HD200

Compact High Definition
Downconverter

Operator's Manual

© May 1999

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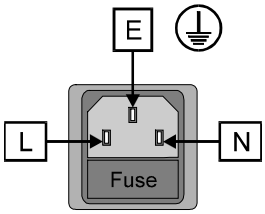
Safety Warnings

Always ensure that the unit is properly earthed and power connections correctly made.

This equipment shall be supplied from a power system providing a **PROTECTIVE EARTH** ⏚ connection and having a neutral connection which can be reliably identified.

The power terminals of the IEC mains input connector on the rear panel are identified as shown below:



E = Protective Earth Conductor

N = Neutral Conductor

L = Live Conductor

Power cable supplied for countries other than the USA

The equipment is normally shipped with a power cable with a standard IEC moulded free socket on one end and a standard IEC moulded plug on the other. If you are required to remove the moulded mains supply plug, dispose of the plug immediately in a safe manner. The colour code for the lead is as follows:

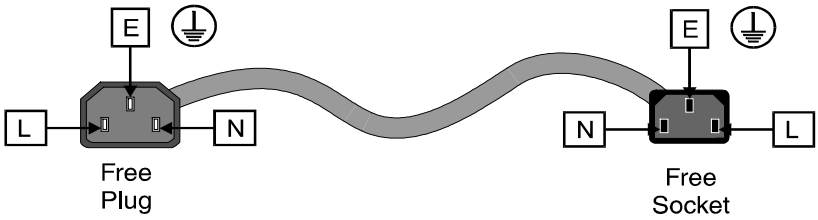
GREEN/YELLOW lead connected to E (Protective Earth Conductor)
BLUE lead connected to N (Neutral Conductor)
BROWN lead connected to L (Live Conductor)

Power cable supplied for the USA

The equipment is shipped with a power cord with a standard IEC moulded free socket on one end and a standard 3-pin plug on the other. If you are required to remove the moulded mains supply plug, dispose of the plug immediately in a safe manner. The colour code for the lead is as follows:

GREEN lead connected to E (Protective Earth Conductor)
WHITE lead connected to N (Neutral Conductor)
BLACK lead connected to L (Live Conductor)

The terminals of the IEC mains supply lead are identified as shown opposite:



Note that for equipment that is not fitted with a mains power switch, to comply with BS60950 Clauses 1.7.2 and 2.6.9, the power outlet supplying power to the unit should be close to the unit and easily accessible.

⚠ Warnings ⚠

Voltages within this unit can be lethal under certain circumstances. Where power is required to be connected to the unit during servicing great care must be taken to avoid contact with these voltages.

Maintenance should only be carried out by suitably qualified personnel.

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EMC Standards

This unit has been designed to comply with the following standards:

Electromagnetic Compatibility-Generic Immunity Standard BS EN 50082-1:1992

The European Standard EN 50082-1:1992 has the status of a British Standard and is related to European Council Directive 89/336/EEC dated 3rd May 1989.

Electromagnetic Compatibility-Generic Emission Standard BS EN 50081-1:1992

The European Standard EN 50081-1:1992 has the status of a British Standard and is related to European Council Directive 89/336/EEC dated 3rd May 1989.

Safety Standards

This unit has been designed to comply with EN60950:1992 as amended by amendment A1(May 1993) and amendment A2(March 1994). Specification for safety of technology equipment, including electrical business equipment.

EMC Performance of Cables and Connectors

Snell & Wilcox products are designed to meet or exceed the requirements of the appropriate European EMC standards. In order to achieve this performance in real installations it is essential to use cables and connectors with good EMC characteristics.

All signal connections (including remote control connections) shall be made with screened cables terminated in connectors having a metal shell. The cable screen shall have a large-area contact with the metal shell.

COAXIAL CABLES

Coaxial cables connections (particularly serial digital video connections) shall be made with high-quality double-screened coaxial cables such as Belden 8281 or BBC type PSF1/2M.

D-TYPE CONNECTORS

D-type connectors shall have metal shells making good RF contact with the cable screen. Connectors having "dimples" which improve the contact between the plug and socket shells, are recommended.

Packing List

The unit is supplied in a dedicated packing carton provided by the manufacturer and should not be accepted if delivered in inferior or unauthorised materials. Carefully unpack the carton and check for any shipping damage or shortages.

Any shortages or damage should be reported to the supplier immediately.

Enclosures:

- HD200 unit
- Power cable
- Operator’s Handbook

INFORMATION TO THE USER

NOTE
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION
Any changes or modifications to this equipment that are not specifically authorised in writing by Snell & Wilcox could void your authority to use the equipment.

This device complies with Part 15 of the FCC rules.
Operation is subject to the following two conditions:
1, this device may not cause harmful interference, and
2, this device must accept any interference received, including interference that may cause undesired operation.

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Manual Revision Record

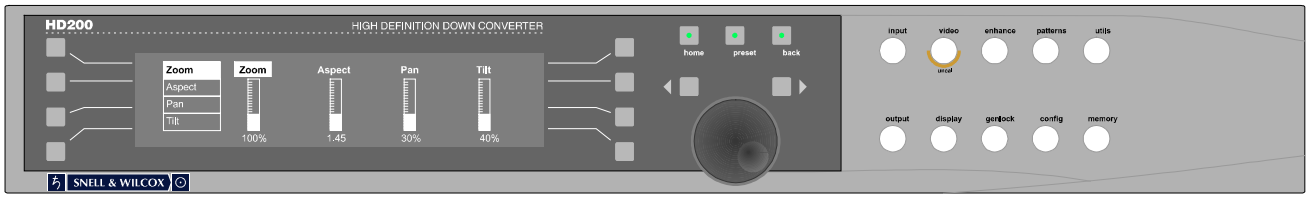
Date	Version No.	Issue No.	Change	Comments
020798	1	1		First Issue
090798	1	2	Mixed syncs input function removed –all sections	New manual issued
150998	1	3	FCC data added to section 0	New section 0 issued
171198	1	4	Section 6 RS422 interface added	New section 0 and 6 added
200599	1	5	To spec, card edge controls added, input and memory menus Text changes to 1.3, 1% to 0.1% 2.1, extra standard 4.4, 1% to 0.1% 4.8 & 4.9, page 4.21 to 4.17 4.11, SW2 text 4.16	New section 0, 1, 2, 4 issued

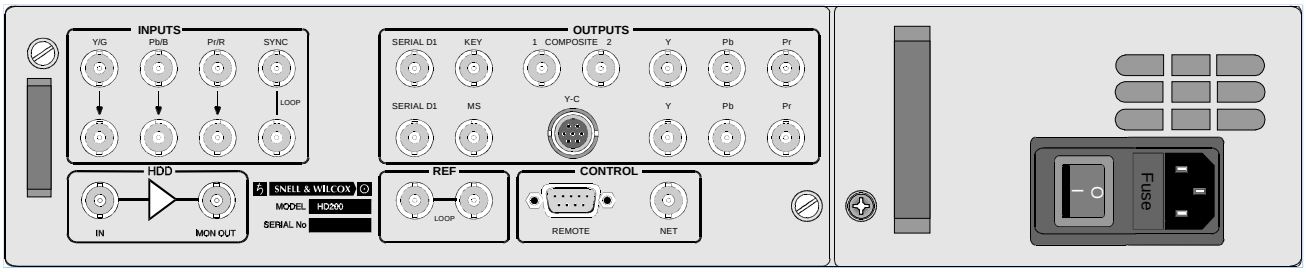
Description

HD200

The HD200 is a compact unit that converts any high definition input to the standard definition equivalent.. It is an ideal camera downconverter, converting a HD camera into a spatially over-sampled device.
The HD200 offers SDI component digital output with EDH as standard, and analog component and composite outputs. Aspect ratio conversion is integral with pan, tilt and zoom controls allowing the key part of the HD image to be available at the output. An HD serial digital component input is available as an option.

With a three dimensional filter structure, HD200 can handle interlacing without loss of quality so that those fine lines in the input are truly resolved. In addition to automatically sensing the input standard, HD200 allows features such as up to 4 x zoom with pan and tilt so that the wanted area of the picture can be enlarged to fill the television screen.





Features

- Compact interface from HD to SDTV
- All current HD standards supported
- Optional serial digital HD input
- Aspect ratio conversion
- Component digital output with EDH
- Analog component and composite outputs
- Compact: only 2RU
- Low power
- Built-in test patterns
- Full proc. amp facilities

Overview

The HD200 from Snell & Wilcox is able to convert a wide range of high definition formats into standard TV video without artificial degradation.

The HD200 performs true format conversion. It does not restrict the operation of the HD source so that the HD monitor can continue to operate at full resolution. It uses high quality wide aperture three-dimension interpolation to perform true scan format conversion.

Vital to any high quality conversion system is its ability to handle motion in the graphics. Animated graphic sequences are nowadays the norm and so it is no longer possible to use a simple converter that just drops fields to reduce the field rate to 50 or 60Hz. Converters that use this technique will introduce unacceptable motion judder. As we move into the era of virtual studios the motion portrayal issue becomes even more important.

Even though the input format is high definition the use of three-dimensional interpolation is necessary if the resulting output is to be accurately interlaced. Without this, motion portrayal would suffer. The full resolution is sampled and stored inside HD200 and is used to build the necessary output pixels.

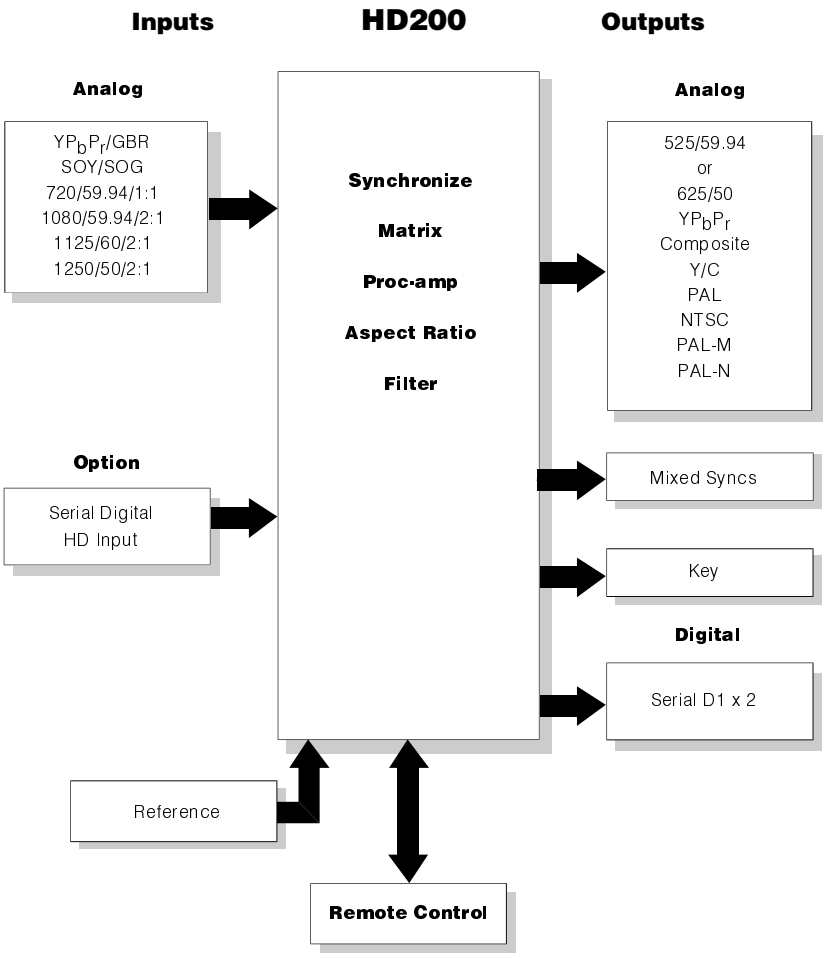
The output, by definition, needs to use interlaced scan as it is a standard TV video signal. Through the use of Snell & Wilcox's patented three dimensional interpolation techniques, the twitter often associated with interlaced scan is dramatically reduced leading to stable TV video that is pleasing to watch.

The correct shaping of the three dimensional filters is the secret of the HD200's ability to correctly anti-alias the video without introducing the softness often associated with over filtered pictures. This filter shaping experience has been built up over years of producing top of the range PAL-NTSC standards converters.

A range of outputs is available including Serial D1, YPbPr, Y/C, and analog composite. The component input is accurately matrixed to fully compliant broadcast quality YPbPr. Many adjustments such as black level are adjusted automatically, but there are also manual controls available to allow the optional adjustments of some proc-amp parameters.

A useful feature is the HD200's ability to zoom in or shrink the size of video from the HD source and offset it both vertically and horizontally.

Input-Output Characteristics



Specifications

Features

Signal Inputs

Component	One YPbPr with active loop-through or one GBRS with active loop-through
Sync	SOG/Y/0.6 V tri-level (loop-through)
Digital Input (Option)	1.5 Gbits of 1125/59.94/2:1 with active monitor output
	1.75 m of PSF1/2 supported
Reference	Composite Video or Black Burst (loop-through)

Signal Outputs

Digital	2 x Serial D1
Analog	2 x Component YPbPr Chroma 100% saturation 0.7V or 0.93 V pk to pk
Analog	2 x Composite
Analog	1 x Y-C Separated 4 pin connector
Sync	Mixed syncs at 2 V pk to pk into 75 Ohms
Key	1 V pk to pk (0.7 V luminance, 0.3 V syncs)
	High during active video output

Front Panel Buttons

Input
Video
Enhance
Patterns
Utilities
Output
Display
Genlock
Memory

Preset Controls

Input Standards	1125/59.94/2:1, 1080 active lines 1035 interlaced 1250/50, 1152 active lines 1250/50, 1080 active lines 720 progressive
Input Chroma Standards	Pass through, SMPTE 240, SMPTE 274, BT709
Input Aspect Ratio	16:9
Analog Input	YPbPr/GBR
Sync Input	SOG/SOY

Features

Output Standards	525/59.94/2:1, 625/50/2:1 Aspect Ratio 4:3
Y/C Timing	-200 ns to +100 ns in 37 ns steps
Luminance Gain	±3 dB in 0.1 dB steps
Black Level	±50 mV in 2 mV steps
Chrominance Gain	±3 dB in 0.1 dB steps
Patterns	100% color bars
	100% bars and red
	Cross hatch
	Multi-burst: 0.5, 1, 2, 3, 4, 5 MHz
	10 steps
	Valid Ramp
	PLUGE
	White
	Black
Utilities	Monochrome, freeze, fade-to-black; fade time cut to 10 s in 500 ms steps
Display Size, Zoom and Aspect	Separate horizontal and vertical size controls;
	77.5 to 500% scale in 0.1% steps
Pan Control	±90% of input picture in 0.1% steps
Tilt Control	±75% of input picture in 0.1% steps
Aspect Ratios	16:9 to 4:3 conversion using letterbox
	16:9 to 4:3 conversion using side curtains
Genlock Horizontal Timing	±32 µs in 37 ns steps
Genlock Vertical Timing	+4, -8 lines in 1 line steps
Transition time for size changes	Variable to 4 s in 20 ms increments
Memory	4 x user memories storing all parameters.
	Variable transition time for size variations 4 s in 20 ms increments
SC-H Phase	Fixed at 0°
Aperture Correction	Separate horizontal and vertical filtering corrections
	-3 to +1 vertical filters -3 to +4 horizontal filters
Gamma	-4 to +5 tables to change gamma of Luminance outputs

Remote Control

Full control via RollCall™ system by a KUDOS IQ active front panel or RS422 computer interface

Specifications

Video Processing	8-bit 4:2:2
Aperture	Spatio-temporal
2T Pulse to bar ratio k-rating	Better than 1%
2T Pulse response k-rating	Better than 1%
Tilt	Better than 1%
Residual Jitter	< ±10 ns
Y/C Timing Error	±10 ns
Reference Input Return Loss	Better than 38 dB at 4.5 MHz
Analog Blanking Timings 525	Horizontal: Front porch 1.7 µs, back porch 9.4 µs Blanking total 11.1 µs, 708 active line samples Vertical: 1st line 21/283, active lines 483
Analog Blanking Timings 625	Horizontal: Front porch 1.5 µs, back porch 10.5 µs Blanking total 12.0 µs, 702 active line samples Vertical: 1st line 23/336, active lines 574
Digital Blanking	Digital blanking option selects 720 active samples; analog blanking timings are correspondingly reduced
Output Rates	625/50/2:1 or 525/59.94/2:1 interlaced
Output Standards	PAL/NTSC/PAL-N
Bandwidth (YPbPr)	8.0 MHz -3 dB, 4.0 MHz -0.1 dB
Bandwidth (Composite)	6.0 MHz -1 dB
Composite or Black Burst Reference Level	Standard level ±6 dB

Power

Rated Voltage Range	88 V to 264 V 47/65 Hz A.C.
Consumption	150 W maximum.

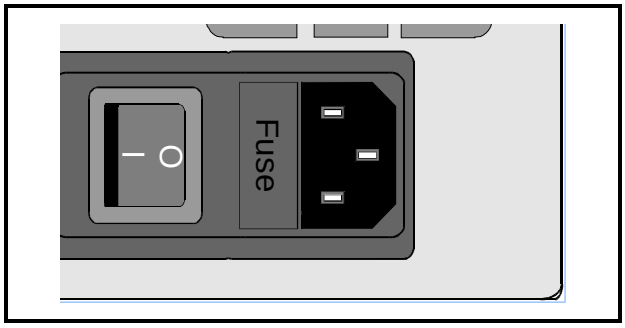
Mechanical

Temperature range	0 to 40° C Operating
Case Type	2U Rack Mounting
Dimensions	483 mm x 450 mm x 89 mm (w,d,h)
Weight	10 kg

Installation

POWER CONNECTIONS

This is the IEC320 mains power connector suitable for a standard IEC type power cable and contains a 1A(T) fuse. If a fused type plug is fitted to the cable a fuse of 5A (F) rating should be installed.

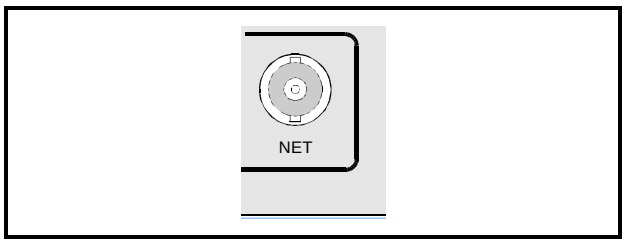


POWER ON/OFF SWITCH

The power ON/OFF switch is located on the rear panel combined with the fuse holder and mains inlet.

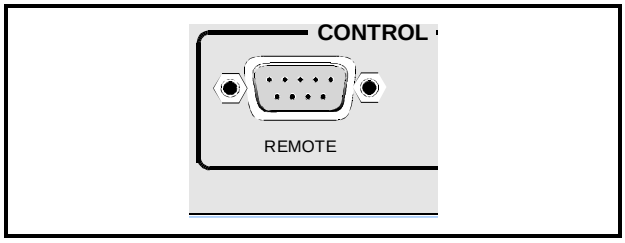
ROLLCALL™

This single BNC connector allows the unit to be connected to the RollCall network communications system. For more details of this system see Section 2 `Remote Control'



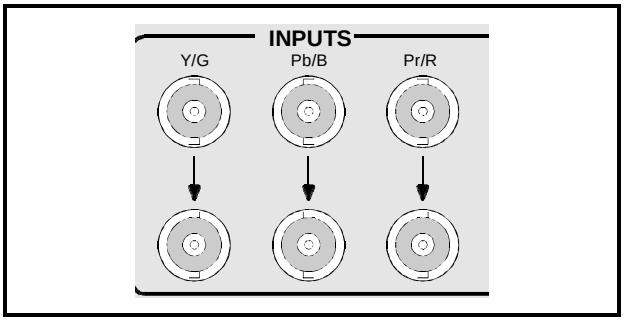
REMOTE

This 9 pin `D' connector on the rear panel is the remote control connector that allows specific functions to be controlled remotely.



INPUT CONNECTIONS

G/Y, B/Pb, R/Pr (GBR/YPbPr Component Inputs)



Component RGB or YPbPr inputs are accepted via these three sets of active loop-through BNC connectors for 75 Ohms.
Input signals should be connected to the upper set of connectors. Buffered signal outputs are available from the lower set of connectors.

For RGB signals

Connect **Green** signal to the **G/Y** connector
Connect **Blue** signal to the **B/Pb** connector
Connect **Red** signal to the **R/Pr** connector

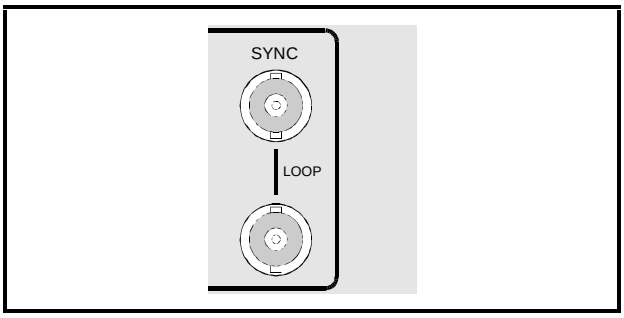
Signal levels are 0.7V p-p into 75 Ohms with syncs on the green channel.

For YPbPr signals

Connect **Y** signal to the **G/Y** connector
Connect **Pb** signal to the **B/Pb** connector
Connect **Pr** signal to the **R/Pr** connector

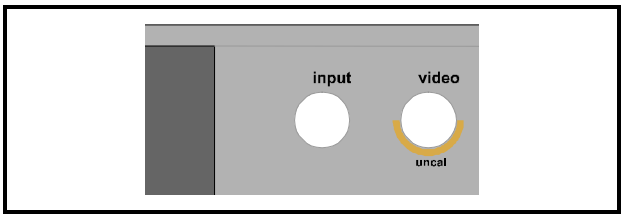
Signal levels are 0.7V p-p into 75 Ohms with syncs on the Y channel.

Sync



These connectors have no function on this unit.

Selection of Input Sync Format

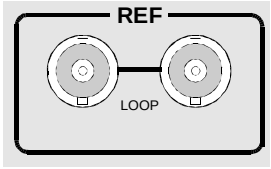


This **Input** button allows, via the Input Syncs menu either Syncs on green/Syncs on Y, or Digital HD syncs to be selected.

REF (Reference Sync Input)

The unit and its output signals may be reference locked to an external analogue (black burst or composite video) signal using the 'REF' connector. This loop-through input expects a standard level signal and should be terminated in 75 Ohms.

Note that any reference signal supplied must be compatible with the operating output standard of the unit.

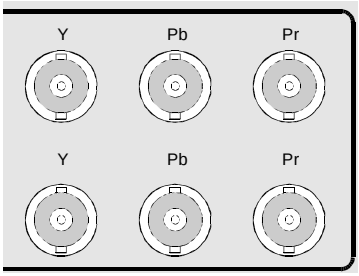


OUTPUT CONNECTIONS

YPbPr (Component Outputs)

2 sets of component YPbPr signals are available from these BNC connectors at 75 Ohms impedance.

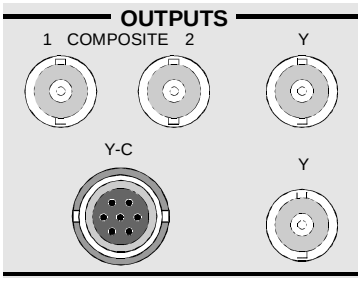
Pb and Pr signal levels are 0.7V p-p and the Y signal is 1 V p-p (0.7 V video and 0.3 V syncs) into 75 Ohms.



Y-C

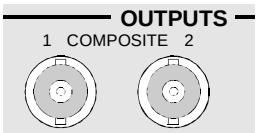
A Y/C separated luminance/chrominance type signal is available via this 7-pin dub type connector for 75 Ohms.

Y level is a nominal 1V p-p into 75 Ohms and C level is a nominal 0.3V p-p colour burst into 75 Ohms.



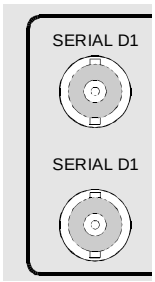
CVBS (Composite Outputs)

2 sets of composite video signals are available at standard level from these BNC connectors at 75 Ohms impedance.



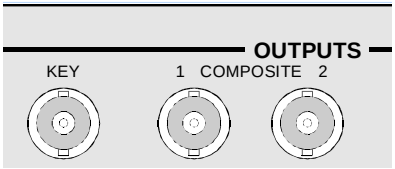
D1 (Serial D1)

2 sets of Serial Digital Video (D1) signals are available from these BNC connectors at 75 Ohms impedance.



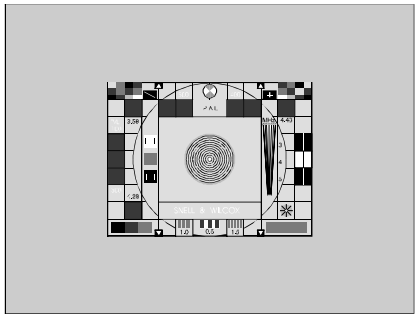
KEY (Output)

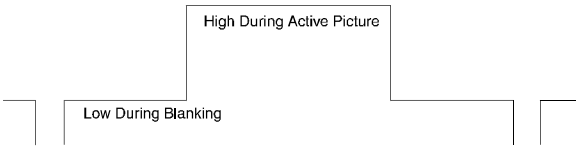
This connector provides a luminance signal at standard level (0.7 V video and 0.3 V syncs) that represents the location of the active picture within the screen area.



The signal will be high during active picture time and low at other (picture blanking) times as illustrated opposite.

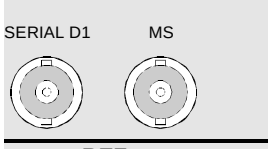
This signal may be used for feeding the key or DSK input of a vision mixer, especially when the picture has been zoomed out and another picture is used as a background.





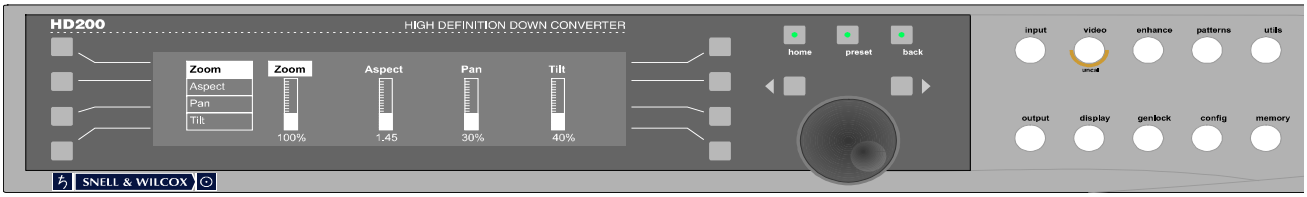
MS (Mixed Sync Output)

This BNC connector provides an output of standard mixed syncs. The output may be an analogue signal for 75 Ohms at 2 V p-p or a TTL compatible signal, selected by internal links.



Operation

GENERAL OPERATING PRINCIPLES



The HD200 may be operated by three methods:

1. By using the front panel controls
2. By using a remote control panel via the RollCall control system
3. Card edge controls

OPERATION USING THE FRONT PANEL CONTROLS

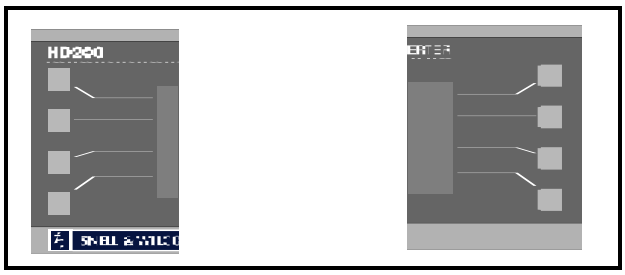
All operational parameters and selections may be made by pressing dedicated push buttons and selecting items from a system of menus displayed in the Plasma Display window.

Menus are selected by push buttons and and/or the spinwheel.

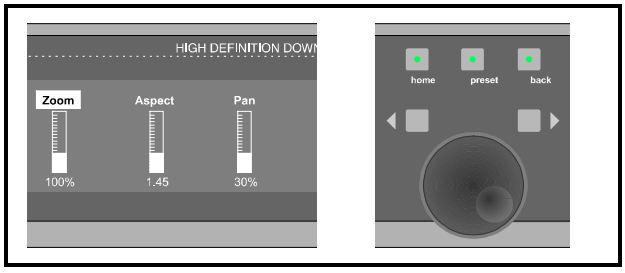
The spinwheel also allows continuously variable parameters, e.g. Gain, to be adjusted and the numerical value or setting to be seen in the window.

Various specific menus may be selected by operating dedicated push buttons.

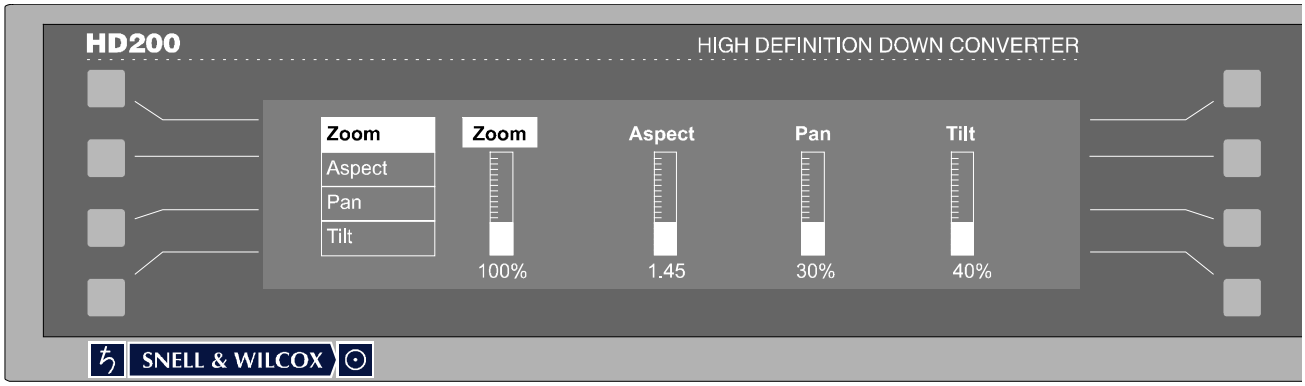
The two rows of vertical buttons either side of the display panel allows selections to be made from the adjacent menus. The item will become highlighted when enabled.
The example opposite shows that **Zoom** function selected.



The left and right arrow-headed buttons allow menu items (e.g. Zoom, Aspect, Pan etc.) to be selected in a left-to-right or right-to-left direction.
The example opposite shows that the **Zoom** bargraph has been selected.



The value of this function may then be adjusted using the spinwheel and the numerical value indicated below the bargraph display.

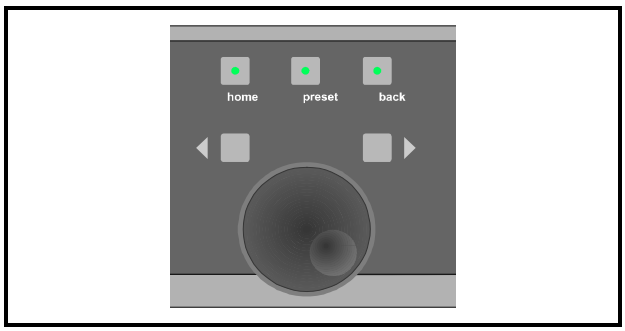


GENERAL OPERATING INFORMATION

Display Window

The control window displays all selection menus sub-menus and unit status information.

A selection is made by pressing the button adjacent to the required item and will become highlighted (reversed text) when active.



Pressing the **Home** button will display the home status screen in the display window from any position in the menu hierarchy.

It will display the current system set-up including the status of input and output signals.

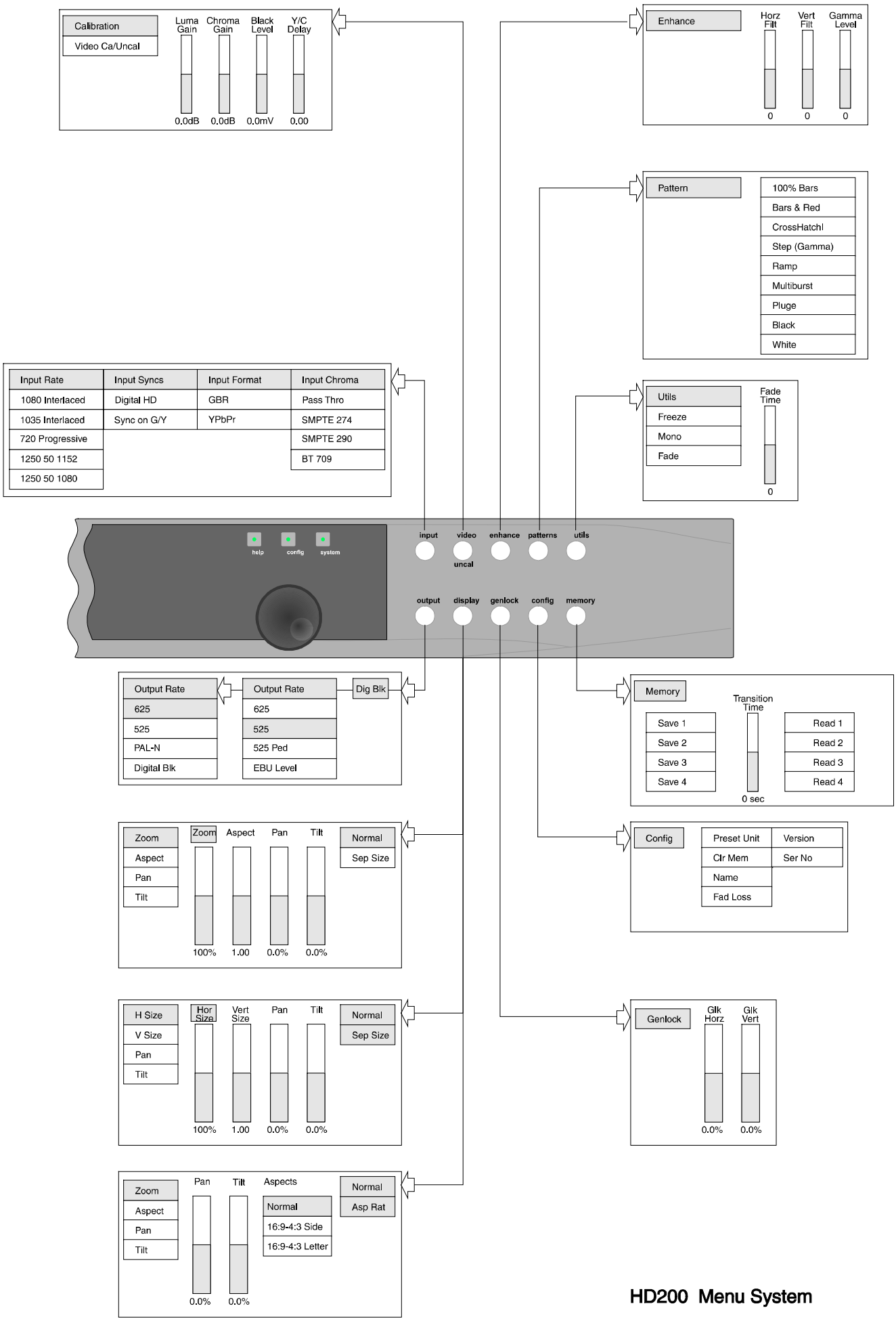
Home Display

In:	1080 Interlaced
Out:	525 59.94 2:1
Freeze	➠ Input Loss

The **Back** button allows a return to the last menu item that was *changed*. Up to 20 changed menu items may be retraced using this function.

Preset

Pressing this button will return all settings of the displayed menu to zero or default settings.

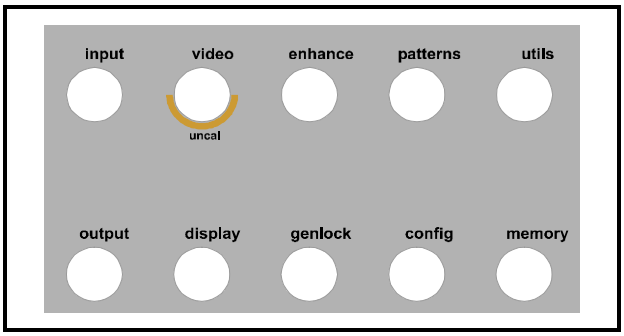


HD200 Menu System

USING THE DEDICATED PUSH BUTTONS
(see HD200 Menu System opposite)

Various specific menus may be selected using these push buttons.

When pressed the relevant menu will appear in the display window.



INPUT

This button will display a list of input signal selections available.

The correct input format, sync derivation and input rate for the connected signal are chosen from this menu.

Input Rates that may be selected are:

1080 Interlaced

1035 Interlaced

720 Progressive

1125 50 1080

1250 50 1152

1250 50 1080

Input Syncs that may be selected are:

Digital HD	Syncs derived from the HD video input (if fitted)
Sync on G/Y	Syncs derived from the signal connected to the G/Y input

Input Formats that may be selected are:

GBR	Component Green, Blue and Red video signals.
YPbPr	Component luminance and color difference video signals.

Signal connections are made via the BNC connectors marked Y/G, Pb/B, PrR

Input Chroma may be either:

Pass Thro	Chrominance is passed through the unit
SMPTE 274	Chrominance is processed from SMPTE 274 requirements
SMPTE 290	Chrominance is processed from SMPTE 290 requirements
BT709	Chrominance is processed from BT709 requirements

VIDEO

This button will display a list of video parameters (selected by using the arrow-headed push buttons) that may be adjusted using the spinwheel.
The bargraph display will move in sympathy with the rotation of the spinwheel and a numerical readout will be shown below the display. To return all settings to zero or their preset settings, press the preset button.

Adjustments for Analog Input Only

Luma Gain

The luma gain may be adjusted over a range of ±3 dB in steps of 0.1 dB

Chroma Gain

The chroma gain may be adjusted over a range of ±3 dB in steps of 0.1 dB.

Black Level

The black level of the output signal may be adjusted over a range of ±50 mV in steps of 0.1 mV.

Y/C Delay

The relative horizontal timing between the luminance signal and the chrominance signal may be adjusted with these controls.

The Delay Horiz will change the horizontal timing (left/right) by up to +16 to –8 pixels in steps of 1 pixel. A positive value of delay will shift the chrominance signal to the left of the picture and a negative value will shift the chrominance to the right of the picture.
The luminance signal will remain stationary.

ENHANCE

This function allows horizontal/vertical filtering/ehancement and Gamma correction to be applied to the picture.

+4 to –3 levels of horizontal filtering, and +1 to –2 levels of vertical filtering may be applied, in steps of single levels.

+5 to –4 levels of Gamma correction may be applied to the signal.
Not that these are arbitrary levels; they are not actual values of Gamma.

Gamma Notes

In this context Gamma is defined as the shape of the transfer characteristic between input signal amplitude and output signal amplitude. Normally the shape is a straight line with a slope of unity and the output level follows the input level over the dynamic range of the signal. i.e. Gain does not change with signal level.

If the shape of the transfer characteristic is changed to a curve, gain will then change with signal level and can be arranged to either stretch black parts of the signal and compress white parts or stretch white parts and compress black parts of the signal.

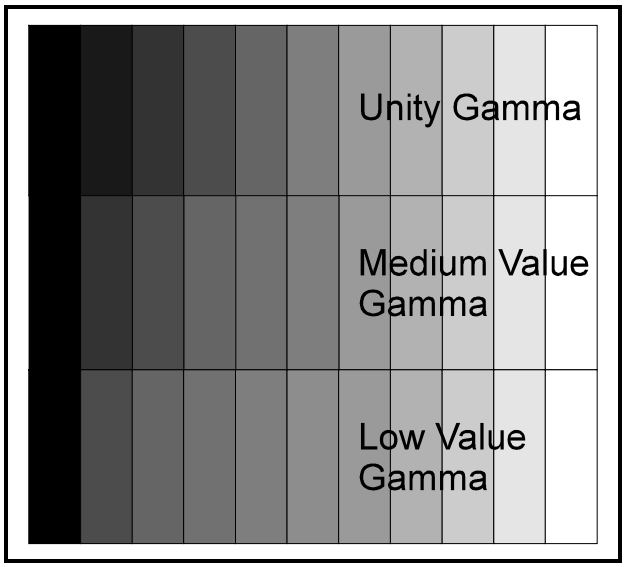
Generally the output level is related to the input level by the equation

$$Vout = Vin^{\gamma}$$

Where γ = Gamma Value

The Gamma correction is only applied to the Y (Luminance) signal. An example of the effects of gamma correction is shown below.

This function is particularly useful for correcting the non-standard Gamma characteristics of some computer-generated images.



PATTERNS

This function allows a pattern to become the output signal.

To change from a normal video output to a pattern output **Pattern** should be selected (highlighted text) using the push button adjacent to the text and the required pattern selected from list using the spinwheel.

Patterns available are as follows:

100% Bars
Bars & Red
Crosshatch
Step (Gamma)
Ramp
Multiburst
Pluge
Black
White

UTILS

This function allows the following actions to be applied to the output picture:

Freeze	The output picture will become a frozen frame
Mono	The output picture will become a monochrome (black and white) picture
Fade	The output picture will fade out to black or fade from black to a picture. The fade time may be adjusted using the adjacent spinwheel

OUTPUT

Pressing this button will reveal details about output rate and allow various selections to be made.

Dig Blk (Digital Blanking)

This function allows the width of blanking to be set.
When Digital Blanking is enabled blanking width will be correct for the D1 output signal; however, it should be noted that under these conditions the blanking width for the analogue output signals will be outside broadcast specifications.
When Digital Blanking is not enabled blanking width will be correct for analogue output signals; Under these conditions the blanking width for the D1 output signal will be outside broadcast specifications (too long).

Output Rate

Output line rates of 625 or 525 may be selected.

When **625** is selected the composite output will be standard PAL; if the PAL-N item is selected a **PAL-N** signal will appear at the composite output.

Blanking is normally to standard System I requirements; if **Digital Blk** is selected blanking will be the minimum allowed by CCIR 624.

When **525** is selected the composite output will be standard NTSC.
If **525 Ped** is selected the pedestal will be removed from the signal.
EBU Level is normally enabled to give 0.7 V p-p color difference signals for 100% Color Bars at the PbPr outputs; if this is disabled the color difference signals will be 0.7 V p-p for 75% Color Bars.

DISPLAY

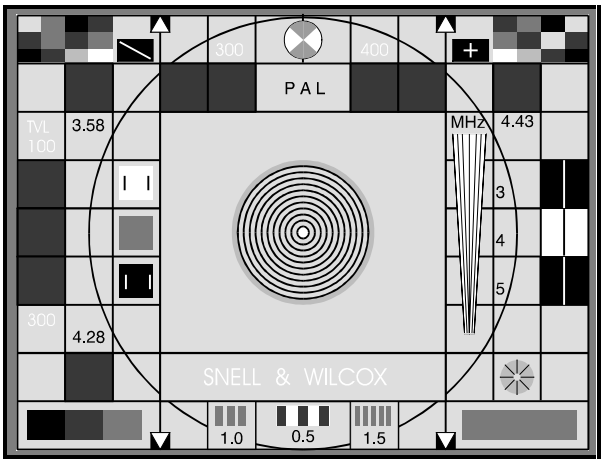
Pressing this button will reveal menus for changing the size of the output picture.

Note that the availability of particular size controls will depend on the selected function.

Normal

When Normal is selected (using the buttons to the right of the display) and **Sep Size** *not selected* adjustment of picture size may be made using the following controls:

(these functions are selected using arrow-headed buttons and adjusted using the spinwheel)



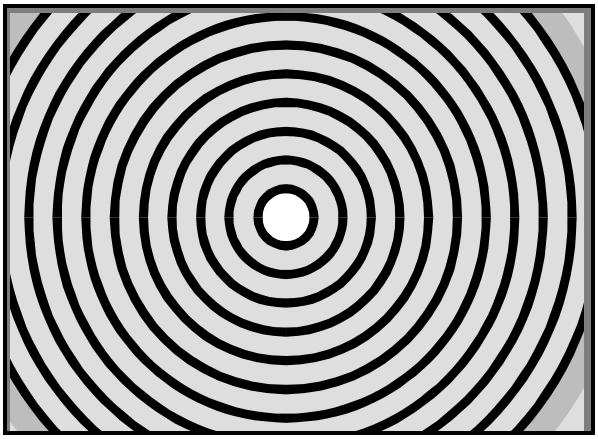
Picture at 100% Zoom

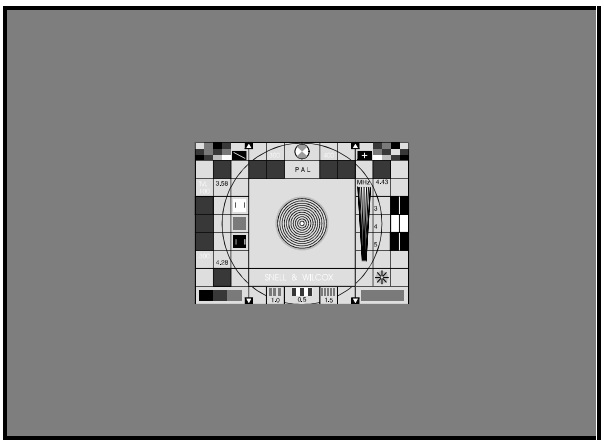
Zoom

The picture may be zoomed into to 500% and zoomed out to 40%

The numerical value of zoom will be shown below the bargraph display.

Preset value is 100%


Picture at +500% Zoom

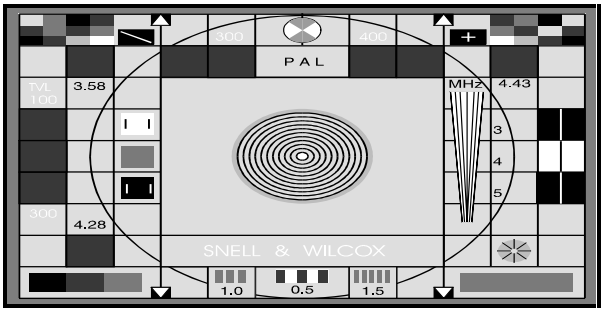

Picture at +500% Zoom

Aspect

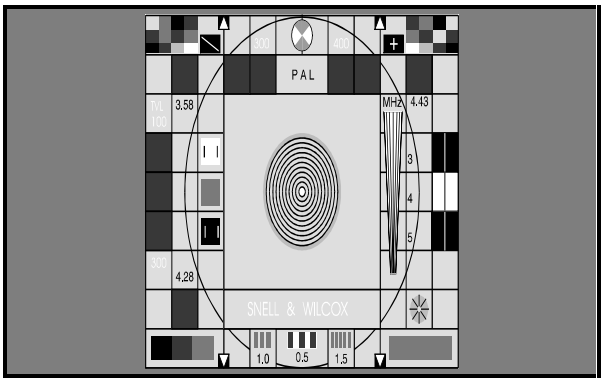
This function allows the picture aspect ratio to be adjusted over a large range; the actual range will depend on the value of zoom.

The numerical value will be shown below the bargraph display.

The preset value is 1:1.



Aspect Ratio set to 1.5 :1



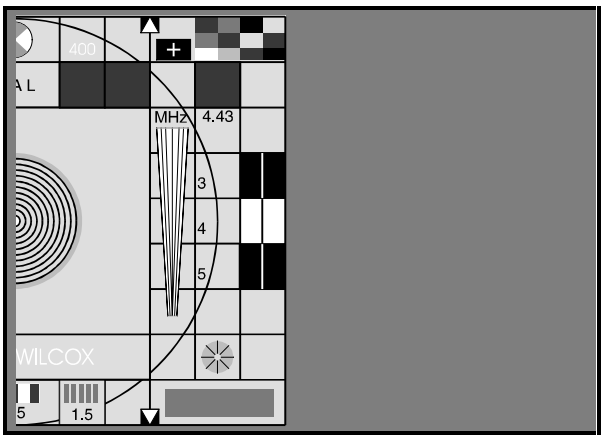
Aspect Ratio set to 0.75:1

Pan

The Pan selection allows the picture to be panned horizontally by ±90% of input picture width, in steps of 0.1%.

The numerical value will be shown below the bargraph display.

The preset value is 0



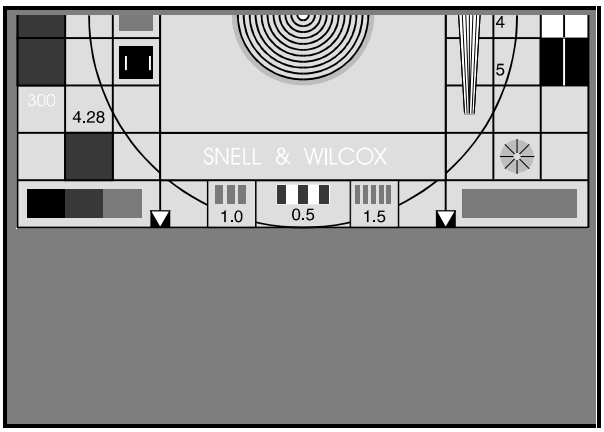
Picture panned 50%

Tilt

The Tilt selection allows the picture to be vertically panned by ±75% of input picture height, in steps of 1 input picture line.

The numerical value will be shown below the bargraph display.

The preset value is 0



Picture vertically panned (Tilt) 50%

Normal + Sep Size

When Normal and Sep Size is selected (using the buttons to the right of the display) adjustment of picture size may be made using the following controls:

(these functions are selected using arrow-headed buttons and adjusted using the spinwheel)

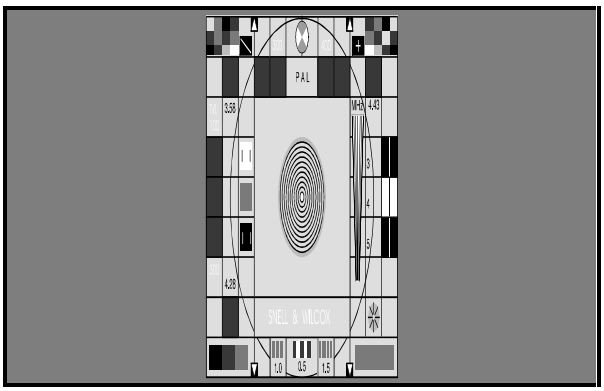
H Size

This allows the relative width of the output picture to be varied compared to the input picture.

The width may be reduced to 40% or increased to 500% in steps of approximately 0.1% as illustrated opposite.

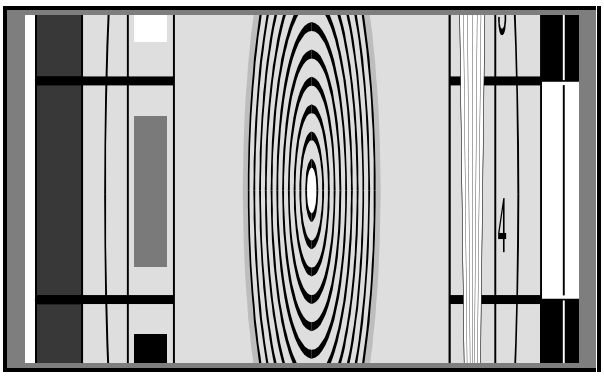
The numerical value will be shown below the bargraph display

The Preset value is 100%



Picture width reduced to 40%

Picture width increased to 500%

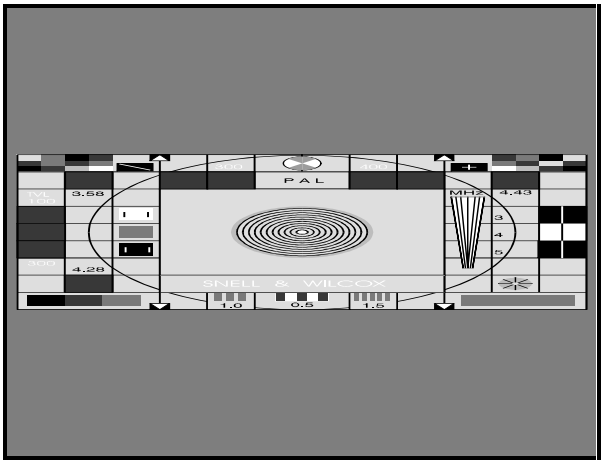

Picture height increased to 500%

V Size

This allows the relative the relative height of the output picture to be varied compared to the input picture.

The height may be reduced to 40% or increased to 500% in steps of approximately 0.1%.

The Preset value is 100%



Picture height reduced to 40%

Pan	*As for Normal; for details see above*
Tilt	*As for Normal; for details see above*

Asp Rat

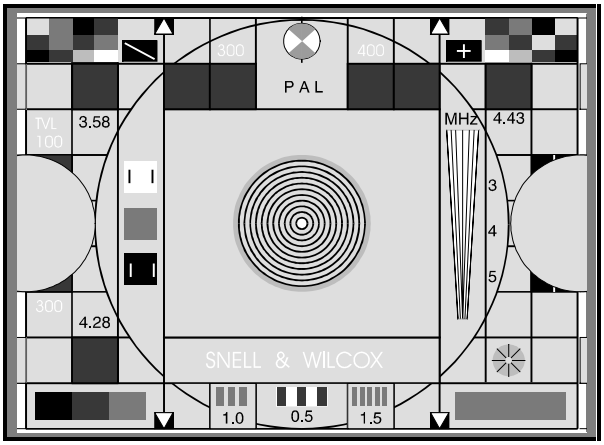
Pan *As for Normal; for details see above*

Tilt *As for Normal; for details see above*

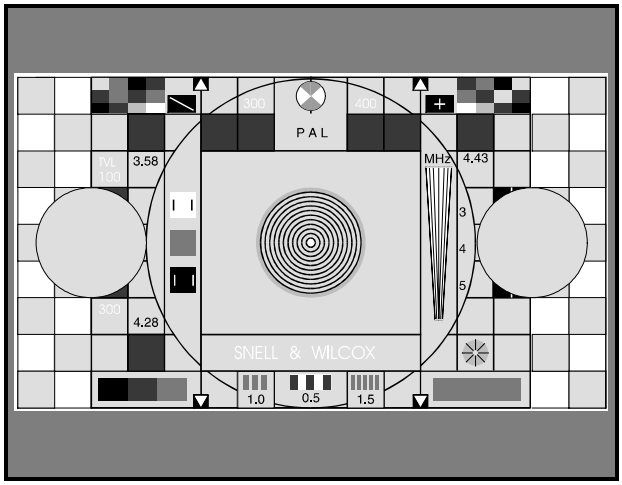
Aspects

Fixed aspect ratios may be selected from this menu:

Normal	Output ratio same as input ratio
16:9 – 4:3 Side	Loss of picture at the sides
16:9 – 4:3 Letter	Loss of picture at the top and bottom



16:9 to 4:3 Side



16:9 to 4:3 Letterbox

GENLOCK

This function allows genlock to be enabled (Genlock text highlighted) and horizontal/vertical timing between the reference and the output syncs to be adjusted.
Pressing the button adjacent to the genlock text will enable the genlock function when highlighted.

Glk Horz

The timing horizontal may be adjusted using the spinwheel to give an advance or a delay of up to 32 µs in 37 ns steps

The preset is zero.

Glk Vert

The vertical timing may be adjusted using the spinwheel to give an advance or a delay of up to 4 lines in steps of 1 line.

The preset/default value is zero.

CONFIG

Pressing this button reveals a menu that allows the unit configuration to be set.

Preset Unit

Selecting the preset function will return the unit and all settings to a preset condition. The preset conditions will be the factory default settings except where the default settings have been changed by the DIP switch SW3 *(see page 4.17).*

Note that this is not a reset function and all stored memory information will be retained.

This function is particularly useful for a first-time user or when the user is uncertain of a previous users set-up; returning to a preset condition provides an ideal starting point for configuring the unit to one's own preferences.

Clr Mem (Clear Memories)

This selection clears all data stored in all memory locations.

Name

Selecting this item will display the name of this unit in the control window. This name is used in the RollCall system and is supplied set as `HD200'

The user may change this name to an alphanumeric string of a maximum of 14 characters including spaces. This useful feature allows a unit to have a name more specific to an application e.g. HD Down Converter, etc.

When the text line is selected, the first character of will be in reversed flashing text; rotating the spinwheel can then change this character. When the desired character is found the button to the left or right of the text line should be pressed and the next text character will be highlighted and available for changing. The buttons to the left and right of the text line may be used to select other characters.

To save the new text, press the OK button. It should be noted that this is the only way to save the new text, as any other button function will return to another menu without modifying the original text.

Note that to remove a character and leave a clear space in the text line the Clear function (above Preset) should be used.

Fad Loss

Normally, by default, the unit will produce a frozen picture when the input signal is lost; however if this function is enabled and the signal input lost, the unit will produce a frozen picture which will then gradually fade to black. When the input signal is restored the picture will gradually fade from black to the picture signal.

Version (Software Version)

Selecting this function will display a message in the window indicating the software revision.

Ser No (Serial Number)

Selecting this function will display a message in the window indicating the serial number of the unit.

MEMORY

This selection reveals the memory save and read functions.

There are 4 memory locations where all settings may be saved. To save settings select a memory location, for example, Save 1. When this is highlighted the settings will be saved in the Mem 1 location. To recall a memory, select the required read memory location. When this is highlighted the settings stored in that location will be loaded.
To return to factory set default values press the Preset button.

When a new memory location (with new scale parameters) is enabled the time taken for the new values to become active may be set using the Transition time function.
The time may be set from 0.0 seconds to 10 seconds in 0.5 second steps.

OPERATING THE HD200 FROM AN ACTIVE CONTROL PANEL VIA THE ROLLCALL REMOTE CONTROL SYSTEM

The Menu System

All operational parameters and selections are made using a system of menus displayed in two LCD windows.
Menus are selected by push buttons adjacent to the display windows and further menu selections made by rotating a spinwheel and pressing a push button.

The spinwheel also allows continuously variable parameters, (where applicable) to be adjusted and the settings seen in the LCD window.

Various specific operations may be achieved by operating dedicated push buttons.

The system may be considered structured as a set of menus and sub-menus that are displayed in the windows. The windows will display the current status of the controlled module and other information messages and the names of the lower-level menus which may be scrolled through using the spinwheel.

A new menu may be selected by pressing the appropriate dedicated function button.

For full operational details of the active front panel consult the operating manual supplied with the active front panel.

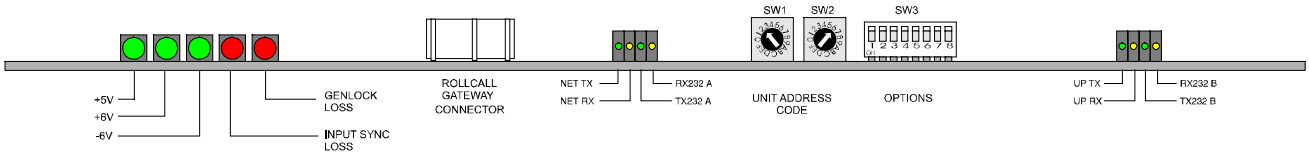
The menu items have the same functions and ranges as those displayed on the main unit front panel.

OPERATING THE HD200 USING THE CARD EDGE CONTROLS

PCB MODULE CONTROLS

On the front edge of the card fitted in the unit there are a number of preset controls, indicators and switches.

To access these controls the front panel should be pulled forward and lowered.



LED INDICATORS

Power Supply	+5V	Green ON=OK
	+6V	Green ON=OK
	- 6V	Green ON=OK
Input Signal Sync Loss	Red	ON=No sync, OFF=Signal Present
Genlock Signal Loss	Red	ON=No Ref signal, OFF=Ref Signal Present or ‘Genlock’ not selected
Data Received	Yellow	
Data Transmitted	Green	

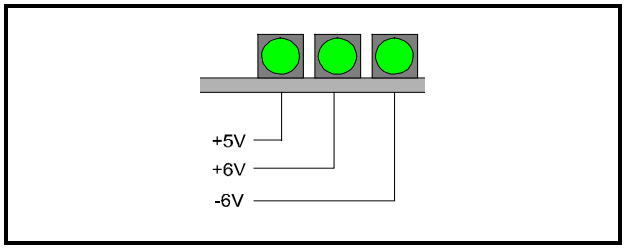
CONTROLS

Unit Address Code	These Hexadecimal switches set the unit address code
Options	Various Preset options may be set using an 8-way DIP

POWER SUPPLY INDICATORS

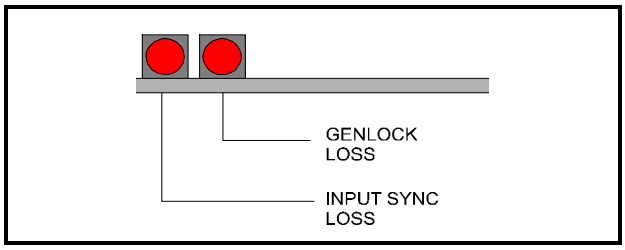
Three green LED indicators are provided to show the status of the internal +5V, +6V and -6V power supplies.

If any of the LED's are not illuminated the unit should be switched off immediately and the unit referred to a qualified service area.



GENLOCK (SIGNAL) LOSS

This Red LED will become illuminated if the unit is not receiving a reference input signal at the selected genlock source connector when the genlock function is enabled or if the sync level of the reference input signal is less than 100mV p-p Note that under these conditions the front panel left hand display window will indicate 'Reference Loss'

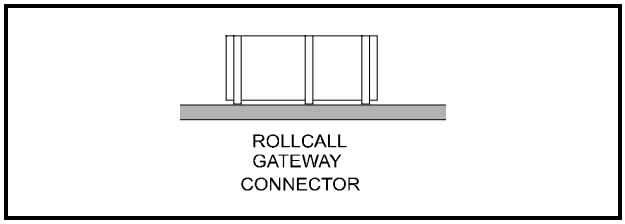


INPUT (SIGNAL) SYNC LOSS

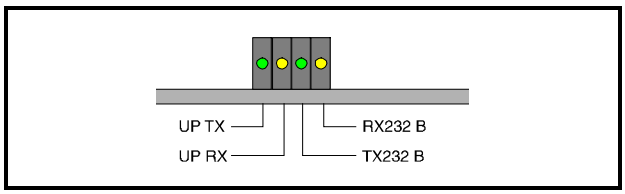
This Red LED) will become illuminated if the unit is not receiving an input signal at the selected input connector or if the sync level of the input signal is less than 100mV p-p Note that under these conditions the front panel left hand display window will indicate 'Signal Loss'

ROLLCALL GATEWAY CONNECTOR

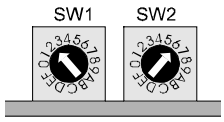
This connector is used to connect the PCB to the RollCall Gateway.



These two sets of green/yellow LED's indicate the CPU communications bus activity.



UNIT ADDRESS CODE



UNIT ADDRESS CODE

The HEX switches SW1 and SW2 are used to define the Unit Address code for the equipment. They are only read at power-up.

Position 00 is reserved.

Note that if SW1 is set to '0' this will be read as '1' i.e. values '01' to '0F' will read as '11' to '1F'

The minimum address code allowable is 10h (SW1=1, SW2=0) The unit as standard is shipped with the code 26h (SW1=2, SW2=6)

All positions above 10h may be used to set the unit address code in Hexadecimal. (SW1, 0 to F, SW2, 0 to F)

If a code is already in use, the RollCall receive and transmit LED's NET TX, NET RX, will flash alternately at a 1 second rate. The unit must then be powered-down, the code reset and the unit powered-up again.

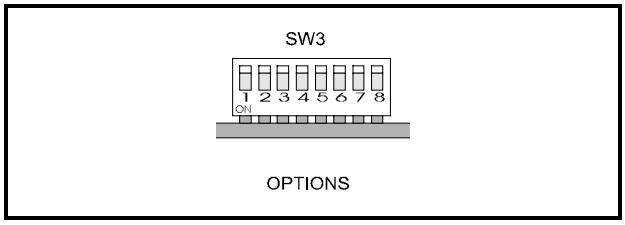
Note that in a RollCall segment, all units must have different unit address codes. For more information see RollCall Remote Control System Section 5.

OPTIONS

The DIP switch SW3 has two main functions:

1 The settings of this switch are read on power-up when memory function is disabled or when the preset button is pressed. When the memory is enabled previous settings will be restored on power-up.

2 When a passive front panel is fitted or host computer is not connected to the unit, this switch allows various functions to be enabled that would normally be set with the front panel controls or by the host computer.



FUNCTION SELECT	SW3							
	1	2	3	4	5	6	7	8
525 Output	■							
625 Output								■
525 Pedestal ON		■						
525 Pedestal OFF								
EBU Component Levels			■					
Betacam Component Levels								
Patterns OFF				■	■			
Pattern Bars				■				
Pattern Multiburst					■			
Pattern Ramp								
Input with Digital HD							■	
Input with Syncs on Green								■
Memory ON								■
Memory OFF								■

Remote Control

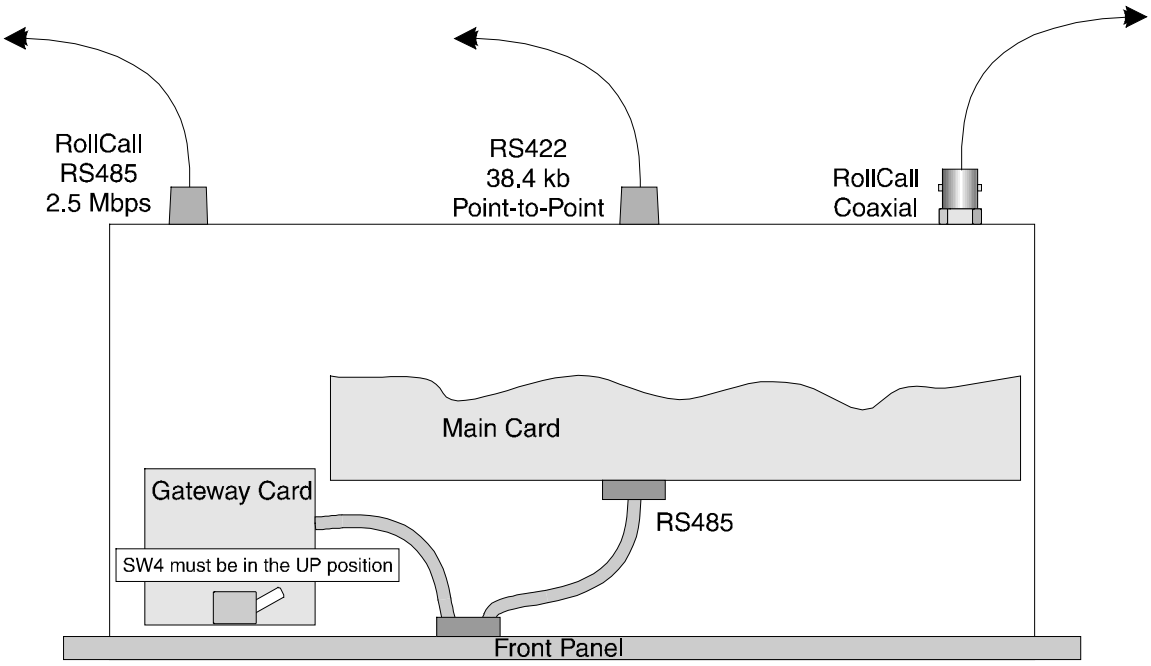
ROLLCALL™ OVERVIEW

The Snell & Wilcox RollCall™ remote control protocol fitted to HD200 provides full remote control of all functions, and in addition, integration with a range of compatible units all of which can be controlled from a variety of graphical controls.

Although offering a unified set of protocols, the RollCall™ system supports three physical connection arrangements.

RollCall™ communication may be via either a 9 pin `D' connector configured to RS485 or via a 75-Ohm coaxial cable connection to the network allowing long distance multi-drop coaxial inter-connections. The address of a unit is set by two Hex switches, each unit having a different address. In addition an RS422 port allows single point-to-point communication with a simplified set of Protocols.

The system may support multiple slave operation, multiple control operation or as a single network with a choice of coaxial or RS485 interface connection. High data rates of 2.5Mbits/sec are used on the coaxial port and RS485 port, and up to 38.4 kbits/sec on RS422 port.

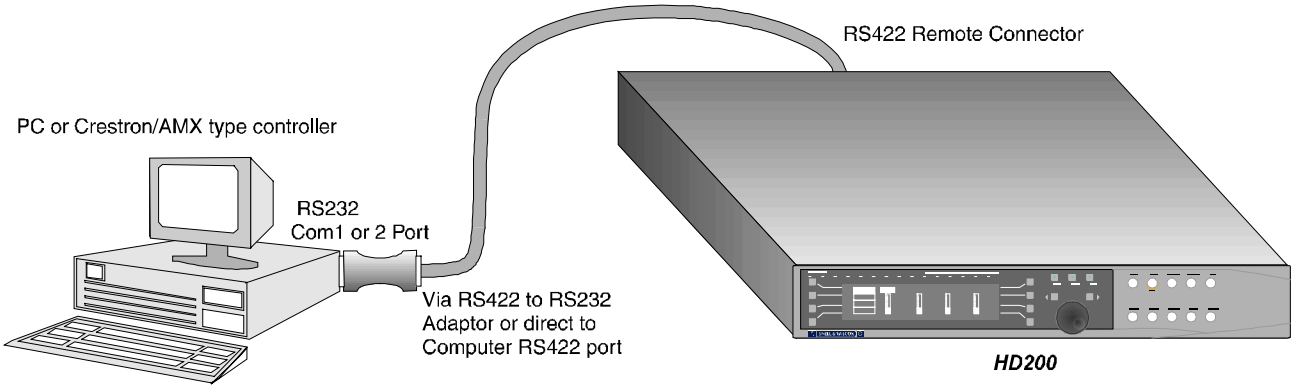


Further RollCall™ developments support Ethernet and Internet control, so providing the ultimate in ‘Remote Control’

Remote Control Options

Control from a PC or similar (non-RollCall network)

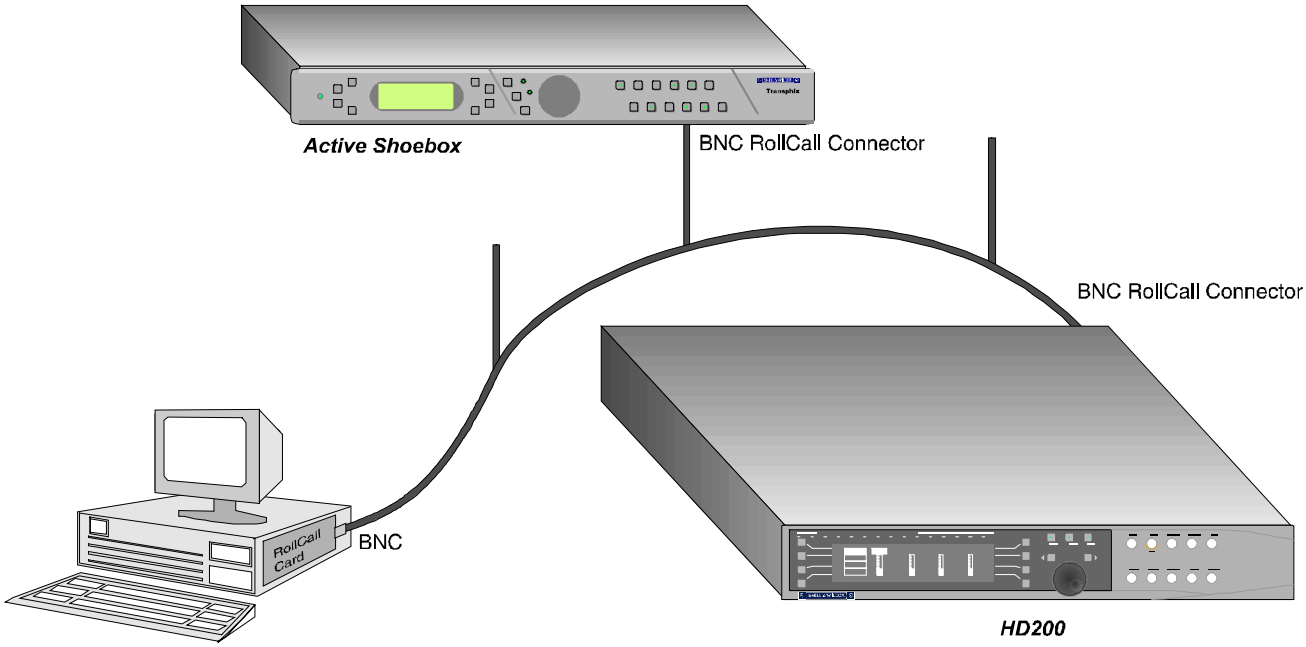
Using the RS422 Connection (see Appendix A for wiring information)



Control may be made using individual commands as described in Appendix A or by using the Snell & Wilcox RollCall program with the HD200 template (Product code IQSPCR).

Control from a PC or similar (RollCall network)

Snell & Wilcox can provide this Windows™ based P.C. RollCall™ program to control one or more units via a RollCall™ BNC coaxial port, for which a P.C. card is available (Product code IQCPC plus IQSPCR).



The RollCall™ coaxial connection allows interfacing with other RollCall™ compatible equipment, fitted with the RollCall™ BNC connector, over a maximum distance of 400 m using PSF1/2 cable or 300 m using RG59/U.

Under these conditions control is available from any other RollCall™ control device.

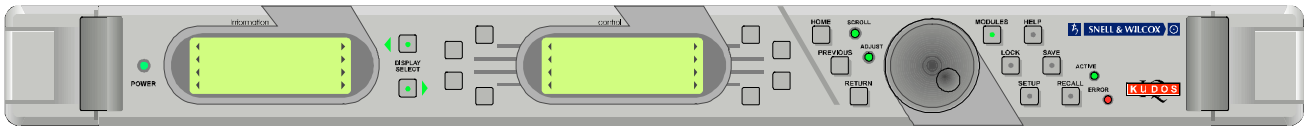
Included with the RollCall™ card is the RollCall™ program with the HD200 template.

Control of HD200 with other RollCall Units

Other RollCall units, fitted with a KUDOS IQ active front panel, may be used to control the HD200.

The KUDOS IQ active front panel has similar operation to the HD200 front panel, the main differences being the functions of the dedicated push buttons.

KUDOS IQ Active Front Panel



When using the KUDOS IQ active front panel to control the HD200 unit, the display windows and their associated push buttons, will function in the same way as those on a HD200 front panel; however, the dedicated push buttons will operate functions as described in Section 1 of the KUDOS IQ Modular System, Operator's Manual, 1U Active Control Panel, Dedicated Push Buttons.

To access the Output, Size, Filter, Freeze, Pattern, Save, Input, Video, Config, Mono, Glk and Recall functions (dedicated buttons on the HD200 front panel, but buttons not available on the KUDOS IQ active front panel) connect to the HD200 unit using the Modules function (see KUDOS IQ Modular System, Operator's Manual) and use the HD200 menu structure to access the functions.

Operating the HD200 Down Converter from a remote controller using the RS422 interface

Version 3.1 HD200 and above.
RollCall™ 3.0 compatible

HD200 remote control

The HD200 unit uses RollCall™ that is a software protocol based around an RS422 interface. This document describes how to use RollCall™ to interface with a HD200 computer graphics down converter.

The wiring for the cable connection from HD200 to the RS422 on a PC is drawn on page 16.

The protocol is a binary packet stream between controller and HD200. Comma separators are shown in this document for clarity, but should not be included in the actual protocol. Unless otherwise indicated all numbers in this document are hexadecimal representations of 8 bit (1 BYTE) binary numbers.

> Before controlling a unit, it is necessary to form a session with that unit, by way of a CONNECT command.
> Then control of the unit is performed by use of the SET PARAMETER command with associated data being unit specific.
> It is also possible to look at the settings of the HD200 using the GET FUNCTION STATUS command, the reply being a RETURN FUNCTION STATUS message.
> Finally once the controller no longer wishes to control the unit it can close the session with a DISCONNECT command.

These 4 commands are Rollcall™ commands, and as such should not be confused with the HD200 specific commands which are carried in the data block of the SET PARAM command.

Reserved characters
The software protocol used is a packet-based system which uses a start and end control byte to define the start and end of each packet.

CMD	Definition
0x02	Start of packet (STX)
0x03	End of packet (ETX)
0x1B	Escape character (ESC) for STX, ETX and ESC

An escape sequence is used if the start end or escape control code values are required in the packet.
The escape character is inserted, and the desired character has its MSB inverted.
The table below shows the 2-byte replacements.

Note that the value of the Data Length part of the packet will remain the same, since this escape character sequence is handled at a lower level.

Value required in body of Packet.	Sequence of bytes to be sent
0x02	0x1B, 0x82
0x03	0x1B, 0x83
0x1B	0x1B, 0x9B

Sending commands

The Rollcall protocol defines the format of all messages sent to the HD200. It consists of 4 distinct parts:

i) The packet header consisting of the start byte, destination address, source stream and destination stream. This is constant with the exception of the HD200's physical address.

ii) The Rollcall command, block consisting of a data length that includes the rollcall command, the command required, (1 byte) and the command flag (1 byte). This document details four ROLLCALL commands.

iii) The data block. This varies dependant on which ROLLCALL command is sent, and is HD200 specific. Use the tables at the end to fill in this section.

iv) The packet tail consisting of a checksum (use 00 to ignore) and the stop byte.

The protocol is presented below.

In this document the packet header is shaded.	Only changed if hardware is altered.
The remote command is lightly shaded.	Data length for command + data CONNECT / TERMINATE / SET PARAM / GET FUNCTION STATUS are the four cases used in this note.
Data is left unshaded.	Every Command is different.
Packet tail is shaded.	Only changed if hardware is altered.

The only difference between commands is the command number, the length of data field and the data which is sent with the command. i.e. the packet header is the same.

Establishing a session

CONNECT

Before commands can be sent to the HD200 unit, a session needs to be set up. The way in that this is done, is to send a data packet with the CONNECT command. Here is the byte sequence.

Nominal Value	Description.
0x02	(Start Packet (STX))
0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address) **
0x00, 0xFF	(HD200 stream index = Unknown)
0x00, 0x00	(Controller stream index)
0x00, 0x1B, 0x82	(Data length to follow, 2bytes + 0 [Value 02 is replaced.])
0x1B, 0x82	(RollCall™ CONNECT command [Value 02 is replaced.])
0x00	(RollCall™ command flag)
Data items	(Data items dependent on above; will be none.)
0x00	(Ignore Checksum)
0x03	(End packet (ETX))

i.e. 02 00 00 26 00 00 FF 00 00 00 1B 82 1B 82 00 00 03
Connects a session to the HD200

**NOTE: The value of the third byte in the hardware specific net address should be the value set on the hex switch that is located on the front of the main board of the HD200. If you change this switch, substitute new value in all packets. As shipped the value is 26_H

If the session is successfully set up an Acknowledge packet should be received from the HD200 that will consist of the following sequence of bytes:

0x02			(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00		(Hardware specific, HD200 net address)
	0x00, 0x00		(HD200 stream index)
	0x00, 0x00		(Controller stream index)
		0x00, 0x1B, 0x82	(Data length to follow)
		0x01	(RollCall™ ACKNOWLEDGE command)
		0x00	(RollCall™ Command flag)
		Data items	(None)
	0xXX		(Checksum)
0x03			(End packet (ETX))

i.e. 02 00 00 26 00 00 00 00 00 00 1B 82 01 00 XX 03
Acknowledges a session start from the HD200

Controlling the unit

SET PARAMETER

0x02			(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00		(Hardware specific, HD200 net address)
	0x00, 0x00		(HD200 stream index)
	0x00, 0x00		(Controller stream index)
		0x00, 0x0A	(Data length, 8 bytes for SET PARAM + 2 for Rollcall cmds)
		0x10	(RollCall™ SET PARAMETER command.)
		0x00	(RollCall™ command flag)
		Data items	(6 bytes, HD200 specific as per following tables.)
	0x00,		(Ignore checksum)
0x03			(End packet (ETX))

The *Data length* field for SET PARAM is 8 bytes, and consists of the following:

The *command number* is a word (two-byte) length field that contains the number of the menu that contains the desired command. For example, command number 00 A5 means select the pedestal menu.

The *mode* is a word (two byte) length field which contains a indicator to the type of the parameter. All paramters listed in this document are of type VALUE. (Other options are STRING, DATA or WRAPPED. VALUE is indicated by 0x00 0x01.

Parameter is a long (4 byte) field, which is either the menu item that is required or a parameter value, in 2's compliment. In the case of the pedestal, a parameter of 00 00 00 01 will provide normal pedestal; a parameter of 00 00 00 00 will remove the pedestal.
Region marked *** is taken from the command tables.

REMOVE PEDESTAL		Packet
	0x02	(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
	0x00, 0x00	(HD200 stream index)
	0x00, 0x00	(Controller stream index)
	0x00, 0x0A	(Data length (2 + 8 = 10))
	0x10	(RollCall™ SET PARAMETER command)
	0x00	(RollCall™ command flag)
***	**0x00, 0xA5**	**(Command number)**
***	**0x00, 0x01**	**(Mode number)**
***	**0x00,0x00,0x00,0x00**	**(Parameter)**
	0x00,	(Ignore checksum)
0x03		(End packet (ETX))

Actual byte sequence = 02 00 00 26 00 00 00 00 00 00 0A 10 00 00 A5 00 01 00 00 00 00 00 03

An example of where the 2's compliment number would be used is setting the luma gain. To set luma gain to 0.2 db; the packet would read;

LUMA GAIN SET TO 0.2dB		Packet
0x02		(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
	0x00, 0x00	(HD200 stream index)
	0x00, 0x00	(Controller stream index)
	0x00, 0x0A	(Data length)
	0x10	(RollCall™ SET PARAMETER command)
	0x00	(RollCall™ command flag)
***	**0x00, 0xC0**	**(Command number)**
***	**0x00, 0x01**	**(Mode number)**
***	**0x00,0x00,0x00,0x1B,0x82**	**(Parameter)**
	0x00,	(Ignore checksum)
0x03		(End packet (ETX))

Actual byte sequence is = 02 00 00 26 00 00 00 00 00 00 0A 10 00 00 C0 00 01 00 00 00 1B 82 00 03

After each SET PARAMETER has been sent a RETURN FUNCTION STATUS packet (see below) should be expected back from the HD200 unit, consisting of the following bytes:

02 00 00 26 00 00 00 00 00 00 0A 0C 00 xx xx 00 01 yy yy yy yy zz 03

where:

xx = HD200 command number.
yy = value the above is now set to
zz = packet checksum

Units status

GET FUNCTION STATUS

In order to find out the current parameters of the HD200, the RollCall™ Get Function Status command is required, number $0B_H$.

0x02		(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
	0x00, 0x00	(HD200 stream index)
	0x00, 0x00	(Controller stream index)
	0x00, 0x04	(Data length, 2 bytes for GET FUNCTION STATUS + 2)
	0x0B	(RollCall™ GET FUNCTION STATUS command.)
	0x00	(RollCall™ command flag)
	Data items	(2 bytes, HD200 specific as per tables.)
	0x00,	(Ignore checksum)
0x03		(End packet (ETX))

The *Data length* field for GET FUNCTION STATUS is 2 bytes.

In this case the *command number* is a word (two-byte) length field which contains the number of the menu that we want to know the status of.

The parameter or mode are not included in the GET FUNCTION STATUS packet since it is these which we want to know!

Included below are a few examples of GET FUNCTION STATUS:

GET PEDESTRAL STATUS		Packet
0x02		(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
	0x00, 0x00	(HD200 stream index)
	0x00, 0x00	(Controller stream index)
	0x00, 0x04	(Data length)
	0x0B	(RollCall™ GET FUNTION STATUS command)
	0x00	(RollCall™ command flag)
***	**0x00, 0xA5**	**(Command number)**
	0x00,	(Ignore checksum)
0x03		(End packet (ETX))

Actual byte sequence = 02 00 00 26 00 00 00 00 00 00 04 0B 00 00 A5 00 03

To get the value of the luma gain to the packet would read:

GET LUMA GAIN		Packet
0x02		(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
	0x00, 0x00	(HD200 stream index)
	0x00, 0x00	(Controller stream index)
	0x00, 0x04	(Data length)
	0x0B	(RollCall™ GET FUNCTION STATUS command)
	0x00	(RollCall™ GET FUNCTION STATUS command flag)
***	**0x00, 0xC0**	**(Command number)**
	0x00,	(Ignore checksum)
0x03		(End packet (ETX))

Actual byte sequence is = 02 00 00 26 00 00 00 00 00 00 04 0B 00 00 C0 00 03

RETURN FUNCTION STATUS

After a GET FUNCTION STATUS command has been sent a RETURN FUNCTION STATUS packet should be expected back from the HD200 unit, instead of an Acknowledge packet. It is in a similar format to the commands:

0x02		(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
	0x00, 0x00	(HD200 stream index)
	0x00, 0x00	(Controller stream index)
	0x00, 0x0A	(Data length, 8 bytes for RETURN FUNCT'N STATUS)
	0x0C	(RollCall™ RETURN FUNCTION STATUS command.)
	0x00	(RollCall™ command flag)
	Data items	(8 bytes, HD200 specific as per tables.)
	0xXX,	(Checksum)
0x03		(End packet (ETX))

The *Data length* field for RETURN FUNCTION STATUS is 8 bytes, and consists of the following:.

The *command number* is included and is a word (2 byte), and should match the command number sent in the GET FUNCTION STATUS command.

The *mode* is included and is a word (2 byte), and should be 00 01 for VALUE.

The *Parameter* is a long (4 byte) field, which gives the current value of the paramter associated with the command.

The following examples show possible return packages corresponding to the previous GET FUNCTION STATUS examples:

RETURN FUNCTION STATUS's

	RETURN PEDESTAL STATUS	Packet
0x02		(Start Packet (STX))
	0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
	0x00, 0x00	(HD200 stream index)
	0x00, 0x00	(Controller stream index)
	0x00, 0x0A	(Data length (8 + 2))
	0x0C	(RollCall™ RETURN FUNCTION STATUS command)
	0x00	(RollCall™ command flag)
***	**0x00, 0xA5**	**(Command number)**
***	**0x00, 0x01**	**(Mode = value)**
***	**0x00, 0x00, 0x00, 0x00**	**(Parameter)**
	0xXX,	(Checksum)
0x03		(End packet (ETX))

Actual byte sequence = 02 00 00 26 00 00 00 00 00 00 0A 0C 00 00 A5 00 01 00 00 00 00 XX 03
(Pedestal is being removed)

Again 2's compliment is used to read parameters with actual values, as shown below.

LUMA GAIN STATUS	Packet
0x02	(Start Packet (STX))
0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address)
0x00, 0x00	(HD200 stream index)
0x00, 0x00	(Controller stream index)
0x00, 0x0A	(Data length (8 + 2))
0x0C	(RollCall™ RETURN FUNCTION STATUS command)
0x00	(RollCall™ command flag)
*** **0x00, 0xC0**	**(Command number)**
*** **0x00, 0x01**	**(Mode = value)**
*** **0x00,0x00,0x00,0x1B,0x82**	**(Parameter)**
0xXX,	(Checksum)
0x03	(End packet (ETX))

Actual byte sequence is = 02 00 00 26 00 00 00 00 00 00 0A 0C 00 00 C0 00 01 00 00 00 1B 82 XX 03
(Luma gain is set to 0.2dB)

Ending a session

DISCONNECT

When a program has stopped communicating with the HD200 a disconnect session packet should be sent. (This is a rare event since usually a controller will stay in session permanently) This packet consists of the following sequence of bytes:

DISCONNECT SESSION	Packet
0x02	(Start Packet (STX))
0x00, 0x00, 0x26, 0x00	(Hardware specific, HD200 net address) **
0x00, 0x00	(Destination stream)
0x00, 0x00	(Source stream)
0x00, 0x1B, 0x82	(Data length, 2 bytes [Value 02 is replaced.])
0x1B, 0x83	(RollCall™ DISCONNECT command [Value 03 is replaced.])
0x00	(RollCall™ command flag)
0x00,	(Ignore checksum)
0x03	(End packet (ETX))

Actual sequence is = 02 00 00 26 00 00 00 00 00 1B 83 00 00 00 00 03

If the session is successfully terminated an Acknowledge packet should be expected back from the HD200 unit.

02 00 00 26 00 00 00 00 00 00 1B 82 01 00 00 03
Acknowledge from the HD200

Example Session

All bytes in **bold** are sent to HD200; all bytes in `small text` are from HD200.

A session with the HD200 unit should be initiated with the following packet

02, 00, 00, 26, 00, 00, FF, 00, 00, 00, 1B, 82, 1B, 82, 00, 00, 03

Connects a session to the HD200.

An Acknowledge packet will be expected back consisting of the following bytes

`02, 00, 00, 26, 00, 00, 1B, 82, 00, 00, 00, 1B, 82, 01, 00, A0, 03`

`Acknowledge from the HD200.`

Change Luma Gain to -3dB

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 00, C0, 00, 01, FF, FF, FF, E2, 00, 03

Select Luma Gain to -3db

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, OC, 00, 00, C0, 00, 01, FF, FF, FF, E2, A5, 03`

`Acknowledge from the HD200.`

Change Luma Gain to +3dB

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 00, C0, 00, 01, 00, 00, 00, 1E, 00, 03

Select Luma Gain to +3db

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, C0, 00, 01, 00, 00, 00, 1E, E6, 03`

`Acknowledge from the HD200.`

The next sequence of bytes should set Pattern Generation on.

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 00, FD, 00, 01, 00, 00, 00, 01, 00, 03

Set Pattern Generation On.

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, FD, 00, 01, 00, 00, 00, 01, C6, 03`

`Acknowledge from the HD200.`

The next sequence of bytes should set Pattern Generation Off.

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 00, FD, 00, 01, 00, 00, 00, 00, 00, 03

Set Pattern Generation Off.

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, FD, 00, 01, 00, 00, 00, 00, C7, 03`

`Acknowledge from the HD200.`

Change Aspect Ratio to 16:9- 4:3 Letterbox

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 00, B5, 00, 01, 00, 00, 00, B8, 00, 03

Select Aspect Ratio to 16:9- 4:3 Letterbox

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, B5, 00, 01, 00, 00, 00, B8, D7, 03`

`Acknowledge from the HD200.`

Change Aspect Ratio to Normal

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 00, B5, 00, 01, 00, 00, 00, B6, 00, 03

Select aspect ratio to 16:9- 4:3 Letterbox

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, B5, 00, 01, 00, 00, 00, B6, D9, 03`

`Acknowledge from the HD200.`

Store in memory 1

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 01, 2D, 00, 01, 00, 00, 01, 2E, 00, 03

Save in memory 1

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 01, 2D, 00, 01, 00, 00, 01, 2E, E7, 03`

`Acknowledge from the HD200.`

Read memory 1

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 10, 00, 01, 37, 00, 01, 00, 00, 01, 38, 00, 03

Read memory 1

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 01, 37, 00, 01, 00, 00, 01, 38, D3, 03`

`Acknowledge from the HD200.`

Identify Luma Gain Value

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 04, 0B, 00, 00, C0, 00, 03

Get Function Status on Luma Gain

`02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, C0, 00, 01, 00, 00, 00, 1E, E6, 03`

`Return Function Status from the HD200.`

`Luma Gain is +3dB`

Identify Pattern Generation Status

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 04, 0B, 00, 00, FD, 00, 03

Get Function Status on Pattern Generation

```
02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, FD, 00, 01, 00, 00, 00, 00, C7, 03
Return Function Status from the HD200.
Pattern Off
```

Identify Aspect Ratio Status

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 04, 0B, 00, 00, B5, 00, 03

Get Function Status on Aspect Ratio

```
02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 0A, 0C, 00, 00, B5, 00, 01, 00, 00, 00, B6, D9, 03
Return Function Status from the HD200.
Normal Aspect
```

When a program has finished the following disconnect session packet should be sent

02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 1B, 82, 1B, 83, 00, 00, 03

Disconnects a session to the HD200.

```
02, 00, 00, 26, 00, 00, 00, 00, 00, 00, 1B, 82, 01, 00, BD, 03
Acknowledge from the HD200
```

Tables to show the commands of the HD200

The *Scale and unit* field signifies the amount that the parameter sent with a command is multiplied by. For example when the Luma Gain is being set a value between -30 and +30 is sent which is then multiplied by 0.1 to give an actual value of -3 to +3 which has the unit dB. The numbers are decimal in this column.

The Step unit indicates the amount by which parameters sent with a command can be stepped by. For example the Horizontal picture size command has a range of acceptable values between 170 and 560 and should be stepped in units of 10. This means that values like 175 and 195 are not acceptable. This numbers in this column are decimal.

Note: commands without a parameter field expects a number to be sent to set the actual value of the parameter. For example the Luma gain command which expects the required value of the Luma gain to be sent to the unit. The format of the numbers to be sent is 2's complement 4 byte to allow negative numbers to be sent. For commands where the range goes from negative to positive, the negative numbers can be expressed by using binary twos complement. If the default setting for a command such as Luma gain is required the value to send is Max Value + 1.

Menu item	Function name	Command number	Parameter
Output	625 50 2:1	00 A1	00 00 00 A2
Output	525 59.94 2:1	00 A1	00 00 00 A3
Output Format	525 Pedestal (none)	00 A5	00 00 00 00
Output Format	525 Pedestal On	00 A5	00 00 00 01
Output Format	525 Pedestal Toggle	00 A5	00 00 00 02
Output Format	PAL-N Off	00 A6	00 00 00 00
Output Format	PAL-N On	00 A6	00 00 00 01
Output Format	PAL-N Toggle	00 A6	00 00 00 02
Output Format	EBU Levels On	00 A7	00 00 00 00
Output Format	EBU Levels Off	00 A7	00 00 00 01
Output Format	EBU Levels Toggle	00 A7	00 00 00 02
Output Format	Digital Blanking	00 A8	00 00 00 00
Output Format	Digital Blanking	00 A8	00 00 00 01
Output Format	Digital Blanking	00 A8	00 00 00 02
Output Format	625 out Off	00 A9	00 00 00 00
Output Format	625 out On	00 A9	00 00 00 01
Output Format	625 out Toggle	00 A9	00 00 00 02

Menu item	Function name	Command number	Parameter
Input Rate	Auto std detect	00 7A	00 00 00 7B
Input Rate	1250 H	00 7A	00 00 00 83
Input Rate	1250 L	00 7A	00 00 00 84
Input Rate	1125 59.94	00 7A	00 00 00 85
Input Rate	1125 60	00 7A	00 00 00 86
Input Rate	1050	00 7A	00 00 00 87
Input Rate	1080	00 7A	00 00 00 88
Input Rate	720 Progressive	00 7A	00 00 00 89
Input Rate	480 Progressive	00 7A	00 00 00 8A

Menu item	Function name	Command number	Parameter
Input Syncs	Digitsl HD Syncs	00 91	00 00 00 95
Input Syncs	Sync on G/Y	00 91	00 00 00 92

Menu item	Function name	Command Number	Parameter
Input Format	GBR	00 8D	00 00 00 8E
Input Format	YPbPr	00 8D	00 00 00 8F

Menu item	Function name	Command number	Parameter	Min Value	Max Value	Size and Unit	Step
Picture Sizing	Horizontal size	00 AC		00 00 01 90	00 00 13 88	0.1	1
Picture Sizing	Vertical size	00 AD		00 00 01 90	00 00 13 88	0.1	1
Picture Sizing	Zoom	00 B0		00 00 01 90	00 00 13 88	0.1	1
Picture Sizing	Aspect	00 B1		00 00 01 F4	00 00 07 D0	0.001	1
Picture Sizing	Pan	00 AF		FF FF EC 78	00 00 13 88	0.1	1
Picture Sizing	Tilt	00 AE		FF FF EC 78	00 00 13 88	0.1	1
Picture Sizing	Separate Size Off	00 D8	00 00 00 00				
Picture Sizing	Separate Size On	00 D8	00 00 00 01				
Picture Sizing	Separate Size Toggle	00 D8	00 00 00 02				
Aspect Ratio	Normal	00 B5	00 00 00 B6				
Aspect Ratio	16:9-4:3 Side Crop	00 B5	00 00 00 B7				
Aspect Ratio	16:9-4:3 Letter Box	00 B5	00 00 00 B8				
Aspect Ratio	4:3-16:9 Curtains	00 B5	00 00 00 B9				
Aspect Ratio	4:3-16:9 Top Crop	00 B5	00 00 00 BA				

Menu item	Function name	Command number	Parameter	Min value	Max value	Scale and Unit	Step
ProcAmp controls	Luma gain	00 C0		FF FF FF E2	00 00 00 1E	0.1(dB)	1
ProcAmp controls	Chroma gain	00 C1		FF FF FF E2	00 00 00 1E	0.1(dB)	1
ProcAmp controls	Black level	00 C2		FF FF FF CE	00 00 00 32	1 (mV)	2
ProcAmp controls	Horz Y/C delay	00 C7		FF FF FF F8	00 00 00 16	1 (H)	1
ProcAmp controls	Video reset On	00 BF	00 00 00 00				
ProcAmp controls	Video reset Off	00 BF	00 00 00 01				
ProcAmp controls	Video reset Toggle	00 BF	00 00 00 02				

Menu item	Function name	Command number	Paramater Min value	Max value	Scale and Unit	Step
Filtering	Horizontal enhance	00 CA	FF FF FF A6	00 00 00 78	3.0 (dB)	1E
Filtering	Vertical enhance	00 C9	00 00 00 00	00 00 00 5A	3.0 (dB)	1E
Filtering	Gamma	00 CC	00 00 00 00	00 00 00 09	1	1

Menu item	Function name	Command number	Paramater
Config Menu	Preset unit	00 D2	00 00 00 D3
Config Menu	Clear memories	00 D2	00 00 00 D4
Config Menu	Software version	00 D6	00 00 00 00
Config Menu	Unit name	00 D7	00 00 00 00
Config Menu	Fade loss off	00 E0	00 00 00 00
Config Menu	Fade loss on	00 E0	00 00 00 01
Config Menu	Fade Loss toggle	00 E0	00 00 00 02

Menu item	Function name	Command number	Parameter
Freeze	Freeze off	00 E8	00 00 00 00
Freeze	Freeze on	00 E8	00 00 00 01
Freeze	Freeze toggle	00 E8	00 00 00 02
Mono	Mono off	00 F0	00 00 00 00
Mono	Mono on	00 F0	00 00 00 01
Mono	Mono toggle	00 F0	00 00 00 02

Menu item	Function name	Command number	Parameter
Pattern Select	100% Bars	00 FC	00 00 00 00
Pattern Select	Cross Hatch	00 FC	00 00 00 02
Pattern Select	Step (Gamma)	00 FC	00 00 00 03
Pattern Select	Ramp	00 FC	00 00 00 04
Pattern Select	Multi Burst	00 FC	00 00 00 05
Pattern Select	Pluge	00 FC	00 00 00 06
Pattern Select	Black	00 FC	00 00 00 07
Pattern Select	White	00 FC	00 00 00 08
Pattern Select	Pattern off	00 FD	00 00 00 00
Pattern Select	Pattern on	00 FD	00 00 00 01
Pattern Select	Pattern toggle	00 FD	00 00 00 02

Menu item	Function name	Command number	Parameter	Min value	Max value	Scale and Unit	Step
Genlock Adjust	Genlock off	01 1A	00 00 00 00				
Genlock Adjust	Genlock on	01 1A	00 00 00 01				
Genlock Adjust	Genlock toggle	01 1A	00 00 00 02				
Genlock Adjust	Genlock horiz phaze	01 1B		FF FF 83 00	00 00 7D 00	37 (ns)	37
Genlock Adjust	Genlock vert phase	01 1C		FF FF FF FC	00 00 00 04	1 (lines)	1

Menu item	Function name	Command number	Parameter
Save menu	Save 1	01 2D	00 00 01 2E
Save menu	Save 2	01 2D	00 00 01 2F
Save menu	Save 3	01 2D	00 00 01 20
Save menu	Save 4	01 2D	00 00 01 31
Save menu	Save 5	01 2D	00 00 01 32
Save menu	Save 6	01 2D	00 00 01 33

Menu item	Function name	Command number	Min value	Max value	Scale	Step
Memory time	Transition time	01 3F	00 00 00 00	00 00 0F A0	20 (ms)	20

Menu item	Function name	Command number	Parameter
Recall menu	Read 1	01 36	00 00 01 37
Recall menu	Read 2	01 36	00 00 01 38
Recall menu	Read 3	01 36	00 00 01 39
Recall menu	Read 4	01 36	00 00 01 3A
Recall menu	Read 5	01 36	00 00 01 3B
Recall menu	Read 6	01 36	00 00 01 3C

WIRING FOR HD200 RS422 INTERFACE TO PC RS422 INTERFACE

Baud Rate: 38 400
Parity: None
Data: 8 Bits
Stop Bits: 1

PC End
RS422 on PC

HD200 End

Tx +ve (A)		7	Tx +ve
Tx -ve (B)		2	Tx -ve
Rx +ve (A)		3	Rx +ve
Rx -ve (B)		8	Rx -ve
Ground		6	Ground **

Note:

Do not connect to any other pins on the HD200 9-way D-type connector
**Ground is on pins 1, 4, 6 & 9. Connect to any one of these pins.
Pin 5 is power and no connection should be made to this pin.