FRC-7000
HD Frame Rate Converter
Supporting High-Definition Frame Rate Conversion

Using the highest quality video processing to achieve superior image conversion results. The HD Frame Rate Converter FRC-7000 is the ultimate product incorporating the essence of FOR-A's expertise in video processing technology. Frame synchronizer, video stabilizer, DVEs in video switchers, and other FOR-A products used around the world have already served as a testament to our high-definition conversion performance.

At first glance, the FRC-7000 looks like a simple product that only converts the frame rate. Inside, however, it features numerous video processing technologies that cannot be matched by anyone else.

**Supported Formats**

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<th>Conversion</th>
<th>Supported Formats</th>
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<td>1080p/PsF to 1080i*</td>
<td>1080p/PsF to 1080p/PsF*</td>
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<td>1080i to 1080p/PsF*</td>
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**Motion Compensation Technology**

One major problem with linear converters performing simple frame rate conversion is their inability to perform suitable conversion on moving objects. In the FRC-7000, FOR-A’s long experience in video processing technology was used to develop a motion compensation processing technique based on motion vectors. The motion vector of the object is detected, and movement of the interpolation frame object is generated based on the objects amount of vector movement in the frames just before and after the calculated area. The result is frame rate conversion with minimum judder.

**Scene Cut Detection**

Another problem in frame rate conversion is the processing of scene changes. Because an interpolation frame is generated from the frames before and after, the process can fail to convert the video properly by combining the frames before and after the scene boundary. The FRC-7000 incorporates a scene cut detection function. Scene changes are automatically detected so that frame rate conversion is performed without using motion compensation processing on unrelated data for the frames before and after scene cuts.

**Progressive Format Support**

Improvements to motion estimation/compensation performance now enable smooth motion conversion even when converting from low frame rates to high frame rates such as from 1080/23.98PsF to 1080/59.94i. (1080p/1080PsF format support requires the FRC-70PSFC option.) These improved functions provide better conversion accuracy even when converting between interlaced formats such as from 1080/59.94i to 1080/50i.

**Conversion of Video with Subtitles**

A function is available for converting video with imposed elements such as subtitles. Appropriate image processing is performed by the specifying the corresponding area so that conversion is performed without harming the visibility of the subtitles.

**AES/EBU Digital Audio Support**

Installation of the optional FRC-70DA or FRC-70DA16 enables input of asynchronous/synchronous digital audio signals. This enables building of a flexible audio system by combining with stereo four-channel internal processing (sample rate conversion/individual delay adjustment function) and a remapping function.
**Other Features**

**Embedded Audio Support**
Support is provided for 8-channel 48-kHz 24-bit embedded audio signals. It also includes a delay function for synchronization with video processing. Conversion is possible without phases between the video and audio. (Please inquire when support will be available for asynchronous embedded audio signals.)

**Dolby E and AC-3 Support**
Adding the FRC-70D-D or FRC-70DE-E to the FRC-70DA or FRC-70DA16 option enables Dolby E data decoding/encoding and AC-3 decoding using only the FRC-7000.
The FRC-70DA/70DA16 also includes a BB output terminal in synchronization with input and output SDI. Synchronous signals can be supplied to external Dolby E/AC-3 equipment. Even when users already have Dolby E decoder/encoder equipment, this allows significant simplification when building Dolby E systems, which tend to grow in complexity when performing rate conversion.

**Genlock**
The video and audio signals in frame rate conversion are output in synchronization with synchronizing signals supplied internally or externally. Two independent input terminal channels are provided for synchronizing signals, and tri-level sync or BB can be selected for input.

**Process Control**
Process control is possible for post-conversion video. The video level, chroma level, chroma phase, setup level, and clips can be adjusted to produce the optimum video.

**Alarm Output**
Includes alarm tally output for indicating power supply, fan, and temperature errors.

**Test Signals**
Includes a color bar, lamp signals, and 1kHz embedded audio output for signal checking.

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**Options**

**FRC-70PSFC 1080p/PsF Support**
Improvements to motion estimation/compensation performance now enable smooth motion conversion even when converting from low frame rates to high frame rates such as from 1080/23.98PsF to 1080/59.94i.

**FRC-70DA Digital Audio Multiplexer/Demultiplexer**
An audio expansion card to add to the FRC-7000. Enables multiplexing/demultiplexing of asynchronous/synchronous digital audio signals (AES/EBU) for the FRC-7000 video signal.

**FRC-70DA16 Digital Audio Multiplexer/Demultiplexer**
Expanded version of the audio expansion card FRC-70DA for adding to the FRC-7000. Supports up to 16 channels of audio signals.

**FRC-70D-D Dolby E/AC-3 Decoder**
A Dolby E and AC-3 decoder card that can be installed to the FRC-70DA. Input Dolby E or AC-3 signals can be output as AES/EBU or embedded into HD-SDI signals.

**FRC-70DE-E Dolby E Encoder**
A Dolby E encoder card that can be installed to the FRC-70DA. Enables output of audio signal embedded in HD-SDI signal or AES/EBU input signal as Dolby E signal.

**FRC-70RU Remote Control Unit**
Remote control unit for the FRC-7000.

**FRC-70WEB Remote Control Software**
A Control software for the FRC-7000. Enables remote control and status monitoring of the FRC-7000 from a computer web browser.
Specifications

- Standards: 1080/60i, 1080/59.94i, 1080/50i, 720/60p, 720/59.94p, 720/50p
- Standards (FRC-70PSFC)*1: 1080/30p, 1080/30PsF, 1080/29.97p, 1080/29.97PsF, 1080/25p, 1080/25PsF, 1080/24p, 1080/24PsF, 1080/23.98p, 1080/23.98PsF
- Conversion Directions: 1080 to 1080i, 720p to 720i
- Conversion Directions (FRC-70PSFC)*2: 1080p/psF to 1080i, 1080p/psF to 1080psF, 1080i to 1080p/psF
- Video Inputs: HD SDE: 1.485/1.001Gbps, 75Ω, 1 input, BNC
- Reference Input: BB: NTSC: 0.37Vp-p/PAL: 0.405Vp-p or Tri-level sync: ±0.35V, 75Ω or loopthrough, 2 inputs, BNC
- Reference Output (FRC-70DA or FRC-70DA16)*2: NTSC: 0.37Vp-p/PAL: 0.405Vp-p, 75Ω, 2 channels, 2 output, BNC
- Video Output: HD SDE: 1.485/1.001Gbps, 75Ω, 1 channel, 4 outputs, BNC (Output 1 functions as bypass output)
- Quantization: Y: 10-bit, C: 10-bit
- Sampling Frequency: Y: 74.25MHz or 74.25/1.001, C: 37.125MHz or 37.125/1.001MHz
- Process Control: Video level: ±30% (0.5% step) Chroma level: ±30% (0.5% step) Chroma phase: ±0.5° (0.5° step) Setup level: ±30% (0.5% step) Clip Y: 100% ON/OFF, Y0% ON/OFF, C100% ON/OFF
- Phase Control: System horizontal phase: ±512 clk, ±511 clk, System vertical phase: ±512 H, ±511 H
- I/O Delay: +100 ~ +340 ms (Based on input/output format) (i.e., Delay during conversion from 1080/59.94i to 1080/50i: Approx. 105 ms)
- Audio Input (FRC-70DA)*2: 1/2 - 7/8: AES/EBU Unbalanced, 75Ω
- Audio Output (FRC-70DA)*2: 1/2 - 7/8: AES/EBU Unbalanced, 75Ω, 4 inputs, BNC (4 stereo channels)
- Audio Output (FRC-70DA)*2: AUX (AES/EBU) 1 channel or Dolby E: Unbalanced, 75Ω, 1 input, BNC
- Audio Output (FRC-70DA)*2: AUX (AES/EBU) 1 channel or Dolby E: Unbalanced, 75Ω, 1 output, BNC
- Audio Input (FRC-70DA16)*2: 1/2 - 15/16: AES/EBU Unbalanced, 75Ω, 2 inputs, BNC (8 stereo channels or Dolby E or AC-3)
- Audio Input (FRC-70DA16)*2: 1/2 - 15/16: AES/EBU Unbalanced, 75Ω, 4 inputs, BNC (18 stereo channels or Dolby E or AC-3)
- Audio Input (FRC-70DA16)*2: AES/EBU input only: 32 kHz, ±4.1 kHz possible(±27.8bit, 20bit, 10bit)
- Audio Delay: +5 ~ +350 ms (± 1 ms steps, four stereo channel pairs can be adjusted separately)
- Audio Remapping Function (Quantization): Individual settings are possible for embedded output, AES/EBU/output*2, internal Dolby E encoder input*2
- Time Code Input/Output (FRC-70DA or FRC-70DA16)*2: Ancillary time code support, reader/generator function
- Interfaces: Alarm output: 1 port, 13-pin D-sub (female) (Power, fan, and temperature alarm)
- Temperature / Humidity: 0°C ~ 40°C / 30% ~ 85% (no condensation)
- Power Consumption: 100VAC, 50/60Hz / Approx. 440VA (Approx. 440W) (When 100VAC supplied, at maximum output current)
- Dimensions / Weight: 430 (W) x 132 (H) x 500 (D) mm ELA 3RU / Standard: Approx. 17kg (with one power supply unit), Full option: Approx. 20kg
- Accessories: Operation manual, AC cord, Rack mount brackets

Options
- FRC-70PS: Redundant power supply unit
- FRC-70PSFC: Redundant power supply unit
- FRC-70DA: Digital audio card (8 channels)
- FRC-70DA16: Digital audio card (16 channels)
- FRC-70DA-E: Dolby E encoder
- FRC-70PSFC: 1080p/psF support option
- FRC-70WEB: Control GUI
- FRC-70RU: Remote control unit

*1: When the FRC-70PSFC option is installed *2: When the FRC-70DA or FRC-70DA16 option is installed

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