES-Enabled Modules Only)

Balanced AES output specifications are provided for the configuration with SFS6803+BD, OP+SFS+BD, or external baluns, and require the Output AES Interface Control parameter to be set to Balanced (see Setting SFS6803+ and OP+SFS+ Remote Control Parameters (on page 65).

Item	Bala nced Specification	Unbalanced Specification
Standard	AES 3	AES 3, SMPTE 276M
Type	Balanced, transformer coupled	Unbalanced, AC coupled
Connector	44-pin connector; or 3-pin male XLR with external balun	BNC (IEC169-8)
Impedance	110Ω ± 20% (0.1 to 6 MHz)	75Ω
Return loss	N/A	> 25 dB, 0.1 to 6 MHz
Signal amplitude	2 to 7 V pk-to-pk into 110 Ω load	1.0 V pk-to-pk ±10% into 75Ω load
Audio rate	48 kHz	48 kHz
Jitter	± 20 ns	± 20 ns
Rise/fall time	5 ns to 30 ns (10% to 90%)	30 ns to 44 ns (10% to 90%)
Bits	24, 20, or 16	24, 20, or 16
Channel status and user bits	Maintained, but professional mode, 48 kHz. See Appendix A for full details.	

Analog Audio Outputs (SFS6800+AO+T and OP+SFS+AO+T Only)

Item	Specification
Number of inputs	8 mono channels
Connector	Weidmuller 24-pin locking header-socket pair
Output audio level	28 dBu to 16 dBu (adjustable in 2 dB increments)
Output lipedance	66Ω

Item	Specification
Frequency response	< ±0.1 dB @ 0 dBFS (+28dBu), 20 Hz to 20 kHz, typical
THD	> 90 dB @ 1kHz, -1 dBFS = +23 dBu (66 Ω) or -1 dBFS = +17 dBm (600 Ω), typical
SNR	> 100 dB @ -60dBFS
Cross talk	> 95 dB, 20 Hz to 20 kHz, typical
Linearity	< ±1.0 dB (to -100 dBFS), typical

Data I/O Output

Item	Specification
Number of outputs	1
Output connector	BNC (IEC169-8)
Impedance	75Ω

Reference Video

Item	Specification
Level	1 V pk-to-pk +6 dB/-3.5 dB
Signal type	Analog composite 525/625 or tri-level sync (1080i/p/720p)
Connector	BNC per IEC 169-8
Impedance	75Ω
Return loss	> 40 dB up to 10 MHz (typical)

Laser Output (OP+SFS+(C)xxD Only)

OP**+**SFS**+**(C)xxD optical modules comply with laser product performance standards set by the Center for Devices and Radiological Health (except for deviations), pursuant to Laser Notice No. 50, dated July 26, 2001. Additionally, OP**+**SFS**+**(C)xxD modules comply with the provisions of IEC 60825-1.

Optical Specifications for Laser Modules

Laser Module Model	Wavelength (nm)		Output Optical Power	Pulse Duration	Laser Product Class/Laser Radiation Class
OP**+**SFS**+**13D	1310		-7 dBm typical	Continuous	1/I
OP**+**SFS**+**(C)xxD	1270 1290 1310 1330 1350 1370 1430 1450	1470 1490 1510 1530 1550 1570 1590 1610	0 dBm typical		

Optical Port (OP+SFS+(C)xxD and OP+SFS+R+D Only)

Fiber Option Video Output (OP+**SFS**+**(C)xxD)**

Item	Specification
Number of inputs	1
Number of outputs	1
Output connector	BSC2 Optical Coupler
Transmitter signal type	• 3 Gb/s • 1.5 Gb/s
Connector	• SC/PC per IEC 61754-4-1 (standard) • ST/PC per IEC 61754-2 (optional) • FC/PC per IEC 61754-13 (optional)

Optical Port Performance Specifications–Input (Receiver)

Item	Min	Typical	Max	Conditions
Standard Sensitivity PIN Modules (OP+SFS+R+D)				
Input Wavelength	1260 nm	-	1620 nm	
Sensitivity	-	-21 dBm	-20 dBm	3 Gb/s, Pathological (SMPTE 424M SDI check field signal, BER < 1E-10)
	-	-22 dBm	-21 dBm	3 Gb/s, PRBS (2^{23}-1 PRBS, BER < 1E-10)
	-	-22 dBm	-21 dBm	Up to 1.5 Gb/s, pathological (SMPTE 259M, SMPTE 344M, SMPTE 292M SDI check field signal, BER < 1E-10)
	-	-22 dBm	-21 dBm	Up to 1.5 Gb/s PRBS (2^{23}-1 PRBS, BER < 1E-10)
Overload	-1 dBm	0 dBm		BER < 1E-10
High Sensitivity APD Modules (OP+SFS+HI+R+D)				
Input Wavelength	1260 nm	-	1620 nm	
Sensitivity	-	-28 dBm	-27 dBm	3Gb/s, Pathological (SMPTE 424M SDI check field signal, BER < 1E-10)
	-	-28 dBm	-28 dBm	3Gb/s, PRBS (2^{23}-1 PRBS, BER < 1E-10)
	-	-30 dBm	-28 dBm	Up to 1.5Gb/s, pathological (SMPTE 259M, SMPTE 344M, SMPTE 292M SDI check field signal, BER < 1E-10)
	-	-30 dBm	-28 dBm	Up to 1.5Gb/s PRBS (2^{23}-1 PRBS, BER < 1E-10)
Overload	-10 dBm	-7 dBm		BER < 1E-10

Optical Port Performance Specifications–Output (Transmitter)

Item	Min	Typical	Max	Conditions
Fixed Wavelength Modules (OP+SFS+13D)				
Peak wavelength (FP)	1290 nm	1310 nm	1340 nm	
Spectrum width (RMS) (FP)	-	2 nm	4 nm	
Average output power (FP)	-8 dBm	-7 dBm	-6 dBm	
Multiple Wavelength Modules (OP+SFS+(C)xxD)				
Peak wavelength (CWDM)	n-3 nm	n nm	n+3 nm	Peak wavelength n = 1270; 1290; 1310; 1330; 1350; 1370; 1430; 1450; 1470; 1490; 1510; 1530; 1550; 1570; 1590; 1610
Average output power (CWDM)	-1 dBm	0 dBm	+2 dBm	

Item	Min	Typical	Max	Conditions
All Modules				
Extinction ratio	6 dB	8 dB	-	2.1 GHz filter (4th order Bessel filter)
Optical rise time	-	-	135 ps	No filter, 20%~80%
Optical fall time	-	135 ps	150 ps	No filter, 20%~80%

: To prevent overload damage, ensure that you observe the following:

For best results, do not install high-sensitivity (APD) optical receivers on multimode fiber. Due to its dispersion characteristics, multimode fiber is typically limited to shorter distance applications with very little signal attenuation. The resulting power levels may damage the receiver.

Before connecting any standard-sensitivity (PIN) or high-sensitivity (APD) optical receiver to a fiber network, ensure the power level is tested to fall within the published specifications of the receiver. Failure to verify optical power before connection will void the warranty.

To ensure error-free operation, the input power must be less than -7 dBm.

RS-232/RS-422

Item	Specification
Standard	Electrical specification EIA-232C
Connector	• DB-9 • 232/422 switchable

Propagation Delay

Item	Specification	
Video	Frame synchronizer in Delay mode and AV Timing off:	Frame synchronizer bypassed:
	• 1080p 3G: 4.70 μsec • 1080p/i: 9.50 μsec • 720: 9.50 μsec • 525/625: 35.4 μsec	• 1080p 3G: 1.50 μsec • 1080p/i: 3.0 μsec • 720: 3.0 μsec • 525/625: 16.0 μsec
Audio delay	• 3.7 ms (PCM) 0.7 ms (non-PCM)	

*Note:With the **Audio Track Video** parameter set to **Disabled** and **Input Source Select** and **Output Source Select** parameters set to **AES***

Item	Specification
AES IN-AES OUT; SRC ON	3.57 ms
AES IN-AES OUT; SRC OFF	0.72 ms

Power Consumption

Module	Power Consumption
SFS6800**+**	< 12 W
OP**+**SFS**+**R**+**D	< 12 W
OP**+**SFS**+**(C)xxD	< 12 W

Start-Up Time

The start-up time for SFS6803**+** and OP**+**SFS**+** modules is <10 seconds.

Operating Temperature

The operating temperature for SFS6803**+** and OP**+**SFS**+** modules is 41° to 113°F (5° to 45°C).

Audio Bit Manipulation

Manipulating Channel Status Bits (C-Bit)

Channel Status (C-Bits) Data Description

Byte	Bit	Function	RX	TX	Remarks
0	0	[0] Consumer Use [1] Professional Use	N Y	N Y	• RX ignores bit • TX sets bit to 1
0	1	[0] Audio [1] Non-Audio	S S	Y Y	• RX sets up audio channel to pass data (Gain=0 dB, Invert=off) • TX bit passed unmodified or forced, according to Output Chxx Format and Out Chxx Format Fb parameters
0	2 to 4	[000] Not Indicated [100] No Emphasis [110] 50/15 µs [111] CCITTJ17	S S S S	Y Y Y Y	• RX ignores bits • TX passed bits unmodified
0	5	[0] Locked [1] Unlocked	N N	Y N	• RX ignores bits • TX sets bit to [0]
0	6 to 7	[00] Not indicated [01] 48 kHz [10] 44.1 kHz [11] 32 kHz	Y Y Y Y	N Y N N	• RX ignores bits • TX sets bits to [01]
1	0 to 3	[0000] Not indicated [0001] Two channel [0010] Mono [0011] Prim/sec [0100] Stereo [0101] to [1111] Undefined	N N N N N N	Y N N N N N	• RX ignores bits • TX sets bits to [0000]
1	4 to 7	[0000] Not indicated [0001] 192 bit block [0010] AES18 (HDLC) [0011] User defined [0100] to [1111] Undefined	S S S S S	Y Y Y Y Y	• RX ignores bits • TX passes bits unmodified

Byte	Bit	Function	RX	TX	Remarks
2	0 to 2	[000] Aux. bit use is not indicated [001] Aux. bit use is audio data [010] Aux. bit use is co-ordination signal [011] to [111] Undefined	N N N N	Y Y N N	• RX ignores bits • TX sets bits according to transmitted word length
2	3 to 5	[000] Not indicated [001] Max Length–1 [010] Max Length–2 [011] Max Length–3 [100] Max Length–4 [101] Max Length [110] to [111] Undefined	N N N N N N N	N N N N Y Y N	• RX ignores bits • TX sets bits according to transmitted word length
2	6 to 7	[00] Alignment level not indicated [01] Alignment to SMPTE RP155 [10] Alignment to EBU R68 [11] Reserved	N	Y	• RX ignores bits • TX sets bits to [00]
3	0 to 6	bit 7 = 0: Channel number bit 7 = 1: [0,1,2,3] Channel number [4,5,6] Multi-channel mode	N	Y	• RX ignores bits • TX sets bits to [0000000]
3	7	[0] Undefined multi-channel mode [1] Defined multi-channel mode	N	Y	• RX ignores bits • TX sets bits to [0]
4	0 to 1	[00] Not a reference [01] Grade 1 reference [10] Grade 2 reference [11] Undefined	N N N N	Y N N N	• RX ignores bits • TX sets bits to [00]
4	2	Reserved	N	Y	• RX ignores bits • TX sets bits to [0]
4	3 to 6	[0000] Not indicated [1000] 24 kHz [0100] 96 kHz [1100] 192 kHz [1001] 22.05 kHz [0101] 88.2 kHz [1101] 176.4 Hz [1111] User defined	N	Y	• RX ignores bits • TX sets bits to [0000]
4	7	[0] Sample frequency not scaled [1] Sample frequency scaled by 1/1.001	N	Y	• RX ignores bits • TX sets bits to [0]

Byte	Bit	Function	RX	TX	Remarks
5	0 to 7	Reserved	N	Y	• RX ignores bits • TX sets bits to [00000000]
6 to 9	0 to 7	Alphanumeric channel origin data	S	Y	• RX ignores bits • TX passed bits unmodified
10 to 13	0 to 7	Alphanumeric channel destination data	S	Y	• RX ignores bits • TX passed bits unmodified
14 to 17	0 to 7	Local sample address code	S	Y	• RX ignores bits • TX passed bits unmodified
18 to 21	0 to 7	Time-of-day sample address code	S	Y	• RX ignores bits • TX passed bits unmodified
22	0 to 3	Reserved	N	Y	• RX ignores bits • TX passed bits unmodified
22	4	Bytes 0 to 5 reliability flag	N	Y	• RX ignores bits • TX passed bits unmodified
22	5	Bytes 6 to 13 reliability flag	S	Y	• RX ignores bits • TX passed bits unmodified
22	6	Bytes 14 to 17 reliability flag	S	Y	• RX ignores bits • TX passed bits unmodified
22	7	Bytes 17 to 21 reliability flag	S	Y	• RX ignores bits • TX passed bits unmodified
23	0 to 7	CRC	Y	Y	• RX ignores bits • TX calculates CRC on output

Manipulating Validity and User Bits (V-Bit and U-Bit)

V-Bit and U-Bit Data Descriptions

Item	RX	TX	Remarks
Validity (V) bit	S	Y	• RX optionally mutes data if enabled • TX passes bit unmodified
User (U) bit	S	Y	• RX ignores bits • TX passed bits unmodified

Identifying Audio Characteristics(Audio Sampling Frequency and Word Length)

Item	Remarks
Audio sampling frequency	• RX: 32 to 108 kHz • TX: 48 kHz
Audio word length	• RX: 16 to 24 bits • TX: 16 to 24 bits

Laser Safety

WARNING

Use of controls, adjustments, and procedures other than those specified in this document may result in hazardous laser radiation exposure.

Optical fiber telecommunication systems use semiconductor laser transmitters that emit infrared light that is normally not visible to the human eye. Although a conventional laser produces a small beam of light, the power density is very high, and it can cause damage to your eyes.

If a beam of laser light enters the eye, the eye magnifies and focuses the energy on the retina. The energy that reaches the retina can be as much as 100,000 times more than at the cornea and, as a result, it can burn the retina.

Laser transmission products are classified in four major groups (Class 1, 2, 3, and 4), according to their emissions and potential for causing injury. Fiber optic transmitter modules in this series are designated Class 1.

Precautions for Enclosed Systems

In its normal operating mode, an optical fiber communication system is totally enclosed and presents no risk of eye injury. However, if the fiber optic cables that interconnect various components of an optical fiber disconnect or break, you may be exposed to laser emissions. Also, technicians may be exposed to laser emissions during installation and servicing.

Unlike some other laser designs, semiconductor lasers have a highly divergent beam that decreases rapidly with distance. The greater the distance, the less energy will enter the eye, and the less potential risk for eye injury.

> **WARNING**
>
> **Eye damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at the energized fiber end.**

Under normal operating conditions, optical fiber telecommunication systems are completely enclosed; nonetheless, observe the following precautions:

1. Do not stare into optical connectors or broken fibers.
2. Ensure technicians have satisfactorily completed an approved training course before performing installation or maintenance.
3. Ensure there are appropriate warning labels near the optical ports of the modules.

Precautions for Unenclosed Systems

During service, maintenance, or restoration, an optical fiber telecommunication system is considered unenclosed. Under these conditions, follow these practices:

> **CAUTION**
>
> **Only authorized, trained personnel shall be permitted to do service, maintenance, and restoration.**

1. Avoid exposing the eye to emissions from unterminated, energized optical connectors at close distances.
2. Ensure that only authorized, trained personnel use optical test equipment during installation or servicing.
3. Turn off all laser sources before scanning a fiber with an optical test set.
4. Keep all unauthorized personnel away from the immediate area of the optical fiber systems during installation and service.

For guidance on the safe use of optical fiber communication systems in the workplace, consult *ANSI Z136.2, American National Standard for Safe Use of Lasers* in the U.S., or outside the U.S., *IEC-60825, Part 2*.

Labels

The label shown below is applicable to Class 1 laser products.
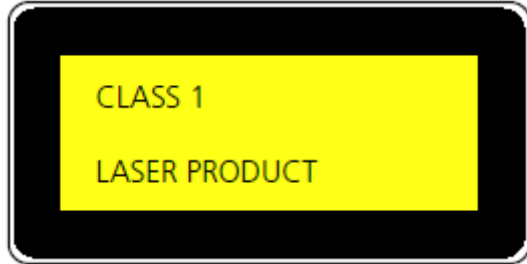
Figure 29: Label for Class 1 Laser Products

Troubleshooting

Software Communication Problems

Problem

The frame is powered up, but the module does not communicate with CCS Navigator or the web GUI interface.

Solutions

- Ensure you have specified the proper module slot.

  See your *6800+ Frame Installation and Operation Manual* for more information about slot identification.

- Confirm there is an 6800**+**ETH module installed in the frame.

- Remove any legacy 6800 series product that is in the frame.

  CCS software cannot communicate with legacy 6800 series products, even if these modules may operate with card-edge controls in the frame. Legacy 6800 products do not have the "**+**" symbol on their extractor handles.

- Check for damaged pins on the back module by following this procedure:

  i.   **i.**Unplug the front module.

  ii. **ii.**Unscrew and remove the back module.

  iii. **iii.**Inspect the 20- or 30-pin spring connector at the bottom of the back module, and verify that the connector does not have any slightly bent, or severely depressed pins.

  iv. **iv.**Carefully reposition any bent or depressed pins. If this is not possible, contact Harris Customer Support.

Figure 30: Typical Back Module Spring Connector

Problem

The IP address of the frame has been forgotten.

Solution

Follow this procedure:

1. Remove the ETH6800**+** module from the frame.
2. Select DIP switch **2** on the ETH6800**+** module and slide the tab to the forward position.

   This sets the ETH6800**+** module to its default IP address of **192.168.100.250**.
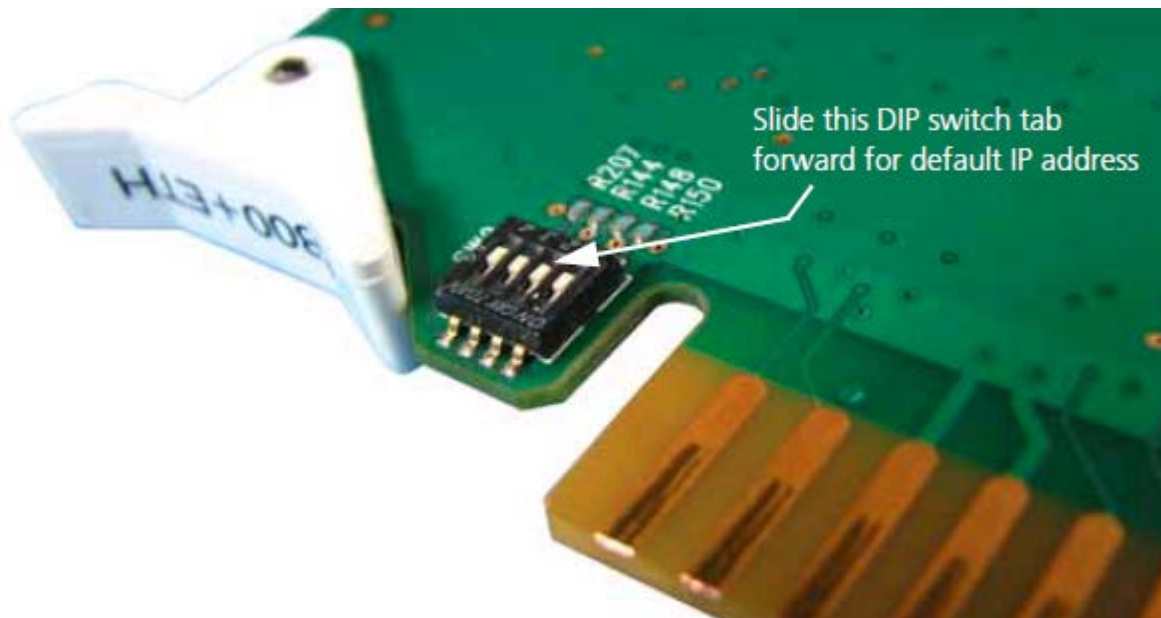
Figure 31: ETH6800+ **DIP Switch**

3. Use CCS Navigator or the web browser to interface with the ETH6800**+** module and then set the desired IP address.
4. Set the DIP switch back to its normal position and then re-insert the module.

Problem

There is no Ethernet connectivity with the frame.

Solutions

- Verify that the correct IP address is being used. If your are not certain, refer to the above procedure to set to default IP.
- Verify that the ethernet cable is the correct type (a *crossover* cable is required for direct connection from a PC).
- Verify the **Link** and **Activity** (left and right) status LEDS are active on the RJ-45 connector at the rear of the frame.
- Verify the **Status** LED is lit and green on the ETH6800+ card, as viewed from the front of the frame with the door open.

- Verify that the security settings on the PC allow for connection to a frame (TCP port 80 and UDP ports 4000/4050 must be open).
- Verify that the PC is configured for and can communicate on the desired subnet.
- Verify that the frame reference signal has not been mistakenly connected to a Communications port on the rear of the frame.

Problem

CCS software sees the frame, but does not find all of the modules.

Solutions

- Remove any legacy 6800 series products.
- Plug your modules in before starting the discovery.
- Start your discovery after the frame and all modules have fully powered up.
- Refresh the CCS software and ensure that the installed modules are fully powered up first before discovery.

Problem

CCS Software does not respond after it is launched.

Solutions

Close any CCS software that is already launched.

Problem

CCS software shows a module in the **Control** window, but cannot control it.

Solution

Follow this procedure:

1. Set the module's Local/Remote jumper to **Remote.**
2. Ensure the module name in the **Control** window matches the module type in the frame.
3. Gently push the module into its slot in the frame to ensure it is seated properly and powered up.
4. Verify that the **Control** window indicates the device is ready.

Hardware Communication Problems

Problem

After a power failure, the frames and PC do not communicate.

Solution

Follow this procedure:

1. Wait four minutes for the frames to recover from the power failure.
2. Close the CCS software, and then restart the PC.
3. Restart the software application.

Problem

The module does not seem to work.

Solutions

*   Ensure the correct frame is powered up.
*   Verify that all appropriate rear connections are secure.
*   Gently push the module into its slot in the frame to ensure it is seated properly. Then verify the **Status** LED on the module is lit and green.
*   Ensure the back module does not have any slightly bent, or severely depressed pins.
    Follow this procedure:
    i.   Unplug the front module.
    ii.   Unscrew and remove the back module.
    iii. Carefully reposition any slightly bent, or severely depressed pins. If this is not possible, contact Customer Support.

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