



# SyncroDAC

| Operating Manual

## ABOUT US

Synchronorm GmbH are highly motivated producers of high-end multimedia show design software, which features a most unique real-time 3D visualizer. Our dynamic & experienced team thereby operates on a world-wide scale, providing you with the best software & hardware solutions fitting to your dedicated project. From show-design, training-programs, instant support & consulting to continuously soft- & hardware development, the team at Synchronorm is eager to realize your visions. Synchronorm provide the most established & renowned products for the entertainment- & water-show sectors within the industry and beyond.

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#### *4 Channel DMX to Analog Decoder*

## **SYNCRODAC**

The SyncroDAC is a Universal Network Decoder to drive electronic control components in a multi-media show environment. The Decoder supports all Major Protocols: Analog (0...10V) or Digital (DSI or DALI). SyncroDAC is the perfect tool to integrate analog VFD's into a Synchronorm Dependence Network as well as to control any 0...10V, 1...10V, DSI, DALI or PWM Output.

The SyncroDAC is a DMX RDM compatible interface and features four DMX personalities. Thus, the Decoder can be operated with standard DMX or bidirectional DMX RDM and is fully compatible with the Synchronorm RDM Browser application.

# WELCOME TO SYNCRONORM

You made a great choice by purchasing Synchronorm's SyncroDAC hardware unit. Prior to commissioning the unit, please read the following instructions of use carefully and fully familiarise yourself with the unit. Ensure that all work on and with this unit is only carried out in accordance to these instructions. Adhere to the safety information for the correct and safe use of the unit. Keep these instructions in a safe place! Please also hand over the instructions, when passing the unit on to a new owner.

## Preface

This document is a guideline for controlling the hardware of Synchronorm's fountain control systems. The information contained in this manual will give you a sufficient understanding of this product, helping you to use the unit correctly and effectively. Adhere to all instructions contained in this manual, when installing and operating this unit. Every person working with this equipment must read this manual before installation and commissioning of the equipment/device. Every person working with this device/equipment must read the manual before starting to work. Even personnel working with this device only occasionally must read and understand this manual before beginning to work. This manual must always be available at the site, where the device is located. Every user of this device must be aware of the location of the manual.

## Technical Data

SyncroDAC	
Dimensions	80x90x58 mm DIN RAIL 4U
Weight	0.20 kg
Protection Class	IP 20
Power Supply	24V DC*
Operation Temperature	0.. 40° / 0.. 80% humidity
Certification	CE
Outputs	4 Outputs 0..10V or 1..10V DC, DSI, DALI, PWM max 2mA
Inputs	DMX RMD
Order Number	SN-STDAC24



## Checking the Scope of Delivery

Please check that the scope of delivery is complete. Keep the packaging for later transport. If components are damaged or missing, contact your Synchronorm supplier via **info@synchronorm.de**.

Scope of delivery:  
1x SyncroDAC 4 Channel DMX to Analog Decoder

Please note that a programming adaptor (3000P) is not included with DIN rail mount devices. A programming adaptor (required to set DMX start addresses and operating options) must be ordered separately.

This unit requires the SyncroTools DMX address board (SN-STADRB) (not included).

## Intended Use

The SyncroDAC, in the following referred to as „unit“, may only be used as specified as follows:  
Converting ArtNet signal to DMX-RDM signal

## Safety Information

Danger to persons and assets may emanate from this unit, if it is used in an improper manner or not in accordance with its intended use, or if the safety instructions are ignored. This unit must not be used by children under the age of 18. Persons with impairments or lack of experience and knowledge may use the unit, as long as they are supervised and instructed on how to use the unit safely and are able to understand the potential risks. Do not allow children to play with this unit. Do not allow children to clean or maintain the unit.

## Correct electrical Installation

- Electrical installations must meet the national regulations and may only be carried out by a qualified electrician.
- A person is regarded as a qualified electrician, if, due to his/her vocational education, knowledge and experience, he or she is capable of and authorized to judge and carry out the work commissioned to him/her. This also includes the recognition of possible dangers and the adherence to the pertinent regional and national standards, rules and regulations.
- For your own safety, please consult a qualified electrician.
- The unit may only be connected when the electrical data of the unit and the power supply coincide. The unit data is to be found on the unit type plate or on the packaging, or in this manual.
- Ensure that the unit is fused for a rated fault current of max. 3A on the mains side by means of a fault current protection device.





## **Save Operation**

- Never operate the unit, if either the electrical cables or the housing are defective!
- Do not carry or pull the unit by its electrical cables.
- Route cords/hoses/lines in a way that they are protected against damage, and ensure that they do not present a tripping obstacle.
- Only open the unit housing or its attendant components, when this is explicitly required in the operating instructions or approved/prescribed by Synchronorm's technical support service.
- Only execute work on the unit that is described in this manual. If problems cannot be overcome, please contact an authorized customer service point or, when in doubt, the manufacturer.
- Only use original spare parts and accessories for the unit.
- Never carry out technical modifications to the unit.
- Only operate the unit, if no persons are in the water!
- The unit, the connections and the plugs are not water-proof and must not be routed or installed in water.

## **Qualifications and Training of Employees**

- Ensure that installation personnel have the required technical qualifications.
- Also ensure that all operating personnel are sufficiently qualified.
- Ensure that maintenance work is only performed by personnel authorized for this purpose, e.g. specialists of Synchronorm GmbH or personnel with suitable training.

## **Dangers resulting from non-adherence to the Safety Information**

Please note that Synchronorm GmbH assumes no liability for damage, downtimes or malfunctions resulting from non-adherence to this installation and operating manual. By ignoring or not adhering to all of the safety information contained in this manual, you could endanger people, the environment and the system of this unit. For example, non-adherence to the safety information contained in this manual can lead to the following dangerous occurrences:

- A malfunction of important features of this unit
- Danger for persons due to electric shock

## **Safety-conscious Operation**

As a user of this unit, ensure that you follow all safety information contained in this manual. Follow the accident prevention regulations at all times. If the unit is used in a location where internal regulations, operating and safety instructions apply, ensure that these regulations and instructions are also adhered to.



## **Safety Information regarding Maintenance, Inspection and Installation Work**

It is the owner/user's responsibility to ensure that all maintenance, inspection and installation work is carried out by authorized and qualified personnel, who have read and understood this manual. Only carry out maintenance work on this unit, when the unit system is switched off. Ensure that no pressure is applied to the unit and it is disconnected from the power supply (voltage-free) before carrying out maintenance or repair work.

Ensure that small malfunctions are immediately rectified by authorized personnel to avoid possible future damage, malfunctions and/or downtimes of the unit system. Certain maintenance work may require safety barriers to be removed and/or deactivated. If this is the case, ensure that all safety and protective devices/guards are re-installed and/or reactivated after completing the maintenance work.

## **Optional retrofitting and Production of Spare Parts**

Changes or modifications to the device are only permitted after consultation with the manufacturer. Original spare parts and accessories approved by the manufacturer provide safety. We wish to stress that all parts and accessories not supplied by Synchronorm GmbH have neither been tested nor approved by Synchronorm GmbH. For this reason, the installation and/or use of such products can, under certain circumstances, negatively affect the specifications for the device. This could also lead to restrictions of the active and/or passive safety of the device. Synchronorm GmbH assumes no liability for damage resulting from the use of parts and accessories other than original Synchronorm GmbH parts. In this case all guarantee expires.

## **Dangers encountered by the Combination of Water and Electricity**

- The combination of water and electricity can lead to death or severe injuries from electrocution, if the unit is incorrectly connected or misused.
- Prior to reaching into the water, always switch off the mains voltage to all units used in the water.



## Connectors

The DAC Decoder 4x comprises of these connectors::

CN6 POWER SUPPLY 230V AC 50 Hz

1 black: L 230V AC

2 blue: N 0V AC

CN2 DMX Data Input

1 (grey) GND, Screen

2 (blue) DMX Drive Signal -

3 (orange) DMX Drive Signal +

CN3-6 Drive Output to electronic ballasts

1 CH 1: Drive Signal 1

2 CH 1: Drive Signal GND

3 CH 2: Drive Signal 2

4 CH 2: Drive Signal GND

5 CH 3: Drive Signal 3

6 CH 3: Drive Signal GND

7 CH 4: Drive Signal 3

8 CH 4: Drive Signal GND

Refer to the drawing for the location of the connectors. To open clamp, press lever. Insert wire, release lever.

You may connect DSI (Digital Serial Interface) compatible, or DALI (Digital Addressable Lighting Interface) compatible, or analog 1-10V compatible electronic ballasts (EVG) to the DAC Decoder 4x. Optimum performance will be obtained when using DSI compatible ballasts. The interface has to be programmed for Analog, DSI or DALI mode, see below. You are not allowed to mix analog, DSI and DALI devices on one decoder. Ballasts must be connected to the output terminals of the DAC Decoder 4x. Multiple ballasts may be connected in parallel if required – see technical data. Digital SYNCRONORM PCA electronic ballasts are insensitive to polarization. If using other ballasts, please check before wiring. The signal output of the DAC Decoder 4x is positive (+).



## CONNECTION



### Signal Indicators

Status signalling is with LED indicators:

- green: DMX data reception OK
- red: ERROR
- normally off
- blinks at transmission errors or at loss of signal

### DMX Start Address

It is a commonly used scheme for building automation devices to avoid configuration switches. All settings are stored permanently in non-volatile memory. When installing the decoder for the first time, however, the output protocol and the DMX start address (number of the first DMX data slot, value 001 ... 509) must be programmed. The start address switch board 3000P or 3003P is required to set start address and mode of operation. This is a standard device, which can be used for all Synchronorm decoders.



## SETTINGS & SETUP

### **Programming adaptor**

To set a DMX start address, connect the address board as described above. Make sure the connector is plugged in the right orientation as indicated on the label. Connecting the address board the wrong way may damage both, the decoder and the address board. Then power up the decoder and apply a valid DMX signal. Then simply set the desired start address. The hundreds switch is located next to the LEDs. Valid address settings are from 001 to 509. Wait some seconds until the unit recognizes and programs the address setting. The programming cycle will be indicated by the the red and green LED flashing alternatively four times. If the decoder is already fully wired you may test the system for proper operation right now. If everything works to your satisfaction, power down the system and remove the address board.

### **DIP switches**

The output protocol of the decoder and the behaviour at loss of data may be selected by the user. The address board consists of four DIP switches to select the required features. All settings are stored in internal nonvolatile memory (same as the DMX start address).

#### DIP-SWITCH 1: DMX HOLD

Defines the behaviour at loss of DMX data.

OFF= see DIP switch #2

ON = DMX HOLD at data loss

Connector for start address board and polarization notice Hundreds - Tens – Ones

#### DIP-SWITCH 2: OUTPUT LEVEL AT NON-HOLD

OFF= all outputs are driven to 0% (e.g. stage lighting)

ON = all outputs are driven to 100% (e.g. architectural lighting)

#### DIP-SWITCH 3/4: OPERATING MODE

OFF/OFF= Analog output 0..10V / 1-10V

ON /OFF= DSI

OFF/ON = DALI

ON /ON = PWM

### Modes of Operation

MODE 1: ANALOG OUT 0-10V / 1-10V

DIP-SWITCH 3 = OFF

DIP-SWITCH 4 = OFF

The decoder DAC Decoder 4x supports both, 0-10V output and 1-10V output. The difference of both protocols is the direction of the drive current: while 0-10V devices require a control current to be supplied by the decoder, 1-10V devices require control current to be drawn by the decoder. The decoder satisfies both needs and adjusts its output automatically. The control characteristics are fully linear ranging from DMX=000 (full off, or minimum intensity, depending on ballast characteristics) to DMX=255 (maximum intensity). Please note, that most analog driven electronic ballasts cannot be driven to the OFF state using the control input. This is a ballast property. Minimum ballast intensity is 1% (typically). Again, this is a ballast property: minimum levels of 3%, even 5% (or higher) are commonly available (The decoder will nevertheless go down to 0V). Please check the data of your ballasts. SYNCRONORM recommends use of OSRAM ballasts for optimum performance.

MODE 2: DSI

DIP-SWITCH 3 = ON

DIP-SWITCH 4 = OFF

DSI (Digital Serial Interface) is a digital protocol for smooth intensity control. Optimized drive characteristics, following a quasi-logarithmic law to match the eye's intensity sensing and excellent common mode characteristics are among the DSI benefits. You may use all PCA ECO and PCA EXCEL ballasts made by Tridonic and BBC. Each output may be loaded with up to two ballasts, giving a total of 8 ballasts to be driven by the DAC Decoder 4x. DMX control is identified by these control values:

DMX = 000 ballast OFF (Standby)

DMX = 001 ON , 1% Intensity

DMX = 128 10% Intensity

DMX = 255 100% Intensity

MODUS 3: DALI

DIP-SWITCH 3 = OFF

DIP-SWITCH 4 = ON

Nearly all ballast manufacturers (e.g. Philips, Helvar, Osram, Tridonic etc) will supply DALI compatible ballasts. All DALI ballasts may be connected to the 3004A-H, independent of type and manufacturer. Wiring is same as with DSI.

The DAC Decoder 4x supplies drive voltage to connected DALI ballasts.

Thus NO ADDITIONAL DALI power supply must be used, DALI BUS is not supported (only individual devices). The decoder control range is defined to support a 1% to 100% intensity span. Please note, that several DALI ballasts will only support lower dim levels starting at 3%, 5% or even 10%. If so, the DMX ignition point will remain intact, but intensity will only increase as soon as the ballast starting value has been reached. For a 3% starting value, this is about half-scale. DALI ballasts usually react much faster than DSI ballasts, but lack resolution (only 170 intensity steps available as compared to 255 for DSI). That is why they may appear somewhat „rougher“ when fading.



DMX = 000 ballast OFF (Standby)  
DMX = 001 ballst ON , 1% intensity  
DMX = 128 10% intensity  
DMX = 255 100% intensity

MODE 4: PWM  
DIP-SWITCH 3 = ON  
DIP-SWITCH 4 = ON

A PWM output allows intensity control for electrically non-linear devices, such as LEDs. PWM (pulse width modulation) achieves intensity control by setting the output to either full ON or full OFF using a variable on/off ratio. The DAC Decoder 4x features four 4 PWM outputs delivering a 10V PWM control signal. This may be used to drive power output stages equipped with bipolar transistors or MOSFETs. Output frequency is approx. 240 Hz. The control characteristic is absolutely linear and has a 8 bit resolution (256 steps).

DMX = 000 OFF, output = 0V  
DMX = 128 50% intensity, duty cycle 50% (ratio 1:1)  
DMX = 255 100% intensity, output = 10V

### **Drive Characteristics**

Using microprocessor-controlled electronic ballasts results in a unprecedented precise logarithmic control curve matching the eye's intensity sensitivity very closely. Thus the whole dimming range (1%...100%) seems completely linear to the eye. DSI cuts the DMX control range (256 steps) into two halves to generate two decades of intensity (from 1% to 10% and from 10% to 100%). Thus a DMX input value of 001 represents a output intensity of 1%, a DMX input value of 128 represents a output intensity of 10% and a DMX input value of 255 represents a output intensity of 100%. DALI cuts the DMX control range (256 steps) into three thirds to generate three decades of intensity control (from 0.1% to 1%, from 1% to 10% and from 10% to 100%). Thus a DMX input value of 087 would represent a output intensity of 1%, and all values from 001 to 086 would do the same because there a no electronic ballasts available worldwide which can dim lower than 1%. This, however, would make 1/3 of the fader control range useless. To obtain the same behaviour as with DSI devices the 3004B-H stretches the remaining 2/3 (170 steps) of the DMX control range to full scale. Thus smooth fades in DALI mode may appear somewhat „rougher“.

### **Electronic Ballasts**

The electronic ballasts are connected to connector CN4. Each output has two terminals, orange (output drive signal, +) and blue (ground, -). SYNCRONORM PCA electronic ballasts are insensitive to polarization of the drive signal, thus terminal connections may be interchanged. When using other brands, make sure to obey correct polarization of the drive signal. Each output may drive up to 2 ballasts maximum. Installation of electronic ballasts must only be carried out by trained and qualified technicians. Electronic ballasts must be connected to mains voltage; interchanging power supply and control lines will damage both, ballast and decoder. Check your wiring thoroughly before powering up your system.

# MAINTANANCE & DISPOSAL

## Maintenance and Cleaning

The device requires regular maintenance.

Carry out maintenance in accordance with the maintenance schedule:

- If necessary, update your software version.
- Check, if all external cables are working properly.

## Important information!

**Maintenance must be carried out by qualified personnel only!**

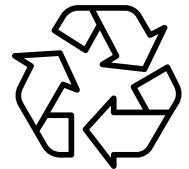
## CE Conformity

This DMX decoder is microprocessor controlled and uses high frequency (8 MHz quartz). The interface has been tested in our EMC lab to comply with EN5022B and IEC65/144. To ensure the best performance regarding radiated and conducted emissions, please make sure that shielded data cable is used and the shield is connected properly to the GND terminal. Shield must never make contact to any other signal lines.

## Protecting the environment

For the transport and Protective packaging, environmentally friendly materials have been chosen that can be supplied normally recycling. Do not just dispose of these materials with your normal household waste, but make sure that they are collected for recycling

This product is subject to the European Waste Electrical and Electronic Equipment Directive (WEEE).



## FCC Statement

This product has been tested and complies with the specifications for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used according to the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which is found by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment or devices
- Connect the equipment to an outlet other than the receiver's
- Consult a dealer or an experienced radio/TV technician for assistance

FCC Caution: Any change or modification to the product not expressly approved by SLH could void the user's authority to operate the device.



## GUARANTEE

Synchronorm GmbH assures a 12 month manufacturer's guarantee for this specific Synchronorm unit, purchased by you. This guarantee only exists in accordance to the specific guarantee conditions laid down as follows:

The guarantee period starts with the purchase from a Synchronorm GmbH specialist dealer. In the event of a resale, the guarantee period will not start again.

If services by Synchronorm GmbH are provided under the terms of this guarantee, this does not lead to extension or renewal of the guarantee period. Your legal rights as a purchaser, especially those ensuing from the warranty, persist. They are not restricted by this guarantee.

**Synchronorm warranties are limited to our product only and do not extend to any direct, indirect or subsequential loss under any circumstances.**

**Misusage of the device leads to a loss of guarantee!**

### **Guarantee Conditions**

SYNCRONORM GmbH guarantees impeccable, purpose-related properties and workmanship, expert assembly and proper functionality. Subject to our discretion, the guarantee refers to free-of-charge repair or free-of-charge supply of spare parts or of a replacement unit respectively. Should the unit type concerned no longer be manufactured, we reserve the right, at our discretion, to supply a replacement unit from our range that is closest to the type subject to complaint. Claims, the origin of which can be traced back to installation and operating faults as well as lack of care, e.g. the use of unsuitable cleaning materials or negligent maintenance, use other than that intended, damage due to accidents, falls, impact, effect of frost, cutting plugs, shortening cables, calcium deposits or improper attempts to repair the unit, are not covered by our guarantee. We hereby refer to the proper use as specified in the instructions of use that form an integral part of the guarantee. Wearing parts such as bulbs etc. are exempted from the guarantee.

The refund of costs for removal and installation, checks, claims for lost profit and damages are exempted from the guarantee together with further reaching claims for damages and loss of whatever nature caused by the unit or its use. The guarantee is only valid in the country in which the unit was purchased from a Synchronorm GmbH dealer. This guarantee is governed by German law under the exclusion of the agreement of the United Nations covering contracts, governing the international sale of goods (CISG) regulations. Guarantee claims can only be brought forward by presenting the sales receipt to

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by returning the unit or part of the unit's subject of complaint to us, freight free, at your own risk, accompanied by a copy of the original purchase receipt from the Synchronorm GmbH specialist dealer, this guarantee document and written information of the fault encountered.

