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Gb/s, HD, SD

TWINS

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S2016

SYNAPSE

2GM100-2HM100

3Gb/s, HD, SD SDI Dual channel VANC analyzer

Installation and operation manual

Preface

- ALWAYS disconnect your entire system from the AC mains before cleaning any component. The product frame (SFR18, SFR08 or SFR04) must be terminated with three-conductor AC mains power cord that includes an earth ground connection. To prevent shock hazard, all three connections must always be used.
- NEVER use flammable or combustible chemicals for cleaning components.
- NEVER operate this product if any cover is removed.
- NEVER wet the inside of this product with any liquid.
- NEVER pour or spill liquids directly onto this unit.
- NEVER block airflow through ventilation slots.
- NEVER bypass any fuse.
- NEVER replace any fuse with a value or type other than those specified.
- NEVER attempt to repair this product. If a problem occurs, contact your local Axon distributor.
- NEVER expose this product to extremely high or low temperatures.
- NEVER operate this product in an explosive atmosphere.

Warranty: Axon warrants their products according to the warranty policy as described in the general terms. That means that Axon Digital Design BV can only warrant the products as long as the serial numbers are not removed.

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Date created:	12-04-2017
Date last revised:	24-04-2017

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This product complies with the requirements of the product family standards for audio, video, audio-visual entertainment lighting control apparatus for professional use as mentioned below.

CE		
	EN60950	Safety
	EN55103-1: 1996	Emission
	EN55103-2: 1996	Immunity

Axon Digital Design B.V. 2GM100-2HM100 FC Tested To Comply With FCC Standards FOR HOME OR OFFICE USE	This device complies with part 15 of the FCC Rules Operation is subject to the following two conditions:
	1. This device may cause harmful interference, and
	2. This device must accept any interference received, including interference that may cause undesired operation.

Contents

1 Introduction to Synapse

An Introduction to Synapse

Synapse is a modular system designed for the broadcast industry. High density, intuitive operation and high quality processing are key features of this system. Synapse offers a full range of converters and processing modules. Please visit the AXON Digital Design Website at *www.axon.tv* to obtain the latest information on our new products and updates.

Local control Panel

The local control panel gives access to all adjustable parameters and provides status information for any of the cards in the Synapse frame, including the Synapse rack controller. The local control panel is also used to back-up and restore card settings. Please refer to the rack controller manuals for a detailed description of the local control panel, the way to set-up remote control over IP and for frame related settings and status information.

Remote Control Capabilities

The remote control options are explained in the rack controller manual. The method of connection to a computer using Ethernet is described in the ERC/ERS/RRC/RRS manual.

ℹ️ "AXON CORTEX" SOFTWARE WILL INCREASE SYSTEM FLEXIBILITY OF ONE OR MORE SYNAPSE FRAMES

Although not required to use Cortex with a Synapse frame, you are strongly advised to use a remote personal computer or laptop PC with Axon Cortex installed, as this increases the ease of use and understanding of the modules.

2   Unpacking and Placement

Unpacking

The Axon Synapse card must be unpacked in an anti-static environment. Care must be taken NOT to touch components on the card – always handle the card carefully by the edges. The card must be stored and shipped in anti-static packaging. Ensuring that these precautions are followed will prevent premature failure from components mounted on the board.

Placing the card

The Synapse card can be placed vertically in an SFR18 frame or horizontally in an SFR04 and SFR08 frame. Locate the two guide slots to be used, slide in the mounted circuit board, and push it firmly to locate the connectors.

Correct insertion of card is essential as a card that is not located properly may show valid indicators, but does not function correctly.

---

i On power up all LED's will light for a few seconds, this is the time it takes to initialise the card.

3   A Quick start

When Powering-up

On powering up the Synapse frame, all settings of the card will be set to the default state. All LED's will light during this process. After initialisation, several LED's will remain lit – the exact number and configuration is dependent upon the number of inputs connected and the status of the inputs.

Changing settings and parameters

The front panel controls or the Axon Cortex can be used to change settings. An overview of the settings can be found in chapter 5, 6 and 7 of this manual.

Front Panel Control

Front Panel Display and Cursor

Settings are displayed and changed as follows;

Use the cursor 'arrows' on the front panel to select the menu and parameter to be displayed and/or changed.

Press ▶	To go forward through the menu structure.
Press ◀	To go back through the menu structure.
Press ▲	To move up within a menu or increase the value of a parameter.
Press ▼	To move down through a menu or decrease the value of a parameter.

Whilst editing a setting, pressing ▶ twice will reset the value to its default.

Example of changing parameters using front panel control

With the display as shown below

Pressing the ▶ selects the GFS100 in frame slot 01.

The display changes to indicate that the GFS100 has been selected. In this example the Settings menu item is indicated.

```
GFS100 [Select Menu]
>Settings
```
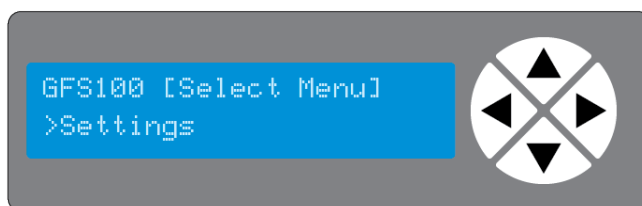
Pressing the ► selects the menu item shown, in this example Settings.

(Pressing ▲ or ▼ will change to a different menu eg Status, Events).

The display changes to indicate that the GFS100 Settings menu item IO-Ctrl has been selected and shows that it current setting is Manual.

```
GFS100 [Settings]
>IO-Ctrl=Manual
```
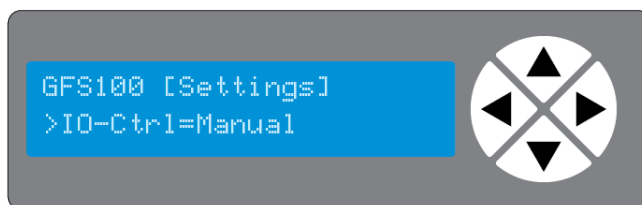
Pressing the ► selects the settings item shown, in this example IO-Ctrl.

(Pressing ▲ or ▼ will change to a different setting, eg #Out-Frmt or #Inp_SelA).

The display changes to indicate that the GFS100 Edit Setting menu item SDI-Format has been selected

```
GFS100 [Settings]
IO-Ctrl>Manual
```
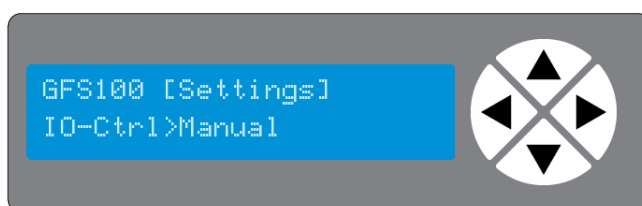
To edit the setting of the menu item press ▲ or ▼.

All menu items can be monitored and/or changed in this way. Changing a setting has an immediate effect.

Axon Cortex Software

Synapse Cortex can be used to change the settings of Synapse modules from a PC, either locally or remotely. The software enables communication based on TCP/IP between the Setup PC and Synapse frames/modules.

Each Synapse frame is addressed through its rack controller's unique IP address, giving access to each module, its menus and adjustment items. Axon Cortex has access to data contained within the Synapse module and displays it on a GUI. The software has an intuitive structure following that of the module that it is controlling.

For operation of Axon Cortex, please refer to the Cortex help files.

Menu Structure Example

Slot	Module		Item		Parameter		Setting
▲							
▲							
S02			Identity				
▲			▲				
S01	GFS100	►	Settings	►	IO-Ctrl	►	Manual
▼			▼		▼		▼
S00	RRC18		Status		IO_Prst_Act		GPI
			▼		▼		▼
			Events		IO_Prst_Edit		GPI-A
					▼		▼
					#Inp-SelA		GPI-B
					▼		▼
					▼		GPI-C

4 Introduction

4.1 Block schematic & I/O panel
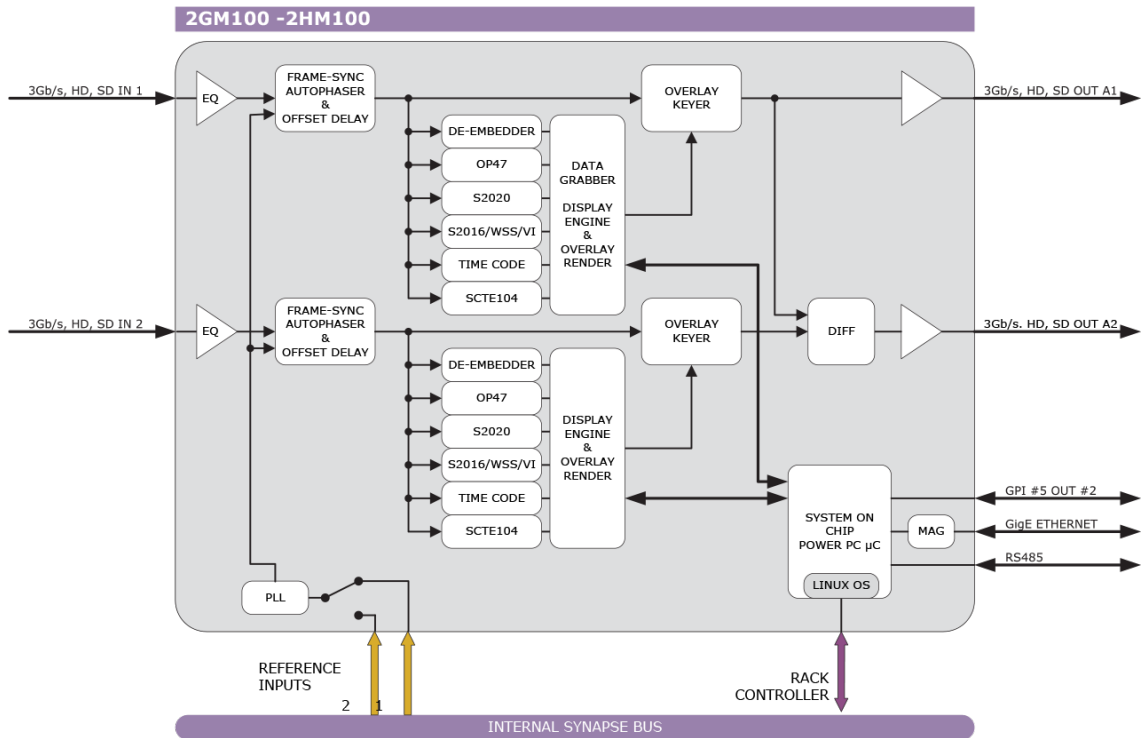
HD, SD INPUT 1

HD, SD INPUT 2

HD, SD OUTPUT 1

HD, SD OUTPUT 2

USB

Gig-Ethernet control

Gig-Ethernet control

RS485 – LTC - GPI I/O
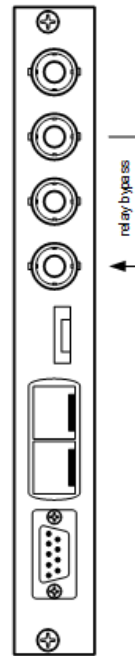
4.2 Features

The 2GM100 and 2HM100 are VANC data analyzers with an application in mind where the data is monitored on screen in the SDI domain. Monitoring the data through ACP and SNMP is also possible. The different VANC signals are decoded and displayed as an overlay on the SDI output. Audio is also decoded and monitored for presence and format. The dual channel decoder analyzer can also be used to look for differences between a known good signal and the signal under test.

The layout of the OSD is defined into groups and can be switched on or off by menu selection. All OSD ANC data is displayed timed correctly on their original frame. OP47 and s2031 data need to be decoded and rendered and will take a finite time to process. This offset can be compensated by additional video delay.

Phase 2 development:

To allow more detailed analysis, logging, or recording of ancillary data a client may connect to the card over an IP Ethernet port and request all or some of the raw or parsed ancillary data. The client may request the current frame only or a continuous stream. The exact protocol for this request is not defined.

- Two individual channels with autophaser, Framesync and offset delay
- Up to 20 frames offset delay @ 1080i, and 10 frames @ 1080p
- OSD monitoring of the following data

  - Embedded audio of all 4 groups presence, of PCM with Clip and silence detection, Dolby E presence detection
  - S2031 Subtitles (TBD)
  - OP47 Subtitles

    - DID/SDID
    - Line number
    - Subtitle Page number
    - Subtitle text (position & color)
  - Audio metadata S2020

    - DID/SDID
    - Line number
    - Program configuration
    - Program id
    - Program description
    - Coding mode
    - Bitstream mode
    - Dialogue normalization
    - LFE flag
    - …Etc
  - AFD (s2016), WSS and VI
  - Timecode

    - ANC VITC decoded

- - ANC LTC decoded
  - Drop/non drop
  - Frames per second
- SCTE104
  - WHP296 extension to SCTE104
  - Subtitle timing (delay/not delay)
  - Subtitle mode (live/not live)
  - DOG Logo insert mode
- Locks to SDI input, or external reference
- Full control and status monitoring through the front panel of the SFR04/SFR08/SFR18 frame and the Ethernet port (ACP)

4.3   Applications

- High End Truck dual input frame synchronizer and anything to anything converter
- High End Infrastructure up/down/cross conversion
- High End transmission up/cross conversion
- UHD (4k) up and down conversion from and to any supported video standard in the same frequency

4.4   Specifications

Serial video input

Standard	SD,HD and 3Gb/s SDI: SMPTE424M, SMPTE425M, SMPTE274M, SMPTE296M, SMPTE259M
Number of inputs	3
Connector	BNC
Equalization	Typical maximum equalized length of Belden 1694A cable: 90m at 2.97Gb/s, 120m at 1.485Gb/s, and 250m at 270Mb/s
Return loss	> 15dB up to 270MHz

Serial video output

Standard	SD,HD and 3Gb/s SDI: SMPTE424M, SMPTE425M, SMPTE274M, SMPTE296M, SMPTE259M
Number of outputs	4
Connector	BNC
Signal level	800mV nominal

DC offset	0V ±0.5V
Rise/Fall time	135ps nominal
Overshoot	< 10% of amplitude
Return loss	> 15dB up to 1.5GHz (typ)
Wideband jitter	< 0.2UI

Ethernet

Standard	10Base-T, 100Base-Tx IEEE 802.3
Connector	8P8C

VANC standards

Standard	SCTE104-2014, SMPTE2010

Miscellaneous

Weight	Approx. 250g
Operating Temp.	0 °C to +40 °C
Dimensions	137 x 296 x 20 mm (HxWxD)

Electrical

Voltage	+24V to +30V
Power	< 17 Watts

5   Settings

5.1   Introduction

The settings menu displays the current state of each GEE-HEE2x0 setting and allows you to change or adjust it. Settings can be changed using the front panel of the Synapse frame (SFR18, SFR08 or SFR04) or with Cortex. Also the SCP08 control can be used. Please refer to chapter 3 for information on the Synapse front panel control and Cortex.

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i   All items preceded with a #-sign are part of the presets.

5.2

Output1-Overlay	This setting sets the overlay of channel 1 to either *Fullscreen* or *Overview*, or switches the overlay *off*. Default is *off*
FS_Teletext	When *Fullscreen* is selected as overlay mode, this setting switches *on* or *off* Fullscreen Teletext display. The Teletext page is selected with the setting *WST-Page_1*
FS_RT-Analyzer	This setting switches on or off the real time analyzer. The real time analyzer contains information about the video format, ATC timecode, Payload, embedded audio, teletext, AFD and SCTE104. The information can be displayed *Transparent*, *Masked*, *Blink-Transparent* or *Blink-Masked*.
FS_RT-SCTE104	With this setting you can switch *on* or *off* extra information about SCTE104 which is displayed in the real time analyzer (*FS_RT-Analyzer*)
OV_Video	When the overlay mode is set to *Overview* with this setting you decide in which corner the video window is displayed. Can be *Top-Left*, *Top-right*, *Bottom-Left* or *Bottom-Right*. You can also decide to switch the video window *off* entirely. Default is *Bottom-right*.
OV_Teletext	When the overlay mode is set to *Overview* with this setting you decide in which corner the Teletext window is displayed. Can be *Top-Left*, *Top-right*, *Bottom-Left* or *Bottom-Right*. This can be placed over the video windows (*OV_Video*) to show the position of the subtitles. You can also decide to switch the Teletext window *off* entirely. Default is *Bottom-left*.
OV_RT-Analyzer	When the overlay mode is set to *Overview* with this setting

you decide in which corner the realtime analyzer window is displayed. The real time analyzer contains information about the video format, ATC timecode, Payload, embedded audio, teletext, AFD and SCTE104. Can be *Top-Left*, *Top-right*, *Bottom-Left* or *Bottom-Right*. You can also decide to switch the realtime analyzer window *off* entirely. Default is *Bottom-left*.

OV_RT_SCTE_104 When the overlay mode is set to *Overview* with this setting you decide in which corner the realtime SCTE104 information window is displayed. Can be *Top-Left*, *Top-right*, *Bottom-Left* or *Bottom-Right*. You can also decide to switch the real time SCTE104 information window *off* entirely. Default is *Off*.

Monitor-Temp With this setting you can switch *on* or *off* the temperature display in the status menu (*CPU_Env_Temp*, *CPU_Core_Temp*, *FPGA_Env_Temp* and *FPGA_Core_Temp*). This setting is switched *off* by default.

Lock-Mode *Lock-Mode* determines whether the card is locked to the *input* or to the reference *Ref1* or *Ref2*). Can also be set to *Freerun*, using the cards own clock. By default it is set to *Ref1*.

Out-Frmt With *Out-Frmt* you can set what the output should be. This will not up/down/cross convert your input signal. Possible settings are:

- *1080p60*
- *1080p50*
- *1080i60*
- *1080i50*
- *720p60*
- *720p50*

AFD-Sel_1 With *AFD-Sel_1* you select which type of AFD data you want to display in the realtime analyzer of channel 1. Can be *VI*, *WSS*, *WSS-Ext* or *S2016*. You can also choose to set this to *Auto* in which case the card chooses the data according to this priority list: S2016 -> WSS -> VI. Default is *Auto*.

WST-Page_1 With this setting you decide which S2031, OP47 or WST-B page should be decoded in the Teletext window of channel 1. By default it is set to *888* (the standard subtitles page).

AFD-Sel_2 With *AFD-Sel_1* you select which type of AFD data you want to display in the realtime analyzer of channel 2. Can be *VI*, *WSS*, *WSS-Ext* or *S2016*. You can also choose to set this to

Auto in which case the card chooses the data according to this priority list: S2016 -> WSS -> VI. Default is *Auto*.

WST-Page_2   With this setting you decide which S2031, OP47 or WST-B page should be decoded in the Teletext window of channel 2. By default it is set to *888* (the standard subtitles page).

5.3   Network

IP_Conf0   With this setting you can let the card obtain an IP address automatically via *DHCP*, or set a *Manual* IP address. The default setting is *DHCP*.

mIP0   When *IP_Conf0* is set to *Manual*, you can enter the preferred IP address here. The default setting is 0.0.0.0

mNM0   When *IP_Conf0* is set to *Manual*, you can enter the required Netmask 0.0.0.0 to 255.255.255.255. Changing *NetwPrefix0* will update this value as well. The default setting is 0.0.0.0

mGW0   When *IP_Conf0* is set to *Manual*, this setting lets you set a standard gateway. The default setting is 0.0.0.0

NetwPrefix0   When *IP_Conf0* is set to *Manual*, this item lets you set a network prefix varying from *0 bit* to *30 bit*. This is an alternate entry for the actual netmask. Changing *mNM0* will update this value as well. The default setting is *0bit*

6 Status

6.1 Introduction

The status menu indicates the current status of each item listed below.

6.2 2GM100 - 2HM100 status items

sInp1

This status item indicates the presence and format of a valid signal on input 1. This is displayed as:

- *1080p60*
- *1080p50*
- *1080p30*
- *1080p25*
- *1080p24*
- *1080i60*
- *1080i50*
- *720p60*
- *720p50*
- *SD625*
- *SD525*
- *NA*

SDI1DemFrmt01/02 ~ SDI1DemFrmt15/16

These status items indicate the detected audio format of each corresponding audio pair in the de-embedder of SDI input 1. Can be one of the following formats:
- *N/A*
- *PCM*
- *Null*
- *AC-3*
- *TimeStmp*
- *MPEG-1*
- *MPEG-2*
- *SMPTE-KLV*
- *Dolby E*
- *Caption data*
- *UserDef*
- *Rsvd*
- *Enh Ac-3*

SDI1AudioStat

Displays the status of the individual audio channels of the embedder output of input 1. Displayed as for instance *SC_PPPPPPPPPPPPPP*, when audio channel 1 is Silent, channel

	2 is Clipped, channel 3 is NA (not available) and channel 4 to 16 are Present
sInp2	This status item indicates the presence and format of a valid signal on input 2. Displayed the same as described in *sInp1*.
SDI2DemFrmt01/02 ~ SDI2DemFrmt15/16	These status items indicate the detected audio format of each corresponding audio pair in the de-embedder of SDI input 2. Can be one of the following formats: ■ *N/A* ■ *PCM* ■ *Null* ■ *AC-3* ■ *TimeStmp* ■ *MPEG-1* ■ *MPEG-2* ■ *SMPTE-KLV* ■ *Dolby E* ■ *Caption data* ■ *UserDef* ■ *Rsvd* ■ *Enh Ac-3*
SDI2AudioStat	Displays the status of the individual audio channels of the embedder output of input 2. Displayed as for instance *SC_PPPPPPPPPPPPPP*, when audio channel 1 is Silent, channel 2 is Clipped, channel 3 is NA (not available) and channel 4 to 16 are Present
Ref	Displays the status of the reference input. Can be *Present* or *NA* (not available).
CPU_Env_Temp	This item displays the CPU environment temperature when the setting *Monitor-Temp* is switched *on*.
CPU_Core_Temp	This item displays the CPU core temperature when the setting *Monitor-Temp* is switched *on*.
FPGA_Env_Temp	This item displays the FPGA environment temperature when the setting *Monitor-Temp* is switched *on*.
FPGA_Core_Temp	This item displays the FPGA core temperature when the setting *Monitor-Temp* is switched *on*.
FPGA_Fan	This item displays the FPGA fan speed in rpm.

6.3   Network status

IP_Addre0   This item displays the status of the IP address. It can be
                      Manual, *DHCP Asking*, *DHCP Leased* or *DHCP Infin*.

MAC0   This item displays the MAC address of the card.

IP0   This item displays the current IP address of the card.

NM0   This item displays the current netmask of the card.

GW0   This item displays the current default gateway of the card.

7 Events Menu

7.1 Events

Introduction

An event is a special message that is generated on the card asynchronously. This means that it is not the response to a request to the card, but a spontaneous message.

What is the goal of an event?

The goal of events is to inform the environment about a changing condition on the card. A message may be broadcast to mark the change in status. The message is volatile and cannot be retrieved from the system after it has been broadcast. There are several means by which the message can be filtered.

Events Announcements

The following event(s) are reported by the 2GM100-2HM100. *Announcements* is not actually an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on

What information is available in an event?

The message consists of the following items;

1. A message string to show what has happened in text, for example: "INP_LOSS", "REF_LOSS", "INP_RETURN".
2. A tag that also shows what happens, but with a predefined number: e.g. 1 (= loss of input), 2 (= loss of reference), 129(= 1+128 = return of input). For a list of these predefined tags see the table on the next page.
3. A priority that marks the importance of an event. This value is defined by the user and can have any value between 1 and 255, or 0 when disabled.
4. A slot number of the source of this event.

The message string

The message string is defined in the card and is therefore fixed. It may be used in controlling software like Cortex or Cerebrum to show the event.

The tag

The tag is also defined in the card. The tag has a fixed meaning. When controlling or monitoring software should make decisions based on events, it is easier to use the tag instead of interpreting a string. The first implementation is the tag controlled switch in the GPI16.

In cases where the event marks a change to fault status (e.g. 1 for Loss of Input) the complement is marked by the tag increased by 128 (80_{hex}) (e.g. 129 (81_{hex}) for Return of Input).

Defining Tags   The tags defined for the 2GM100-2HM100 are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcement of report and control values

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