

Crystal Vision

TANDEM HD

HD/SDI AUDIO EMBEDDER/DE-EMBEDDER

TANDEM HD-20 is the ideal product for all High Definition embedding and de-embedding applications - whether you need a straightforward embedder/de-embedder or whether you're seeking a feature-packed product with two group handling, audio processing and sophisticated routing.

Flexibility is at the heart of TANDEM HD-20, with its ability to be configured in many different ways. It can be used as an embedder for one or two groups of analogue or digital audio. Alternatively it can be used as a de-embedder for one or two groups of analogue or digital audio. Should you need it, TANDEM HD can even embed one group and de-embed the other.

The functionality is defined by input and output piggyback modules which fix on to the 100mm x 266mm motherboard. Fit one piggyback for one audio group and two piggybacks for two groups. There is a choice of six piggybacks to suit every application.

HD-DIP2	Digital audio input piggyback	For embedding AES
HD-DIP2-RS	Digital audio input piggyback with resampler	For embedding asynchronous AES
HD-DOP2-110	110Ohm balanced digital audio output piggyback	For de-embedding 110Ohm AES
HD-DOP2-75	75Ohm unbalanced digital audio output piggyback	For de-embedding 75Ohm AES
HD-AIP2	Analogue audio input piggyback	For embedding analogue audio
HD-AOP2	Analogue audio output piggyback	For de-embedding analogue audio

Need something different? Just fit alternative piggybacks to completely transform the product. The ability to work with SDI as well as all common HD formats brings further flexibility to this versatile board.

No other product offers such powerful audio routing. Full channel shuffling is provided by a 16 x 8 mono router which will allow you to rearrange the audio tracks between the two groups.

With audio replace an input piggyback can be used to overwrite some of the original audio channels from the HD or SDI feed. An optional audio delay of up to 64ms will compensate for any video processing, with each audio channel routed either directly or via the delay.

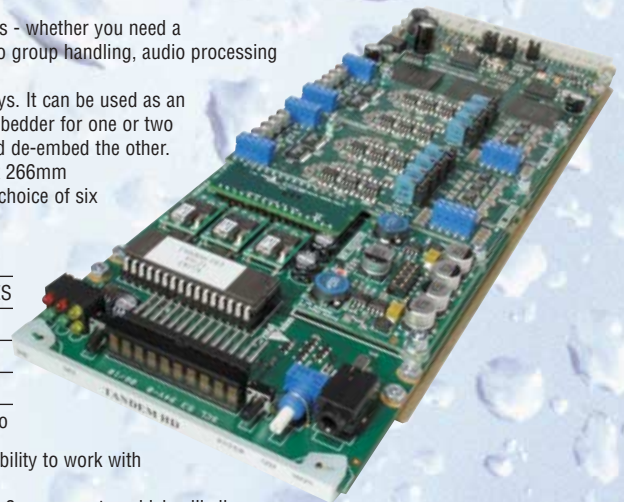
The audio level can be increased or decreased to match the rest of your system: each mono audio channel offers individual gain control, adjustable between +3dB and -3dB in 0.1dB steps. Audio channels can be muted, while stereo to mono conversion helps those broadcasting a multi-language service. TANDEM HD-20 can be used without piggybacks for applications with a requirement simply to change the gain or shuffle the audio channels.

One of the great things about TANDEM HD-20 is its extensive Dolby E handling. It can embed and de-embed Dolby E, mix AES and Dolby E in a single group and overwrite the Dolby E of a single group.

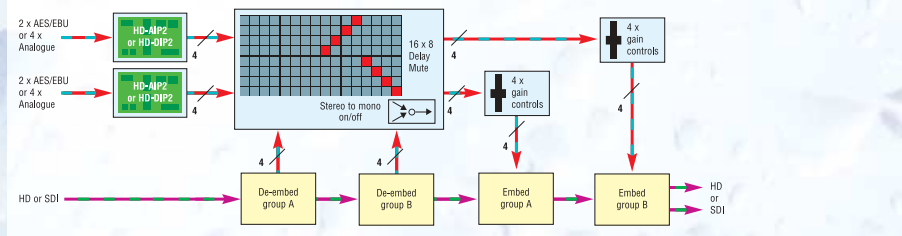
Forward error correction ensures audio quality is maintained, while a headphone socket on the front of the board can be used to preview the audio sources.

Ideal for any environment that uses High Definition with embedded audio, TANDEM HD-20 is extremely straightforward to operate. It is the first product to include the intuitive new board edge interface which, using two select buttons, a shaft encoder and a display, allows you to instinctively and quickly locate any option from menus structured in the most logical way possible. Control can additionally be from an active front panel on the frame, a remote panel or the Statesman PC software.

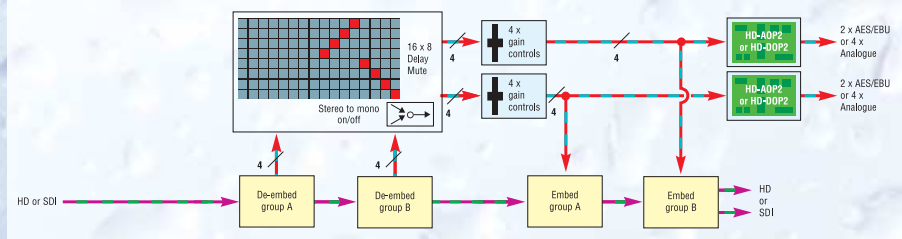
TANDEM HD-20 fits in the standard frames (available in 4U, 2U, 1U and desk top box) and can be used with two frame rear modules to access all the inputs and outputs: select the RM33 if you're using analogue audio or 110Ohm AES and the RM39 if you're using 75Ohm AES.



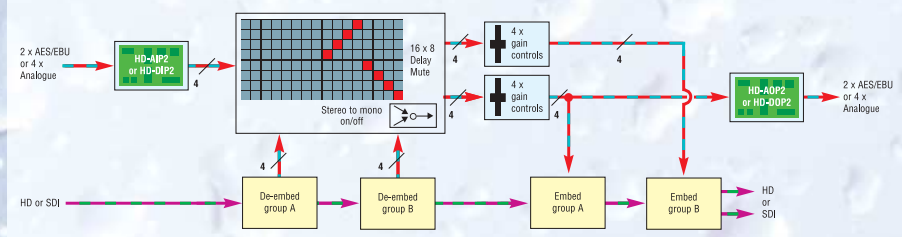
TANDEM HD-20 as two group audio embedder



TANDEM HD-20 as two group audio de-embedder



TANDEM HD-20 as mixed audio embedder/de-embedder for one group



A new version of TANDEM HD coming in early 2007 includes the additional function of a switchable one frame video delay - useful for matching Dolby E audio delays.

SPECIFICATION

TANDEM HD-20 MOTHERBOARD

MECHANICAL

Standard Crystal Vision module 266mm x 100mm
Weight (with two piggyback modules fitted): 260g
Power consumption: 12 Watts

VIDEO INPUT

One HD or SDI input
270Mbit or 1.485Gbit serial compliant to EBU 3267-E, SMPTE 259M and SMPTE 292M
All common High Definition formats supported
HD cable equalisation up to 140m with Belden 1694 or equivalent (approx. 100m with Belden 8281). Cable lengths are for new HD version of frames. SD cable equalisation >250m Belden 8281 or equivalent
Input return loss: -15dB for 5MHz to 1.5GHz
Automatic de-embedding to SMPTE 272M or SMPTE 299M

VIDEO OUTPUTS

Two HD or SDI outputs using RM33 or RM39 frame rear modules
Serial output: 270Mbit to 1.485Gbit serial compliant to EBU 3267-E, SMPTE 259M and SMPTE 292M
Output follows the input format
Audio is embedded to SMPTE 272M or SMPTE 299M

AUDIO INPUTS AND OUTPUTS

Piggybacks can be added to the main board to enable either input or output of 2 x AES or 2 x analogue stereo pairs. Fit one piggyback for one audio group or two piggybacks for two audio groups
Use HD-AIP2, HD-DIP2 or HD-DIP2-RS to input analogue, synchronous AES or asynchronous AES audio
Use HD-AOP2, HD-DOP2-75 or HD-DOP2-110 to output analogue, 750ohm AES or 1100hm AES audio

EMBEDDER TIMING PERFORMANCE

Interchannel: <1 clock cycle
Audio to video: embed and de-embed delays approximately 800us in SD and 90us in HD
De-embedder automatically handles asynchronous and synchronous audio

MONITORING

One miniature front mounted audio jack and switch selects individual stereo audio analogue monitoring on both embedder and de-embedder

EDH

EDH insertion on SD output

DOLBY E

Dolby E signals can be processed and routed without corruption

AUDIO DELAY

Adjustable audio delay of up to 64ms on each channel. Delay is either on or off for any given channel
Pre-settable and controllable via the card, frame active front panel, remote panel and Statesman

DELAY THROUGH BOARD

Less than one line

AUDIO REPLACE

Routing of input piggyback audio together with audio or Dolby E from up to two de-embedded groups present on video input to any channel of up to two output embedder groups

AUDIO PROCESSING

Gain level adjustment on each channel between +3dB and -3dB in 0.1dB steps with 0dB calibration
Mute
Stereo to mono conversion

AUDIO PROTECTION IN DE-EMBEDDERS

Full support for data recovery using SMPTE 299M error correction codes
A variety of sophisticated techniques are employed to protect and minimise the effects of cuts to untimed and asynchronous SDI

LED INDICATION OF:

Power supplies on board
HD input present
SD input present
GPI error output (alarm) active
Audio levels calibrated

GPI INPUT LEVELS

Active pull to ground, pulled up to +5V through 10kOhm

GPI OUTPUT LEVELS

Electrically: Open collector transistors 30V, 2700hm current limit resistors. Pulled up to +5V through 7kOhm

GPI INPUTS

Four GPI inputs can be used to recall stored presets

GPI OUTPUTS

Two GPI outputs have programmable alarm outputs

LOCAL CONTROL

New intuitive board edge interface with two select buttons, shaft encoder and 10 character alphanumeric display
All functions available from board edge

REMOTE CONTROL

RS422/485
19200 baud, 8 bits, 1 stop no parity
Control from frame active front panel and remote panel
Statesman allows control from any PC on a network
All functions available from Statesman. All main functions available from frame active front panel and remote panel

HD-AIP2 DUAL ANALOGUE AUDIO INPUT PIGGYBACK

AUDIO INPUTS

Two analogue stereo pairs or four mono channels. 24 bit quantising A to Ds. High input impedance (20kOhm) balanced

INPUT LEVEL RANGE

0dBFS = +28dBu max / 0dBFS = +12dBu min
Factory set default: 0dBFS = +18dBu or +24dBu by on board link

SIGNAL TO NOISE

99dB (+18dBu) rms., 22Hz to 22kHz typ.

TOTAL HARMONIC DISTORTION

0.004% THD+N rms., 22Hz to 22kHz typ.

INTERCHANNEL CROSSTALK

-110dB at 1kHz, -90dB at 20kHz, rms., typ.

HD-DIP2 AND HD-DIP2-RS DUAL DIGITAL AUDIO INPUT PIGGYBACKS

AUDIO INPUTS

Two 24 bit stereo pairs. AES3 1100hm or HiZ (balanced) D-Type, or AES3-id (unbalanced) 750hm BNC. Set by on board jumper links

Synchronous audio to video 48kHz

Asynchronous audio to video 48kHz + or - 50ppm

HD-DIP2-RS is used for asynchronous AES inputs or AES at different sample rates (30kHz to 108kHz eg. 44.1kHz CD players or 96kHz DVD players)

TOTAL HARMONIC DISTORTION

0.0002%

HD-AOP2 DUAL ANALOGUE AUDIO OUTPUT PIGGYBACK

AUDIO OUTPUTS

Two analogue stereo pairs or four mono channels. 24 bit quantising D to As. Low output impedance (660hm) balanced

INPUT LEVEL RANGE

0dBFS = +28dBu max / 0dBFS = +12dBu min
Factory set default: 0dBFS = +18dBu or +24dBu by on board link

SIGNAL TO NOISE

99dB (+18dBu) rms., 22Hz to 22kHz typ.

TOTAL HARMONIC DISTORTION

0.002% THD+N rms., 22Hz to 22kHz typ.

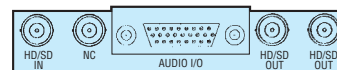
INTERCHANNEL CROSSTALK

-110dB at 1kHz, -90dB at 20kHz, rms., typ.

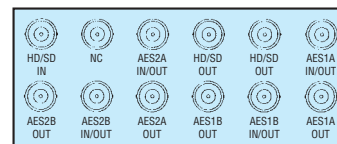
HD-DOP2-110 AND HD-DOP2-75 DUAL DIGITAL AUDIO OUTPUT PIGGYBACKS

AUDIO OUTPUT

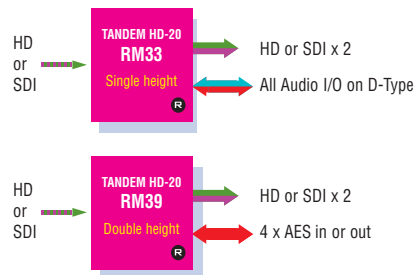
Two 24 bit AES/EBU stereo pairs
AES: DOP2-110 1100hm balanced D-Type or DOP2-75 750hm unbalanced BNC



RM33



RM39



ORDERING INFORMATION

TANDEM HD-20	HD/SDI single embedder or de-embedder for one or two groups of analogue or digital audio (allows fitting of one or two audio piggybacks)
HD-AIP2	Analogue audio (two stereo pairs) input piggyback
HD-AOP2	Analogue audio (two stereo pairs) output piggyback
HD-DIP2	750hm, 1100hm, HiZ AES/EBU (two stereo pairs) input piggyback. 48kHz only, synchronous to video input
HD-DIP2-RS	Resampling version of HD-DIP2. 30-108kHz AES/EBU
HD-DOP2-110	1100hm AES/EBU balanced (two stereo pairs) output piggyback
HD-DOP2-75	750hm AES/EBU unbalanced (two stereo pairs) output piggyback
DCDCV18	18 Volt regulator for analogue audio configurations (one required if analogue audio piggyback fitted)
Indigo 4	4U frame with passive front panel for up to 24 Crystal Vision modules
Indigo 4SE	4U frame with passive front panel fitted with Statesman CPU for up to 24 Crystal Vision modules
Indigo 2	2U frame with passive front panel for up to 12 Crystal Vision modules
Indigo 2AE	2U frame with active front panel for up to 12 Crystal Vision modules
Indigo 2SE	2U frame with passive front panel fitted with Statesman CPU for up to 12 Crystal Vision modules
Indigo 1	1U frame with passive front panel for up to six Crystal Vision modules
Indigo 1A	1U frame with active front panel for up to six Crystal Vision modules
Indigo 1S	1U frame with passive front panel fitted with Statesman CPU for up to six Crystal Vision modules
Indigo DT	Desk top box with passive front panel for up to two Crystal Vision modules
Indigo DTA	Desk top box with active front panel for up to two Crystal Vision modules
Indigo DTS	Desk top box with passive front panel fitted with Statesman CPU for up to two Crystal Vision modules
RM33	Single slot frame rear module. Allows maximum number of TANDEM HD-20s in frame (24 in 4U, 12 in 2U, six in 1U, two in desk top box). Suitable for analogue or 1100hm digital audio. Allows all audio connections and both SDI outputs
RM39	Two slot frame rear module. Allows 12 TANDEM HD-20s in 4U, six in 2U, three in 1U and one in desk top box. Suitable for 750hm digital audio. Allows all audio connections and both SDI outputs
REMIND	19" remote control panel
Statesman	PC Control System

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