# OPERATING MANUAL

## DMX Stepper Motor Interface 3904S Mk1 RDM
## Mk 7.3

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# PREFACE

Thank you for choosing a SOUNDLIGHT device.

The SOUNDLIGHT steppeer motor driver3904S-H is an intelligent DMX decoder designed to drive a simple unipolar stepper motor. The card can be used with all standard light control systems. Its special advantages include:

- **universal protocol decoding**
  Recognizes all variants of the protocol as defined by USITT / ESTA / DIN

- **future-proof**
  The unit is software controlled an can easily be adapted to any change in protocol definition.

- **simple supply**
  The power supply is from standard DC voltage 12..24V=

- **signal loss**
  In the case of a loss of the drive signal a pre-definable action will be taken.

- **cost-effective**
  The SOUNDLIGHT 3904S-EP is a cost-effective solution for many purposes.

# FEATURES

The stepper motor interface 3904S can be used to drive stepper motors to a pre-defined position using DMX commands. The driver can be used with many standard unipolar steper motors which can be driven from voltages from 12...24VDC, sinking a current of max. 2A per Phase and featuring a step angle from 0,6...2,7 degrees.

**IMPORTANT NOTICE:** This stepper motor driver **MUST NOT** be used for applications with safety-critical issues or applications where dangerous situations may arise (moving loads, personnel etc.). You will have to use special motor controllers with specific safety circuitry to perform such tasks.

# NOMENCLATURE

These symbols are used within this manual:

DANGER ! May cause harm to user and/or equipment

INFO:        How to setup your device

INFO:        Status informationAnschlüsse

Please unpack carefully and check that all items are intact. When leaving our factory, the card has been in good condition. In case of damage during transport please notify the carrier immediately.

When unpacking, you should identify these items:

*       the interface card 3904S-EP
*       a start address board 3000P
*       this manual

# CONNECTORS

The motor driver 3904S consists of these inputs and outputs:

**CN6**          **DMX INPUT** (XLR 5-pin)

           1       GND
           2       -DMX
           3       +DMX
           4       2. Link (spare)
           5       2. Link (spare)

**CN7**          **DMX OUTPUT** (XLR 5-pin)

           1       GND
           2       -DMX
           3       +DMX
           4       2. Link (spare)
           5       2. Link (spare)

**CN1**          **CONTROL  OUTPUT  TO  STEPPER  MOTOR**

           1       blue    0V
           2       grey    Drive Output 1
           3       grey    Drive Output 2
           4       grey    Drive Output 3
           5       grey    Drive Output 4
           6       red     Power Supply 12-24V DC

**CN3**          **POWER SUPPLY**

           1       rot     Spannungsversorgung 12/24V DC
           2       blau    Masse

**CN 2**         **START ADDRESS BOARD CONNECTOR**
           Connect start address board 3000P, 3003P or 3005P. The interface can be operated with or without start address board connected. The interface cames with start address board 3000P, other types are available as optional accessories.

**J1**           **END SWITCH CONNECTOR (Zero Position)**
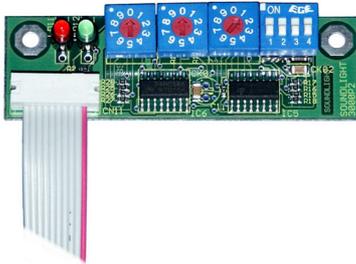           Connect a N.O. type potential-free contact. See text.
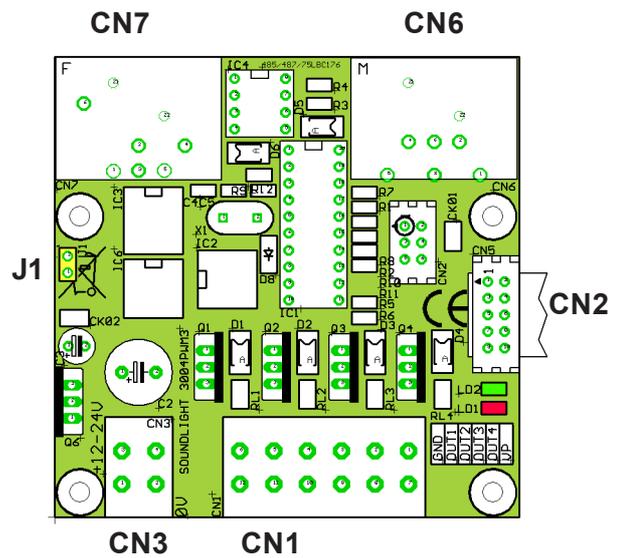
# SIGNAL INDICATORS

The state of the decoder card is signalled with two indicator LEDs.

green:      OPERATION
red:        ERROR (blinking)
            Error blinking at data errors or loss of communication.

# ADDRESS SWITCHES

Use the rotary switches to set the DMX start address and the DIP switches to set the DMX personality. When using the start address board 3003P, use the ADR setting to set the start address and Functions F1...F4 to set the personality.

Setting address 000 disables all outputs, regardless of data received.

**IMPORTANT NOTICE:** It may take some seconds until the new start address is being recognized and activated. A fourfold red-green blinking cycle of the indicator LEDs indicates succesful programming of parameters.
The address board can be detached when all settings have been made and stored in memory.

**IMPORTANT NOTICE:** Please note that the start address switches get locked as soon as settings have been changed using DMX RDM. This prevents the decoder from reading start address switch data again.
To unlock the switches, set the hundreds position to "9" temporarily. This will unlock the switches.

# DIP SWITCH SETTINGS

The DMX stepper motor driver can be set to meet your specific needs using the DIP switches.

**S1:     HOLD  Mode**

OFF           HOLD Mode OFF
ON            HOLD Mode ON ("last look" retained at loss of control)

**S2:     SAFETY LEVEL**

When HOLD MODE (S1) has not been activated, S2 takes control:
S2=OFF        all Outputs OFF at loss of control signal
S2=ON         all Outputs ON   at loss of control signal

**S3, S4:  DMX PERSONALITY**

| | | |
|---|---|---|
| S3=OFF,  S4=OFF  Personality 1 | 8Bit mode, clockwise |
| S3=OFF,  S4=ON    Personality 2 | 8Bit mode, counter-clockwise |
| S3=ON,    S4=OFF  Personality 3 | 16Bit Mode, clockwise |
| S3=ON,    S4=ON    Personality 4 | 16Bit Mode, counter-clockwise |

Personality 5 can only be invoked via DMX RDM.

Personality 5: continuous mode      000...063:   stopp
064...159:   turn left
160...255   turn right

# Stepper Motor

The DMX Stepper Motor Interface can drive various stepper motors.
Please select a  suitable stepper motor taking into account these restrictions:

1. You need a 4-phase motor (unipolar motor). A unipolar steppen motor can be identified easily since it has typically six connection leads (two common and four coil connections). Unipolar motors (with only 4 leads) cannot be used.

2. maximum motor voltage: 24VDC (this is the maximum supply voltage of the decoder)
3. minimum motor volatage  10VDC (this is the minimum supply voltage of the decoder)
-> recommended motor voltage 12...24VDC

When using a common psu for both, decoder and motor, voltages must match. When powering the motor from a separate power supply, the motor voltage may be lower than the decoder power supply voltage. Connect both psu ground terminals.

4. The motor coils current must not exceed 2 amps.

5. The resolution (Step width, degrees) shoukld match 0.9/1.8° for best performance but can vary to meet your specific needs.

Recommended motors would be types UAG23N05RE (Burgess), sold via  RS Components GmbH, 64546 Mörfelden-Walldorf, Hessenring 13b, or   Vexta PH264-03 (Oriental Motor Co).

Colour codings of the motor connections fiffer between manufacturers; thus we cannot give specific data. Pls refer to our product website where a simple method to identify the correct sequence is described. Pls refer to the basic wiring scheme below.
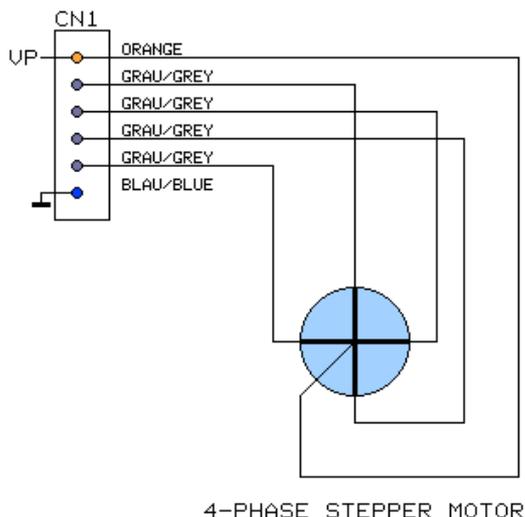


Stepper motor wiring

Pls referv to our product page:
*www.soundlight.de/produkte/3904s-ep*

**CN6**      **Drive output to Stepper Motor**

| | | |
|---|---|---|
| 1 | blue | 0V, Masse |
| 2 | grey | Output / Winding 1 |
| 3 | grey | Output / Winding 2 |
| 4 | grey | Output / Winding 3 |
| 5 | grey | Output / Winding  4 |
| 6 | orange | +V (12...24V, power supply) |
| | | common connection for winding centers |

**CN3**      **Power Supply**

| | | |
|---|---|---|
| 1 | orange | +V (10...24V) |
| 2 | blau | 0.0V, GND |



**CN3**

**CN6**
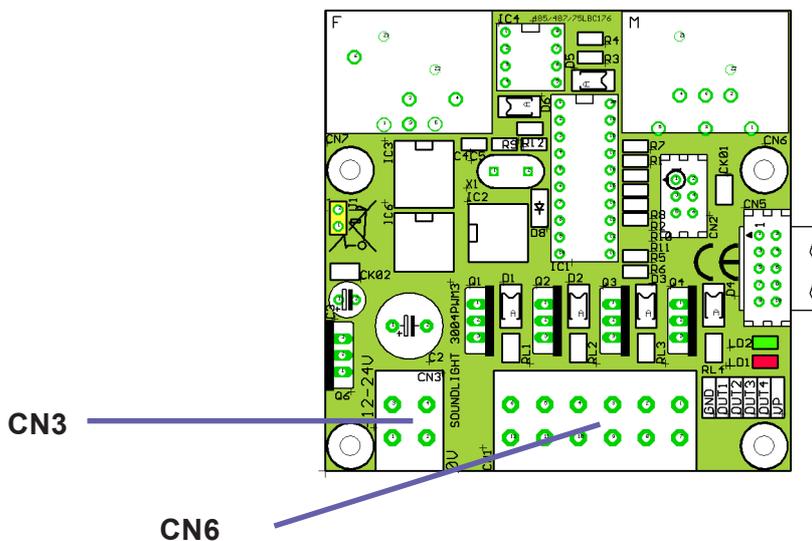
# DMX Data Slot Allocation

The DMX stepper motor driver  3904S-EP is using 2 or 3 DMX slots to control motor functions:

**Positioning Mode:**

The motor turns to the set position.

<u>- in 8 Bit Mode</u>
Slot 1:      Motor position  (take scaling factor STEP WIDTH into account)
Slot 2:      Speed

<u>- in 16 Bit Mode</u>
Slot 1:      Motor position LowByte (fine)
Slot 2:      Motor position HighByte (coarse)
Slot 3:      Speed

**Endless Mode (Continuous Mode):**

| | | |
|---|---|---|
| Slot 1: | Direction: | |
| | 0...25% | off |
| | 25%...62% | turn left |
| | 63%...100% | trun right |
| Slot 2: | Speed | |
| | (16 Steps available) | |

The 3904S-EP is compatible with ANSI E1-20 DMX RDM Version 1.0. Please note some special properties of devices complying with DMX RDM:



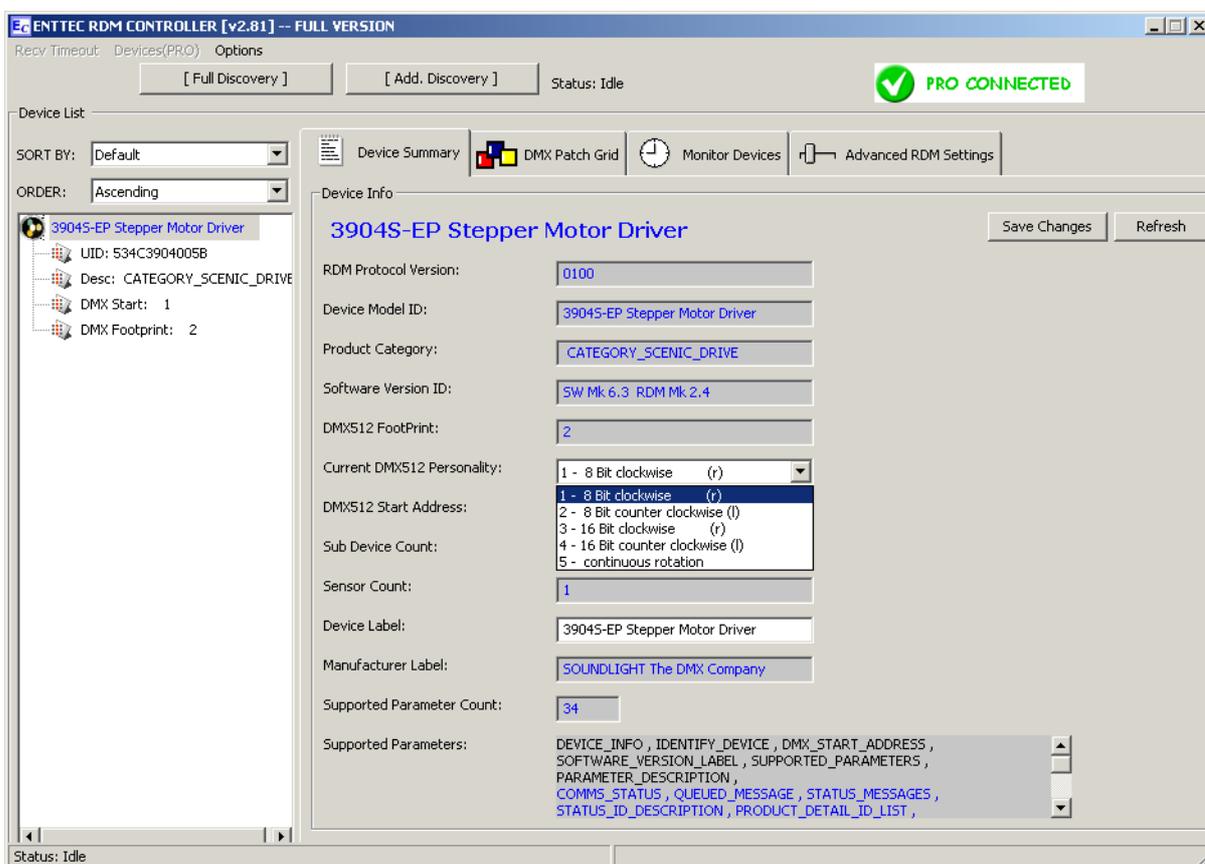- DMX HOLD properties are not supported by RDM standard ANSI E1-20. A factory specific command (DMX HOLD) has been added to compensate these restraints. Use parameters 0...2 to set the desired HOLD mode:

      0: no HOLD, all outputs OFF upon loss of signal
      1: no HOLD, all Outputs ON upon loss of signal
      2: DMX HOLD (last look remains active)

- Setting the DMX personality reflects setting of DIP switches 3 and 4 (and vice versa).

**Start adress setting with RDM::**
Please note that the start address switches get locked as soon as settings have been changed using DMX RDM. This prevents the decoder from reading start address switch data again.
To unlock the switches, set the hundreds position to "9" temporarily. This will unlock the switches.

Additional RDM function allow to:
      - read the DMX slot labels
      - read and modify the device label
      - identify the decoder
      - read device hours and device initalizations
      - read, activate or deactivate the DMX HOLD mode
      - monitor DC supply voltage

For more information on DMX RDM commands, options and possibilities, application examples and more pls refer to our RDM website **www.rdm.soundlight.de**

You may change some parameters to optimize your system or adapt the controller to the motor or application properties. All settings can be read and written via DMX RDM and a suitable DMX RDM controller. SOUNDLIGHT recommends the JESE GET/SET controller, which is available from www.jese.co.uk.

All parameters are preset to optimum values and should only be changed if necessary. All parameters will be reset o their factory default values when the RDM function FACTORY DEFAULTS is called.

**$C000     SPEED SCALING**

This parameter defines the maximum speed. When driven beyond the maximum frequency (this is a motor dependent parameter) the motor may not rum smoothly and lose steps. Reduce the maximum speed the ensure smooth operation at all times.

default setting:     $ED     dec: 237
Maximum value:     $FF     dec: 255

**$C0001     STEP WIDTH**

This is a scaling factor, which is only active in positioning mode. By default, the scaling factor is set to 1.

The scaling factor is used to calculate the drive angle in respect to the DMX drive signal. In general,

angle = step width * step count * step size

where:

step size     = 0,9° (half step for a 1,8° motor)
step count    = DMX input  0...255 in 8-bit mode, or
                      0...65535 in 16bit mode
step width    = 1...255

With step width =1 this will give a maximum angle of
1 * 255 * 0,9° = 229,5° in 8-bit-mode

Motor position can be read out by sensor #3 (range 0...360°). Sensor calculation refers to 0.9/1.8° motors only.

**$C002     MOTOR HOLD CURRENT**

When stopping, motor current is reduced to save energy but also to provide enought torque to firmly keep the actual position, even under load. The power factor can be set freely fom 0%  (0 dez, 00hex)  to 100% (255 dez, FFhex). The Default setting is 60% (153 dez,99hex).

> **IMPORTANT NOTE:** all values must be entered as hexadecimal values. Some RDM controllers may require values as decimal values instead. Use the Windows Calculator in Programmer's View to easily convert between decimal and hexadecimal values.

# END SWITCH

When turning on a stepper motor drive, the current motor position is unknown. Thus the driver has to evaluate the zero position and exercise the motor to find the zero (start) position. There are two basic methods to do so:

1. Using a mechanical stop
   At startup, the motor rotates the maximum drive range backward until the mechanical stop is reached. A slip clutch may be needed to limit wear.

2. Using a End Switch
   Use a mechanical or optical switch to detect start position. The end switch must close as soon the position is reached. Upon contact closure, the motor stops and anvances to the DMX position.
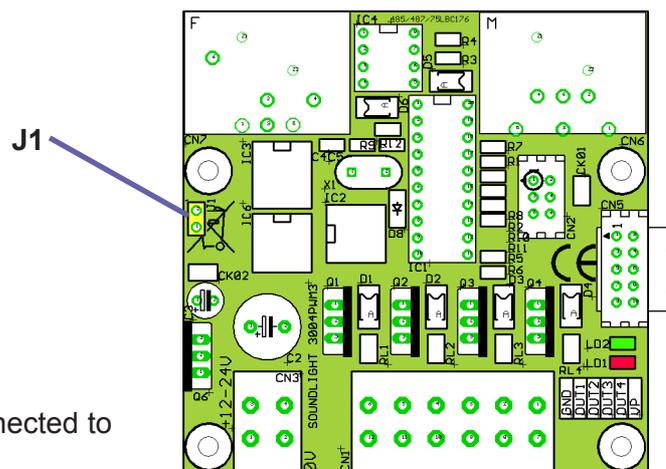


The end switch must be connected to the J1 terminals.

# TECHNICAL DATA

| | |
|---|---|
| Dimensions: | 72 mm x 70 mm x 45 mm |
| Power Supply: | 12...24V DC |
| DMX IN: | 1 Unit Load |
| DMX OUT: | durchgeschleift |
| Motor Out: | 12...24V Impulse signal (depends on power supply) |
| IP mode: | IP00 |
| Temperature range: | 0...+50C |
| Order Code: | 3904S-EP |

# DISTURBANCES

If a trouble-free operation cannot be guaranteed, disconnect the relay card interface and secure it against unwanted operation. This is especially necessary, when
- the unit has visible damages;
- the unit does not operate;
- internal parts are loose;
- connection cables show visible damages.

# LIMITED WARRANTY

This DMX interface ist warranted against defects in metarials and workmanship for a period of 12 month, beginning with the date of purchase. The warranty is limited to repair or exchange of the hardware product; no further liability is assumed. SOUNDLIGHT is not responsible for damages or for loss of data, sales or profit which arise from usage or breakdown of the hardware product. In Germany, SOUNDLIGHT will repair or replace established defects in hardware, provided that the defective part is sent in, freight paid, through the responsible dealer along with warranty card and/or sales receipt prior to expiration of warranty.

**Warranty is void:**
- when modifying or trying to repair the unit without authorisation;
- modification of the circuitry;
- damages by interference of other persons;
- operation which is not in arccordance with the manual;
- connection to wrong voltage or current;
- misuse.

# CE CONFORMITY

This DMX relay card is microprocessor controlled and uses high frequency (8 MHz quartz). The interface has been tested in our EMC lab to comply with EN55015.
Please make sure that shielded data cable is used and the shield is connected properly to the GND pin. Shield must never make contact to other signal lines.

# 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.

# SERVICE

There are no parts within the DMX relais card 3904S-EP which require the user's attention. Should your unit require servicing, please send it to the factory, freight paid.

# END OF LIFETIME

When the useful lifetime of this product has been reched, it must be disposed of properly. Electronic devices must not be placed in domestic waste. Consult your local authorities to find the nearest collection point of used electric and electronic devices. SOUNDLIGHT is a WEEE registered company (Reg Nr. DE58883929).

# PRODUCT HOMEPAGE

For more information, pls refer to our product homepage:  *www.soundlight.de/produkte/3904s-ep*

For more information about DMX RDM , pls refer to our RDM webpage:  *www.rdm.soundlight.de*

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