

Synapse

DWC18

Word Clock distribution amplifier with video
reference locked Word Clock generator

Installation and Operation manual

Synapse

TECHNICAL MANUAL

DWC08-18

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WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE

- 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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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.



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



Axon Digital Design
DWC18

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.

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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 RRC18, RRC10, RRC08, RRC04, RRS18, RRS08 and RRS04 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 (RRC18/RRC10/RRC08/RRC04/RRS18/RRS08/RRS04) manual. The method of connection to a computer using Ethernet is described in those manuals as well.



CHECK-OUT: “AXON CORTEX” SOFTWARE WILL INCREASE SYSTEM FLEXIBILITY OF ONE OR MORE SYNAPSE FRAMES

Although not required to use Axon 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.

Locating the card

The Synapse card can be placed vertically in an SFR18 frame or horizontally in an SFR08 or SFR04 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.

Note: On power up all LEDs 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, the card set will use basic data and default initialization settings. All LEDs will light during this process. After initialization, several LEDs will remain lit – the exact number and configuration is dependant upon the number of inputs connected and the status of the inputs.

Default settings

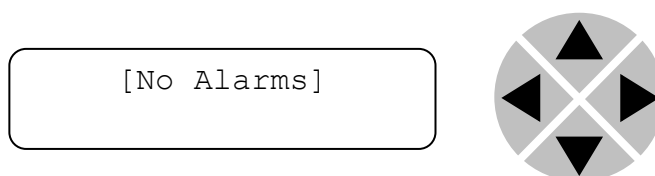
In the default condition, the DWC18 acts as a Dolby Digital Plus encoder locked to AES input 1, encoding AES 1/2 till AES 7/8 into a 5.1+2 Dolby digital plus output, using external incoming meta data program streams.

Changing settings and parameters

The front panel controls or 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.

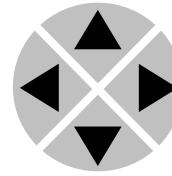
- Press ► To go forward through the menu structure.
- Press ◀ To go back through the menu structure.
- Press ▲ To move up within a menu or increase the value of a parameter.
- Press ▼ To move down through a menu or decrease the value of a parameter.

REMARK: 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

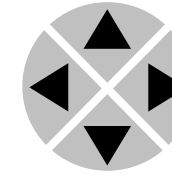
```
RRC18 [Select Card]
>S01=SFS10
```



Pressing the ► selects the SFS10 in frame slot 01.

The display changes to indicate that the SFS10 has been selected. In this example the Settings menu item is indicated.

```
SFS10 [Select Menu]
>Settings
```

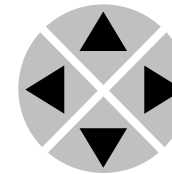


Pressing the ► selects the menu item shown, in this example Settings.

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

The display changes to indicate that the SFS10 Settings menu item SDI-Format has been selected and shows that its current setting is Auto.

```
SFS10 [Settings]
>SDI-Format=Auto
```

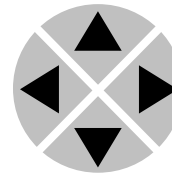


Pressing the ► selects the settings item shown, in this example SDI-Format.

(Pressing ▲ or ▼ will change to a different setting, eg Mode, H-Delay).

The display changes to indicate that the SFS10 Edit Setting menu item SDI-Format has been selected.

```
SFS10 [Edit Setting]
```



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

Axon 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 Axon Cortex help files (press F1 in any window).

Menu Structure Example

Slot	Module	Item	Parameter	Setting
▲				
▲				
S02		Identity		
▲		▲		
S0	SFS10	Setti	SDI-	Auto
1		ngs	Format	
▼		▼	▼	▼
S00	RRC18	Status	Mode	625
		▼	▼	▼
		Events	Ref-Input	525
			▼	
			H-Delay	
			▼	
			▼	

REMARK: Further information about Front Panel Control and Axon Cortex can be obtained from the rack controller manual and Axon Cortex help files.

4 The DWC18 Card

Introduction

The DWC18 is a dedicated Word Clock distribution amplifier. It accepts a Word Clock input (with loop through if a BPL07 is used) and outputs 8 (7) individually buffered replicas of the input.

The DWC18 has a unique feature in the possibility to source the card with a B&B or tri-level reference through the internal Synapse frame distribution rail and use this source to generate a reference locked Word Clock. This feature makes the DWC18 a true broadcast enabled Word Clock generator

- 8 outputs (7 with BPL07)
- High impedance or 75 Ohms terminated input 32 to 192 kHz compatibility
- Signal present indication
- Word Clock generation from video reference with phase timing delay offset (DWC18 only)
- Frequency indication
- Full control and status monitoring through the front panel of the SFR04/SFR08/SFR18 frame and the Ethernet port (ACP)

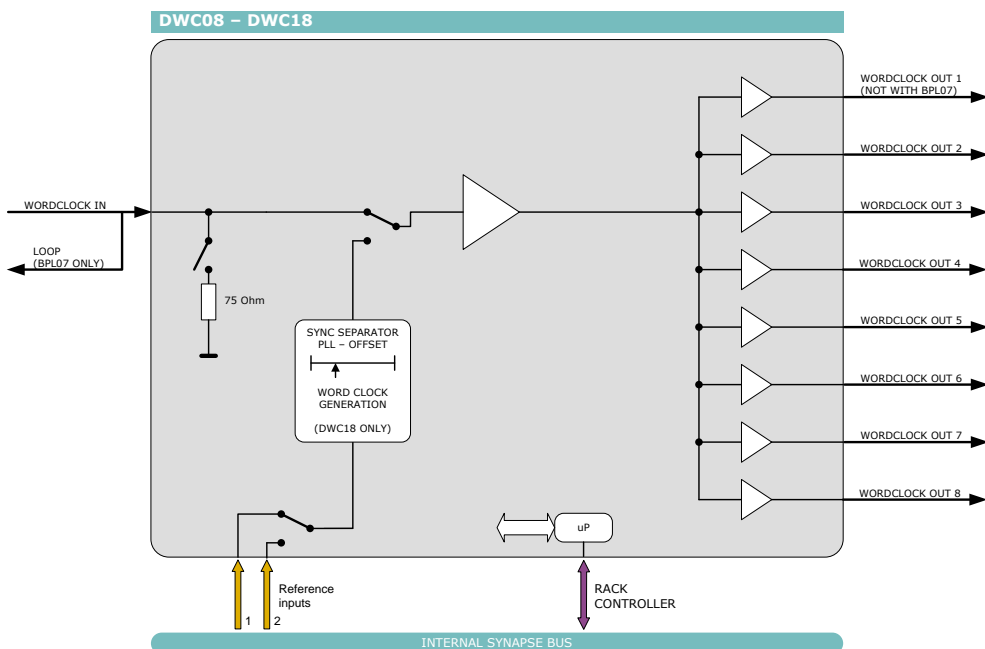
Applications

Generic Word Clock distribution or video reference locked generation

Program Procedure

This card can be updated with new firmware when new firmware versions are released by Axon. You can download the .spf file from our website when new releases are announced. To upgrade the DWC18 you can follow the instructions as described in the ‘reprogramming cards quick-guide’, downloadable via our website.

Block schematics



5 Settings Menu

Introduction

The settings menu displays the current state of each setting within the DWC18 and enables the item to be changed or adjusted.

Settings can be changed using the front panel of the Synapse frame (SFR18, SFR08 or SFR04) or Axon Cortex.

Please refer to chapter 3 for information on the Synapse front panel control and Axon Cortex.

SYSTEM CONTROL

Card-Mode

With this setting you select the mode of the DWC18. Can be `Distr. Amp.` (distributes the input without processing) or `Generator` (generates a processed Word Clock). Default is `Generator`.

Gen-Mode

With this setting you select the source of the DWC18, when the `Card-Mode` is set to `Generator`. Can be `WClk-Input` (the physical Word Clock input), `Ref1-Vid`, `Ref2-Vid` (the video reference input from the internal synapse bus), `Ref1-WClk`, `Ref2-WClk` (a Word Clock connected to the reference input of the rack controller) or `Freerun` (DWC18 generates his own Word Clock). Default is `WClk-Input`.

Inp-Loss-Backup

Here you select which source should be selected in case the `WClk-Input` selected with `Gen-Mode` is lost. Can be set to `Off` (no backup switching at all), `Ref1-Vid`, `Ref2-Vid`, `Ref1-WClk`, `Ref2-WClk` or `Freerun`. Default is `Off`.

Ref-Loss-Backup

Here you select which source should be switched to in case the input selected with `Gen-Mode` doesn't contain a video or Word Clock reference signal. Can be set to `Off` (no backup switching at all), `WClk-Input`, `Ref1-Vid`, `Ref2-Vid`, `Ref1-WClk`, `Ref2-WClk` or `Freerun`. Default is `Off`.

Switch-Back

When this is set to `On`, the source will switch back to what is set with `Gen-Mode` whenever the signal returns. When the `Loss-Backup` settings are set to `Off`, the card will always switch back to the source whenever the signal returns. Default is `On`. When `Switch-Back` is set to `On` and two different reference inputs are selected with `Gen-Mode` and `Ref-Loss-Backup` (only the SFR08 and SFR18 have two reference inputs on the rack controller), the card will only switch back when the reference signal selected with `Ref-Loss-Backup` fails.

WClk-In-Term	With this setting you indicate whether the input must be internally terminated with 75Ohm (On) or not (Off). The low level input range is between 0V and 1,225V and the high level input range is between 1,225V and 10V. Default is On.
WClk-Out-Freq	With this setting you set the Word Clock output frequency. Can be: 32kHz, 44.1kHz, 48kHz, 64kHz, 88.2kHz, 96kHz, 128kHz, 176.4kHz or 192kHz. Can also be set to Auto, in which case the input frequency will be used for the output whenever the source is the Word Clock input or Ref-WClk. In case the source is Ref1-Vid, Ref2-Vid or freerun, the last used output frequency is selected. When a frequency hasn't been selected before, 48Khz will be used.. Default is Auto.
WClk-Out-Volt	Here you select the output amplitude voltage. Can be 5V or 10V. Default is 5V. When the output is 75Ohm terminated, the actual output voltage of the 10V setting will be 5V.
WClk-Out-Mute	When set to On, this setting will mute the signal on the output. Set to Off will pass thru the signal without muting. Default is Off.
WClk-Out-Delay	With this setting you can apply a phase shift to the Word Clock outputs between 0 and 337.5 degrees in steps of 22.5 degrees. When the output frequency is 128kHz, you can only set steps of 45 degrees. Default is 0.

V-Delay

With this setting you can apply a vertical delay in lines between 0 and 1124 lines. This can only be set when the source is a video reference. The phase alignment is done on frame basis. For various formats, this can only be performed every x-amount of frames. For instance: with a 1080p60 reference and a 32kHz WClk-output, the WClk-output is phase aligned every 15 frames. Refer to the following table for an overview.

Wclk-output	32 kHz	44,1 kHz	48 kHz	64 kHz	88,2 kHz	96 kHz	128 kHz	176,4 kHz	192 kHz
CVBS ref format									
1080p50	1	1	1	1	1	1	1	1	1
1080p60	15	200	5	15	100	5	15	50	5
1080i50 / 1080p25	1	1	1	1	1	1	1	1	1
1080i60 / 1080p30	15	100	5	15	50	5	15	25	5
1080p24	3	80	1	3	40	1	3	20	1
720p60	15	200	5	15	100	5	15	50	5
720p50	1	1	1	1	1	1	1	1	1
720p30	15	100	5	15	50	5	15	25	5
720p25	1	1	1	1	1	1	1	1	1
720p24	3	80	1	3	40	1	3	20	1
SD625	1	1	1	1	1	1	1	1	1
SD525	15	100	5	15	50	5	15	25	5

Maximum amount of delay per format:

- 1080i/p: up to 1124 lines
- 720p: up to 749 lines
- SD525: up to 524 lines
- SD625: up to 624 lines

When the source is WClk-input or Ref-WClk, for various frequencies the signal can only be phase aligned every x-amount of clocks. For instance with a 44.1Khz WClk-input and a 32kHz WClk-output, the 32kHz output is phase aligned each 441 clocks of 44.1kHz. Refer to the following table for an overview:

WClk out	32 kHz	44,1 kHz	48 kHz	64 kHz	88,2 kHz	96 kHz	128 kHz	176,4 kHz	192 kHz
WClk in/ref									
32 kHz	1	320	2	1	160	1	1	80	1
44,1 kHz	441	1	147	441	1	147	441	1	147
48 kHz	3	160	1	3	80	1	3	40	1
64 kHz	2	640	4	1	320	2	1	160	1
88,2 kHz	441	2	147	441	1	147	441	1	147
96 kHz	3	320	2	3	160	1	3	80	1
128 kHz	4	1280	8	2	640	4	1	320	2
176,4 kHz	441	4	147	441	2	147	441	1	147
192 kHz	6	640	4	3	320	2	3	160	1

6 Status Menu

Introduction	The status menu indicates the current status of each item listed below.
WClk-In-Freq	This item indicates the frequency of the Word Clock input in kHz. If there's no Word Clock input, this item indicates NA.
Ref-Format	This item indicates the format of the currently active video reference input. If there's no reference input, this item indicates NA.
Ref-WClk-Freq	This item indicates the frequency of the Word Clock reference input in kHz. If there's no reference Word Clock input, this item indicates NA.
Source	Indicates the current active source. If there's no source available, this item indicates NA.
Locked-To	Indicates to which source the card is locked. If the card is not locked to any source, this item indicates Unlocked.
Backup	Off: the source is according to what is set with Source-Sel. On: the source is switched according to what is set with the Loss-Backup settings.

7 Events Menu

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.
DWC18 Events	The events reported by the DWC18 are as follows;
Announcements	<code>Announcements</code> is not an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on
Input-Status	Error in input status can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting.
What information is available in an event?	<p>The message consists of the following items;</p> <ol style="list-style-type: none">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 to show the event.
The Tag	<p>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.</p> <p>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).</p>

Defining Tags

The tags defined for the DWC18 are:

Event Menu Item	Tag	Description
Announcements	0 or NA	Announcing of report and control values
Input-Status	01 _{hex} =INPUT_ERROR 81 _{hex} =INPUT_OK	Input status error or ok

The Priority

The priority is a user-defined value. The higher the priority of the alarm, the higher this value. Setting the priority to Zero disables the announcement of this alarm. Alarms with priorities equal or higher than the Error Threshold setting of the RRC/RRS will cause the Error LED on the Synapse rack front panel to light.

The Address

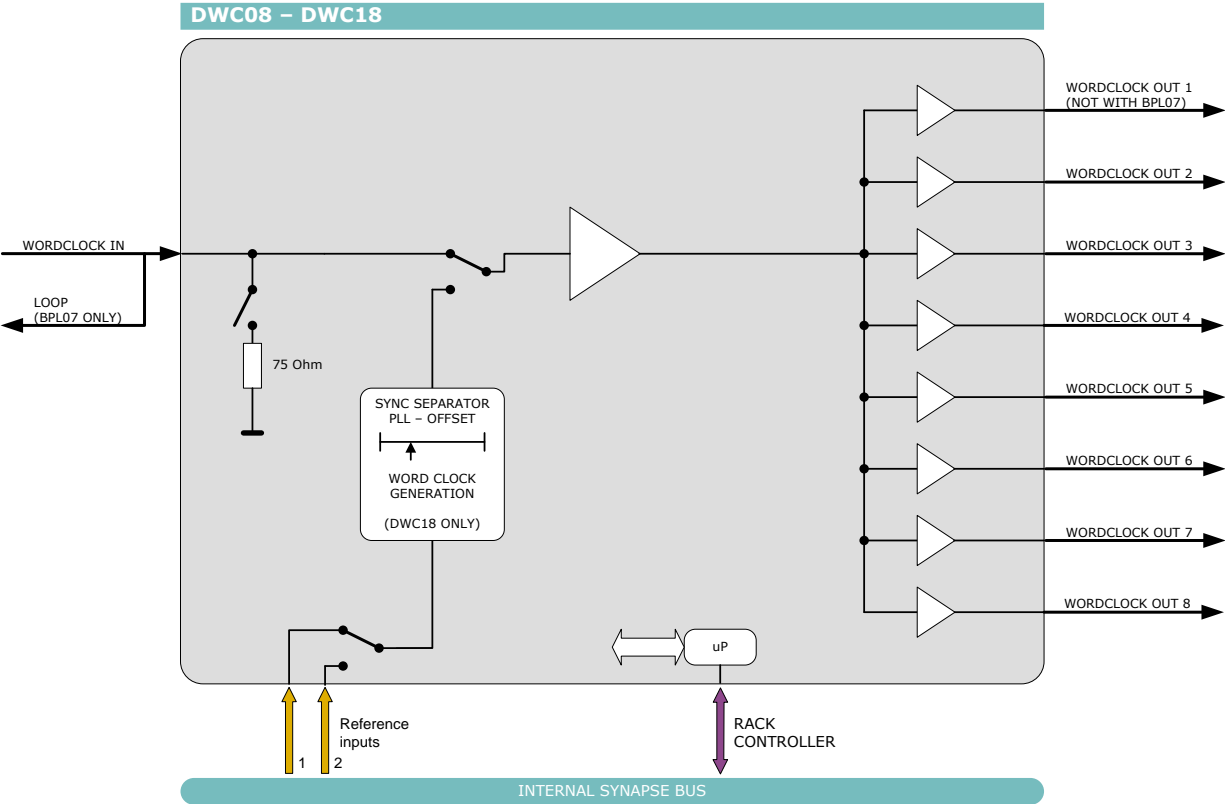
Together with the message string or the tag, the slot number or address of the card is relevant to be able to assign the event to a certain card.

8 LED Indication

ERROR The error LED indicates an error if the internal logic of the DWC18 card is not configured correctly or has a hardware failure.

INPUT These LEDs indicated the presence of a valid input signal on the input 1.

9 Block Schematics



10 Connector Panel

The DWC18 can be used with the BPL11 back plane only:

