KRAMER ELECTRONICS LTD.

USER MANUAL

MODEL:

SP-4D
4-Channel HD-SDI Synchronizer

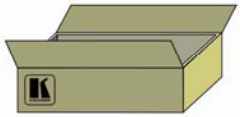
P/N: 2900-000577 Rev 3

SP-4D Quick Start Guide

This page guides you through a basic installation and first-time use of your **SP-4D**.
For more detailed information, see the **SP-4D** user manual. You can download the latest manual at http://www.kramerelectronics.com.

Step 1: Check what's in the box

- **SP-4D** 4-Channel HD-SDI Synchronizer
- 1 Power cord
- 1 Set of rack "ears"
- 4 Rubber feet
- 1 Quick Start sheet
- 1 User Manual
- Windows®-based Kramer control software



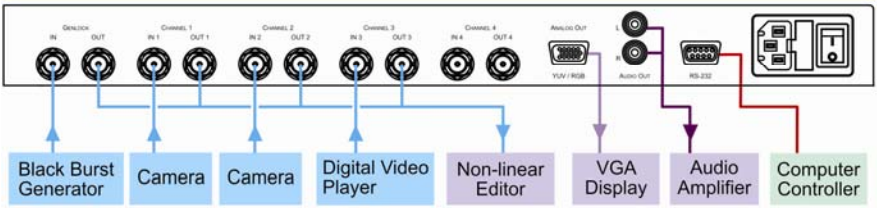
Save the original box and packaging materials in case your Kramer product needs to be returned to the factory for service.

Step 2: Install the SP-4D

Mount the machine in a rack (using the included rack "ears") or attach the rubber feet and place on a table.

Step 3: Connect the inputs and outputs

Always switch off the power on each device before connecting it to your **SP-4D**.



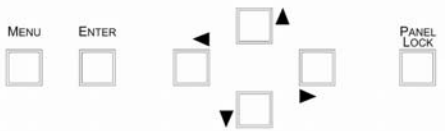
For best results, we recommend that you always use Kramer high-performance cables to connect AV equipment to the **SP-4D.**

Step 4: Connect the power

Connect the power cord to the **SP-4D** and plug it into the mains electricity.
Switch the power on to all devices.

Step 5: Operate the SP-4D

From the front panel: press the buttons to select an input and choose a function.
Adjust the displayed setting with the adjustment knob.
Or operate via the PC and the RS-232 commands.



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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Our 1,000-plus different models now appear in 11 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Products.

Congratulations on purchasing your Kramer **SP-4D** *4-Channel HD-SDI Synchronizer*, which is ideal for the following typical applications:

- Broadcasting studios
- Post-production

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high performance high resolution cables
- Use only the power cord that is supplied with this machine

Go to http://www.kramerelectronics.com to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

2.1 Achieving the Best Performance

To achieve the best performance:

- Use only good quality connection cables to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality
- Position your Kramer **SP-4D** away from moisture, excessive sunlight and dust

3 Overview

The **SP-4D** *4-Channel HD-SDI Synchronizer* is a synchronizer for serial digital signals up to HD-SDI. The unit synchronizes up to four channels from the dedicated digital genlock input or any other specified channel.

The multi-standard synchronizer **SP-4D** can convert the frame rate of HDTV signals without changing the number of lines per frame or the progressive–interlaced raster structure. It implements cross conversion between any two standards belonging to the same group. Three groups contain mutually compatible standards:

- 720p: 720p/50, 720p/59.95, 720p/60
- 1080i: 1080i/50, 1080i/59.95, 1080i/60, 1080psf/23.97, 1080psf/24, 1080psf/25, 1080psf/29.97, 1080psf/30
- 1080p: 1080p/23.97, 1080p/24, 1080p/25, 1080p/29.97, 1080p/30

Each of the four SDI channels contains a special audio synchronizer that de-embeds all 16 input audio channels, resamples them simultaneously, and embeds the resulting audio signals in the SDI output. This corrects signal deterioration such as a frame drop or repetition that may occur during video signal synchronization.

The **SP-4D** features:

- Multi-standard operation: SDI (SMPTE 259M and SMPTE 344M) & HD−SDI (SMPTE 292M)
- Four SDI video inputs and outputs (SD, ED and all HD, besides 1080p/50 and 1080p/60) with automatic standard detection (any video input can be used as the timing reference input for all channels instead of the dedicated genlock input)
- One dedicated SDI genlock input common for all four channels (also in the same standard group)
- An audio embedder/de-embedder that handles 16 audio channels per input

- One VGA/UXGA port on a 15-pin HD connector (in YUV or RGBHV format selectable from menu) to output any one of the four synchronized video channels
- Unbalanced stereo audio outputs on RCA connectors that can output any of the embedded audio channels
- A two-line, 20-character per line LCD display that shows the status of machine while in the main mode of operation
- Seven front panel buttons that control operation of the machine
- Five LEDs that indicate input signal loss or genlock loss
- One RS-232 port for controlling the **SP-4D** from a serial remote control device or a PC

3.1 Defining the SP-4D 4-Channel HD-SDI Synchronizer

This section defines the **SP-4D**.

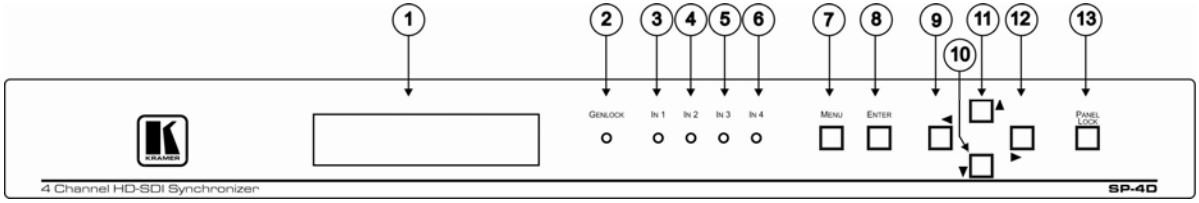


Figure 1: SP-4D 4-Channel HD-SDI Synchronizer Front

#	Feature	Function
1	Display Panel	2-line, 40-character LCD display
2	*GENLOCK* LED	Illuminates when a reference source is available
3	*IN 1* LED	Illuminates when a valid Input 1 is connected
4	*IN 2* LED	Illuminates when a valid Input 2 is connected
5	*IN 3* LED	Illuminates when a valid Input 3 is connected
6	*IN 4* LED	Illuminates when a valid Input 4 is connected
7	*MENU Button*	1. Opens the top level MENU from the MAIN mode of operation 2. Closes the top level MENU and returns to the MAIN mode of operation 3. Closes a SUBMENU and returns to the top level MENU
8	*ENTER* Button	1. Fixes a new value of the adjusted parameter (but doesn't save it) 2. Opens a SUBMENU from the top level MENU item 3. Accelerates the repeat function by 16x, when this button is pressed together with LEFT or RIGHT buttons
9	◄ Left Arrow Button	Selects the previous value of a selected parameter (with repeat function)
10	▼ Down Arrow Button	Selects the next item of any menu
11	▲ Up Arrow Button	Selects the previous item of any menu
12	► Right Arrow Button	Selects the next value of selected parameter (with repeat function)
13	*PANEL LOCK* Button	Press for 2 seconds to enable or disable the PANEL LOCK function

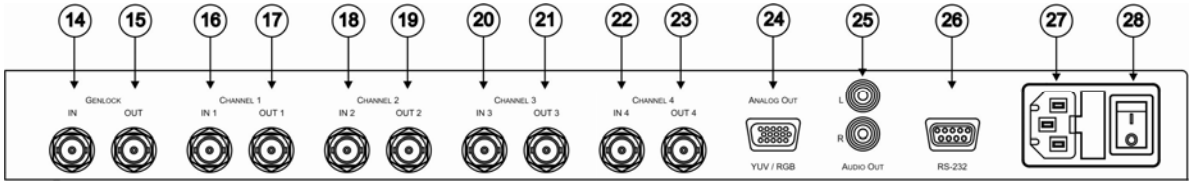


Figure 2: SP-4D 4-Channel HD-SDI Synchronizer Rear

#	Feature	Function
14	*GENLOCK IN* BNC Connector	Connects to an SDI input, common for all four video channels. Auto standard identification is available
15	*GENLOCK OUT* BNC Connector	Looping output for genlock input
16	*CHANNEL 1 IN 1* BNC Connector	Connects to the channel 1 SDI source
17	*CHANNEL 1 OUT 1* BNC Connector	Synchronized SDI output for channel 1
18	*CHANNEL 2 IN 2* BNC Connector	Connects to the channel 2 SDI source
19	*CHANNEL 2 OUT 2* BNC Connector	Synchronized SDI output for channel 2
20	*CHANNEL 3 IN 3* BNC Connector	Connects to the channel 3 SDI source
21	*CHANNEL 3 OUT 3* BNC Connector	Synchronized SDI output for channel 3
22	*CHANNEL 4 IN 4* BNC Connector	Connects to the channel 4 SDI source
23	*CHANNEL 4 OUT 4* BNC Connector	Synchronized SDI output for channel 4
24	*ANALOG OUT YUV/RGB* 15-pin HD Connector	Outputs the selected video channel (see Section 7.4)
25	*AUDIO OUT L* and *R* RCA Connectors	Outputs any two of the 16 audio channels per video channel
26	*RS-232* 9-pin D-sub Port	Connects to a PC or the remote controller via a null-modem connection
27	Power Socket	AC connector enabling power supply to the **SP-4D**
28	Power Switch	Illuminated switch for turning the unit ON and OFF

4 Installing in a Rack

Before installing in a rack, be sure that the environment is within the recommended range:

OPERATING TEMPERATURE:	0º to +55ºC (32º to 131ºF)
STORAGE TEMPERATURE:	-45º to +72ºC (-49º to 162ºF)
HUMIDITY:	10% to 90%, RHL non-condensing

CAUTION!

When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.

2. Once rack mounted, enough air will still flow around the machine.

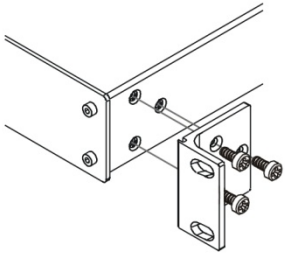
3. The machine is placed straight in the correct horizontal position.

4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.

5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (3 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note:

- In some models, the front panel may feature built-in rack ears
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions available from our Web site

5 Connecting the SP-4D

Always switch off the power to each device before connecting it to your **SP-4D**. After connecting your **SP-4D**, connect its power and then switch on the power to each device.

To connect the **SP-4D**, as shown in Figure 3, do the following:

1. Connect up to four SDI input sources (for example, video cameras or a digital video player) to the IN 1 to IN 4 BNC connectors.
2. Connect up to four SDI output acceptors (for example, a non-linear editor) to the OUT 1 to OUT 4 BNC connectors.
3. Connect the GENLOCK IN BNC connector to an SDI genlock source (for example an HD-SDI black-burst generator).
4. Connect the ANALOG OUT 15-pin HD connector to a computer graphics acceptor (for example, an analog display).
5. Connect the AUDIO OUT RCA connectors to an audio acceptor (for example, a stereo amplifier).
6. If required, connect the RS-232 9-pin D-sub connector to a controlling computer (see Section 5.1).

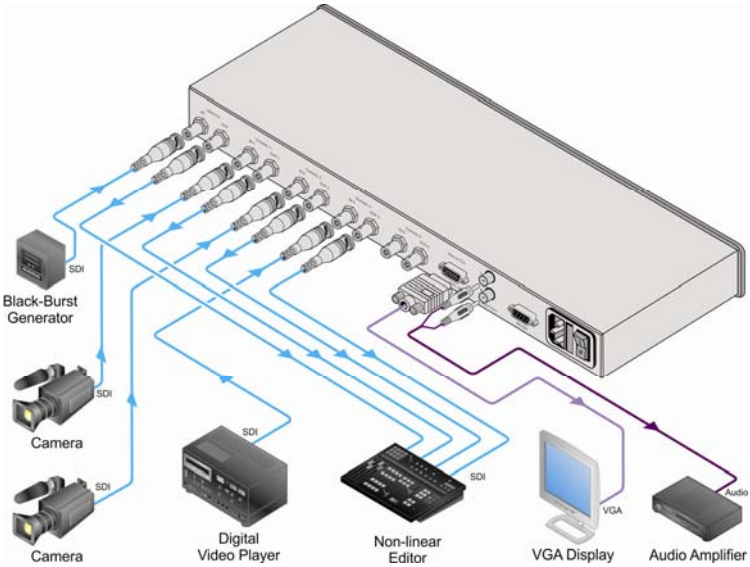


Figure 3: Connecting to the SP-4D Rear Panel

5.1 Connecting to the Product via RS-232

You can connect to the **SP-4D** via an RS-232 connection using, for example, a PC. Note that a null-modem adapter/connection is not required.

To connect to the **SP-4D** via RS-232:

- Connect the RS-232 9-pin D-sub rear panel port on the **SP-4D** via a 9-wire straight cable (only pin 2 to pin 2, pin 3 to pin 3, and pin 5 to pin 5 need to be connected) to the RS-232 9-pin D-sub port on your PC

6 Operating the SP-4D

This section explains how to use the:

- LCD display (see Section 6.1)
- Front panel buttons (see Section 6.2)
- LED indicators (see Section 6.3)

6.1 Using the LCD Display

The **SP-4D** includes a two-line, 20-character per line LCD display that displays (while in the main mode of operation) the machine status, the genlock reference source and standard of video signals on all four SDI outputs. The following examples explain what is shown on the display.

1. When the genlock mode is turned OFF, the display shows:

   SET3 INT.XTAL REF.
   OutpForced: 720p/60

   This means the setup (preset) number is 3; the internal crystal generator XTAL is used as the genlock reference source, the standard of output signals on all four outputs is forced to 720p/60.

2. If the genlock is turned ON and a reference input signal was selected as dedicated input GenlockIN, the display shows:

   SET3 Ref: GenlockIN
   OutpForced: 720p/60

3. If the output standard selection mode is AUTO, the display shows:

   SET3 Ref: GenlockIN
   OutputAuto: 720p/60

4. If genlock is turned ON and SDI input channel 2 is selected as the reference input signal, the display shows:

   SET3 RefSource: IN2
   OutpForced: 720p/60

6.2 Using the Front Panel Buttons

The front panel includes the following buttons:

MENU, ENTER, ►,▲,▼,◄. Pressing any arrow button once advances or returns one parameter. Pressing and holding an arrow button scrolls automatically through the menus or parameters.

Command Buttons	
Button	**Function**
MENU	1. Opens the top level MENU from the MAIN mode of operation 2. Closes the top level MENU and returns to the MAIN mode of operation 3. Closes the SUBMENU and returns to the top level MENU
ENTER	1. Fixes a new value of the adjusted parameter (but does not save it) 2. Opens a SUBMENU from the top level MENU 3. Accelerates the repeat function by 16x, if this button is pressed together with LEFT or RIGHT buttons
UP ▲	Selects the previous item of any menu
DOWN ▼	Selects the next item of any menu
LEFT◄	Selects the previous value of a selected parameter (with repeat function)
RIGHT ►	Selects the next value of a selected parameter (with repeat function)
PANEL LOCK	Enables or disables the PANEL LOCK function after pressing for 2sec

6.3 Using the Front Panel LEDs

Five LEDs on the front panel indicate genlock loss and the presence of a video signal on the input of each channel.

Understanding the Front Panel LEDs		
LED	**Status Condition**	**LED Status**
Genlock	Genlock turned OFF Genlock turned ON, no appropriate reference source Genlock turned ON, the unit is properly locked to reference	LED OFF LED flashes LED ON
Input 1- Input 4	No video signal Input signal standard not in same group as the output standard Proper input signal	LED OFF LED flashes LED ON

7 Using the SP-4D Menus

This section explains how to use the various menus and their functions to operate the **SP-4D**.

The menu maps in Figure 4 and Figure 5 illustrate how to navigate through the various menus and their settings.

Note: All menus show **SET1.** as an example. Your setup numbers may differ.

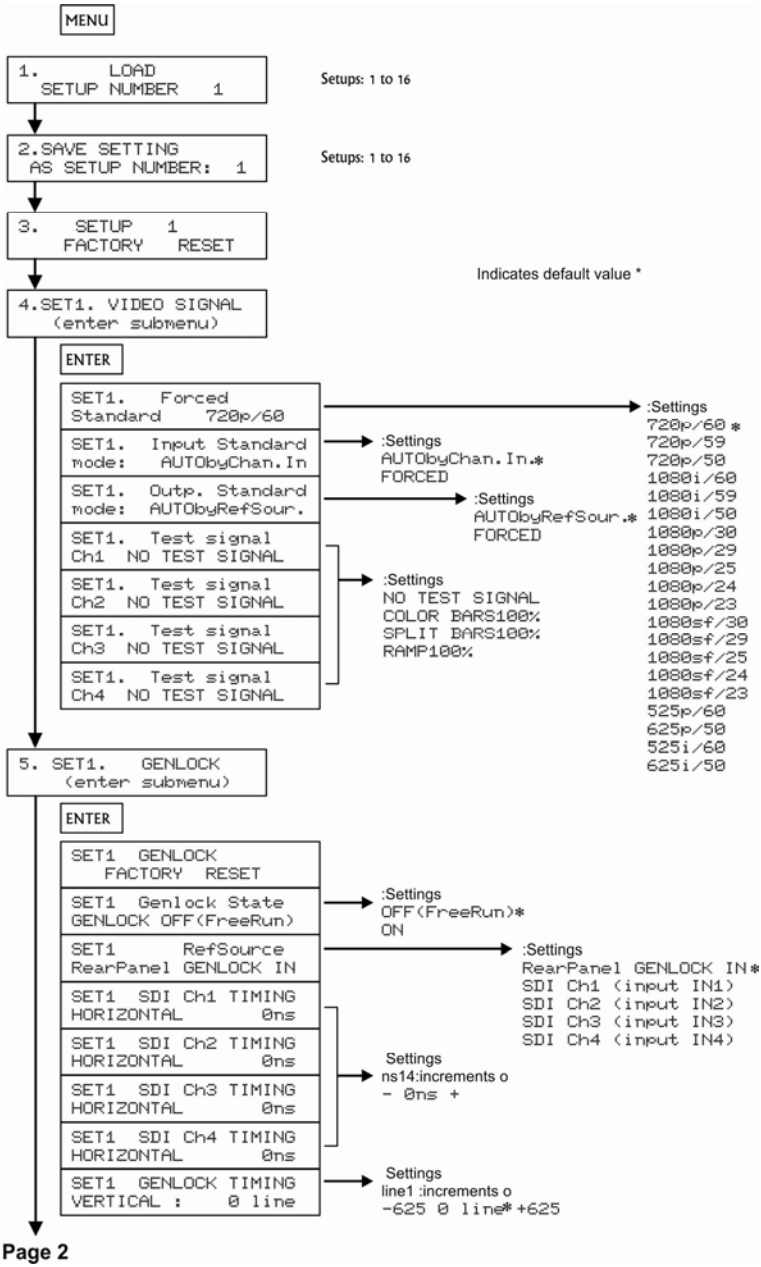


Figure 4: SP-4D Menu Map I

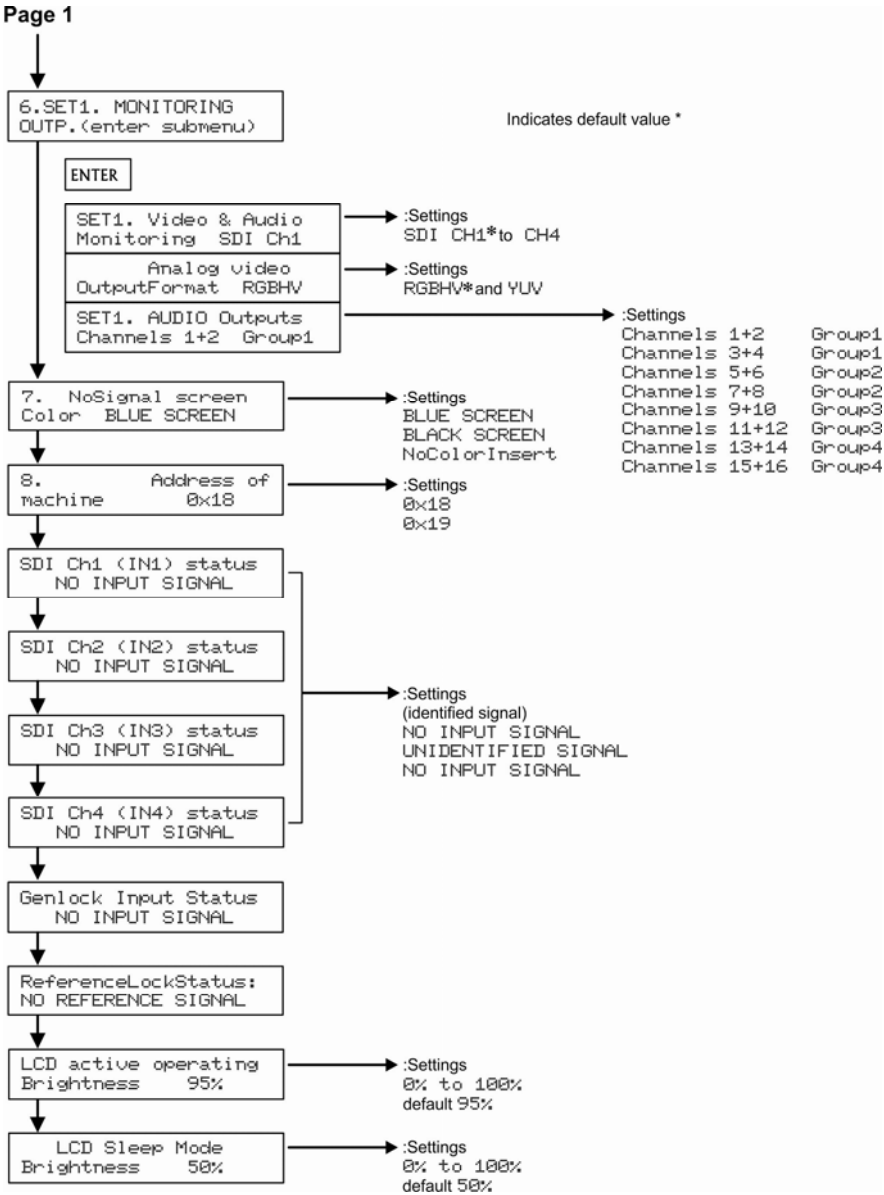


Figure 5: SP-4D Menu Map II

7.1 Loading Setups

To load a saved setup:

- Press MENU to enter the menu mode
- Press ▼ or ▲ as needed until **LOAD SETUP NUMBER** is displayed
- Press ◄ or ► to reach the setup number desired (from 1 to 16)
- Press ENTER to load the setup
- Press MENU to return to the normal operating mode

7.2 Saving Setups

Setups are a snapshot of all machine settings at a given instant. 16 setups are available for saving and reloading.

Note: Most parameter changes are temporarily saved in memory only until the **SP-4D** is powered OFF. To permanently save the change, perform **SAVE SETTING AS A SETUP NUMBER** as shown in this procedure.

To save a setup:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **SAVE SETTING AS SETUP NUMBER** is displayed
- Press ◄ or ► to reach the setup number desired (from **1** to **16**)
  If the present setup is different from the saved setup, **SETUP NUMBER:** appears (with a colon)
- Press ENTER to save the setup (the colon disappears)
- Press MENU to return to the normal operating mode

7.3 Using the Factory Reset

Use Factory Reset to return any individual setup to its original factory setting.

To perform a factory reset:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **SETUP 1 FACTORY RESET** is displayed

- Press ◄ or ► to reach the setup number desired (from **1** to **16**)
- Press ENTER to reset the setup
- Save the new setup using the procedure Saving Setups in Section 7.2
- Press MENU to return to the normal operating mode

7.4 Setting the Video Signal

Use this menu to choose between forced or auto standard identification for input and output signals, also to select and turn ON embedded video test signals for each channel separately.

To set the video signal:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **SET1. VIDEO SIGNAL** (enter submenu) is displayed
- Press ENTER go into the submenu
- Press ▼ and ▲ to navigate through the submenus.

7.4.1 Setting a Standard from the Video Signal Menu

To set a forced standard:

- Press ▼ or ▲ until **SET1. FORCED STANDARD** is displayed
- Press ◄ or ► to reach the desired settings (available settings are shown in this table)

Video Groups				
Group 1		Group 2		Group 3
720p/60 (default)	1080i/60	1080sf/30	1080p/30	525p/60
720p/59	1080i/59	1080sf/29	1080p/29	625p/50
720p/50	1080i/50	1080sf/25	1080p/25	525i/60
		1080sf/24	1080p/24	625i/50
		1080sf/23	1080p/23	

Note: Each group contains its own mutually compatible standards.

- Press ENTER to activate the setting (there is a 5 second delay when changing in either direction between SD and HD settings)

7.4.2 Setting the Input Standard Mode from the Video Signal Menu

To set the input standard mode:

- Press ▼ or ▲ until **SET1. INPUT STANDARD MODE**
- Press ◄ or ► to choose settings: **AUTObyChan.In** or **FORCED**

Note: If all four SDI input settings are strictly defined and never changed, **FORCED** mode is recommended.

- Press ENTER to save the setting temporarily (only until powered off).

7.4.3 Setting the Output Standard Mode from the Video Signal Menu

To set the output standard mode:

- Press ▼ or ▲ until **SET1. OUTPUT STANDARD MODE**
- Press ◄ or ► to choose settings: **AUTObyRefSour.** or **FORCED**

Note: If all four SDI output settings are strictly defined and never changed, **FORCED** mode is recommended.

- Press ENTER to save the setting temporarily (only until powered off)

7.4.4 Running a Test Signal from the Video Signal Menu

To run a test signal:

- Press ▼ or ▲ to choose a channel to test (1 to 4)
- Press ◄ or ► to choose the settings: **NO TEST SETTING, COLOR BARS100%, SPLIT BARS100%** or **RAMP100%**
- Press ENTER to run the test
- To stop the test, return to **NO TEST SIGNAL** and press ENTER

7.5 Setting the Genlock

Use this menu to set genlock parameters; activation, source and timing.

To set the genlock:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **SET1. GENLOCK (enter submenu)** is displayed
- Press ENTER go into the submenu
- Press ▼ and ▲ to navigate through the submenu

7.5.1 Resetting the Genlock

To reset the genlock:

- From **SET1. GENLOCK FACTORY RESET**, press ENTER to reset the genlock to its factory settings
- Save the new genlock using the procedure Saving Setups in Section 7.2

7.5.2 Activating/Deactivating the Genlock from the Genlock Menu

When the genlock is turned OFF, an internal crystal generator is used as the reference source and all four SDI outputs run synchronously with each other.

To activate or deactivate the genlock:

- Press ▼ or ▲ until **SET1. Genlock State**
- Press ◄ or ► to choose the settings: **OFF(FreeRun)** or **ON**
- Press ENTER to save the setting temporarily (until powered down)

7.5.3 Setting the Genlock Reference Source from the Genlock Menu

Use the genlock reference source to select either a dedicated genlock input or any one of the four SDI inputs.

To set the genlock reference source:

- Press ▼ or ▲ until **SET1. RefSource**
- Press ◄ or ► to choose the settings**: RearPanel GENLOCK IN, SDI Ch1 (Input IN1), Ch2 (Input IN2), Ch3 (Input IN3)** or **Ch4 (Input IN4)**
- Press ENTER to save the setting temporarily (until powered down)

7.5.4 Setting the Horizontal Timing from the Genlock Menu

Use the horizontal timing to adjust the horizontal delay of an output signal relative to the reference source signal (for each channel separately).

Possible timing values are:

- -19600nsec to +19600nsec, step 14nsec in HDTV mode
- -26500nsec to +26500nsec, step 19nsec in EDTV mode
- -51800nsec to +51800nsec, step 37nsec in SDTV mode

Default timing is 0nsec. Negative values advance the output signal, positive values retard the signal.

To speed up the adjustment, press and hold the appropriate ◄ or ► button (repeat mode). For the16x ultra repeat mode, press and hold the appropriate ◄ or ► button while pressing the ENTER button. In this case, the adjusted parameter changes by steps of 16 units.

To quickly reset to the factory default value, press and hold both ◄ and ► buttons together for 1 sec.

To set the horizontal timing:

- Press ▼ or ▲ until **SET1. SDI Ch1 TIMING HORIZONTAL**, press ► to advance the timing by **14ns** and ◄ to retard the timing by **14ns**
- Press ENTER to save the setting temporarily (until powered down)
- Repeat for channels 2 through 4
- Save the new horizontal timing using the procedure Saving Setups in Section 7.2

7.6 Monitoring Output

Use output monitoring to select any one of 4 SDI channel (video and embedded audio) for monitoring purposes.

To set output monitoring:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **SET1. MONITORING OUTP. (enter submenu)** is displayed
- Press ENTER go into the submenu
- Press ▼ and ▲ to navigate through the submenu

7.6.1 Selecting the Output Monitoring Channel from the Output Monitoring Menu

To select an output monitoring channel:

- Press ▼ or ▲ until **SET1. Video & Audio Monitoring**
- Press ◄ or ► to choose the settings: **SDI CH1**, **SDI CH2**, **SDI CH3**, **SDI CH4**
- Press ENTER to save the setting temporarily (until powered down)

7.6.2 Selecting the Video Output Format from the Output Monitoring Menu

To select a video output format:

- Press ▼ or ▲ until **SET1. Analog Video Output Format**
- Press ◄ or ► to choose the settings: **RGBHV** and **YUV**
- Press ENTER to save the setting temporarily (until powered down)

7.6.3 Selecting the Audio Output Group from the Output Monitoring Menu

The audio output group selects the embedded audio group – two stereo audio channels that can be extracted from the selected SDI channel. After digital to analog conversion the audio is available on both RCA output connectors.

To select an audio output group:

- Press ▼ or ▲ until SET1. AUDIO Outputs Channels
- Press ◄ or ► to choose the settings:

Channels 1+2	**Group1**
Channels 3+4	**Group1**
Channels 5+6	**Group2**
Channels 7+8	**Group2**
Channels 9+10	**Group3**
Channels 11+12	**Group3**
Channels 13+14	**Group4**
Channels 15+16	**Group4**

- Press ENTER to save the setting temporarily (until powered down)
- Press MENU to return to the top level menu
- Save the new audio group setting by using the Saving Setups procedure in Section 7.2

7.7 Setting the No-Signal Screen

The no-signal screen appears in the absence of an input signal or when input and output signals are incompatible.

To set the no-signal screen:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **NoSignal Screen** is displayed
- Press ◄ or ► to choose the settings: **BLUE SCREEN, BLACK SCREEN** or **NoColorInsert (default)**
- Press ENTER to save the setting

Note: This assignment affects all 16 setups (presets) after ENTER is pressed. The setting is saved with auto power-down.

7.8 Setting the Machine Address

To set the machine address:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **Address of machine** is displayed
- Press ◄ or ► to choose the settings: **0x18** (default), **0x19**
- Press ENTER to save the setting

Note: This assignment affects all 16 setups (presets) after ENTER is pressed. The setting is saved with auto power-down.

7.9 Displaying Status

The next six top-level menu items give a read-only display of all four SDI inputs, the genlock input status and the reference lock status.

To display a status:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until the status of the desired SDI channel, SDI genlock input or reference lock is displayed

7.10 Setting LCD Brightness

This setting adjusts the brightness of the LCD display.

To set LCD brightness:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **LCD active operating brightness** is displayed
- Press ◄ or ► to change the settings from **0%** to **100%** (95% default)

Note: This assignment affects all 16 setups (presets) after ENTER is pressed. The setting is saved with auto power-down.

7.11 Setting the Sleep Mode

This setting adjusts the sleep mode brightness of the LCD display.

To set the sleep mode brightness of the LCD:

- Press MENU to enter the menu mode
- Press ▼ or ▲ until **LCD sleep mode brightness** is displayed
- Press ◄ or ► to change the settings from **0%** to **100%** (50% default)

Note: This assignment affects all 16 setups (presets) after ENTER is pressed. The setting is saved with auto power-down.

8 Technical Specifications

INPUTS:	4 SDI/HD-SDI, 1 SDI/HD-SDI genlock (digital signal) 75Ω on BNC connectors
OUTPUTS:	4 SDI/HD−SDI, 1 genlock 75Ω on BNC connectors, 1 VGA/UXGA port on a 15−pin HD connector (YUV/RGB selectable); stereo audio on 2 RCA connectors
CONTROLS:	7 front panel buttons, RS-232
INDICATORS:	LCD display, 5 input and genlock LEDs
POWER SOURCE:	220V AC, 27VA
OPERATING TEMPERATURE:	0° to +55°C (32° to 131°F)
STORAGE TEMPERATURE:	-45° to +72°C (-49° to 162°F)
HUMIDITY:	10% to 90%, RHL non-condensing
DIMENSIONS:	19" x 7" x 1U W, D, H
WEIGHT:	1.81kg (4.0lbs)
ACCESSORIES:	Power cord, Windows®-based control software, rack “ears”
Specifications are subject to change without notice at http://www.kramerelectronics.com	

8.1 Default Communication Parameters

Protocol 2000 RS-232	
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None
Command Format:	HEX

9 Kramer Protocol 2000

Protocol 2000 for the **SP-4D** is described below. For RS-232 a null-modem connection between the PC and the **SP-4D** is required, and data is at 9600 baud, no parity, 8 data bits, and 1 stop bit. All values shown are hexadecimal.

INSTRUCTION	1st Byte	2nd Byte	3rd Byte	4th Byte	COMMENT
RESET	00	80	80	98+Machine Addr	Power up, pseudo
REPLY TO RESET	40	80	80	98+Machine Addr	
GENLOCK RESET	11	80	80	98+Machine Addr	Timing and phase
REPLY TO GENLOCK RESET	51	80	80	98+Machine Addr	
READ TWO-BYTE LOCAL PARAMETER	20	80+Parameter Number	80	B8+40*MSB_data+ Machine Addr	See TABLE 3 and Notes 1, 2
REPLY TO READ TWO-BYTE LOCAL PARAMETER	60	80+Parameter Number	80+Parameter Data	B8+40*MSB_data+ Machine Addr	See TABLE 3 and Notes 1, 2
WRITE TWO-BYTE LOCAL PARAMETER	21	80+Parameter Number	80+Parameter Data	B8+40*MSB_data+ Machine Addr	See TABLE 3 and Notes 1, 2
REPLY TO WRITE TWO-BYTE LOCAL PARAMETER	61	80+Parameter Number	80+Parameter Data	B8+40*MSB_data+ Machine Addr	See TABLE 3 and Notes 1, 2, 3
READ GLOBAL / ONE-BYTE LOCAL PARAMETER	20	80+Parameter Number	80	98+Machine Addr	See TABLE 1, 2 and Note 1
REPLY TO READ GLOBAL / ONE-BYTE LOCAL PARAMETER	60	80+Parameter Number	80+Parameter Data	98+Machine Addr	See TABLE 1, 2 and Note 1
WRITE GLOBAL / ONE-BYTE LOCAL PARAMETER	21	80+Parameter Number	80+Parameter Data	98+Machine Addr	See TABLE 1, 2 and Note 1
REPLY TO WRITE GLOBAL / ONE-BYTE LOCAL PARAMETER	61	80+Parameter Number	80+Parameter Data	98+Machine Addr	See TABLE 1, 2 and Note 1, 3
SAVE	23	80 + Initial Setup Number	80+Destination Setup Number	98+Machine Addr	See NOTE 4
IDENTIFY MACHINE	3D	81	80	98+Machine Addr	See NOTE 5
IDENTIFY FIRMWARE VERS.	3D	83	80	98+Machine Addr	See NOTE 6

TABLE 1
Global Parameters for Supported Commands (Values in hexadecimal)

Parameter	Number	Data	Comments
Panel Lock	0	0 – Off (default) 1 – On	
No_Signal_Color	1	0 – No_Color_Insert (default) 1 – Black screen 2 – Blue screen	
PC Addr	2	0, 1 (corresponds to 0x18 and 0x19)	Read only
Setup Number	3	0 – F (0 corresponds to setup#1, F to setup#16)	
The next addresses allow periodic request and read of the machine status (read only):			

TABLE 1
Global Parameters for Supported Commands (Values in hexadecimal)

Parameter	Number	Data	Comments
Ch1 Input Standard	9	0 – 15 0 – 720p/60 1 – 720p/59 2 – 720p/50 3 – 1080i/60 4 – 1080i/59 5 – 1080i/50 6 – 1080p/30 7 – 1080p/29 8 – 1080p/25 9 – 1080p/24 A – 1080p/23 B – 1080sf/30 C – 1080sf/29 D – 1080sf/25 E – 1080sf/24 F – 1080sf/23 10 – 525p/60 11 – 625p/50 12 – 525i/60 13 – 625i/50 14 – Unidentified signal 15 – No input signal	Status of standard autoidentification, read only. The coding differs from parameter 40 (forced standard)
Ch2 Input Standard	A	0 – 15	Values and standards same as above (read only)
Ch3 Input Standard	B	0 – 15	Values and standards same as above (read only)
Ch4 Input Standard	C	0 – 15	Values and standards same as above (read only)
Actual Output Standard	D	0 – 13 0 – 720p/60 1 – 720p/59 2 – 720p/50 3 – 1080i/60 4 – 1080i/59 5 – 1080i/50 6 – 1080p/30 7 – 1080p/29 8 – 1080p/25 9 – 1080p/24 A – 1080p/23 B – 1080sf/30 C – 1080sf/29 D – 1080sf/25 E – 1080sf/24 F – 1080sf/23 10 – 525p/60 11 – 625p/50 12 – 525i/60 13 – 625i/50	Common to all 4 channels, read only

TABLE 1
Global Parameters for Supported Commands (Values in hexadecimal)

Parameter	Number	Data	Comments
Genlock Input Standard	E	0 – 15 0 – 720p/60 1 – 720p/59 2 – 720p/50 3 – 1080i/60 4 – 1080i/59 5 – 1080i/50 6 – 1080p/30 7 – 1080p/29 8 – 1080p/25 9 – 1080p/24 A – 1080p/23 B – 1080sf/30 C – 1080sf/29 D – 1080sf/25 E – 1080sf/24 F – 1080sf/23 10 – 525p/60 11 – 625p/50 12 – 525i/60 13 – 625i/50 14 – Unidentified signal 15 – No input signal	Status of standard autoidentification, read only.
Genlock Status	F	0 – 2 0 – No reference signal 1 – Loss of lock to reference 2 – Proper lock to reference	Read only
Output_Video_Format	12	0 – 1 0 – RGBHV (default) 1 – YUV	Read and write allowed

TABLE 2
One-Byte Local Parameters (Values in hexadecimal)

Parameter	Number	Data	Comments
Forced Standard	40	0 – 13 0 – 480i/60 (default) 1 – 480p/60 2 – 576i/50 3 – 576p/50 4 – 720p/50 5 – 720p/59 6 – 720p/60 7 – 1080i/50 8 – 1080i/59 9 – 1080i/60 A – 1080p/23 B – 1080p/24 C – 1080p/25 D – 1080p/29 E – 1080p/30 F – 1080sf/23 10 – 1080sf/24 11 – 1080sf/25 12 – 1080sf/29 13 – 1080sf/30	(May be used as input forced standard and as output forced standard. See two next items – "Input Standard Mode" and "Output Standard Mode")

TABLE 2 One-Byte Local Parameters (Values in hexadecimal)			
Parameter	**Number**	**Data**	**Comments**
Input Standard Mode	41	0 – 1 0 – Auto identified standard using appropriate input signal (on each channel separately) (default) 1 – Forced input standard defined in previous item (common to all 4 channel)	
Output Standard Mode	42	0 – 1 0 – (Default) auto identified standard, based on signal that has been preselected as reference genlock source. (This source can be selected between either dedicated genlock input or any 4 channel input, see parameter 4B – genlock reference source). If genlock is turned off, forced standard is used instead of auto. 1 – Forced output standard defined in parameter 40 (common to all 4 channels).	
Test_Ch1	43	0 – 3 0 – Test off (default) 1 – Color bars 100% 2 – Split bars 100% 3 – Ramp 100%	
Test_Ch2	44	0 – 3 0 – Test off (default) 1 – Color bars 100% 2 – Split bars 100% 3 – Ramp 100%	
Test_Ch3	45	0 – 3 0 – Test off (default) 1 – Color bars 100% 2 – Split bars 100% 3 – Ramp 100%	
Test_Ch4	46	0 – 3 0 – Test off (default) 1 – Color bars 100% 2 – Split bars 100% 3 – Ramp 100%	
Video_Monitor	47	0 – 3 0 – SDI channel1 is selected for monitor output (default) 1 – SDI channel2 is selected for monitor output 2 – SDI channel3 is selected for monitor output 3 – SDI channel4 is selected for monitor output	
Audio_Monitor	48	0 – 7 defines 2 of 16 SDI audio channel to extract from selected (in previous item – Video_Monitor) SDI channel 0 – SDI audio channels 1 + 2 group 1 (default) 1 – SDI audio channels 3 + 4 group 1 2 – SDI audio channels 5 + 6 group 2 3 – SDI audio channels 7 + 8 group 2 4 – SDI audio channels 9 + 10 group 3 5 – SDI audio channels 11 + 12 group 3 6 – SDI audio channels 13 + 14 group 4 7 – SDI audio channels 15 + 16 group 4	
Genlock Off/On	4A	0 – 1 0 – off (default) 1 – on	
Genlock_Ref_Source	4B	0 – 4 defines video input that will be used as genlock reference 0 – dedicated genlock input (default) 1 – SDI channel1 input 2 – SDI channel2 input 3 – SDI channel3 input 4 – SDI channel4 input	

TABLE 3 Two-Byte Local Parameters (Values in hexadecimal)			
Parameter	**Number**	**Data (LB=low byte, HB=high byte)**	**Comments**
Low Byte of Channel 1 Horizontal Timing H	4C	LB = H % 256 i.e. Remainder on dividing H by 256 (signed)	
High Byte of Channel 1 Horizontal Timing H	4D	HB = Floor(H/256) i.e. Greatest signed integer less or equal to (H/256) where H = -1400 to +1400 14ns step (HDTV) 18ns step (EDTV) 37ns step (SDTV) H = 0 (default)	
Low Byte of Channel 2 Horizontal Timing H	4E	LB = H % 256 i.e. Remainder on dividing H by 256 (signed)	
High Byte of Channel 2 Horizontal Timing H	4F	HB = Floor (H/256) i.e. Greatest signed integer less or equal to (H/256) where H = -1400 to +1400 14ns step (HDTV) 18ns step (EDTV) 37ns step (SDTV) H = 0 (default)	
Low Byte of Channel 3 Horizontal Timing H	50	LB = h % 256 i.e. Remainder on dividing H by 256 (signed)	
High Byte of Channel 3 Horizontal Timing H	51	HB = Floor (H/256) i.e. Greatest signed integer less or equal to (H/256) where H = -1400 to +1400 14ns step (HDTV) 18ns step (EDTV) 37ns step (SDTV) H = 0 (default)	
Low Byte of Channel 4 Horizontal Timing H	52	LB = h % 256 i.e. Remainder on dividing H by 256 (signed)	
High Byte of Channel 4 Horizontal Timing H	53	HB = Floor (H/256) i.e. Greatest signed integer less or equal to (H/256) where H = -1400 to +1400 14ns step (HDTV) 18ns step (EDTV) 37ns step (SDTV) H = 0 (default)	
Low Byte of Vertical Timing V	54	LB = V % 256 i.e. Remainder on dividing V by 256 (signed)	
High Byte of Vertical Timing V	55	HB = Floor (V/256) i.e. Greatest signed integer less or equal to (V/256) where V = -625 to +625 1 line step V = 0 (default)	

NOTE 1: There are global parameters that are invariable in the case of a setup number change, and local parameters that have appropriate parameter data values for each setup number (16 different values, stored in special memory). During write or read operations with local parameters, the PC gets access only to the active local parameter that corresponds to an actual setup number. Certain local parameters (not all) are represented in two-byte format because of their large adjustment.

NOTE 2: While writing or reading two-byte parameters (PC -> machine), you must send two consecutive write or read commands (each command having a conventional 4-byte structure) for low (first) and high bytes with a minimal time interval between them.

NOTE 3: These commands are sending by unit also when Local / Global parameters are changing via the front panel or as a result of execution of any other command.

NOTE 4: If it is necessary merely to save adjusted parameters in initial setup number (no setup number change), then the value of byte3 must be equal to the value of byte2 - initial setup number.

NOTE 5: The reply to the Identify Machine command shows the machine name
1st byte: 0x7d
2nd byte: 0x80 + 0x00 (0 dec)
3rd byte: 0x80 + 0x04 (4 dec) - for the unit SP-4D
4th byte: 0x98

NOTE 6: The reply to the Identify Firmware command shows the firmware version as
1st byte: 0x7d
2nd byte: 0x80 + the version number prior to decimal point
3rd byte: 0x80 + the version number following the decimal point
4th byte: 0x98
For example, for version 3.5, the reply would be 0x7d, 0x83, 0x85, 0x98.

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SAFETY WARNING
Disconnect the unit from the power supply before opening and servicing