

Multi-channel processor

# FA-1616 Series



Preliminary



## MULTI CHANNEL PROCESSOR

# FA-1616 SERIES



Multi-channel processor series with essential video production features in a compact 1 RU enclosure. Besides its core role as a frame synchronizer for up to 16 channels, supporting IP/SDI (12G/3G/HD-SDI) and 4K, the FA-1616 series also serves as a color corrector, video processing amp, and audio remapper. Software-defined architecture enables to choose just the right configuration for your needs. Build an optimal system without unnecessary costs by adding exactly what you need with VoIP cards<sup>\*1</sup> and a range of audio (including Dante and MADI) and GPI cards<sup>\*2</sup>.

<sup>\*1</sup> Optional. <sup>\*2</sup> Optional, to be supported.

**Product lineup** → please see page 3 for details.

**FA-1616HB-12G** 12G<sup>\*1</sup>/3G/HD-SDI supported 16 inputs/16 outputs, HD-BNC<sup>\*2</sup> connector model.

**FA-1616B-12G** 12G/3G/HD-SDI supported 16 inputs/outputs<sup>\*3</sup> model.

**FA-1616HB-3G** 3G/HD-SDI supported 32 inputs/outputs<sup>\*3</sup>, HD-BNC<sup>\*2</sup> connector model.

<sup>\*1</sup> 12G compatibility applies to only 8 of the 16 inputs/outputs. <sup>\*2</sup> HD-BNC is a registered trademark of Amphenol Corporation. <sup>\*3</sup> Input or output is selected in a menu for each channel.

■ **Control and monitoring**

- Control from a browser and via Ember+ or NMOS IS-04/05.
- Browser-based control: No need to install a dedicated GUI.
- Ember+ control: Enables control GUI development by users<sup>\*1</sup>.
- SNMP monitoring.
- Management/control system redundancy also ensured, with 2 dedicated LAN ports (1000BASE-T).<sup>\*2</sup>

<sup>\*1</sup> Using Lawo VSM. <sup>\*2</sup> FA-16VOIP is required.

■ **Timecode**

- LTC, ATC (LTC, VITC) time code generating and offset adjustment.
- Equipped with LTC I/O terminals; supports ancillary time code multiplexing.

■ **Others**

- Standard redundant power supply. With the fan, hot-swappable from the front.
- Compact, relatively shallow 1 RU enclosure. 430(W)×500(D)×44(H) mm.

■ **GENLOCK input**

**Features** → please see page 4 for details.

■ **Audio input/output**

- Mux/demux, remap, delay adjustment, and other processing for SDI embedded audio.

■ **Robust frame synchronization**

- Synchronization Mode: Selectable from Frame, Line, AVDL, or Line (Min).

■ **Advanced conversion**

- Interlace/progressive (from HD to 4K).
- Up/down/cross (from HD to 4K).
- Aspect ratio.
- Resize/repositioning.
- 2SI/SQD/3G-SDI Level-A/B conversion.
- Single Link 12G-SDI/Quad Link 3G-SDI interconversion.

■ **ProcAmp**

- Adjustment of video level, chroma level, and hue.

■ **Robust color correction**

- 2 color correction modes: Balance (RGB) mode and color difference (YCbCr) mode.
- Supports and converts between the broad ITU-R BT.2020 gamut and the conventional ITU-R BT.709 gamut.
- Compensates for differences among external devices by using EOTF/OETF corresponding to various HDR or SDR curves.
- EOTF/OETF log curves and gamut can be registered from a computer.
- SDR/HDR conversion designed for an array of log curves (including HLG, PQ, and SDR) and reliable round-trip performance.
- 1D and 3D LUTs supported.

**Main features available from expansion card** → please see page 9 for details.

■ **Video input/output**

- SMPTE ST 2022, SMPTE ST 2110.

■ **Audio input/output**

- Dante, MADI, AES/EBU, analog.

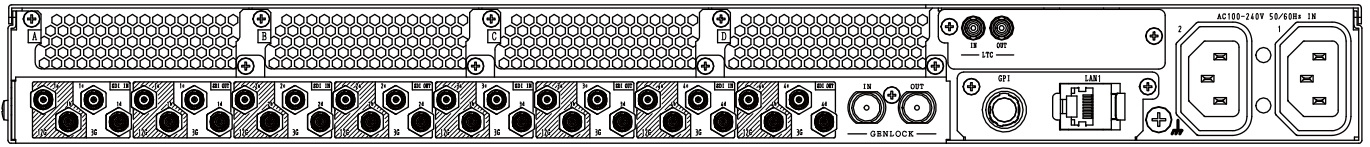
■ **PTP synchronization<sup>\*1</sup>**

- Choose GENLOCK input or PTP for synchronization of each processor installed in processor block<sup>\*1</sup>.

<sup>\*1</sup> Please see page 4 for details of processor block.

## Product lineup

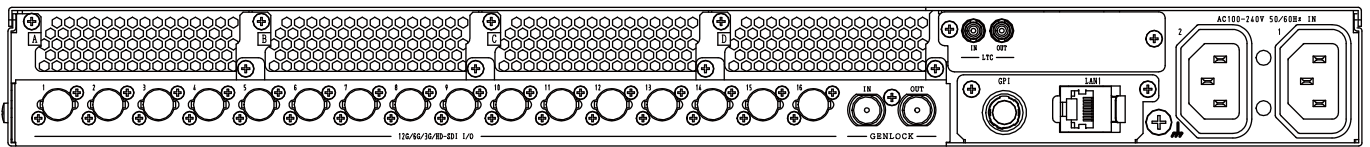
### FA-1616HB-12G



- 12G-SDI<sup>\*1</sup> supported, 16 inputs/16 outputs model.
- 32 HD-BNC connectors are mounted.  
Input: 75Ω HD-BNC ×16, 12G/3G/HD-SDI×8, 3G/HD-SDI×8.  
Output: 75Ω HD-BNC ×16, 12G/3G/HD-SDI×8, 3G/HD-SDI×8.
- IP input/output.  
Add the option(s)<sup>\*2</sup> to choose any mode<sup>\*3</sup>.  
< SMPTE ST 2110 >  
- Transmission only: HD×16/UHD×4.  
- Receive only: HD×16/UHD×4.  
- Transceiver: HD×8/UHD×4.  
< SMPTE ST 2022-6 >  
- Transceiver: HD×16/3G×14.

\*1 12G compatibility applies to only 8 of the 16 inputs/outputs. \*2 FA-16VOIP, FA-16VOIP-EX. \*3 Mode can be set per card. Number of channels indicated is for each card.  
Note: This external view is a tentative version.

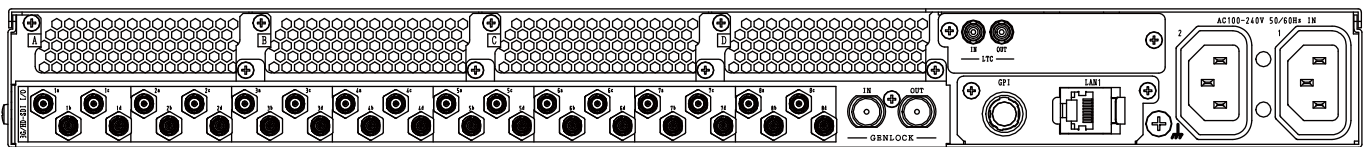
### FA-1616B-12G



- 12G-SDI supported, 16 inputs/outputs<sup>\*1</sup> model.
- All terminals support 12G-SDI.
- 16 normal HD connectors are mounted.  
Input/output<sup>\*2</sup>: 75Ω BNC ×16, 12G/3G/HD-SDI×16.
- IP input/output.  
Add the IP option(s)<sup>\*3</sup> to choose any mode<sup>\*4</sup>.  
< SMPTE ST 2110 >  
- Transmission only: HD×16/UHD×4.  
- Receive only: HD×16/UHD×4.  
- Transceiver: HD×8/UHD×4.  
< SMPTE ST 2022-6 >  
- Transceiver: HD×16/3G×14.

\*1 Input or output is selected in a menu for each channel. \*2 Used for both input and output. \*3 FA-16VOIP, FA-16VOIP-EX.  
\*4 Mode can be set per card. Number of channels indicated is for each card.

### FA-1616HB-3G



- 3G-SDI supported, 32 inputs/outputs<sup>\*1</sup> model.
- 32 HD-BNC connectors are mounted.  
Input/output<sup>\*2</sup>: 75Ω HD-BNC ×32, 3G/HD-SDI×32.
- IP input/output.  
SDI to IP encapsulation and IP to SDI de-encapsulation for up to 32 channels.  
Add the IP option(s)<sup>\*3</sup> to choose any mode<sup>\*4</sup>.  
< SMPTE ST 2110 >  
- Transmission only : HD×16/UHD×4.  
- Receive only : HD×16/UHD×4.  
- Transceiver : HD×8/UHD×4.  
< SMPTE ST 2022-6 >  
- Transceiver : HD×16/3G×14.

\*1 Input or output is selected in a menu for each channel. \*2 Used for both input and output. \*3 FA-16VOIP, FA-16VOIP-EX.  
\*4 Mode can be set per card. Number of channels indicated is for each card.  
Note: This external view is a tentative version.

## Instantly build the system you need with software-defined architecture

FA-1616 units are equipped with 2 processor blocks. Thanks to the processor's software-defined architecture, each block can be customized to get the functions and channels you need. By selecting an optimal configuration\* from 3 choices, hardware resources are applied more efficiently and flexibly for increasingly diverse video production. Instant reconfigurability also makes it a useful portable processor for events with constantly changing requirements.

\* Video processing capacity varies depending on the configuration selected. For details, contact your FOR-A dealer.

### Processor block A / Processor block B

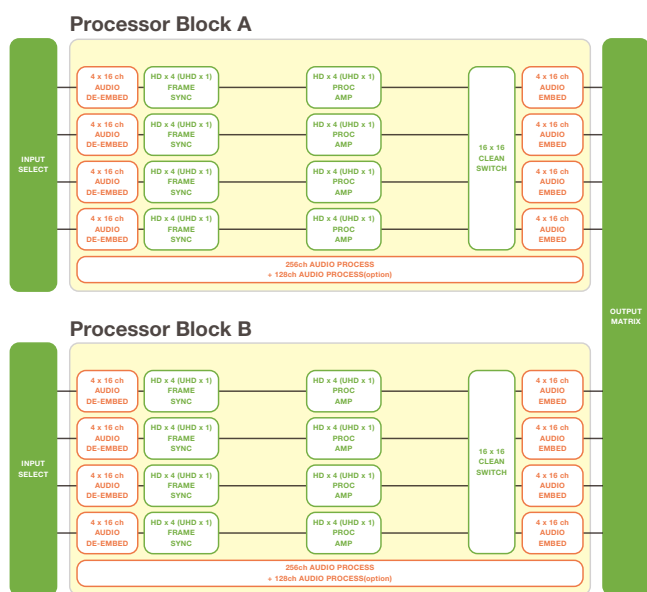
2 blocks process video and audio for output via SDI and IP. Equipped with up to 4 processors each, the blocks can be set up in the same or different configurations, depending on your application.

#### Processing available per video processor

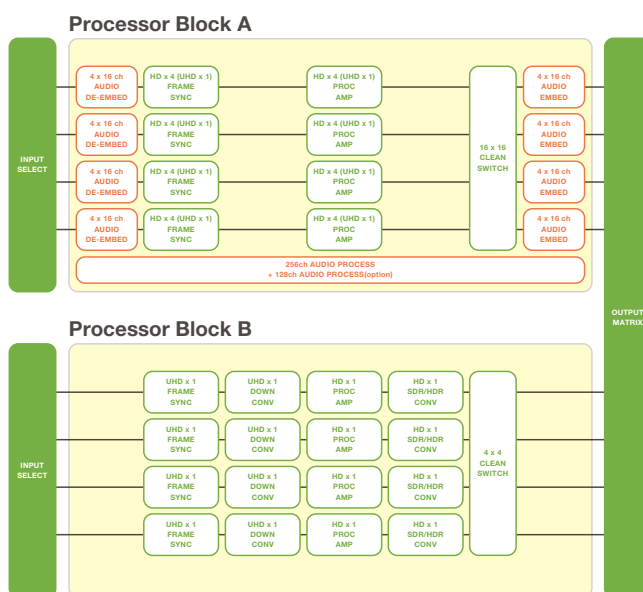
■ Video: 1 channel for 4K or 4 channels for 2K.

■ Audio: 4x16 channels.

#### Configuration example: Same configuration



#### Configuration example: Different configurations



### Table of configurable functions for processor blocks

Available functions will be changed depending upon the chosen configuration.

Frame synchronizer	ProcAmp	Clip function	Test signal output	
RGB color corrector	HDR/SDR conversion	HDR/SDR conversion 1D LUT	HDR/SDR conversion 3D LUT	
Aspect conversion	Resizing/positioning	1080/720 conversion	3G Level-A/B conversion	
Gearbox SQD/2SI conversion	2K → 4K up conversion	4K → 2K down conversion	Frame delay	Simple frame rate conversion
Audio MUX	Audio DEMUX	Audio SRC	Audio remapping	Audio delay
Audio gain				

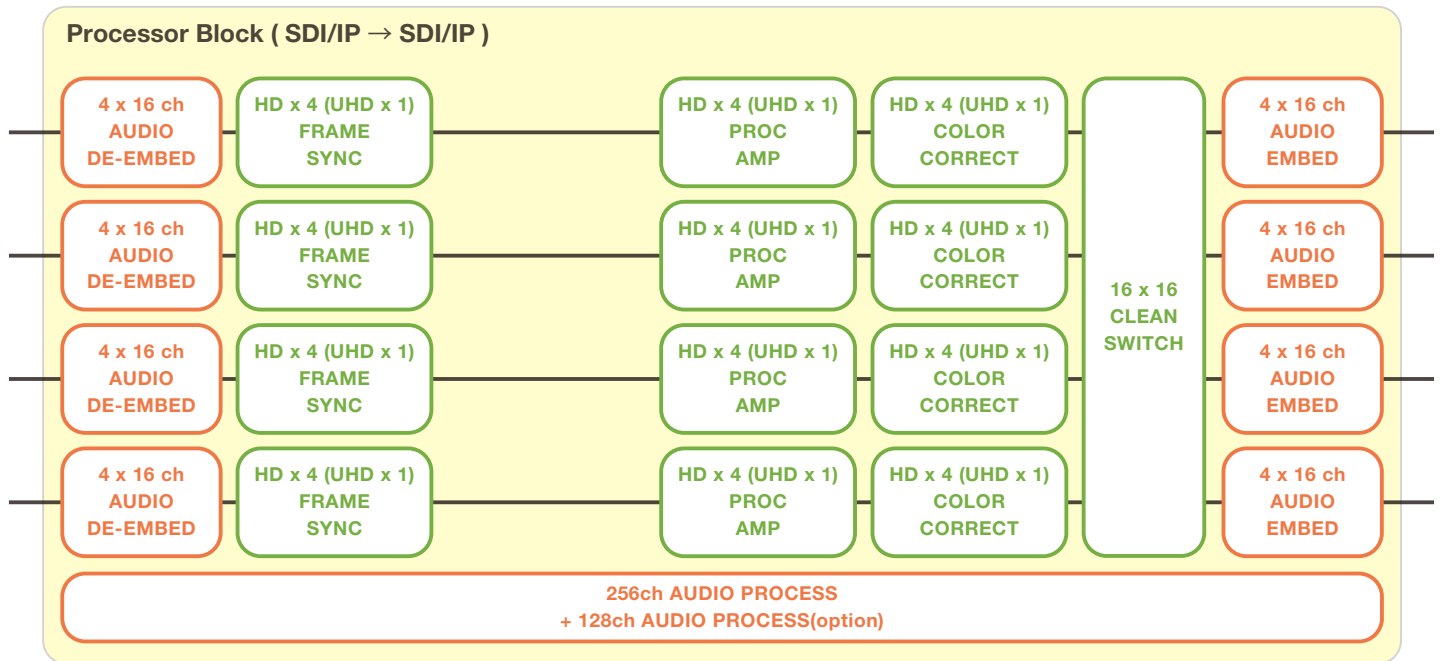
## Configuration lineup selectable according to application

### Configuration 1: Standard configuration

#### Configuration 1 Features

- 4 video processors used for 2K (x4 channels) and UHD (x1 channel). Frame synchronization: up to 16 channels<sup>\*1</sup> for 2K, 4 channels<sup>\*1</sup> for UHD.
- Adding optional VoIP cards enables use as an SDI/IP gateway with FS.
- Audio processing: 256 channels standard. Optional cards enable audio processing for up to 128 additional channels.

<sup>\*1</sup> Configuring both processor blocks (A and B) in this way doubles the number of channels.



#### Table of functions available in Configuration 1

\* Available function is highlighted in yellow.

Frame synchronizer	ProcAmp	Clip function	Test signal output	
RGB color corrector	HDR/SDR conversion	HDR/SDR conversion 1D LUT	HDR/SDR conversion 3D LUT	
Aspect conversion	Resizing/positioning	1080/720 conversion	3G Level-A/B conversion	
Gearbox SQD/2SI conversion	2K→4K up conversion	4K→2K down conversion	Frame delay	Simple frame rate conversion
Audio MUX	Audio DEMUX	Audio SRC	Audio remapping	Audio delay
Audio gain				

## Configuration lineup selectable according to application

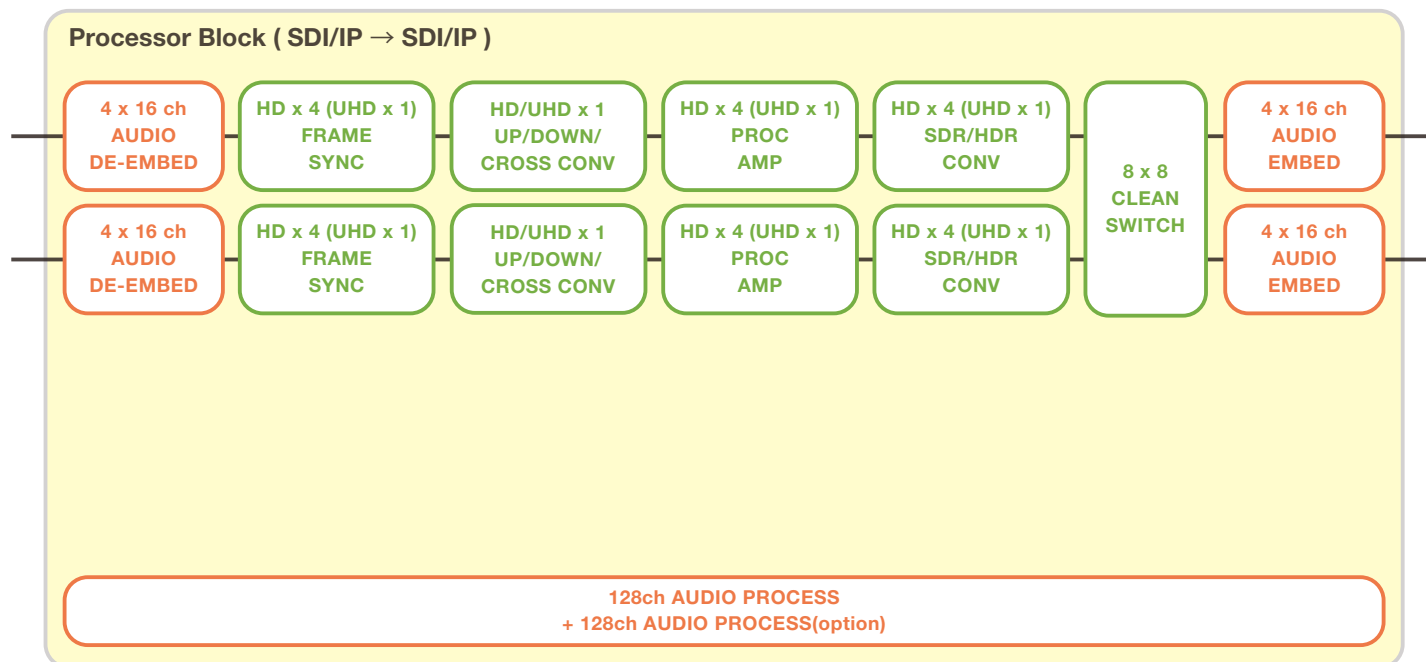
### Configuration 2<sup>\*1</sup>: Optional configuration (Up/down conversion, SDR/HDR conversion)

\*1 To be supported.

#### Configuration 2 Features

- Configuration for switching between upconversion, downconversion, or other processing based on source signals.
- 2 high-performance processors are available.

When using converter functions such as up/down/cross/aspect converter or resizing, only 1 channel can be processed by 1 processor for both HD/4K signals.



#### Table of functions available in Configuration 2

\* Available function is highlighted in yellow.

Frame synchronizer	ProcAmp	Clip function	Test signal output	
RGB color corrector	HDR/SDR conversion	HDR/SDR conversion 1D LUT	HDR/SDR conversion 3D LUT	
Aspect conversion	Resizing/positioning	1080/720 conversion	3G Level-A/B conversion	
Gearbox SQD/2SI conversion	2K→4K up conversion	4K→2K down conversion	Frame delay	Simple frame rate conversion
Audio MUX	Audio DEMUX	Audio SRC	Audio remapping	Audio delay
Audio gain				

## Configuration lineup selectable according to application

### Configuration 3<sup>\*1</sup>: Optional configuration (Up/down conversion, 3D LUT)

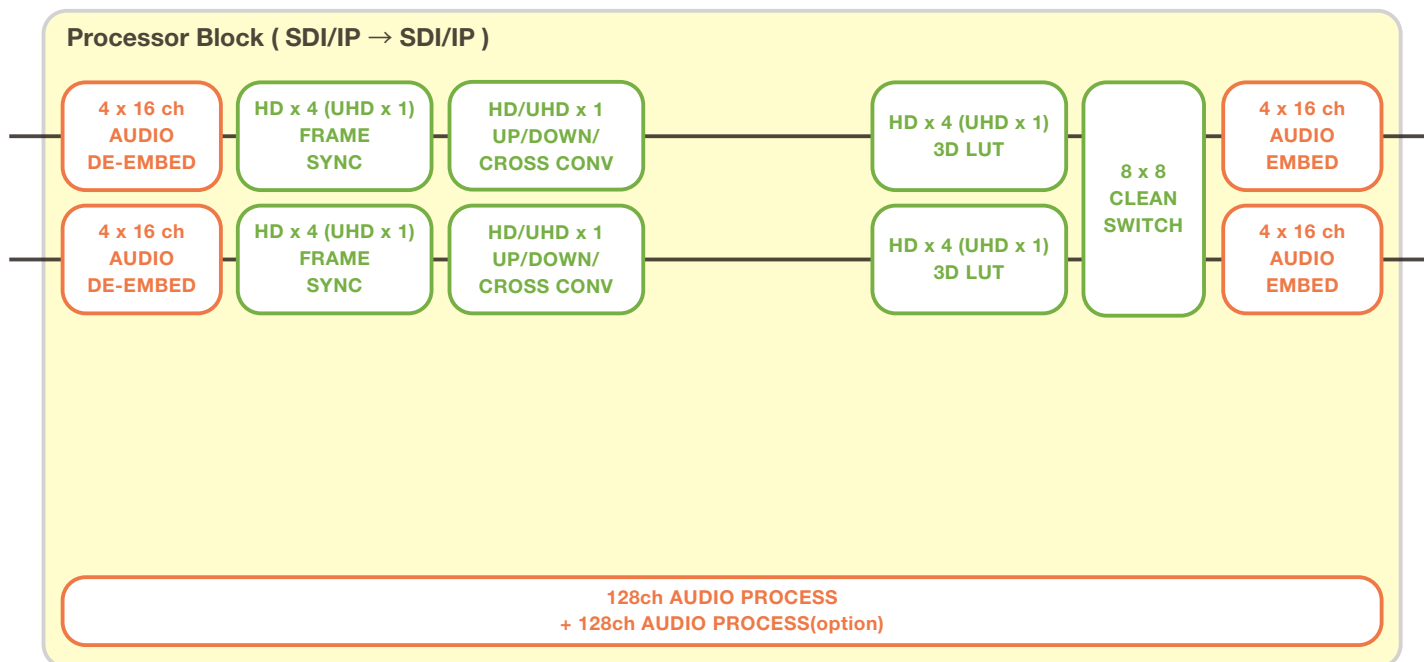
<sup>\*1</sup> To be supported.

#### Configuration 3 Features

- Configuration for switching between upconversion, downconversion, or other processing based on source signals.
- 3D LUT-based upconversion and downconversion supported.
- Without upconversion or downconversion, can also be used as a 3D LUT converter for HD/3G (x8 channels<sup>\*2</sup>) or 4K (x2 channels<sup>\*2</sup>).

<sup>\*2</sup> Configuring both processor blocks (A and B) in this way doubles the number of channels.

When using converter functions such as up/down/cross/aspect converter or resizing, only 1 channel can be processed by 1 processor for both HD/4K signals.



#### Table of functions available in Configuration 3

\* Available function is highlighted in yellow.

Frame synchronizer	ProcAmp	Clip function	Test signal output	
RGB color corrector	HDR/SDR conversion	HDR/SDR conversion 1D LUT	HDR/SDR conversion 3D LUT	
Aspect conversion	Resizing/positioning	1080/720 conversion	3G Level-A/B conversion	
Gearbox SQD/2SI conversion	2K→4K up conversion	4K→2K down conversion	Frame delay	Simple frame rate conversion
Audio MUX	Audio DEMUX	Audio SRC	Audio remapping	Audio delay
Audio gain				

## IP Support

FA-1616 supports SMPTE ST 2110/ST 2022-6 encapsulation and de-encapsulation with an optional VoIP card. It can also be used as an IP gateway for up to 32-channel SDI/VoIP conversion. Add as many as 2 VoIP cards with four 25G SFP ports (2 redundant channels). Ready for production where IP is already in use, where a mix of IP and SDI is used, or where future IP migration is planned.

### ■ Video

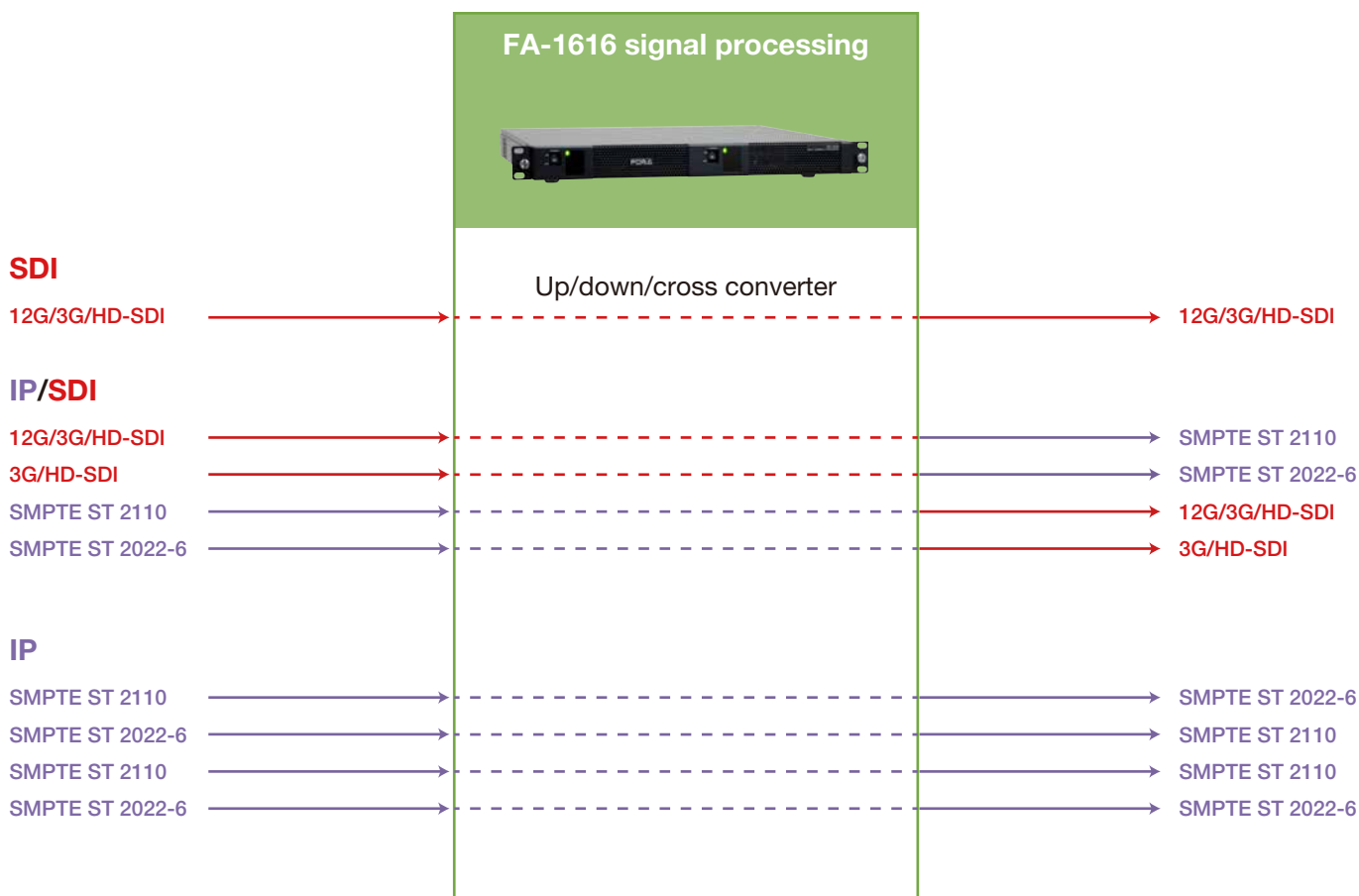
- SMPTE ST 2110/ST 2022-6 encapsulation or de-encapsulation for up to 32 channels.
- Encapsulation/de-encapsulation capacity per VoIP card  
 For SMPTE ST 2110: 16 channels for HD/3G-SDI or 4 channels for 4K.  
 For SMPTE ST 2022-6: 16 channels for HD-SDI or 14 channels for 3G-SDI.
- 2 dual 25 GbE (SFP28) port supports hitless operation for redundancy (SMPTE ST 2022-7).
- 2 VoIP cards can be added to expand capacity and enable SMPTE ST 2022-6/ST 2110 transcoding.

### ■ Audio

- Convert various type of audio data to IP audio data. Audio data received over IP can also be output via an array of optional audio interfaces.

## FA-1616 signal processing

SDI up/down/cross-conversion is supported as well as conversion between SDI/IP and SMPTE ST 2110/ST 2022-6. Besides the added functionality of software-defined architecture and expansion cards, effective signal processing makes the FA-1616 valuable in many production environments.





## Expansion card options

The extensive options available include cards that add IP capabilities and expand audio and GPI interfaces.

### Expansion cards for video over IP

#### FA-16VOIP: Video over IP card

Enables SMPTE ST 2022-6/ST 2110 encap/decap and PTP synchronization. Only one card can be installed.

#### FA-16VOIP-EX: VOIP Expansion card

Expands VoIP functionality. Only one card can be installed. Note: FA-16VOIP is required.

### Expansion cards for audio interface

#### FA-16DNT<sup>1</sup>: Dante audio card

Enables sending/receiving of Dante audio. Supports RJ45x2, RX/TX 64ch each.

Note: Dante® is a registered trademark of Audinate Pty Ltd.

#### FA-16MADI<sup>1</sup>: MADI audio card

Enables input/output of MADI audio. Supports BNCx2, RX/TX 64ch each.

#### FA-16AES-UBL<sup>1</sup>: Unbalanced AES audio card

Enables input/output of AES audio. BNCx4, Rx/Tx switching supported for 8 channels.

#### FA-16AES-PNL<sup>1</sup>: AES audio expansion card

Expands I/O channels for AES audio. BNCx4. Note: FA-16AES-UBL is required.

#### FA-16ANA-AUD<sup>1</sup>: Balanced analog audio card

Enables input/output of analog audio. DSUB-25 pin x1, Balanced audio for 4 Rx and 4 Tx channels.

### Expansion cards for GPI interface

#### FA-16GPI<sup>1</sup>: General purpose interface card

Adds support for GPI control. DSUB-25 pin x 1, 10 inputs + 10 outputs + power + GND.

#### FA-16GPI-PNL<sup>1</sup>: GPI Extension panel

Expands channel control via GPI. DSUB-25 pin x 1. Note: FA-16GPI is required.

<sup>1</sup>To be supported.

## Examples of applications

Production studios are only the start. Can be set up at live/events, in OB vans, and in many other settings.

### Live/Event



- In LED wall staging: Color correction  
Coordinate the colors of LED walls and floors or projections at event venues to create a unified space.
- In LED wall staging: Resizing  
In multi-screen staging, resizing function enables 2 video signals to be enlarged, aligned, or otherwise scaled to fit LED displays.
- Audio selector applications  
With support for SDI embedded audio, SMPTE ST 2110-30, MADI, Dante, AES, and other interface formats, a single FA-1616 unit can integrate the many audio interfaces used at venues. Also useful as an audio selector for remapping, delay or gain adjustment.

### OB vans



- Up to 16 channels of video signals and embedded audio can be managed from a compact 1 RU processor that offers color correction and frame synchronization. In addition, it is possible to select optimum configuration for the operation. In OB vans with size and weight constraints, the FA-1616 series is an ideal solution.

## FA-1616 Series Datasheet

### (FA-1616HB-12G/1616B-12G/1616HB-3G)

#### 1. Specifications

##### Basic specifications

Temperature	0°C to 35°C
Humidity	30% to 90% (no condensation)
Power	AC 100 V to 240 V $\pm$ 10% 50/60 Hz
Consumption	FA-1616HB-12G: Approx 350 W FA-1616B-12G: Approx 350 W FA-1616HB-3G: Approx 350 W
Dimensions	430 (W) x 480 (D) x 44 (H) mm 480 (W) (Including rack mount brackets)
Consumables	Power unit Cooling fan

##### Technical specifications

Video format	2160/50p, 2160/59.94p, 1080/50p, 1080/59.94p, 1080/50i, 1080/59.94i * More formats will be supported sequentially.
Video input/output	
FA-1616HB-12G	Input: 12G/3G/HD-SDI 75-ohm Micro BNC (HD-BNC <sup>(*)</sup> ) x 8 3G/HD-SDI 75-ohm Micro BNC (HD-BNC <sup>(*)</sup> ) x 8 Output: 12G/3G/HD-SDI 75-ohm Micro BNC (HD-BNC <sup>(*)</sup> ) x 8 3G/HD-SDI 75-ohm Micro BNC (HD-BNC <sup>(*)</sup> ) x 8
FA-1616B-12G	Input or output: 12G/3G/HD-SDI 75-ohm BNC x 16
FA-1616HB-3G	Input or output: 3G/HD-SDI 75-ohm Micro BNC (HD-BNC <sup>(*)</sup> ) x 32
VoIP input/output (FA-16VOIP)	IP Media Transmission Standard: ST2110-20, ST2022-6 SFP28 MSA (25 GbE) x 4 (ST2022-7 redundancy)  Input/output < SMPTE ST 2110 > - Transmission only: HD x 16 / UHD x 4 - Receive only: HD x 16 / UHD x 4 - Transceiver: HD x 8 / UHD x 2  < SMPTE ST 2022-6 > - Transceiver: HD x 16 / 3G x 14
(FA-16VOIP-EX)	Same as above
Color sampling	YCbCr 4:2:2 10-bit
Genlock	Input: BB (NTSC or PAL) or Tri-level Sync 75-ohm BNC x 1 Output: BB (input loop-through or generated from PTP) 75 $\Omega$ BNC x 1
Timecode	Input: LTC (SMPTE 12M) DIN 1.0/2.3 x 1 Output: LTC (SMPTE 12M) DIN 1.0/2.3 x 1
Sync mode	Frame, Line, AVDL, Line(Min)

Converter (optional)	Up-/down-converter Conversion for color space and dynamic range
Frame delay (optional)	Max 4 frames (support planned)
Color processing	Proc Amp: Video level, Chroma level, Black level, Hue Color corrector: Balance (RGB) mode, Differential (YCbCr) mode Video clip: Knee Clip (RGB), YCbCr Clip
SDI audio	Input: 12G/3G/HD-SDI 16 channels 48 kHz 16- to 24-bit Synchronous / Asynchronous audio Output: 12G/3G/HD-SDI 16 channels 48 kHz 16/20/24-bit Synchronous / Asynchronous audio
AES/EBU audio	
(FA-16AES-UBL)	BNC x 4 (AES/EBU input or output) 8 channels Input: 32/44.1/48kHz 16-24-bit 75-ohm 1.0 Vp-p unbalanced Output: 48 kHz 16-24-bit 75-ohm 1.0 Vp-p unbalanced
(FA-16AES-PNL)	BNC x 4 (AES/EBU input or output) 8 channels Input: 32/44.1/48kHz 16-24-bit 75-ohm 1.0 Vp-p unbalanced Output: 48 kHz 16-24-bit 75-ohm 1.0 Vp-p unbalanced * FA-16AES-UBL required
Analog audio (FA-16ANA-AUD)	25-pin D-sub (female) x 1 Input: 4 channels 600-ohm/Hi-Z balanced Output: 4 channels 100-ohm balanced 24-bit 48 kHz (A/D D/A and internal processing)
MADI audio (FA-16MADI)	Input: 56/64 channels (PCM) 32/44.1/48kHz 16-24-bit 75-ohm BNC x 1 Output: 56/64 channels (PCM) 48kHz 16/20/24-bit 75-ohm BNC x 1
Dante audio input/output (FA-16DNT)	1000BASE-T RJ-45 x 2 (Primary/Secondary) Input: Max: 64 channels 44.1/48 kHz 16/24-bit Output: Max: 64 channels 48 kHz 16/24-bit
Audio delay adjustment	1 ms to 1,000 ms
Audio processing (optional)	Sample Rate Converter, Gain control, Downmix, Remap, Mute
Interface	
Ethernet	VoIP control (w/ FA-16VOIP): 100BASE-TX/1000BASE-T RJ-45 x 2 * Teaming available Device control and monitoring: 100BASE-TX/1000BASE-T RJ-45 x 1
Control protocol	Ember+, SNMP (monitoring) NMOS (w/ FA-16VOIP)
GPI	Standards: Round connector (7-input/output) FA-16GPI: 25-pin D-sub (female) x 1 (10 inputs, 10 outputs) FA-16GPI-PN: 25-pin D-sub (female) x 1 (10 inputs, 10 outputs) * FA-16GPI required

(\*) HD-BNC is a trademark of Amphenol Corporation

**Options**

FA-16VOIP	VoIP card
FA-16VOIP-EX	VoIP expansion card
FA-16DNT	Dante audio card
FA-16MADI	MADI audio card
FA-16AES-UBL	Unbalanced AES audio card
FA-16AES-PNL	AES audio expansion panel
FA-16ANA-AUD	Balanced analog audio card
FA-16GPI	General purpose interface card
FA-16GPI-PNL	GPI expansion panel

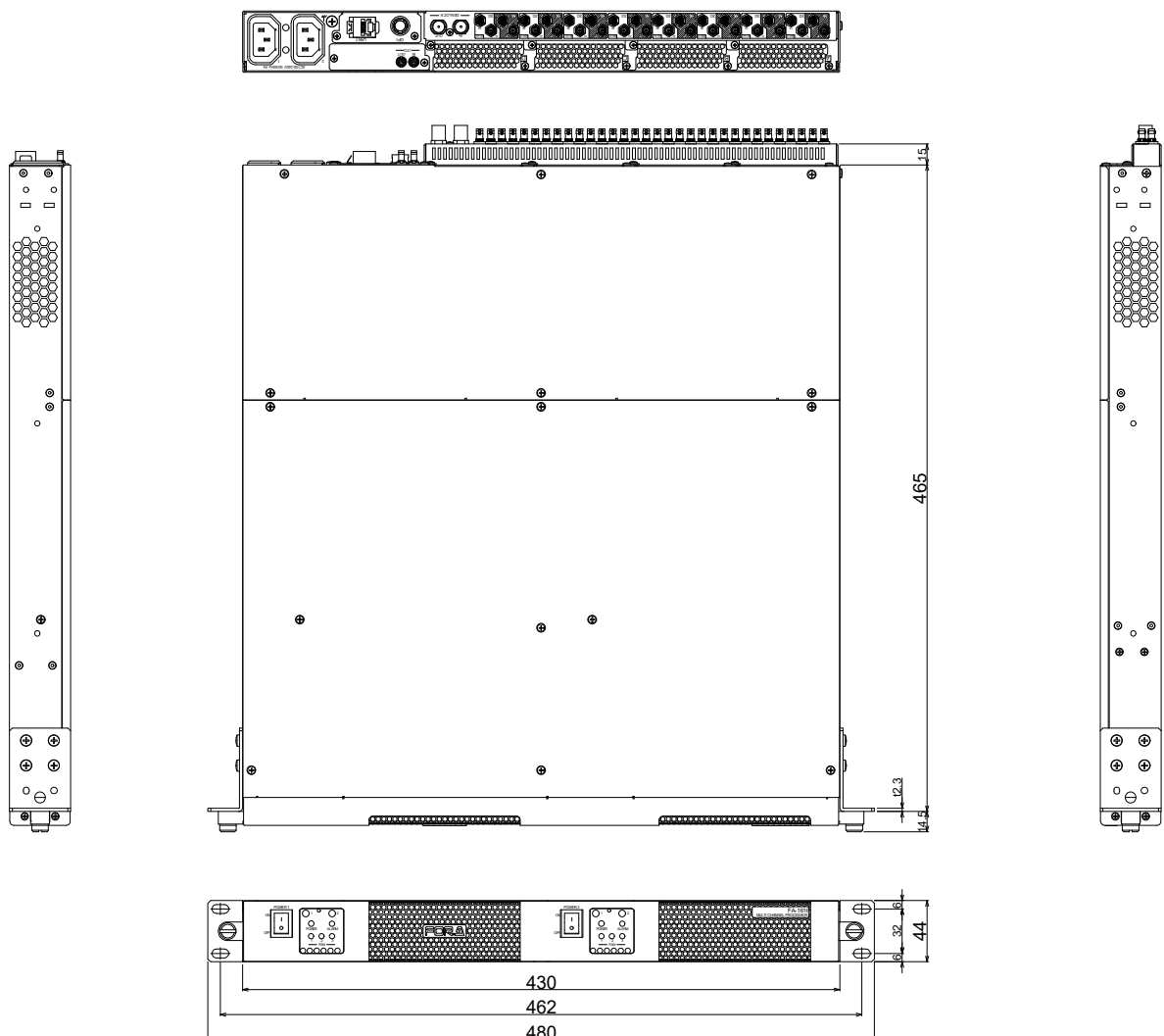
**Accessories**

AC cord, Rubber feet, EIA rack mount brackets, CD-ROM, and Quick setup guide

**2. External Dimensions**

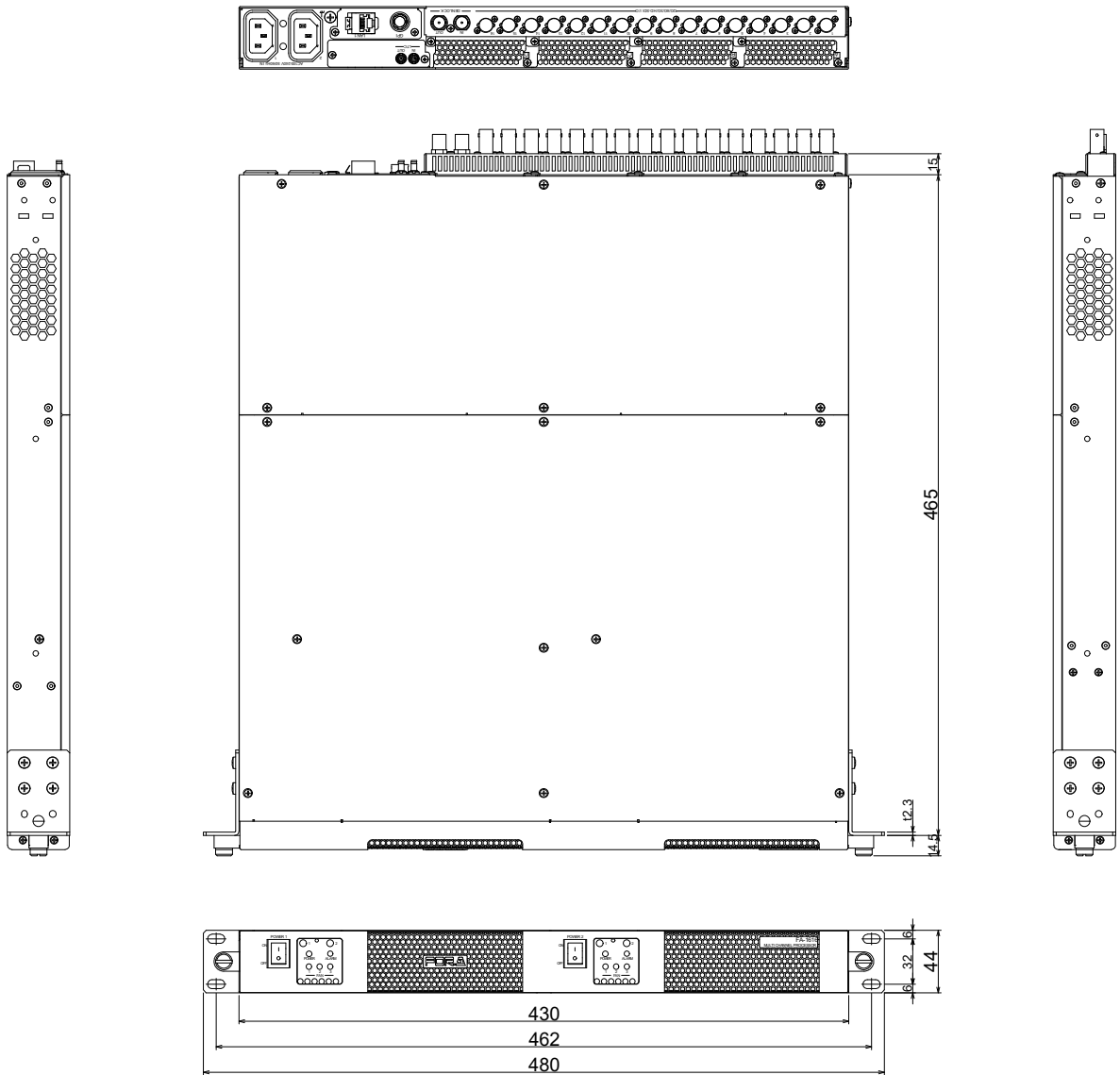
**FA-1616HB-12G**

(All dimensions in mm.)



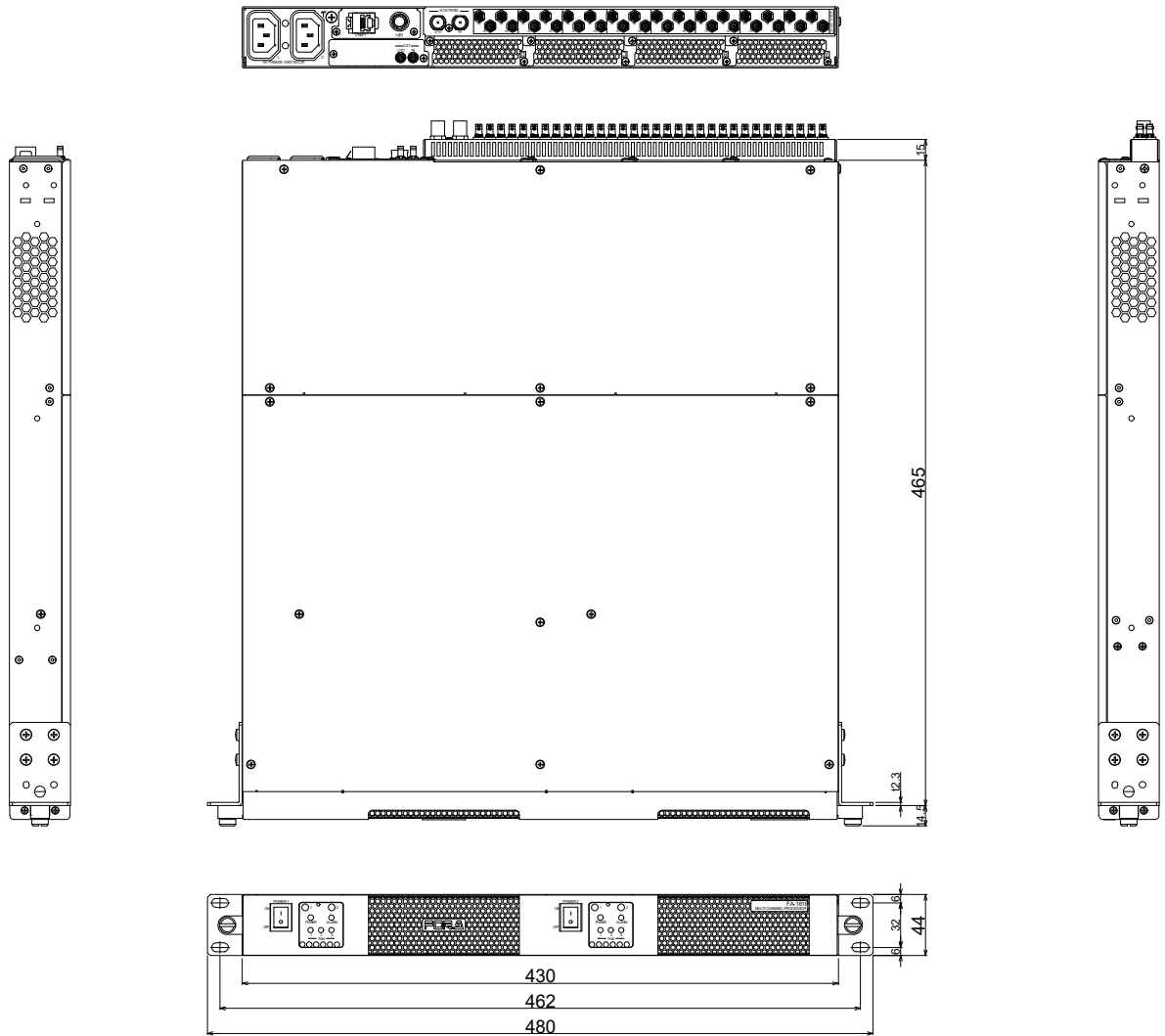
**FA-1616B-12G**

(All dimensions in mm.)



**FA-1616HB-3G**

(All dimensions in mm.)





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