



HD4000

High Definition Synchroniser


Operator's Manual

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Safety Warnings

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

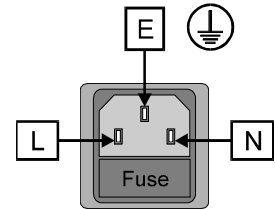
This equipment shall be supplied from a power system providing a **PROTECTIVE EARTH**  connection and having a neutral connection which can be reliably identified.

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:

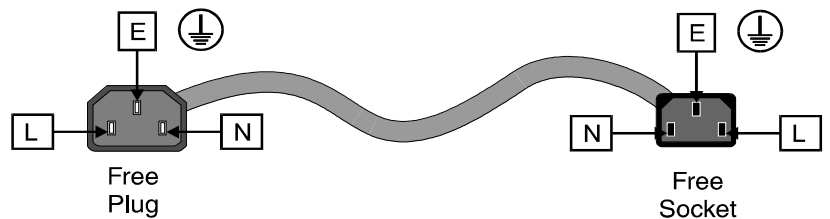
- GREEN/YELLOW lead connected to E (Protective Earth Conductor)
- BLUE lead connected to N (Neutral Conductor)
- BROWN lead connected to L (Live Conductor)

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 conforms to 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.

Federal Communications Commission Rules Part 15, Class A :1998

Safety Standards

This unit conforms to EN60065:1992 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:

- HD4000 High Definition Synchroniser
- Power cable
- Operating and Service Manual
- Extender Card (optional)
- Remote Panel +Cable (optional)

Manufacturers Notice

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Reproduction or disassembly of embedded computer programs or algorithms prohibited.

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 authorized 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.

Information in this manual and software are subject to change without notice and does not represent a commitment on the part of Snell & Wilcox Ltd.

Software Version Amendments

Notes about Version Fitted

This machine is shipped with version 2.00 of the firmware.

Specific limitations of this version are as follows:

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SNELL & WILCOX

HD4000

High Definition Synchroniser

Operation & Service Manual

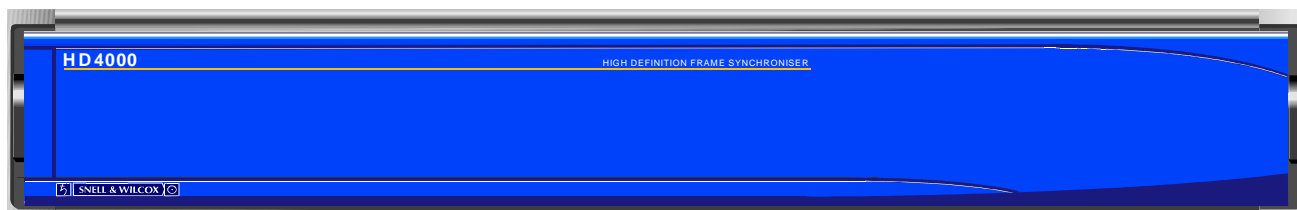
**Snell
&
Wilcox**

HD4000
High
Definition
Synchroniser

Operation &
Service
Manual

Introduction

High Definition Synchroniser HD4000



The HD4000 is a full bandwidth 10-bit broadcast quality synchroniser for high definition television. The serial digital input (conforming to SMPTE 292M) may be asynchronous with respect to the target system. The serial digital output is synchronised to one of two analogue reference inputs of the same standard as the output. A genlock phase function is provided so that the user may provide an offset in the vertical or horizontal domain with respect to the reference syncs.

Scanning formats of 60Hz and 59.94Hz as defined in SMPTE 274M/296M 1995 are supported; the field rate may be selected between 60 Hz or 59.94 Hz. Frame skip and repeat operations are executed when the unlocked source timing slips relative to the target system timing. This is also executed when transferring from one field rate to another.

Other features include an internal test pattern generator, and field/frame freezes. The system functions are preset using buttons and a small display on the edge of a card behind the front panel. The unit can be remotely controlled.

The HD4000 is a compact 2U high unit for location on the desk top or in a 19 in. rack.

Specification

Features

Signal Inputs

Serial Digital	1 x HDTV serial digital input (including embedded audio) at 1.48 GHz -SMPTE 292M/299M
Analog Reference	2 x HDTV tri-syncs for Genlock - SMPTE 240M/274M/296M

Signal Outputs

Serial	3 x HDTV serial digital outputs (including embedded audio) at 1.48 GHz - SMPTE 292M/299M
Analog Reference	loop-through

Front Panel Controls

None	Use card edge or remote
------	-------------------------

Preset Controls

Freeze	On/Off, Field 1, Field 2, Frame
Genlock	Select Reference A or B input, Auto, Input lock; H-Phase: adjustable 0 to 2199, V-Phase: adjustable 0 to 1099
Input Loss	To Black, freeze or input
Memory	Store or Recall 4 memory locations
Output	Select output field rate - 60/59.94 Hz
Patterns	On/Off, 8 patterns per output standard
Network	RollCall Address Set

Additional Controls via Remote Control System

RollCall	
Remote Control	1 x 9 way D-Type serial RS-422

Specifications

Input Standard	1125/60 2:1 (1080,1035 active) 1125/59.94 2:1 (1080,1035 active) 750/ 60 1:1 (720P active) 750/59.94 1:1 (720P active)
Output Standard	1125/60 2:1 (1080,1035 active) 1125/59.94 2:1 (1080,1035 active) 750/ 60 1:1 (720P active) 750/ 60 1:1 (720P active)
Serial Input	HDTV serial digital at 1.48 GHz - SMPTE 292M
Serial Output	3 HDTV serial digital at 1.48 GHz - SMPTE 292M
Embedded AES Audio	Up to 8channels as per SMPTE 299M de-embedded, rate converted and re-embedded. Note: 720P Audio is not supported.
Reference Inputs	2 loop-through analog reference inputs for Genlock purposes: HDTV tri-syncs - SMPTE 240M/274M/296M
Power	
Input Voltage	85- 264 V AC 50/ 60 Hz Automatic selection
Consumption	150 W maximum
Mechanical	
Temperature Range	0 to 40° C operating
Case Type	2U Rack Mounting
Dimensions	483 mm x 530 mm x 93 mm (w,d,h)
Weight	Approx. 18 kg

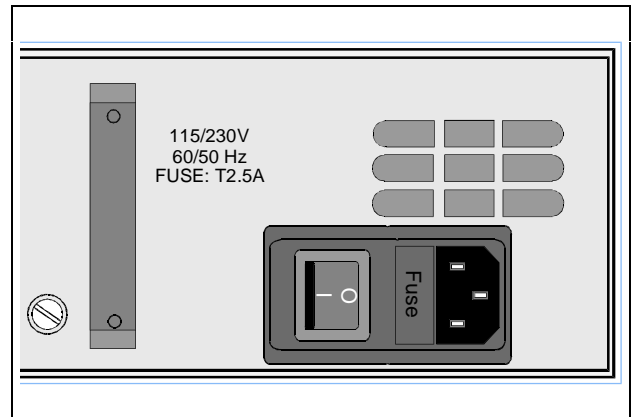
Installation

POWER CONNECTIONS

Power Supply

Mains power is supplied to the unit via a filtered IEC connector with integral mains power switch. The fuse rating is 2.5 A (T).

The unit automatically senses the supply voltage in the ranges 90V-132V and 176V-264V and sets itself up accordingly. No voltage adjustment procedure is required.



ENVIRONMENT

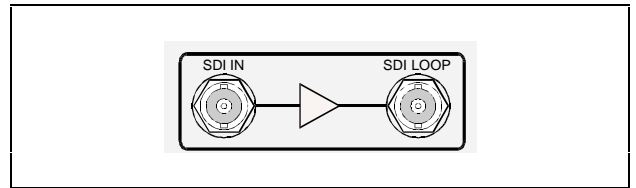
The unit is ruggedly constructed to meet the normal environmental requirements of professional equipment. It is important that there is a free flow of air at the front and rear of the unit to dissipate the heat produced during operation. Installations should be designed to allow for this.

If the unit is to be rack mounted, first open the front panel by lifting up the levers at right and left of the panel, ease the panel forward and hinge it to the left. The fixing "ears" behind the panel will be revealed and the unit can be mounted in the rack. Close the front panel by pushing it back into position (the levers will click into place).

REAR PANEL CONNECTIONS

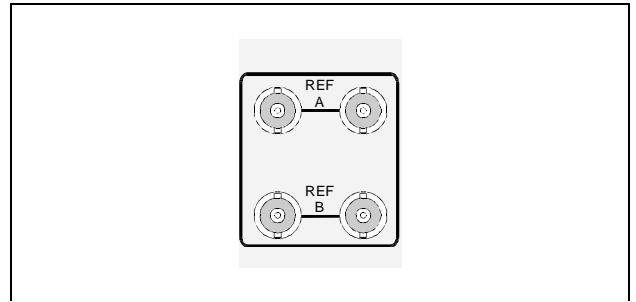
Digital Input (SDI In)

Two BNC connectors are provided for the loop-through serial digital input.



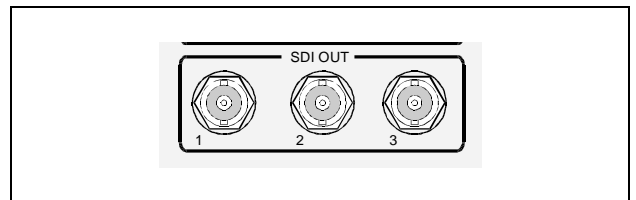
Reference Inputs (Genlock)

Two pairs of loop-through BNCs are provided for the two analogue references (A and B).



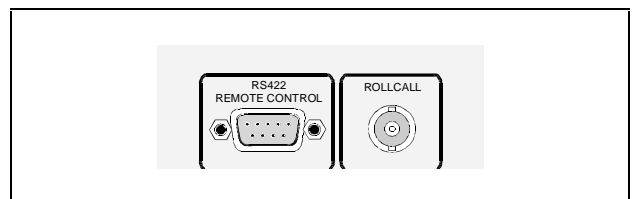
Digital Outputs (SDI-1 to SDI-3)

Three BNC connectors are provided for the serial digital outputs.



Remote Control

The unit can be controlled from the special remote panel option via an RS-422-A D-type connector (see Table - *RS-422-A Remote Connections*)



The unit can also be controlled by the Snell and Wilcox RollCall™ system. This is a serial network connection using a BNC connector.

RS-422-A Remote (Master) Connections

Pin	Function	Direction
1	Ground	
2	Transmit -	HD4000 → Remote
3	Receive +	HD4000 ← Remote
4	Rec Sig Common	
5	Spare	
6	Trans Sig Common	
7	Transmit +	HD4000 → Remote
8	Receive -	HD4000 ← Remote
9	Ground	

The Baud Rate is 38.4Kbs, half duplex. Format is 1 start bit, 7 data bits, 1 parity bit, 1 stop bit.

SWITCHING ON

Check that power is connected to the unit and is switched on. Open the front panel by pushing up the levers at the ends of the panel, easing the panel out and hinging it to the left..

The indicator LEDs on the cards should be illuminated. If not, check that the power switch at the rear of the unit and the one on the front of the power supply unit are set to On. Close the front panel until it “clicks”

Fig. 3.1 PCB Locations HD4000

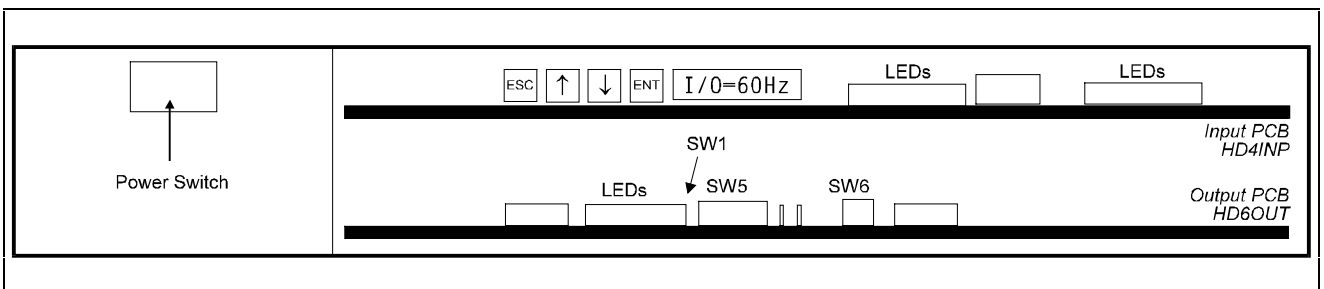
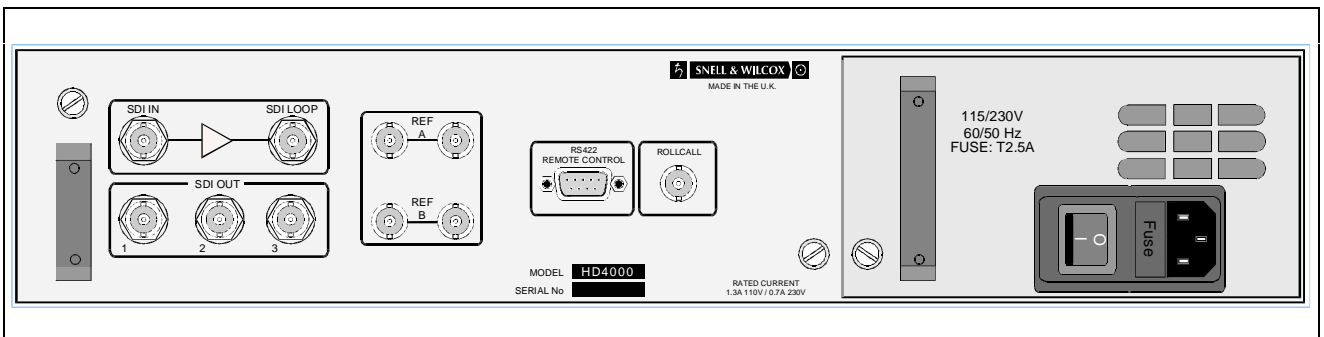


Fig. 3.2 Rear Panel HD4000



Operation

INTRODUCTION

To preset the functions of the HD4000, there are controls on the front edge of one of the plug-in cards. To gain access to the controls, open the front panel by lifting up the levers at right and left of the panel, ease the panel out and hinge it to the left.

To provide a full range of functions with just 4 buttons and an 8-digit display, a menu system is used.

During normal operation, the display cycles through status information on a continuous basis - Input/Output Standard, Input Loss, Genlock Status, Freeze, Test Pattern and firmware versions.

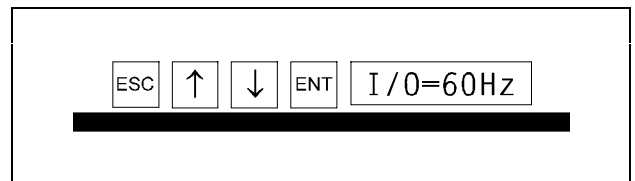
The ENT (Enter) key allows you to enter the menu structure. It is also used to display a selected option. The ↑ and ↓ keys enable you to scroll up and down through the menu. The ESC (Escape) key returns you to the previous menu level.

A ">" at the right of an option on display indicates that selecting the option (pressing ENT) will lead to another menu level without changing a system setting. If there is not a ">" at the right, pressing ENT will change the indicated system setting.

If the menu being displayed allows you to pick one of a number of options, the currently selected option is indicated by an "*" (asterisk) at the left.

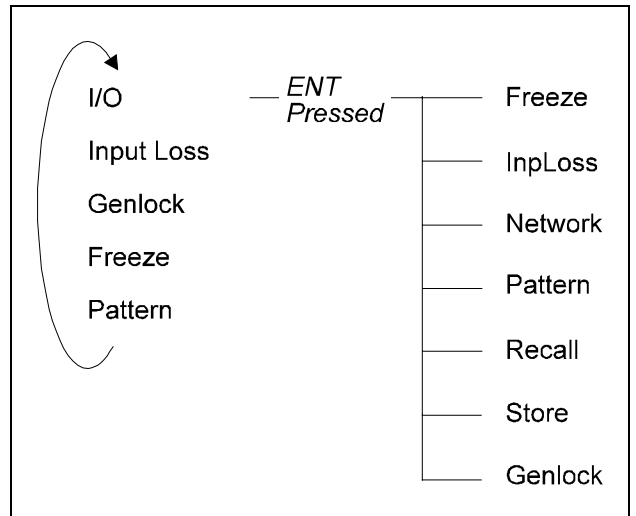
Pressing ↑ and ↓ simultaneously returns a parameter to its preset value.

Pressing ENT and ESC simultaneously will return you to the cycling status display. Also, if the menu system has been entered, the status information will be displayed if a button has not been pressed for about 10 seconds.



TOP MENU

Each of the items on the menu are described separately. To change any of the items first press the ENT key.



SUB-MENUS

FREEZE

Freeze Mode

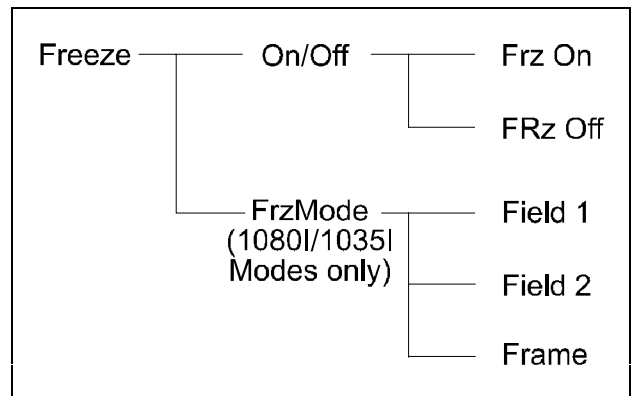
Select "Freeze" and press ENT, then select "FrzMode" and press ENT again. You can now elect to freeze Field 1, Field 2 or the complete frame, when freeze is set to On.

Note that in 720P mode only freeze frame is available.

Press ENT to implement your selection.

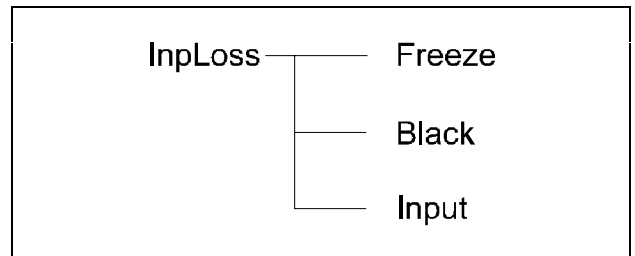
Freeze On/Off

Select "Freeze" and press ENT, then select On/Off. Pressing ENT will now toggle between "Frz On" and "Frz Off".



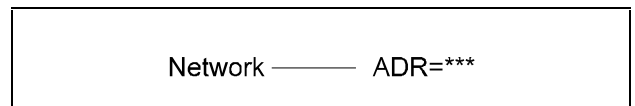
INPUT LOSS

Select "InpLoss" and press ENT. You can now choose between having the current picture frozen or a black screen at the output, when the input signal fails. **You may also attempt to pass the input through even if the unit had decided there is no valid signal at the input.** When you have made your selection press ENT again.



NETWORK

Select "Network" and press ENT. This allows you to set a unique address (in the range 1 to 255) for the HD4000 in the RollCall network. Use the ↑ and ↓ keys to increment or decrement the ADR number and then press ENT.



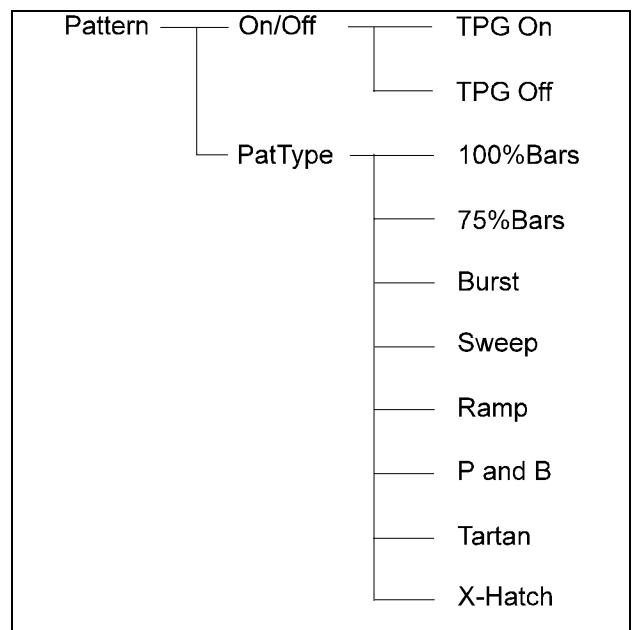
PATTERN

Pattern Type

Select "Pattern" and press ENT, then select PatType and press ENT again. You can select one of eight patterns for display at the output (P and B = pulse and bar) when TPG is set to ON. When you have made your selection, press ENT.

Pattern On/Off

Select "Pattern" and press ENT, then select On/Off. Pressing ENT will now toggle between "TPG On" and "TPG Off".



STORING AND RECALLING SETTINGS

Recalling Settings

Select "Presets" and press ENT, then select "Recall" and press ENT again. Select either "Recall#" or "Default" and press ENT again.

Recall#

There are four memories which hold the setup control settings. You can select any one of the four to be active. Use the ↑ and ↓ keys to select the memory to be recalled and then press ENT.

Default

This provides the default settings of the controls. Press ENT to implement the default values.

Storing Settings

Select "Presets" and press ENT, then select "Store" and press ENT again. You now have the option of saving the current control settings in one of the 4 memories. Use the ↑ and ↓ keys to select the memory for storing the current settings and then press ENT.

Note that settings already in the memory selected will be overwritten. It is suggested that you keep a record of the purpose for which each memory setting is to be used.

Output

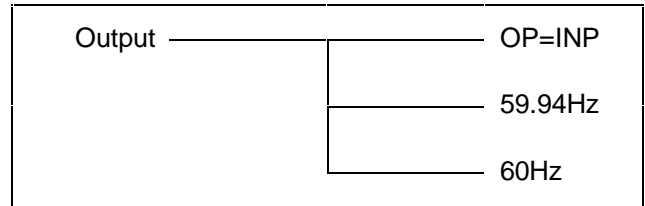
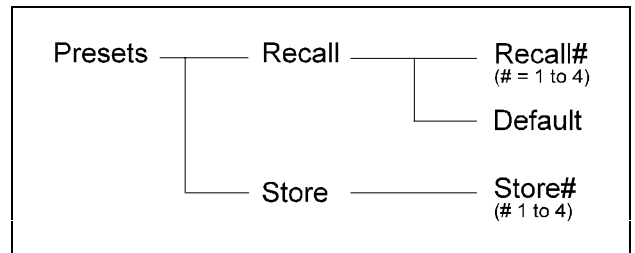
Select the required output field rate. Selections are:

60 Hz

59.94 Hz

OP=INP

Output field rate equal to the input field rate. *Note that this does NOT lock the output to the input.*

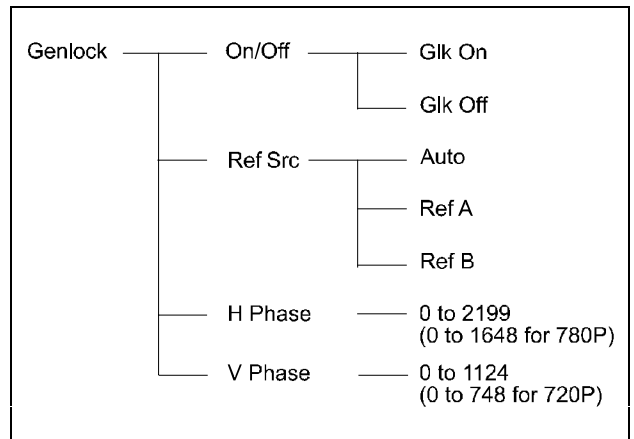


GENLOCK

Selects adjustment of the Genlock parameters. Select "Genlock" and press ENT.

Reference Source

There are two reference input connections (A and B). If you have two different reference signals both at the same field rate, select the required one (A or B). If you have two references, one for 60Hz and the other for 59.94Hz field rate, you can select "Auto" and the HD4000 will automatically select the correct reference according to the line standard of the input data stream; if you have only one reference connected it will automatically select that.



Select "Ref Src" and press ENT. Use the ↑ and ↓ keys to select the reference option and then press ENT.

H Phase

This allows you to set the horizontal phase delay value. While adjusting the H phase it is recommended that you view a display of the HD signal at the output of the HD4000 (note that the monitor should be genlocked to the same reference as the HD4000).

Select "H Phase" and press ENT. Use the ↑ and ↓ keys to increment or decrement the H phase delay. (The change in value is immediately reflected on the screen display and there is no need to press ENT).

V Phase

This allows you to set the vertical phase delay value. While adjusting the V phase it is recommended that you view a display of the HD signal at the output of the HD4000 (note that the monitor should be genlocked to the same reference as the HD4000).

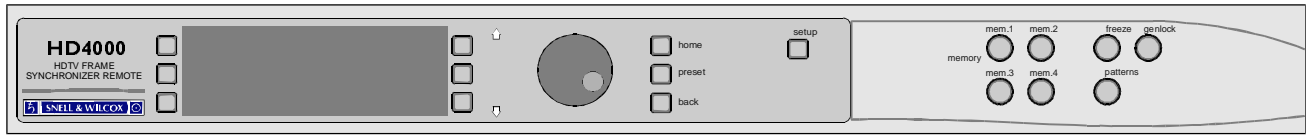
Select "V Phase" and press ENT. Use the ↑ and ↓ keys to increment or decrement the V phase delay. The change in value is immediately reflected on the screen display and there is no need to press ENT.

On/Off

Select "Genlock" and press ENT, then select On/Off. Pressing ENT will now toggle between "Glk On" and "Glk Off"

OPERATING THE HD4000 FROM A REMOTE CONTROL PANEL

The HD4000 may be controlled from an active remote control panel fitted into a Shoebox.



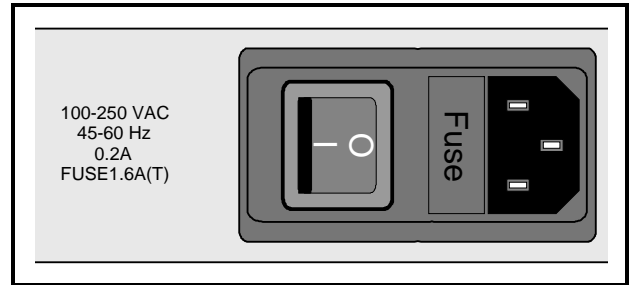
CONNECTIONS TO THE SHOEBOX

Power

This is the mains power connector suitable for a standard IEC type power cable and contains a 1.6 A(T) fuse. If a plug is fitted to the cable a fuse of 5A (Fast) should be installed.

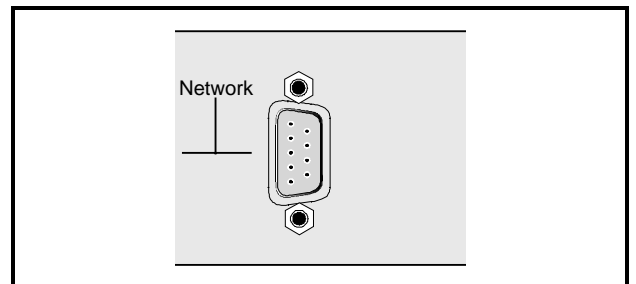
The Power On/Off switch is an integral part of this connector assembly.

Power ON will be indicated by the illumination of the LED on the front panel.



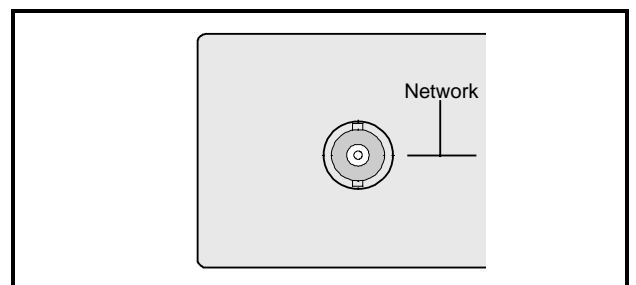
Network Connector

This 9 pin 'D' connector on the rear panel allows the unit to be connected to the RollCall™ 485 network communications system. This connector may also be used as a RS422 port. The RS485 communications may be at up to 2.5 Mbit/s (high speed) and the RS422 at standard low speed.



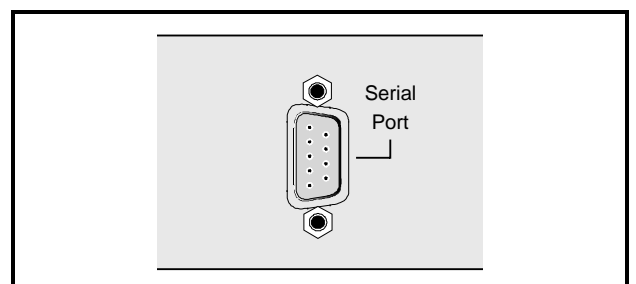
BNC Connector

This single BNC connector allows the unit to be connected to the RollCall™ network communications system.



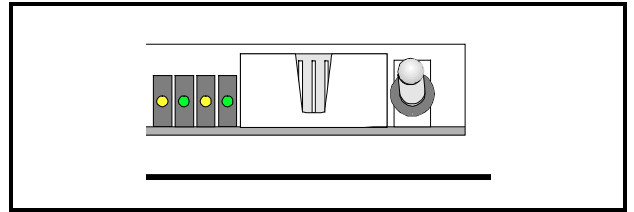
Serial Port

This 9 pin 'D' connector on the rear panel allows the unit to be connected to an RS422 network communications system.



Front Panel Connector

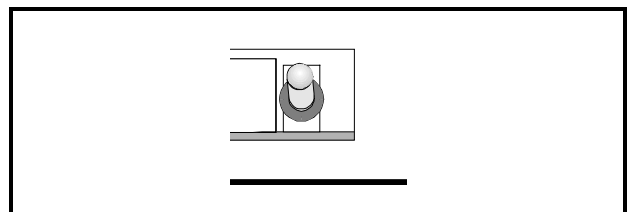
When an active control panel is fitted to the unit, this connector carries the communication signals between the mainframe and the front panel.



Communications Mode Switch

This toggle switch allows the type of communication signal used for the rear panel network 'D' connector, to be selected.

The switch should be in the UP position to use RollCall™485 and in the DOWN position to use RS422(PC) interface signals.



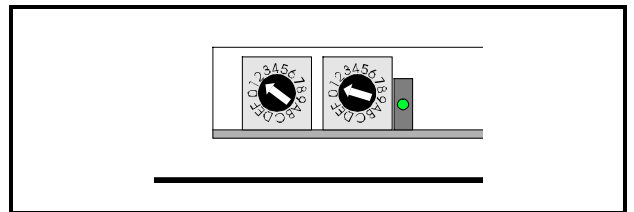
Hex Switches

Both of these switches are used to define the Unit Address code for the equipment. They are only read at power-up.

Position '0' on the left hand switch will disable the RollCall™ function on the unit; all other positions on these switches may be used to set the Unit Address code in Hex. (Left hand switch 1 to f, right hand switch 0 to f)

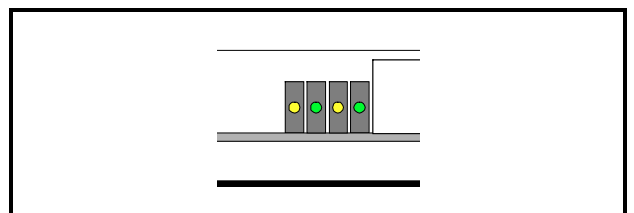
If a code is already in use the RollCall™ receive and transmit LED's will flash alternately at a 1 second rate. The unit must then be powered-down, the code reset and the unit powered-up again.

Note that in a RollCall™segment, all units must have different unit address codes. For more information see RollCall™ section.



LED Indicators

The left hand green LED will be illuminated when the PSU is operating. The next yellow LED indicates that the unit is receiving RollCall™ commands. The next green LED indicates that the unit is transmitting RollCall™ commands. The next yellow LED indicates that the unit is receiving RS422 commands. The next green LED indicates that the unit is transmitting RS422 commands.

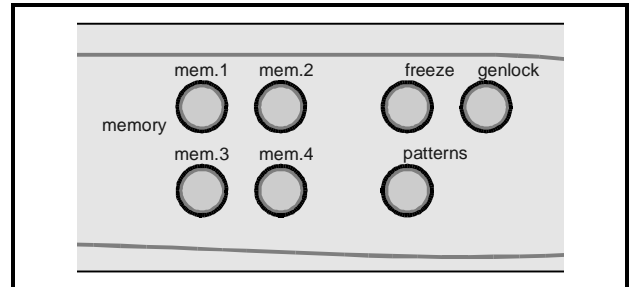


Operating the Remote Control Panel

The panel is grouped into areas to simplify operation and the controls in each area will be described in turn.

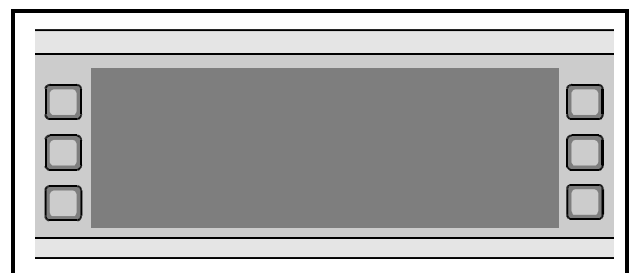
Pushbuttons

The buttons have indicator lamps in the centre. In general, when a button is pressed the indicator lamp illuminates. If controls are not in the “Preset” position or there is an abnormal condition the indicator lamp flashes. For more information see the appropriate control description.



Display and Display Controls

The display comprises three rows of 20 characters; the top row normally shows the current conversion, the bottom row shows the genlock status and the centre row shows other selected conditions.

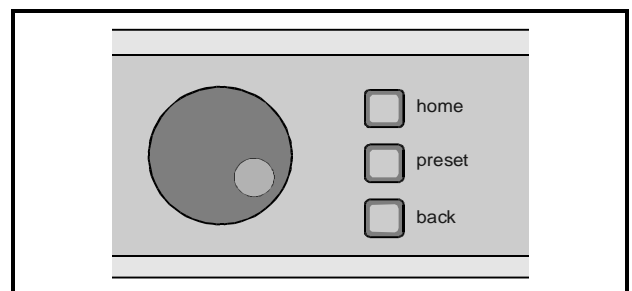


There is a selection pushbutton at both ends of each row. In some cases the row has information on one parameter, in which case the button at either end can be used for selection. In other cases, there are two parameters in the row, in which case the left-hand pushbutton selects the left-hand parameter and the right-hand button the right-hand parameter. An item with further options to select is indicated by \Rightarrow at the right-hand end of the display.

The rotary control allows you to scroll menus and to set parameters to a required value. The illuminated arrows indicate the direction options that you have.

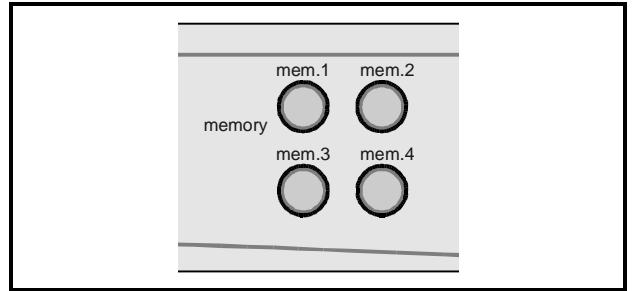
To return to the previous menu level, press the **back** pushbutton. It may be used to progress back up the menu tree. To return to the status display, press the button labelled **home**.

To return a value you have just changed to its preset value press **preset**. To return all the values on the display that you have changed, press **home** and **preset** simultaneously.



Memory

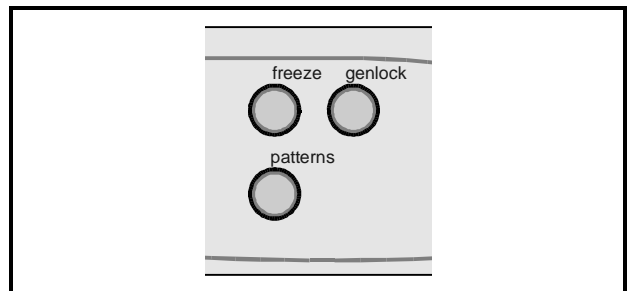
The current front panel settings can be saved to one of four memories. Hold down the HOME button and then press the desired memory button (**mem 1 to mem 4**); a beep will be heard and the indicator in the button will illuminate. It is suggested that you record the button number and the signal type for which the settings are appropriate.



To recall a memory setting, just press the appropriate memory button.

Freeze

When selected the picture will become frozen.



Genlock

When the **genlock** button is selected, the output is genlocked to the reference input which is most appropriate for the output standard selected. If the output cannot lock to the reference signal, the indicator flashes.

Genlock Timing

To adjust genlock timing, hold down the HOME button and press the **genlock** button. The display is shown opposite.

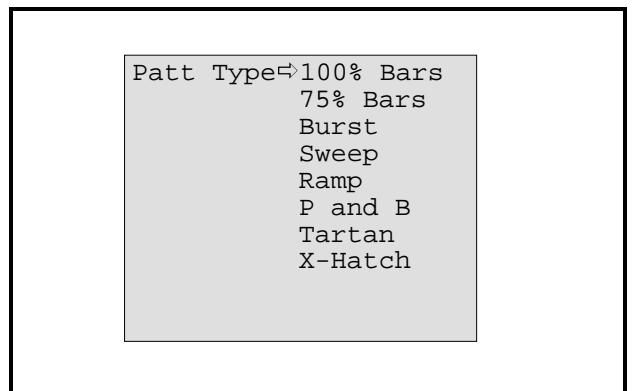
The horizontal and vertical timing with respect to the reference can be adjusted.

Patterns

This allows you to turn on and off the internal test pattern generator, the pattern being determined by the Pattern Type setting. Each time you select the function, it toggles between On and Off.

Pattern Type

This allows you to select the test pattern that will be produced when the internal pattern is switched on. The patterns are digitally generated to exact levels; to preserve their integrity there are no adjustments.



Note that for details of all other menu selections refer to page 4.2.

System Overview

INTRODUCTION

The HD4000 provides a means of synchronising a digital high definition television data stream to a target device. The output can be synchronised to one of two input analogue references. The machine can also be set to provide an offset in the vertical or horizontal domain from the reference.

Freeze and internal pattern generator facilities are provided.

BLOCK DIAGRAM DESCRIPTION

Referring to the block diagram below, the Input Card converts the serial digital input stream to 10-bit parallel. It then de-multiplexes the signal into four busses; two luminance busses, one Pb bus and one Pr bus. The luminance input is at 74.25 MHz and so two luminance busses (one for even pixels and the other for odd pixels) are provided so that all the busses can run at 37.125 MHz.

The data is then written into three HD field stores at the incoming clock rate.

The external reference inputs are fed into the Output Card. The selected reference is fed to a PLL that produces the output clocks and timing signals.

The output clocks are used to read the data from the frame stores and feed it to the Output Card where the four busses are multiplexed into two 10-bit parallel data channels running at 74.25 MHz. The parallel data is then converted into a serial stream running at 1.48 GHz. Three serial outputs are provided to drive external equipment.

The Output Card contains the timing and genlock circuits, and has the output pattern generator.

