

# 3G-SDI 4x4 Matrix Switch Model 2444 Hardware Manual

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SENSORAY | embedded electronics



Designed and manufactured in the U.S.A

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# ***Introduction***

Model 2444 is a 4x4 matrix (crosspoint) switch designed to operate with SDI signals from 125 Mbps to 2.97 Gbps. It supports SMPTE 259M(C) (SD-SDI), 292M (HD-SDI), and 424M (3G-SDI) serial digital video standards. The switch allows connecting any of the four inputs to any of the four outputs. Embedded audio is passed along with the video signal.

Control of the switch is performed with the front panel button interface or using Ethernet or a serial communications link (RS-422/RS-485). A Web page interface is available for easy control and configuration of the switch. The same functionality is available via a simple command line interface over Ethernet (Telnet) or serial communications link.

LED displays on the front panel provide indication of current connections and input carrier detect status.

Network settings (IP address, ports) can be changed via the Web page interface to accommodate various network configurations.

All settings, including the last switch configuration, are stored in non-volatile memory and restored after power up.

# Front panel interface

Model 2444 has 4 SDI inputs (numbered 1 through 4) and 4 SDI outputs (numbered 1 through 4). All of those are brought out using BNC connectors on the back panel of the unit (Fig.1).

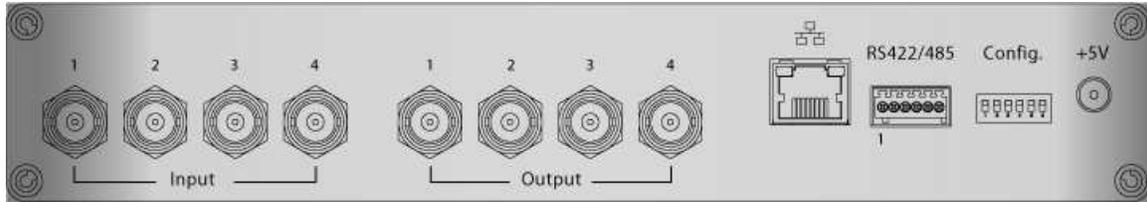


Fig.1. Model 2444, back panel.

The front panel interface (Fig.2) consists of 4 seven-segment LED displays and 5 buttons.

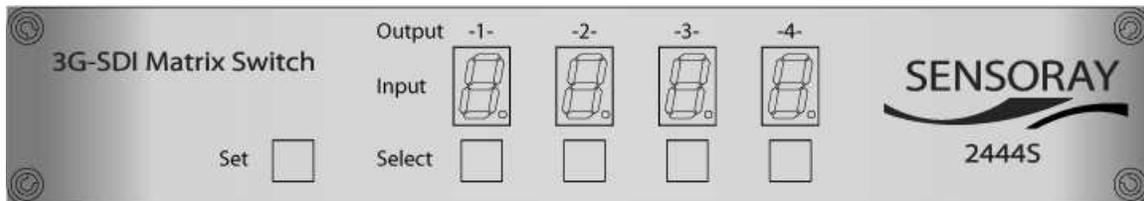


Fig.2. Model 2444, front panel.

LED displays reflect the inputs currently connected to the corresponding outputs (labeled above the displays). The decimal points of the LED displays light up if the signal is detected at the currently selected input.

Connection for a specific output is changed using the following simple procedure:

1. Press Select button corresponding to the desired output momentarily. The displayed number increments and starts blinking. Keep pressing the button until the desired input number is displayed.
2. Press and release Set button. The new settings take effect and the display stops blinking.

If Set button is not pressed within 5 seconds from the last Select button press, the display will revert to the previous setting and no changes will be made.

It is possible to switch more than one output with one press of the Set button. For that use multiple Select buttons within 5 seconds from the last press.

The brightness of the LED displays can be adjusted via the Web page interface. It is preserved across power cycles until changed.

# Network Interface

## Network setup

Each model 2444 unit is assigned a static IP address. As shipped from the factory the IP address is set to 192.168.24.44, with the netmask of 255.255.0.0. Those settings, along with some other, can be modified using a Web page interface. The unit has to be powered up and connected to the LAN using an Ethernet patch cable, Cat5 or better. If connecting directly to the computer, use a crossover cable, otherwise use a standard patch cable.

Depending on the network restrictions one or two steps may be necessary. If the network used to configure the unit can not access 192.168.x.x IP address range, start with Step 1, otherwise go directly to Step 2.

### Step 1 – Set up a temporary IP address

This step is only necessary if the network used to configure the unit can not access the default IP address (192.168.24.44). In this case the unit must be switched into the Configuration Mode which allows setting up a *temporary* IP address accessible from the current network. The temporary IP address should be selected such that it is:

- 1) accessible on the network;
- 2) is not already used by any other device on the same network.

Once the unit is accessible using a temporary IP address, the standard Web page procedure (Step 2) can be used to set up the desired permanent IP address and other settings.

To switch the unit into the Configuration Mode, power it up while holding the Set button on the front panel pressed. The LEDs will display the word “CONF” and the front panel buttons will not be functional.

Once the unit is in the Configuration Mode run ARP on the computer that is connected to the same network with the following command line:

```
arp -s <temporary_address> 08-00-56-ff-ff-ff
```

Example:

```
arp -s 10.135.1.61 08-00-56-ff-ff-ff
```

In Windows either navigate to Start/Run and type the command line in the “Open” box, or start a Command Prompt window and type the command line followed by Enter.

In Linux type the command line in the terminal window at the shell prompt followed by Enter. Please use colon characters (:) instead of dashes (-) in MAC address in Linux.

Note: it is recommended to use a temporary IP address that is different from the target permanent address to be assigned to the unit.

Proceed to step 2 without cycling the power (while the unit is still in configuration mode).

## **Step 2 – Set up a permanent IP address**

Connect to the unit with a Web browser by typing the unit's temporary IP address in the address box.

Examples:

`http://192.168.24.24/network.htm`

or

`http://10.135.1.61/network.htm`

The the network configuration page (Fig.5) will be displayed.

Type in the desired permanent IP address and subnet mask values into corresponding fields. Click on the Set button and wait for the page to reload. Click on Reboot button. The unit will reboot with a new IP address, so the current browser session will disconnect. To continue configuration, type in the new, permanent address in the address box.

## HTTP Server

The HTTP server (Web page interface) makes it possible to control and configure model 2444 using a computer connected to the network and a browser program.

### Control page

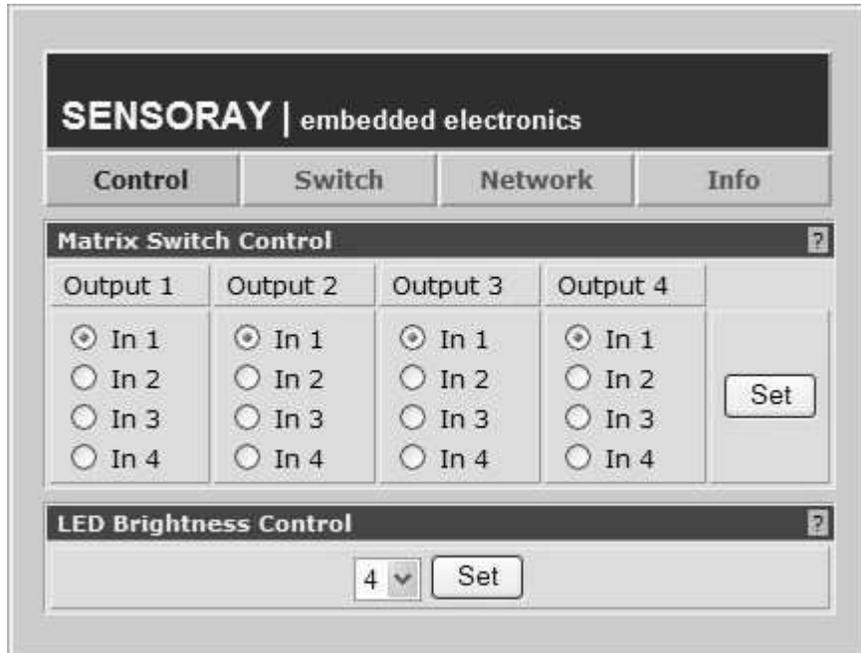


Fig.3. Control page.

Control page allows changing the matrix switch connections and LED brightness.

To change the connections select the desired input for each of the outputs by using radio buttons and click on the corresponding Set button. The changes in the connections are immediately reflected on the front panel LEDs.

To change the LED brightness select one of the 8 levels with a list box and click on the corresponding Set button. The brightness levels vary from 0 (off) to 7 (brightest).

## Switch configuration page

The screenshot shows the Sensoray web interface for switch configuration. At the top, there is a navigation bar with tabs for Control, Switch, Network, and Info. The 'Switch' tab is active. Below the navigation bar is the 'Input Equalizer Setup' section, which contains a table with four rows corresponding to inputs 1, 2, 3, and 4. Each row has three columns: 'Input', 'Extended 3G mode', and 'Launch amplitude adj'. The 'Extended 3G mode' column contains a checkbox labeled 'On'. The 'Launch amplitude adj' column contains three radio button options: 'Nominal', '+50%', and '+100%'. A 'Set' button is located at the bottom left of the configuration area.

Input	Extended 3G mode	Launch amplitude adj
1	<input type="checkbox"/> On	<input checked="" type="radio"/> Nominal <input type="radio"/> +50% <input type="radio"/> +100%
2	<input type="checkbox"/> On	<input checked="" type="radio"/> Nominal <input type="radio"/> +50% <input type="radio"/> +100%
3	<input type="checkbox"/> On	<input checked="" type="radio"/> Nominal <input type="radio"/> +50% <input type="radio"/> +100%
4	<input type="checkbox"/> On	<input checked="" type="radio"/> Nominal <input type="radio"/> +50% <input type="radio"/> +100%

Set

Fig.4. Switch configuration page.

The page allows configuring input equalizers for each of the four inputs of the switch.

*Extended 3G mode* - turning this mode on (checking the corresponding check box) will provide extra 10 m of cable reach at 2.97 Gbps. However with this setting on, the cable reach will be reduced for lower bitrates.

*Launch amplitude adjustment* - this setting compensates for up to 6 dB signal attenuation at the input.

## Network configuration page

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Control	Switch	Network	Info
<b>Network Interface</b> ?			
IP Address	192.168.24.44		Set
Subnet mask	255.255.0.0		
<b>HTTP Server</b> ?			
TCP port	80		Set
<b>Telnet Server</b> ?			
TCP port	23		Set
Timeout (ms)	300000		
<b>Module Restart</b> ?			
Reboot module	Reboot		

Fig.5. Network configuration page.

The page provides means to configure network parameters.

Notes:

1. The new parameters do not take effect until the unit is rebooted by clicking on the Reboot button in the bottom of the page.
2. Certain changes may result in the loss of communication with the unit in the current browser session. If you have trouble restoring communication because of some changes that were made, try the following:
  - a) run ARP with the following command line: `arp -d`
  - b) If a) did not help, follow the procedure described in the "Network setup" section.
3. Do not change ports from their default values unless you are sure it is necessary.

## Information page

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**Control**   **Switch**   **Network**   **Info**

Please visit Sensoray's Model 2444 support page for the most up-to-date product and support information.

**Product Info**

Model number	2444
Function	SDI Matrix Switch
Firmware Version	v.1.0.0 (P)
Temperature	50 °C

**Statistics**

Uptime	0 days, 0 hrs, 0 min, 20 sec
--------	------------------------------

**Telnet**

Active sessions	0
-----------------	---

**Serial Comport** ?

Mode	9600 N 8 1
TX count	106
RX count	1

Fig.6. Information page.

The page contains the unit's status information.

## **Telnet server**

The Telnet server provides an alternative way of controlling the 2444. It may be particularly useful with automated client applications.

The Telnet server allows 2 sessions: one through Ethernet port, and one through the serial port. Although the sessions are independent, it is not recommended to use both simultaneously.

## **Telnet commands**

Below is the list of telnet commands supported by the 2444.

### **help**

Syntax:

**help**

lists all available commands;

**help <command>**

shows command syntax details.

### **quit**

Syntax:

**quit**

terminates current telnet session.

### **ver**

Syntax:

**ver**

displays current firmware version.

### **wto**

Syntax:

**wto <value> <units>**

Set the telnet session timeout value.

<value> - 0 <timeout disabled> to N (<= 3600 s);

<units> - **ms** (milliseconds) or **s** (seconds);

### **ssw**

Syntax:

**ssw <out> <in>**

Connect matrix switch output **out** (1-4) to input **in** (1-4).

### **gsw**

Syntax:

**gsw <out>**

Get the input connected to output **out** (1-4). Returns 1-4.

### **gcd**

Syntax:

**gcd <in>**

Get carrier detection status for input **in**. Returns 1 for carrier detected, 0 otherwise.

### **sx3g**

Syntax:

**sx3g <in> <val>**

Set extended 3G mode for input **in** (1-4) to on (**val** = 1) or off(**val** = 0).

### **gx3g**

Syntax:

**gx3g <in>**

Get extended 3G mode for input **in** (1-4). Returns 1 (on), or 0 (off).

### **sla**

Syntax:

**sla <in> <val>**

Set launch amplitude for selected input **in** (1-4) to one of the following values (**val**): 0 - default, 1 - +50%, 2 - +100%.

### **gla**

Syntax:

**gla** <in>

Get launch amplitude value for selected input **in**. Returns 0 (default), 1 (+50%) or 2 (+100%).

### **sbri**

Syntax:

**sbri** <val>

Sets the front panel LED brightness to value **val** (0-7), with 0 being off, 7 being the brightest.

### **gbri**

Syntax:

**gbri**

Gets LED display brightness value (0-7).

### **cls**

Syntax:

**cls**

Clears terminal screen.

# **Serial communication interface**

Model 2444 supports serial communication interface configurable as RS-422 or RS-485. The interface is connected to external device(s) via a 6-pin terminal block (Table 1). A mating connector is provided with every unit.

The serial interface supports the set of commands identical to that of the Ethernet telnet server. It is possible to communicate to the 2444 using a terminal program (for example, Hyperterminal in Windows). To achieve the look and feel similar to that of a telnet session it is recommended to configure the terminal program to add LF (Line Feed) characters to CR (Carriage Return) characters and to echo input characters. For example, in Hyperterminal select "File/Properties" from the menu, select the "Settings" tab, click on "ASCII setup", and check "send line ends with line feeds" and "echo typed characters locally".

## **Hardware configuration**

The serial communication interface is configured with a set of DIP-switches labeled "Config."), accessible from the back panel of the 2444 (Fig.1). The functions of the switches are described in Table 2. The "On" position of the switch corresponds to the lever pushed down. The default position of switches 1-5 as shipped from the factory is "Off", switch 6 - "On".

Table 1. Serial communication interface pinout.

Pin	Signal	Function
1	RX+	Receive, active high
2	RX-	Receive, active low
3	GND	Signal reference (ground)
4	TX-	Transmit, active low
5	TX+	Transmit, active high
6	GND	Signal reference (ground)

Table 2. Configuration switches.

Switch	Function	
1	Off	Output driver 120 Ohm termination off
	On	Output driver 120 Ohm termination on
2	Off	Input driver 120 Ohm termination off
	On	Input driver 120 Ohm termination on
3	Off	RS-422
	On	RS-485
4	Off	RS-422
	On	RS-485
5	Reserved	Must be in "Off" position.
6	Reserved	Must be in "On" position.

Note. Switches 3 and 4 must be either both "Off" (RS-422), or both "On" (RS-485).

### **Software configuration**

The serial communication interface operates with the following settings:

- baud rate - 9600;
- data bits - 8;
- stop bits - 1;
- parity - none.

# Specifications

<b>Video</b>	
Matrix	4x4 (4 inputs, 4 outputs)
Supported data rates	270 Mbps, 1.483 Gbps, 1.485 Gbps, 2.967 Gbps, 2.97 Gbps
Standards	SMPTE 259M(C), SMPTE 292M, SMPTE 424M
Input equalization <sup>1</sup>	100 meters (2.97 Gbps) 200 meters (1.48 Gbps) 400 meters (270 Mbps)
Impedance	75 Ohm, input and output
<b>Ethernet Interface</b>	
Data rates	10Base-T, 100Base-TX
Protocols	HTTP (Web page), Telnet
<b>Serial Interface</b>	
Operating mode	9600 baud, no parity, 8 data bits, 1 stop bit
Physical layer	RS-422, RS-485
Protocol	Telnet
<b>Mechanical, electrical, environmental</b>	
Dimensions	10.0 (W) x 1.72 (H) x 4.4 (L) in
Weight	600 g
Power, max	7.5 W (5 V DC)
Operating ambient temperature	0-50 °C

<sup>1</sup>With Belden 1694A cable.

## ***Revision history***

Version	Notes
1.0.2, May 2014	Correction in the IP address setup procedure with a Linux computer.
1.0.1, May 2011	Equalized cable length specifications and embedded audio added. Power specification updated.
1.0.0, January 2011	Initial release.