Crystal Vision

UP-DOWN 3G

Up/down/cross converters

Up-Down 3G allows flexible up, down and cross conversions between 3Gb/s, HD and SD sources, provides an output picture of exceptional quality and includes special features to allow studios to easily operate in HD and SD at the same time – with its ability to perform two different conversions simultaneously and give out co-timed dual outputs that remain unchanged in format, even if the input changes.

Available in five different versions to suit all applications, Up-Down 3G offers a wide range of features including integrated fibre I/O connectivity, four group audio handling, audio routing, AFD insertion and reading, timecode conversion and handling of teletext and subtitles data.

Up-Down 3G is a space-saving 100mm x 266mm module which is housed alongside any other product in the standard Crystal Vision frames – available in 4U, 2U, 1U and desk top box sizes. The inputs and outputs are accessed by using the RM41 frame rear module or the RM57 for fibre applications.

The flexible control options include board edge switches, an active front panel on the frame, a remote control panel, SNMP and the Statesman PC software.

THE MAIN FEATURES

Look at the comparison chart on page 4 to find out which versions of Up-Down 3G have which features...

- Up/down/cross converter, available in five versions (as Up-Down 3G, Up-Down-A 3G, Up-Down-AFD 3G, Up-Down-AT 3G and Up-Down-ATX 3G)
- Up, down and cross convert any sources: accepts 3Gb/s, HD or SD input
- Get an output picture of exceptional quality: with motion adaptive video de-interlacing, Crystal Vision's acclaimed proprietary down conversion including four vertical filter characteristics, adjustable detail enhancement and noise reduction
- Easily output HD and SD copies of a feed at the same time: perform two different conversions simultaneously
- Smart routing means there's no need to change your wiring: 3G/HD and SD will always be output on the same pins even if the input format changes
- Easy for your signals to all have the same timing: each output will either be converted from the input or given a matching delay
- Use it for all sorts of applications, including live playout: will reconfigure itself instantly should the input format change
- Ideal as your main signal path up/down/cross converter in embedded environments: use it with up to four groups of embedded audio
- Use the 8 x 8 stereo router to shuffle your embedded audio or select which groups to embed into the output stream
- Optional integrated fibre input/output connectivity means you won't be limited by cable lengths
- Easily deal with any aspect ratio conversion requirements when up and down converting, with Anamorphic, Letterbox, Pillarbox and Full Screen conversions and customised picture size, position and cropping
- Let it automatically select the aspect ratio for you: use the SMPTE 2016 AFD data, WSS or Video index embedded in the input – with live update
- Help downstream equipment to select the correct aspect ratio: insert SMPTE 2016 AFD data, WSS or Video index into the output
- Compensate for video delays generated by other equipment, with the variable video delay of up to one frame
- Maintain your picture's colour fidelity: use the RGB and YUV lift and gain controls
- Flag up faulty video and audio signals and provide warnings of any problems using Statesman alarms or SNMP traps
- Let it help your system timing: all versions can pass Ancillary Timecode from the input to the output and set the phase of the interlaced output based on the ATC data
- Convert timecode as you up and down convert: can translate between HD Ancillary Timecode and SD DVITC
- Carry teletext and subtitle information across different definitions when up converting, with OP-47 data stream creation
- Space-saving: 100mm x 266mm module allows 12 Up-Down 3G in 2U (24 in 4U, six in 1U and two in desk top box), or six Up-Down 3G in 2U if a DA6 is fitted (12 in 4U, three in 1U and one in desk top box)
- Flexible control, including PC software

Up conversions	Down conversions
SD to 720p	720p to SD
SD to 1080i	1080i to SD
SD to 1080p	1080p to SD

Cross conversions	
720p to 1080i	1080i to 1080p
720p to 1080p	1080p to 1080i
1080i to 720p	1080p to 720p

EXCEPTIONAL PERFORMANCE

Up-Down 3G regularly wins evaluations on its output picture quality – with the quality so good that it has been specified by some broadcasters as their mandatory up/down/cross converter.

The up and cross conversion uses motion adaptive video de-interlacing, which maximises the picture's vertical resolution while choosing the best processing method based on the video content. On the up and cross conversion there is both adjustable detail enhancement and noise reduction. Up converting will give an apparently softer picture and therefore adjustable detail enhancement allows the image to be sharpened without ringing, with the options of using either the Fine Detail Enhancement to apply sharpening to the entire image, or the Edge Enhancement to apply sharpening only to object edges. Noise reduction ensures that MPEG encoders do not waste unnecessary bandwidth on detail that is not really part of the picture.

Up-Down 3G also features Crystal Vision's acclaimed proprietary down conversion, which avoids aliasing while retaining picture sharpness. The sophisticated two dimensional filtering gives broadcast results without the complication of looking at multiple fields or movement detection – resulting in reliable, artefact-free conversion. Four alternative vertical filter characteristics (sharpest, sharp, soft and softest) are additionally available for those who want to optimise the performance for their material when down converting.

For further picture improvements there's a video proc-amp, with RGB and YUV lift and gain controls allowing independent digital image adjustments in both the RGB and YUV domains to help maintain colour fidelity.

PERFORM TWO CONVERSIONS AT THE SAME TIME (AND GET DUAL OUTPUTS)

The combination of project-winning picture quality and configurable dual outputs makes Up-Down 3G a very special up/down/cross converter.

Up-Down 3G can perform two conversions at the same time, with two separate converters on the board: one is used for the up and cross conversion, with the other used for the down conversion. This makes it the perfect up/down/cross converter for the installations that work in multiple definitions: it allows them to simultaneously create HD and SD copies of a feed from this one board and so easily fulfil their requirement to offer both HD and SD programming.

Up-Down 3G gives co-timed dual outputs, with two output groups – A and B. Each output group can be individually selected as either SD or 3G/HD, making it possible to configure both outputs as SD, both outputs as 3G/HD (720p, 1080i or 1080p), or one output as 3G/HD with the other as SD. If Outputs A and B are both selected as 3G or HD, then the outputs will be identical. Providing two copies of Output A and three copies of Output B also reduces the need for additional distribution amplifiers in the system. It's easy for the signals to all have the same timing: each output will either be converted from the input or given a matching delay as required – enabling the use of common audio.

One of Up-Down 3G's particularly powerful features is that it will constantly put out HD and SD on the same pins regardless of the input, thanks to its smart routing. Once set, the output selection will remain true irrespective of any change in the input format – which means you won't need to change your wiring.

By fitting a DA6 top board which gives six reclocked feeds of the input, Up-Down 3G becomes a 'double decker' board and takes two frame slots, and requires an RM34 to be used with either the RM41 or RM57 to create a double height rear module.

Up-Down 3G can be used for any applications – including studio and live playout. It can reconfigure itself cleanly in a single frame blanking period should the input format change, with the aspect ratio able to be changed live on air.

FIBRE CONNECTIVITY – ON THE BOARD
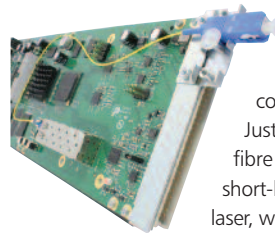
If you need to up and down convert signals from beyond your local equipment bay, it's easy to give Up-Down 3G integrated fibre connectivity – and still only use a single frame slot. Just order either the FIP fibre input option or FOP fibre output option. Designed for SMPTE 297-2006 short-haul applications the FIP and FOP use a Class I laser, with the FIP used to receive an optical input and the FOP to transmit an optical output. With a FIP fitted you can select your video input source to be taken either from the input BNC or the optical input. Having the fibre integral to the board reduces the need to use up additional rack space for separate fibre optic transmitters and receivers – as well as saving you money.

ASPECT RATIO CONVERSIONS

Up-Down 3G has the ability to deal with any aspect ratio conversion requirements when up and down converting. When up converting there is the option of selecting a 16:9 Anamorphic conversion for 16:9 SD systems and either a 4:3 to 16:9 Pillarbox, 4:3 to 14:9 Pillarbox compromise, or 4:3 to 16:9 Full Screen for 4:3 SD systems. When down converting you can select a 16:9 Anamorphic output for 16:9 SD systems and either a 16:9 to 4:3 Letterbox, 16:9 to 14:9 Letterbox compromise, or 16:9 to 4:3 Full Screen with centre cut for 4:3 SD systems.

Each of these aspect ratios can be individually adjusted away from the default values to create customised versions by using independent sets of size, position and crop controls.

Up-Down 3G also ensures the picture is the right shape at all times by coping with both analogue and digital SD blanking widths. When analogue blanking width is selected, the Anamorphic conversion uses 702 pixels of SD (rather than 720 pixels) to create the 1920 pixels of 1080i or 1080p, and all other aspect ratios are adjusted by a similar amount. This prevents an HD signal having black lines down the side when up converting, and prevents SD signals from losing the sides of the picture when down converting.

Up-Down-AFD 3G, Up-Down-AT 3G and Up-Down-ATX 3G additionally offer AFD code activated aspect ratio conversion. (See the next section.)

ACTIVE FORMAT DESCRIPTION, VIDEO INDEX AND WSS
(UP-DOWN-AFD 3G, UP-DOWN-AT 3G AND UP-DOWN-ATX 3G)

HD programmes are often made of a mixture of true High Definition sources and SD-originated sources that have been up converted, and the AFD data in the signal gives information about which areas of the screen contain a picture and which areas have black 'padding'. Up-Down-AFD 3G, Up-Down-AT 3G and Up-Down-ATX 3G all include AFD functionality.

The boards can automatically select the appropriate output aspect ratio according to the SMPTE 2016 AFD data, Video index or WSS embedded in the input video – with live update of the aspect ratio thanks to their ability to instantly reconfigure. The effect of the AFD data varies depending on the conversion being done, with three auto modes available: Auto 16:9, Auto 4:3 and Auto Adaptive. (See the Specification for full information.)
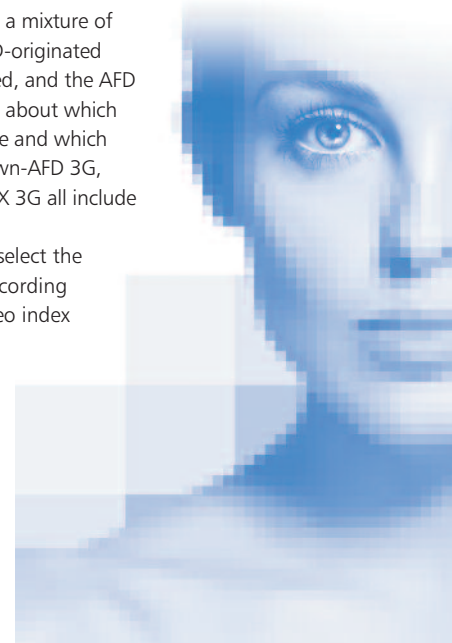
They can also be used to provide picture format information to downstream equipment, by inserting SMPTE 2016 AFD data, Video index and WSS into the video output – either manually or by following the incoming AFD.

MATCH VIDEO DELAYS IN YOUR SYSTEM

Up-Down 3G can compensate for video delays generated by other equipment in your system: on top of the minimum fixed delay of one frame minus 16 lines there is a fully flexible variable video delay of up to one frame plus 16 lines, adjustable in one line steps.

FLAG UP FAULTY VIDEO SIGNALS

All versions of Up-Down 3G have video signal probe functionality making them useful for flagging up faulty signals, especially in multi-channel applications. The status indications available are input missing, video black, video frozen and input incompatible, with Up-Down 3G able to provide warnings of any problems via Statesman alarms or SNMP traps. Video black and video frozen can be delayed before an alarm is asserted to prevent false alarming during brief video pauses.

FOUR GROUP EMBEDDED AUDIO HANDLING
(ALL VERSIONS EXCEPT UP-DOWN 3G)

The boards can be used with up to four audio groups – making them ideal as your main signal path up/down/cross converter if you're working with embedded audio. They will de-embed the four groups and convert them to the appropriate format before re-embedding them. A matching audio delay of up to one frame can be added to match the video conversion and so co-time the video and audio.

FLAG UP FAULTY AUDIO SIGNALS
(ALL VERSIONS EXCEPT UP-DOWN 3G)

Audio signal probe functionality makes the boards useful for flagging up faulty signals. The status indications available are audio missing and audio silent, with warnings of any problems provided by Statesman alarms or SNMP traps. All parameters can be delayed before an alarm is asserted to prevent false alarming during quiet audio periods.

ROUTING YOUR AUDIO
(UP-DOWN-AT 3G AND UP-DOWN-ATX 3G)

Up-Down-AT 3G and Up-Down-ATX 3G provide audio routing by stereo channel. The 8 x 8 stereo router allows the order of the embedded audio to be shuffled between all four groups and means you can select which of the audio groups are embedded in the output stream – useful for those working with one group of audio in SD and two groups in HD.

DEALING WITH TIMECODE
(WITH FULL FUNCTIONALITY ON UP-DOWN-AT 3G AND UP-DOWN-ATX 3G)

All versions can pass Ancillary Timecode from the input to the output and use the ATC data to get the interlace phasing correct when down converting from 1080p or 720p.

Up-Down-AT 3G and Up-Down-ATX 3G also provide conversion of timecode. When up converting they can read Digital Vertical Interval Timecode (DVITC, SMPTE 266M-2002) on the SD input and translate it to Ancillary Timecode (ATC, SMPTE 12M-2-2008) on the HD output. When down converting, they can take in timecode as ATC ancillary data and can generate a DVITC analogue timecode waveform on the SD output.

DEALING WITH SUBTITLES AND TELETEXT
(UP-DOWN-ATX 3G ONLY)

The Up-Down-ATX 3G version includes its own special feature: the ability to carry teletext and subtitle information across different definitions. Ideal for 50Hz video users, it supports OP-47 which is a way of transporting System B teletext data in HD or 3Gb/s video. When up converting it will take the teletext data out of the analogue coded signal and put the same data in the OP-47 data stream it creates.

REAR MODULE CONNECTIONS
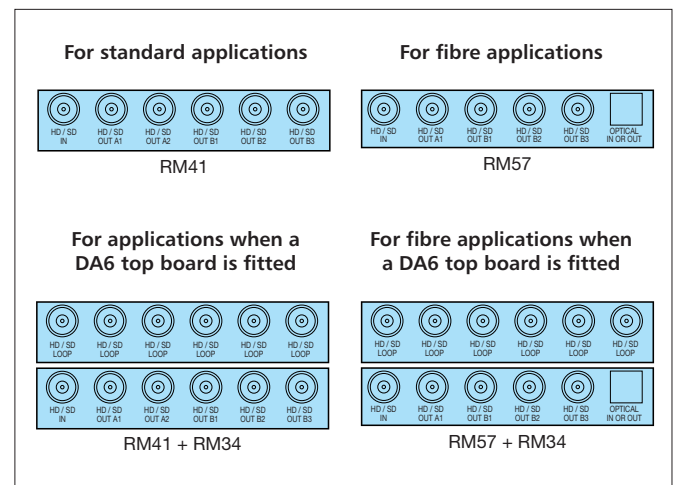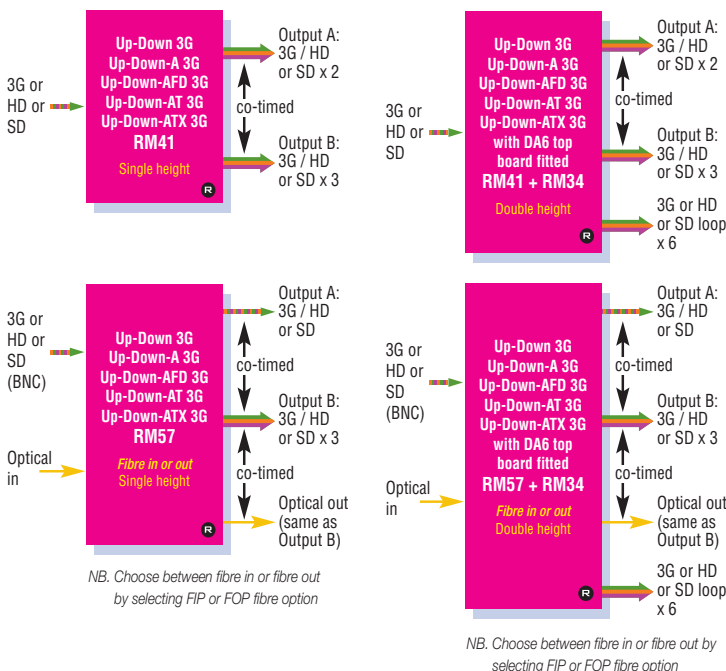
CHOOSING THE RIGHT UP-DOWN 3G FOR YOU

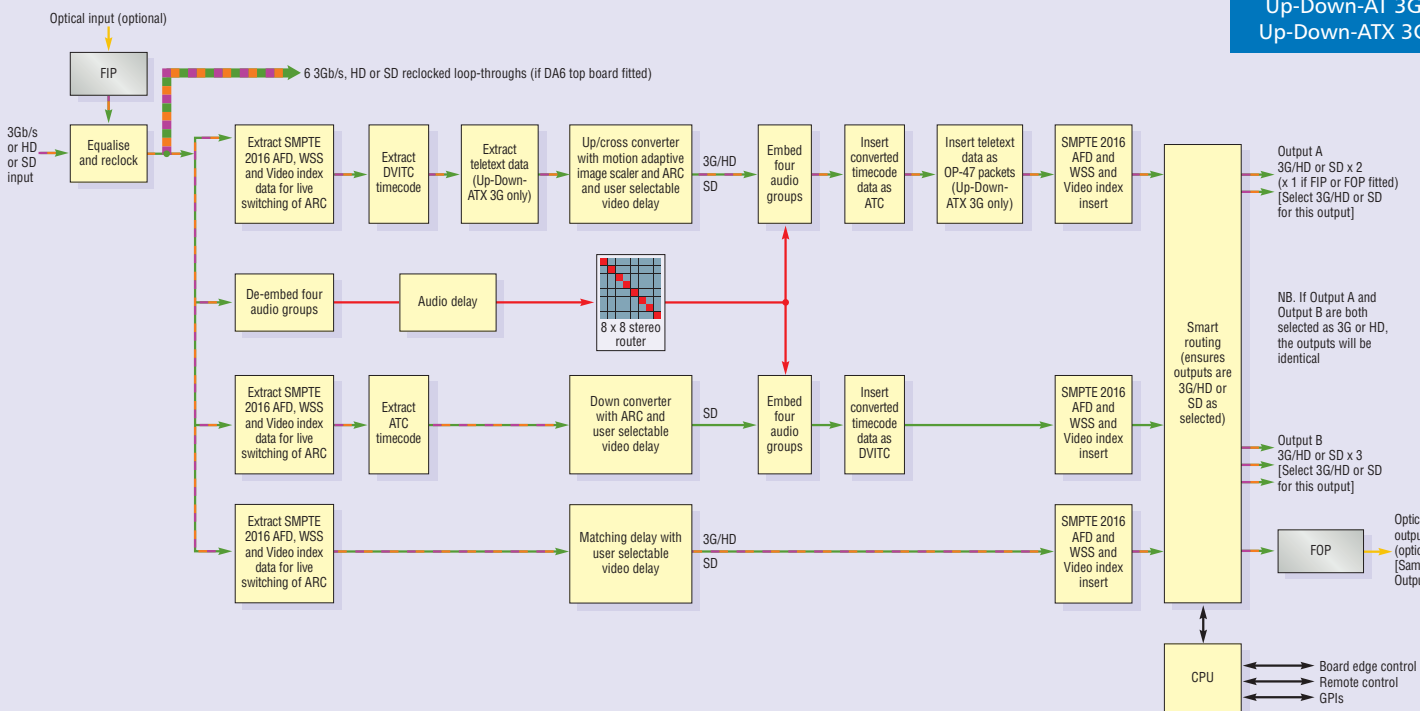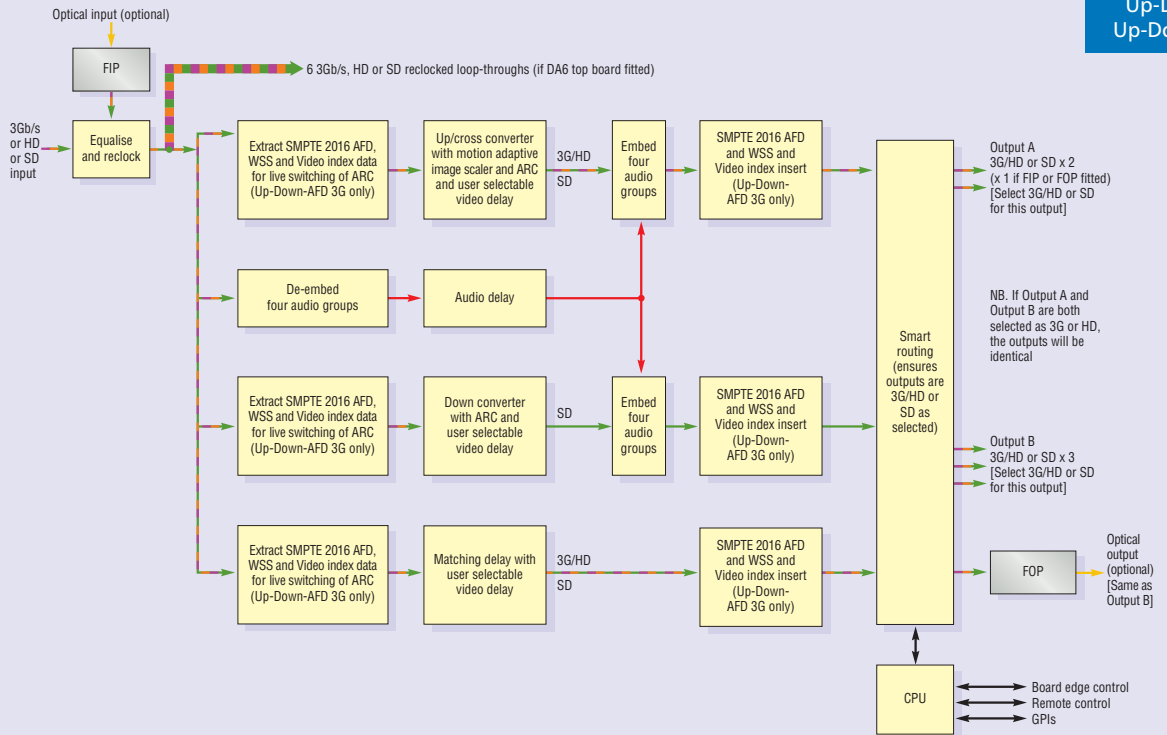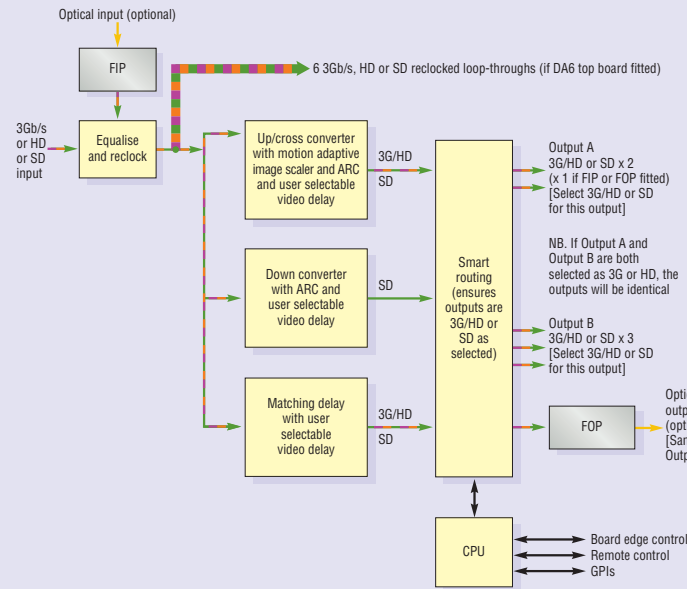| FEATURES	Up-Down 3G	Up-Down-A 3G	Up-Down-AFD 3G	Up-Down-AT 3G	Up-Down-ATX 3G
Input formats (50Hz and 59.94Hz)	1080p, 720p, 1080i, 625i and 525i	1080p, 720p, 1080i, 625i and 525i	1080p, 720p, 1080i, 625i and 525i	1080p, 720p, 1080i, 625i and 525i	1080p, 720p, 1080i, 625i and 525i
Two conversions with dual outputs configurable as 3G/HD or SD	●	●	●	●	●
Number of reclocked input loop-throughs with DA6 fitted	6	6	6	6	6
Smart routing (ensuring outputs remain constant in format even on input change)	●	●	●	●	●
Integrated fibre input/output connectivity	●	●	●	●	●
Four group embedded audio handling		●	●	●	●
Exceptional output picture when up/cross converting, with motion adaptive video interlacing, detail enhancement and noise reduction	●	●	●	●	●
Exceptional output picture when down converting, with proprietary down conversion and four vertical filter characteristics	●	●	●	●	●
RGB and YUV lift and gain controls	●	●	●	●	●
Eight standard aspect ratio conversions when up and down converting (Anamorphic, Letterbox, Pillarbox and Full Screen conversions)	●	●	●	●	●
Flexible aspect ratio adjustments using size, position and crop controls and copes with both analogue and digital SD blanking widths	●	●	●	●	●
Instant reconfiguration in single frame blanking period	●	●	●	●	●
SMPTE 2016 AFD, WSS and Video index activated aspect ratio conversion			●	●	●
SMPTE 2016 AFD, WSS and Video index insertion			●	●	●
Variable video delay of up to one frame plus 16 lines	●	●	●	●	●
Video signal probe indications	●	●	●	●	●
Audio signal probe indications		●	●	●	●
Passes ATC timecode from input to output	●	●	●	●	●
Can set the phase of the interlaced output based on the ATC data	●	●	●	●	●
Conversion of timecode between ATC and DVITC				●	●
Audio routing in stereo pairs				●	●
Teletext and subtitles data handling (OP-47)					●
Rear modules used	RM41 or RM57 (RM41 + RM34 or RM57 + RM34 if DA6 fitted)	RM41 or RM57 (RM41 + RM34 or RM57 + RM34 if DA6 fitted)	RM41 or RM57 (RM41 + RM34 or RM57 + RM34 if DA6 fitted)	RM41 or RM57 (RM41 + RM34 or RM57 + RM34 if DA6 fitted)	RM41 or RM57 (RM41 + RM34 or RM57 + RM34 if DA6 fitted)

ORDERING INFORMATION

Up-Down 3G	Up/down/cross converter for 3Gb/s, HD and SD
Up-Down-A 3G	Up/down/cross converter for 3Gb/s, HD and SD with four group embedded audio handling
Up-Down-AFD 3G	Up/down/cross converter for 3Gb/s, HD and SD with four group embedded audio handling and AFD insertion and reading
Up-Down-AT 3G	Up/down/cross converter for 3Gb/s, HD and SD with four group embedded audio handling, AFD insertion and reading, audio routing and timecode conversion
Up-Down-ATX 3G	Up/down/cross converter for 3Gb/s, HD and SD with four group embedded audio handling, AFD insertion and reading, audio routing, timecode conversion and handling of teletext/subtitles
DA6	Top board for Up-Down 3G motherboards providing six reclocked input loop-throughs
FIP	Fibre input option for Up-Down 3G motherboards provided integrated fibre input connectivity
FOP	Fibre output option for Up-Down 3G motherboards providing integrated fibre output connectivity
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. Power supply redundancy available with Indigo 1-DP
Indigo 1AE	1U frame with active front panel for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1AE-DP
Indigo 1SE	1U frame with passive front panel fitted with Statesman CPU for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1SE-DP
Indigo DT	Desk top box with passive front panel for up to two Crystal Vision modules
Indigo DTAE	Desk top box with active front panel for up to two Crystal Vision modules
Indigo DTSE	Desk top box with passive front panel fitted with Statesman CPU for up to two Crystal Vision modules
RM41	Single slot frame rear module. Allows maximum number of boards in frame (24 in 4U, 12 in 2U, six in 1U, two in desk top box). Gives access to one 3Gb/s, HD or SD input and two co-timed outputs (configurable as 3G/HD or SD), with two feeds of Output A and three feeds of Output B
RM41 + RM34	Two single slot frame rear modules used together for when DA6 top board is fitted. Allows 12 boards in 4U, six in 2U, three in 1U and one in desk top box. Gives access to one 3Gb/s, HD or SD input, six reclocked input loop-throughs and two co-timed outputs (configurable as 3G/HD or SD), with two feeds of Output A and three feeds of Output B
RM57	Single slot frame rear module. Allows maximum number of boards in frame (24 in 4U, 12 in 2U, six in 1U, two in

desk top box). Designed for applications using fibre inputs or outputs. **When using fibre input**, allows you to select between one fibre and one electrical 3Gb/s, HD or SD input, and gives access to two co-timed outputs (configurable as 3G/HD or SD), with one feed of Output A and three feeds of Output B. **When using fibre output**, gives access to one 3Gb/s, HD or SD input and two co-timed outputs (configurable as 3G/HD or SD), with one feed of Output A and three feeds of Output B, along with one copy of Output B on fibre

RM57 + RM34	Two single slot frame rear modules used together for when DA6 top board is fitted. Allows 12 boards in 4U, six in 2U, three in 1U and one in desk top box. Designed for applications using fibre inputs or outputs. **When using fibre input**, allows you to select between one fibre and one electrical 3Gb/s, HD or SD input, and gives access to six reclocked input loop-throughs and two co-timed outputs (configurable as 3G/HD or SD), with one feed of Output A and three feeds of Output B. **When using fibre output**, gives access to one 3Gb/s, HD or SD input, six reclocked input loop-throughs and two co-timed outputs (configurable as 3G/HD or SD), with one feed of Output A and three feeds of Output B, along with one copy of Output B on fibre
REMIND	19" remote control panel
REMIND-E	19" Ethernet remote control panel
Statesman	PC Control System
SNMP	SNMP monitoring and control

Optical input (optional)

FIP

3Gb/s or HD or SD input

Equalise and reclock

6 3Gb/s, HD or SD reclocked loop-throughs (if DA6 top board fitted)

Up/cross converter with motion adaptive image scaler and ARC and user selectable video delay

3G/HD
SD

Down converter with ARC and user selectable video delay

SD

Matching delay with user selectable video delay

3G/HD
SD

Smart routing (ensures outputs are 3G/HD or SD as selected)

Output A
3G/HD or SD x 2
(x 1 if FIP or FOP fitted)
[Select 3G/HD or SD for this output]

NB. If Output A and Output B are both selected as 3G or HD, the outputs will be identical

Output B
3G/HD or SD x 3
[Select 3G/HD or SD for this output]

FOP

Optical output (optional)
[Same as Output B]

CPU

Board edge control
Remote control
GPIs

Optical input (optional)

FIP

3Gb/s or HD or SD input

Equalise and reclock

6 3Gb/s, HD or SD reclocked loop-throughs (if DA6 top board fitted)

Extract SMPTE 2016 AFD, WSS and Video index data for live switching of ARC (Up-Down-AFD 3G only)

Up/cross converter with motion adaptive image scaler and ARC and user selectable video delay

3G/HD
SD

Embed four audio groups

SMPTE 2016 AFD and WSS and Video index insert (Up-Down-AFD 3G only)

De-embed four audio groups

Audio delay

Extract SMPTE 2016 AFD, WSS and Video index data for live switching of ARC (Up-Down-AFD 3G only)

Down converter with ARC and user selectable video delay

SD

Embed four audio groups

SMPTE 2016 AFD and WSS and Video index insert (Up-Down-AFD 3G only)

Extract SMPTE 2016 AFD, WSS and Video index data for live switching of ARC (Up-Down-AFD 3G only)

Matching delay with user selectable video delay

3G/HD
SD

SMPTE 2016 AFD and WSS and Video index insert (Up-Down-AFD 3G only)

Smart routing (ensures outputs are 3G/HD or SD as selected)

Output A
3G/HD or SD x 2
(x 1 if FIP or FOP fitted)
[Select 3G/HD or SD for this output]

NB. If Output A and Output B are both selected as 3G or HD, the outputs will be identical

Output B
3G/HD or SD x 3
[Select 3G/HD or SD for this output]

FOP

Optical output (optional)
[Same as Output B]

CPU

Board edge control
Remote control
GPIs

Optical input (optional)

FIP

3Gb/s or HD or SD input

Equalise and reclock

6 3Gb/s, HD or SD reclocked loop-throughs (if DA6 top board fitted)

Extract SMPTE 2016 AFD, WSS and Video index data for live switching of ARC

Extract DVITC timecode

Extract teletext data (Up-Down-ATX 3G only)

Up/cross converter with motion adaptive image scaler and ARC and user selectable video delay

3G/HD
SD

Embed four audio groups

Insert converted timecode data as ATC

Insert teletext data as OP-47 packets (Up-Down-ATX 3G only)

SMPTE 2016 AFD and WSS and Video index insert

De-embed four audio groups

Audio delay

8 x 8 stereo router

Extract SMPTE 2016 AFD, WSS and Video index data for live switching of ARC

Extract ATC timecode

Down converter with ARC and user selectable video delay

SD

Embed four audio groups

Insert converted timecode data as DVITC

SMPTE 2016 AFD and WSS and Video index insert

Extract SMPTE 2016 AFD, WSS and Video index data for live switching of ARC

Matching delay with user selectable video delay

3G/HD
SD

SMPTE 2016 AFD and WSS and Video index insert

Smart routing (ensures outputs are 3G/HD or SD as selected)

Output A
3G/HD or SD x 2
(x 1 if FIP or FOP fitted)
[Select 3G/HD or SD for this output]

NB. If Output A and Output B are both selected as 3G or HD, the outputs will be identical

Output B
3G/HD or SD x 3
[Select 3G/HD or SD for this output]

FOP

Optical output (optional)
[Same as Output B]

CPU

Board edge control
Remote control
GPIs

NB. The term "Up-Down 3G" is generally used to refer to all versions

MECHANICAL

Standard Crystal Vision module 266mm x 100mm
With DA6 top board fitted: 'Double decker' module 266mm x 100mm (uses two frame slots)
Weight: 180g; 240g with DA6 fitted
Power consumption: 11.9 Watts (all Up-Down 3G versions); 3 Watts (DA6); 0.6 Watts (FIP and FOP)

INTEGRATED FIBRE OPTIONS

Up-Down 3G can be given integrated fibre connectivity by fitting either the FIP fibre input option or FOP fibre output option. The chosen option should be fitted at the factory
To access the optical inputs or outputs an RM57 frame rear module must be used
When fitted with a FIP or FOP, Up-Down 3G can be housed in any frame slot position but due to its extra height it is not possible to place Standard Definition or audio boards directly next when the Up-Down 3G is in even numbered slot positions. 3Gb/s and HD boards do not share this restriction. If a DA6 top board is also fitted, this positioning restriction does not apply
FIP and FOP meet the SMPTE 297-2006 short-haul specification, allowing operation with single-mode and multi-mode fibre
Connector type: SC/PC
FIP:
Optical wavelength: 1260-1620nm
Input level maximum: -1dBm
Input level minimum: Typical -20dBm (-18dBm 3Gb/s pathological)
FOP:
Optical power: Max -0.0dBm, min -5.0dBm (typical -2.0dBm or 630uW)
Fibre pigtail: Single-mode 8/125uM
Optical wavelength: 1290-1330nm (1310 typical)
Extinction ratio: 7.5dB
Laser safety classification: Class 1 (EN 60825), Class I (21CFR1040.10)

INPUT TO OUTPUT CONVERSIONS

Up conversions:
625/50 to 720p50
525/59.94 to 720p59.94
625/50 to 1080i50
525/59.94 to 1080i59.94
625/50 to 1080p50
525/59.94 to 1080p59.94
Down conversions:
720p50 to 625/50
720p59.94 to 525/59.94
1080i50 to 625/50
1080i59.94 to 525/59.94
1080p50 to 625/50
1080p59.94 to 525/59.94
Cross conversions:
720p50 to 1080i50
720p59.94 to 1080i59.94
720p50 to 1080p50
720p59.94 to 1080p59.94
1080i50 to 720p50
1080i59.94 to 720p59.94
1080i50 to 1080p50
1080i59.94 to 1080p59.94
1080p50 to 1080i50
1080p59.94 to 1080i59.94
1080p50 to 720p50
1080p59.94 to 720p59.94

VIDEO INPUT

One 3Gb/s or HD or SD input with reclocking
When using FIP fibre input option allows selection between one optical and one electrical input. The input loop-throughs will show whichever input has been selected
270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to EBU 3267-E, SMPTE 259M, SMPTE 292M and SMPTE 424M
3Gb/s cable equalisation up to 80m using Belden 1694A. HD/SD cable equalisation up to 140m with Belden 1694A or equivalent (approx. 100m with Belden 8281)
Input return loss: -15dB for 50MHz to 1.5GHz and -10dB for 1.5GHz to 3GHz

VIDEO OUTPUTS

Up-Down 3G can perform two different conversions at the same time, making it easy to create HD and SD copies of a feed. Each output will either be converted from the input or given a matching delay to ensure they remain co-timed
There are two output groups, A and B. The A-B matrix control allows the user to select whether an output group will be either SD or 3G/HD. The output groups can be configured as either:
• A=SD and B=SD
• A=3G/HD and B=3G/HD
• A=SD and B=3G/HD
• A=3G/HD and B=SD
If High Definition is selected for any group, the HD format control will determine the output format (720p, 1080i or 1080p). If Output A and Output B are both selected as 3G/HD, the outputs will be identical
Once set, the output selection will remain true, irrespective of any change in the input standard
Should the input format change, Up-Down 3G will reconfigure itself cleanly in a single frame blanking period
Using RM41 rear module: Two co-timed outputs, with two feeds of Output A and three feeds of Output B
Using RM57 rear module with FIP fibre input option: Two co-timed outputs, with one feed of Output A and three feeds of Output B (select between one fibre and one electrical input)
Using RM57 rear module with FOP fibre output option: Two co-timed outputs, with one feed of Output A and three feeds of Output B along with one copy of Output B on fibre
If a DA6 top board is fitted, the Up-Down 3G will also output six reclocked loop-throughs of the 3Gb/s, HD or SD input. In this case Up-Down 3G will use two frame slots and the RM41 or RM57 rear modules need to be used with an RM34 to create a 'double height' rear module
Output frame rate same as input frame rate

PICTURE PROCESSING WHEN UP AND CROSS CONVERTING

Pixel based motion adaptive de-interlacing means that Up-Down 3G will automatically choose the best processing method based on the video content when up and cross converting. In video containing significant movement the output picture will look natural and smooth
Adjustable detail enhancement allows the user to sharpen the image, reducing the perceived softness of an up converted image. Fine Detail Enhancement applies sharpening to the entire image, while the Edge Enhancement applies sharpening only to object edges
Noise reduction is available and can be used to ensure that MPEG encoders do not waste unnecessary bandwidth on detail that is not really part of the picture
RGB and YUV lift and gain controls allow independent digital image adjustments in both the RGB and YUV domains

PICTURE PROCESSING WHEN DOWN CONVERTING

Up-Down 3G uses Crystal Vision's proprietary down conversion, which avoids aliasing while retaining picture sharpness
Sophisticated two dimensional filtering gets broadcast results and avoids the complication of looking at multiple fields or movement detection, resulting in reliable, artefact-free conversion with broadcast filter quality
When down converting the performance can be optimised by choosing one of four alternative vertical filter characteristics (sharpest, sharp, soft, softest)
RGB and YUV lift and gain controls allow independent digital image adjustments in both the RGB and YUV domains

BYPASS MODE

To maintain the best picture quality Up-Down 3G will automatically enter a bypass mode when the input is the same as the selected output standard, bypassing the major processing blocks and adding a matching delay

DELAY THROUGH BOARD AND VARIABLE VIDEO DELAY

Minimum delay of one video frame less 16 lines
On top of the minimum delay, a variable video delay of up to one frame plus 16 lines, adjustable in one line steps, allows compensation for video delays generated by other equipment

ASPECT RATIO CONVERSION

The following standard aspect ratio conversions are available when up converting from SD to HD or 3Gb/s: 16:9 Anamorphic (for 16:9 SD systems) and either 4:3 to 16:9 Pillarbox, 4:3 to 14:9 Pillarbox compromise or 4:3 to 16:9 Full Screen (for 4:3 SD systems)
The following standard aspect ratio conversions are available when down converting from 3Gb/s or HD to SD: 16:9 Anamorphic (for 16:9 SD systems) and either 16:9 to 4:3 Letterbox, 16:9 to 14:9 Letterbox compromise or 16:9 to 4:3 Full Screen with centre cut (for 4:3 SD systems)
The eight standard aspect ratios can be adjusted from their default values by using independent sets of size, position and crop controls:
Vertical and horizontal picture size adjustment: continuous adjustment of approximately +/- 25% of nominal image size
Vertical and horizontal picture position adjust +/- 50%
Vertical and horizontal picture crop adjust 0-100% of picture size
Copes with both analogue and digital SD blanking widths. When analogue blanking width is selected, the Anamorphic conversion uses 702 pixels of SD (rather than 720 pixels) to create the 1920 pixels of 1080i or 1080p, and all other aspect ratios are adjusted by a similar amount

ACTIVE FORMAT DESCRIPTION, VIDEO INDEX AND WIDESCREEN SIGNALLING (UP-DOWN-AFD 3G, UP-DOWN-AT 3G AND UP-DOWN-ATX 3G ONLY)

Up-Down-AFD 3G, Up-Down-AT 3G and Up-Down-ATX 3G can use the SMPTE 2016 AFD, WSS or Video index data embedded in the input video to automatically select the output aspect ratio. Aspect ratio can be changed live on air due to the up/down/ cross converter's ability to reconfigure itself cleanly within a single frame blanking period
If more than one type of AFD data is present, the priority order is SMPTE 2016, then Video index, then WSS
SMPTE 2016 AFD data can be inserted into the output video for use by downstream equipment – either manually or by automatically following the incoming AFD data. One of 16 AFD codes is embedded in an ANC data packet, which is carried in the vertical blanking
Widescreen signalling information can be inserted in 625 line SD outputs for use by downstream equipment. WSS can be inserted manually or be set to automatically follow the incoming AFD data. If WSS data is present on the input video this can either be passed to the output unchanged or substituted for a user selectable code. WSS data can also be set to be blanked
Video index can be inserted into the output video for use by downstream equipment. The Video index AFD value can be selected manually, or automatically based on the incoming AFD value and the conversion used. Video index data can be set to be blanked or pass the input data to the output unchanged
Response to WSS and SMPTE 2016/Video index AFD codes:
The effect of AFD varies depending on the conversion being done, with three auto modes. In these modes the conversion applied (and output AFD data) will depend on the input coded frame and AFD code, which may be presented as WSS, Video index, or SMPTE 2016.
"Auto 16:9": The output coded frame is fixed at 16:9. If the input coded frame is 16:9, there will be an Anamorphic conversion and the output AFD will follow the input AFD. If the input coded frame is 4:3 then AFD codes for undefined/reserved, 14:9, and full frame inputs will produce a Pillarbox output. AFD codes for 16:9 Letterbox inputs will produce a conversion to a full frame output
"Auto 4:3": The output coded frame is fixed at 4:3. If the input coded frame is 4:3, there will be an Anamorphic conversion and the output AFD will follow the input AFD. If the input coded frame is 16:9 then AFD codes for full frame and 14:9 inputs will produce a Letterbox output. AFD codes for a Pillarbox input will produce a conversion to a full screen output
"Auto Adaptive": If the input coded frame is 16:9, a 4:3 Pillarbox AFD will produce a 4:3 full frame output, with appropriate Video index and/or WSS. All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value. If the input coded frame is 4:3, a 16:9 Letterbox AFD will produce a 16:9 full frame output, with appropriate Video index and/or WSS. All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value

EMBEDDED AUDIO PASSING (ALL VERSIONS EXCEPT UP-DOWN 3G)

De-embeds and re-embeds the first four numbered audio groups
Bypass: Audio bypassed in HANC space, with the same delay as the video

VIDEO SIGNAL CHECKS

Checks can be performed on four video parameters, with warnings of any problems provided via Statesman alarms and SNMP traps
The video parameters are: input missing, video black, video frozen and input incompatible
The video black and video frozen parameters can be delayed before an alarm is asserted to prevent false alarming during brief video pauses

AUDIO SIGNAL CHECKS (ALL VERSIONS EXCEPT UP-DOWN 3G)

Checks can be performed on nine audio parameters, with warnings of any problems provided via Statesman alarms and SNMP traps
The audio parameters are: input audio missing, silence group 1 channels 1 and 2, silence group 1 channels 3 and 4, silence group 2 channels 1 and 2, silence group 2 channels 3 and 4, silence group 3 channels 1 and 2, silence group 3 channels 3 and 4, silence group 4 channels 1 and 2 and silence group 4 channels 3 and 4
All parameters can be delayed before an alarm is asserted to prevent false alarming during quiet audio periods

AUDIO ROUTING (UP-DOWN-AT 3G AND UP-DOWN-ATX 3G ONLY)

An 8 x 8 stereo router allows the order of the embedded audio to be shuffled between all four groups
It is possible to select which audio groups are embedded in the output stream

BASIC TIMECODE TRANSPORT

All versions can pass Ancillary Timecode from the input to the output
The Ancillary Timecode can be used to get the interlace timing correct and maintain a correct field sequence when down converting from 1080p or 720p to an interlaced output

TIMECODE CONVERSION (UP-DOWN-AT 3G AND UP-DOWN-ATX 3G ONLY)

When up converting Up-Down-AT 3G and Up-Down-ATX 3G can read Digital Vertical Interval Timecode (DVITC, SMPTE 266M-2002) on the SD input and translate it to Ancillary Timecode (ATC, SMPTE 12M-2-2008) on the HD output
When down converting, it can take in timecode as ATC ancillary data and can generate a DVITC analogue timecode waveform on its SD output

TELETEXT AND SUBTITLES HANDLING (UP-DOWN-ATX 3G ONLY)

Up-Down-ATX 3G supports OP-47 (defined by Free TV Australia and covering the carriage of System B teletext). When up converting will take the teletext data (System B to ITU-R BT 653-3) out of the analogue coded signal and put the same data in the OP-47 data stream it creates

LED INDICATION OF:

Power supplies on board
SD input or input not present
HD input or input not present
ARC selected
GPI output 5 active
GPI output 6 active

PRESETS

The current board settings can be saved in one of 16 locations to be recalled as required

GPI INPUT LEVELS

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

GPI OUTPUT LEVELS

Electrically: Open collector transistors 30V, 270 ohm current limit resistors. Pulled up to +5V through 6800 ohm

GPI INPUTS

Four GPI inputs can recall one of 16 presets

GPI OUTPUTS

Two GPI outputs. Selectable from loss of input, video black and frozen, audio missing, audio channel silence and input incompatible

LOCAL CONTROL

Intuitive board edge interface with two select buttons, shaft encoder and ten character alphanumeric display

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
SNMP monitoring and control available as a frame option

Performance and features are subject to change. Figures given are typical measured values. UP-DOWN3G0711