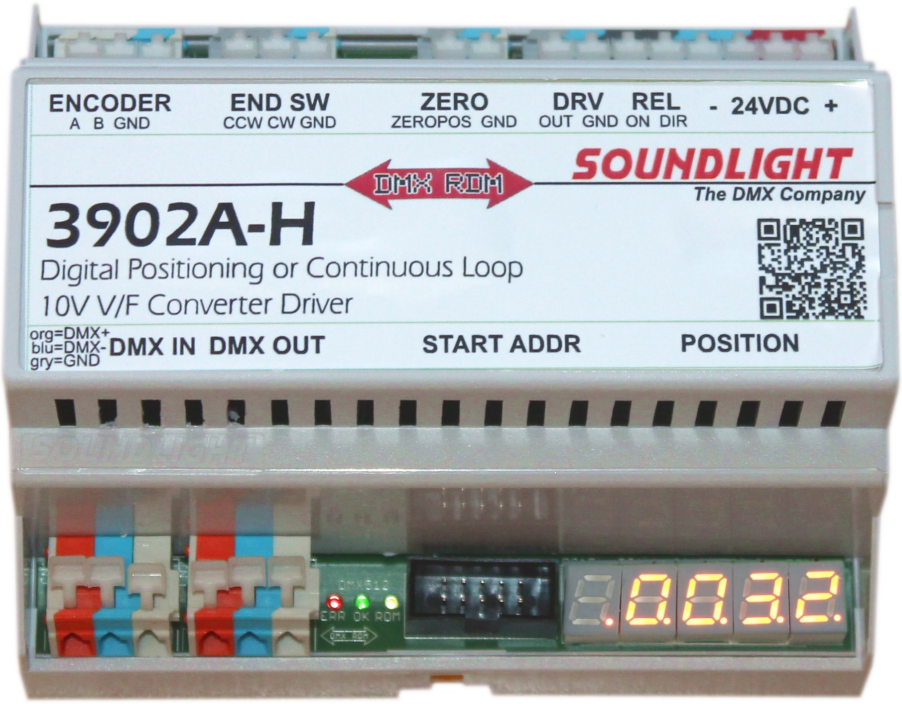
last edited: 2016-09-14

OPERATING MANUAL

DMX V/F Converter Driver 3902A-H Mk1



RoHS compliant

SOUNDLIGHT *The DMX Company* Bennigser Strasse 1 D-30974 Wennigsen Tel. 05045-912 93-11

Thank you for choosing a SOUNDLIGHT device.

The SOUNDLIGHT DMX V/F Converter Driver 3902A-H is an intelligent DMX decoder to convert digital data complying with standards USITT DMX512/1990, ANSI E1-11 DMX512-A, DIN 56930-2 and ANSI E1-20 DMX RDM into control signals for driving a voltage-to-frequncy converter for motor control. The v/f converter driver 3902A-H can be used with all standard lighting 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.

- **signal feed-thru**
  The DMX data input is fed to DMX THRU terminals. This allows easy integration in complex multi-device wirings.

- **simple supply**
  The power supply is from standard voltage 24VDC.

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

- **cost-effective**
  The SOUNDLIGHT 3902A-H is a cost-effective solution for many purposes.

General

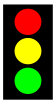
The DMX v/f driver 3902A-H is ideally suited for all kinds of motion control. It has been designed for positioning as well as for non-positioning applications in entertainment lighting. The 3902A-H must not be used for hazardous applications. Certain applications may require additional sefaty measures (see below).

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 information

Unpacking

Please unpack carefully and check that all items are intact. When leaving our factory, the interface has been in good condition. In case of damage during transport please notify the carrier immediately. Please note that specific deadlines may apply to claim transport damages. We will only be able to replace goods damaged during transit if we receive a written and signed confirmation issued by the freight forwarder. Make sure you receive such a document and send to us a.s.a.p.

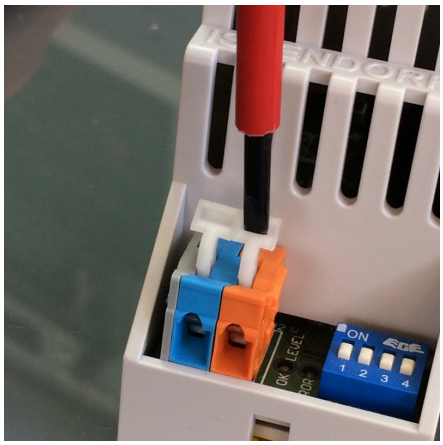
When unpacking, you should identify these items:

* the interface 3902A-H RDM
* this manual

Please note that a start address programming adaptor (3000P) is NOT included with DIN rail mount devices. All settings can be performed using DMX RDM. Alternatively, a programming adaptor, which can be used to set DMX start address, DMX personality and DMX HOLD mode, must be ordered separately. If you already have it, there is no need to buy again: the start address board can be used for all our DMX interfaces, pcb and DIN rail mount alike.

Connectors

The decoder 3902A-H Mk1 consists of 6 terminal blocks. Terminals are based on screwless WAGO cage clamp technology, which prevents loose connections and guarantees safe electrical contact at all times. Use a standard **flat blade** screw driver and press the lever to open the terminal, insert wire and release. Do not use a philipps or pozidrive screwdriver to prevent damage !. Though both, solid and stranded wires may be used we recommend to use stranded wires in combination with isolated ferrules whenever possible.



Please refer to the connector location outlined on page 3.

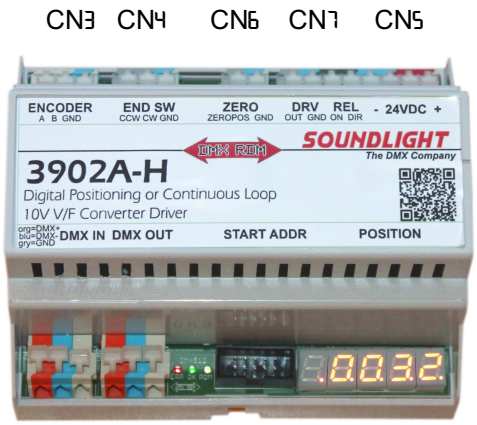
Applications

The decoder 3902A-H is intended to drive 0..+10V voltage-to-frequency converters. Usually, v/f converters are mainly used to control motors, the the 3902A-H can be used as motor controller. The variable voltage output is transformed into variable speed, thus the 3902A-H allows variable DMX positioning and variable DMX speed control.

IMPORTANT NOTICE
The control protocol DMX512 is not intended to control drives and scenery which could be hazardous to man or materials (see standard ANSI E-11 DMX512-A, available from www.ansi.org). This restriction must be similarly applied to previous standards USITT DMX512/1990, DMX56930-2 or standards based on E1-11, such as ANSI E1-10 DMX RDM.
DMX512 does not contain any mechanisms or procedures that allow instant system shutdown in case of malfunction or failure. Thus it is in the sole responsibility of the user to install a second, independent safety circuit to shutdown the application an case of trouble.

The decoder 3902A can be used in positioning mode or in endless mode. The configuration is via DMX RDM and can be performed using any standard DMX RDM controller. We suggest to use the JESE GET/SET DMX RDM controller, being the most advanced, versatile and reliable controller software available.

Connections



CN1 **DMX DATA INPUT**

1	grey	GND
2	blue	-DMX
3	red	+DMX

CN2 **DMX DATA THRU**

1	grey	GND
2	blue	-DMX
3	red	+DMX

CN3 **DIGITAL ENCODER**

1	A	Impulse input A
2	B	Impulse input B
3	blue	0V, GND

The encoder inputs are set for digital pulse signals 0...+24VDC. The position encoder must be connected such that the position counter increases when turning right.

CN4 **END SWITCHES**

1	CCW	End switch counter clockwise (CCW)
2	CW	End switch clockwise (CW)
3	blue	0V, GND

End switches are potential free switches (N.O. contact) referred to GND.

CN6 **ZERO POINT (MID POINT) SENSOR**

1	h'grey	Sensor input 24VDC
2	blue	0V, GND

The zero point sensor input expects a 24VDC signal referred to GND.

CN5/CN7 **POWER SUPPLY AND DRIVE OUTPUTS**

1	h'grey	Control output (0...+10VDC)
2	blue	0V, GND
3	d'grey	Relay "ON"
4	d'grey	Relay "DIRECTION"
5,6	blue	Power Supply 0V, GND
7,8	red	Power Supply +24VDC

Control relays must be 24VDC relays connected to +24DC and the respective control output. The driver outputs includes free-wheeling diodes.

CN8 **Start address board (10-pin)**

To connect a SOUNDLIGHT start address board 3000P or 3006P.

NOTES:

(1) Encoder Inputs
Active or passive encoders may be used. Passive encoders are supplied from a internal voltage/current source supplying 5mA @ 24VDC. Active encoders shall pull the signal input to GND (npn output driver)

(2) End switches
End switches shall be engaged when (and as long as) the end position has been reached. Contact shall be made to GND.

(3) Zero point sensor input
The sensor input expects a positive input voltage and will reset the position counter to „00000“ at the positive flank of the input pulse.

(4) Relay control
The control relays for „ON“ and „DIRECTION“ must be added externally. They are powered from the +24VDC supply and activated when the control output is pulled LOW. The „DIRECTION“ relay is disengaged for „CW“ and is engaged for „CCW“.

(5) Motor drive voltage
The control output supplies a 0...+10VDC control signal and can deliver a control current of up to 2mA.

Signal Indicators

The status of the v/f converter module is signalled with three indicator LEDs.

green: **OK**
A vaild DMX conrol signal is present.

red: **ERROR**
normally: off
blinking: no valid DMX signal present

Yellow: **RDM**
Activated when a RDM programming has taken place. Mechanical address switches are deactivated then.

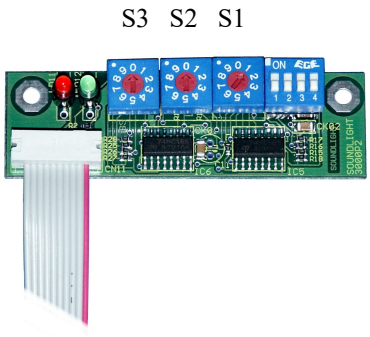
Start Address

The start address can be set by DMX RDM using the START_ADDRESS command (PID $00F0). The start address defines the address of the first data slot used by the decoder. Valid start address settings include start adresss 001 thru 512-(number of slots used).

When using a mechanical start address board 3000P the coding switches give the start address directly. No binary conversion as needed with DIP switches necessary.

S1: Ones
S2: Tens
S3: Hundreds

When setting the address to 000 (invalid setting for DMX data reception), all outputs will be set to „off“ regardsless of DMX data. .



The decoder can be operated with or without start address board connected. Please note that switches become disengaged and the respective settings are overridden when programming is done via RDM. To re-engage the switches, set the hundreds position to „9“ temporarily and wait for a programming cycle to complete. A programming cycle is indicated by the red and the green LED blinking four times alternatively.

DMX HOLD Mode

The DMX HOLD mode defines the behaviour at signal loss. Signal loss is defined as loss of a valid DMX control signal for more than 1 second. Therev are three options present, which can be selected by RDM command DMX_HOLD (PID $80F1):

Parameter	**Setting**	
00	all outputs to OFF:	Motor goes to START position
01	all outputs to ON:	Motor goes to END position
02	keep last look:	operation continues as if last recived value were present

Setting the HOLD mode can also be performed using the DIP switches onboard the 3000P address board.

DIP-SWITCH 1: **HOLD MODE**
keeps the actual motor position at signal loss
ON: HOLD Mode activated („keep last look“)
OFF: DIP switch 2 active

DIP-SWITCH 2: **SAFETY LEVEL**
Motor position at signal loss when no HOLD mode activated
ON: Motor goes to END position
OFF: Motor goes to START position

DMX Personality

The different operating modes are also known as „DMX PERSONALITY“. The DMX personality can be set by DMX RDM using command DMX_PERSONALITY (PID $00E0) or a external address board. There, DIP switches 3 and 4 will set the personality.

<u>PERSONALITY 1: POSITIONING MODE</u>

In positioning mode, the motor will turn as long as required to reach the preset position reported by the positioning sensor. The sensor will send pulses which are counted to calculate the actual position. The table lists the position-counter assignmants:

Position	**POS counter** *decimal*	**DMX position value** *hexadecimal*	*decimal*
LEFT (CCW)	- 9984	5900	22784
MID POSITION	0000	8000	32768
RIGHT (CW)	+9984	A700	42752

Thus the mavimum range is -9984 ... + 9984 = 19968 steps.
The DMX positioning uses DMX data slots 3 (HI) and 4 (LO). The total value is calculated from POSITION = 256*HI + LO. Thus the mid position is: MID = 128*256 + 0, that is, Fader 3 must be set to „128“ and Fader 4 must be set to „0“.

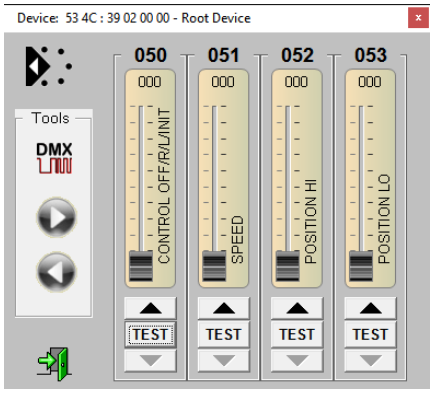
DMX slots 1 and 2 are used to control the movement.

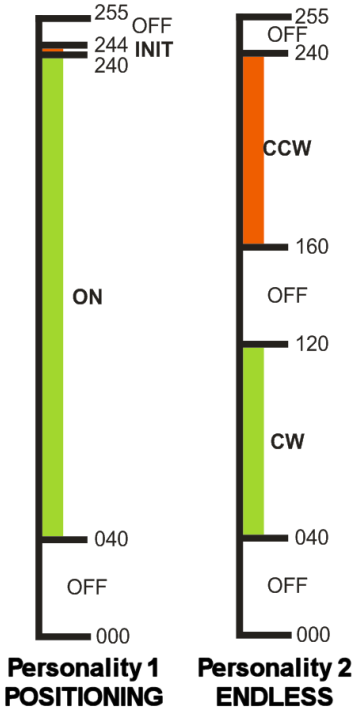
Fader 1 **CONTROL**

0...39: off
40...239: on
240...243: RESET
244...255: off

Fader 2: **SPEED** (output voltage 0...10V)
0: 0 Volt (Minimum Speed)
255: 10 Volt (Maximum Speed)

TIPP:
Please set the required minimum and meximum speeds using the DMX functions MIN_LEVEL and MAX_LEVEL. Also use the function MIN-MAX_MODE to include or exclude stopping at zero level. Refer to the RDM command list available on our internet site: www.rdm.soundlight.de





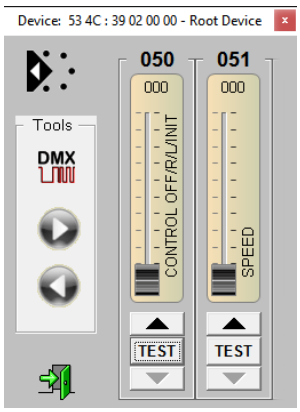
DMX PERSONALITY 2: ENDLESS MODE

Only two DMX data slots are used:

Fader 1 **CONTROL**

0...39: off
40...119: turn right, CW
120...159: off
160...239: turn left, CCW
240...255: off

Fader 2: **SPEED** (output voltage 0...10V)
0: 0 Volt (Minimum Speed)
255: 10 Volt (Maximum Speed)



Using a start addres board 3000P, the personaliy setting would be:

DIP-SWITCH 3: **nicht belegt**

DIP-SWITCH 4: **DMX PERSONALITY**
ON: Personality 2: Endlosbetrieb
OFF: Personality 1: Positionierbetrieb

Initialisation

In position mode a automatic initialization routine will be invokedat power-up or when issuing a RE-SET command by RDM or contral fader 1 (INIT: see above).

The initialization is performed in two steps:

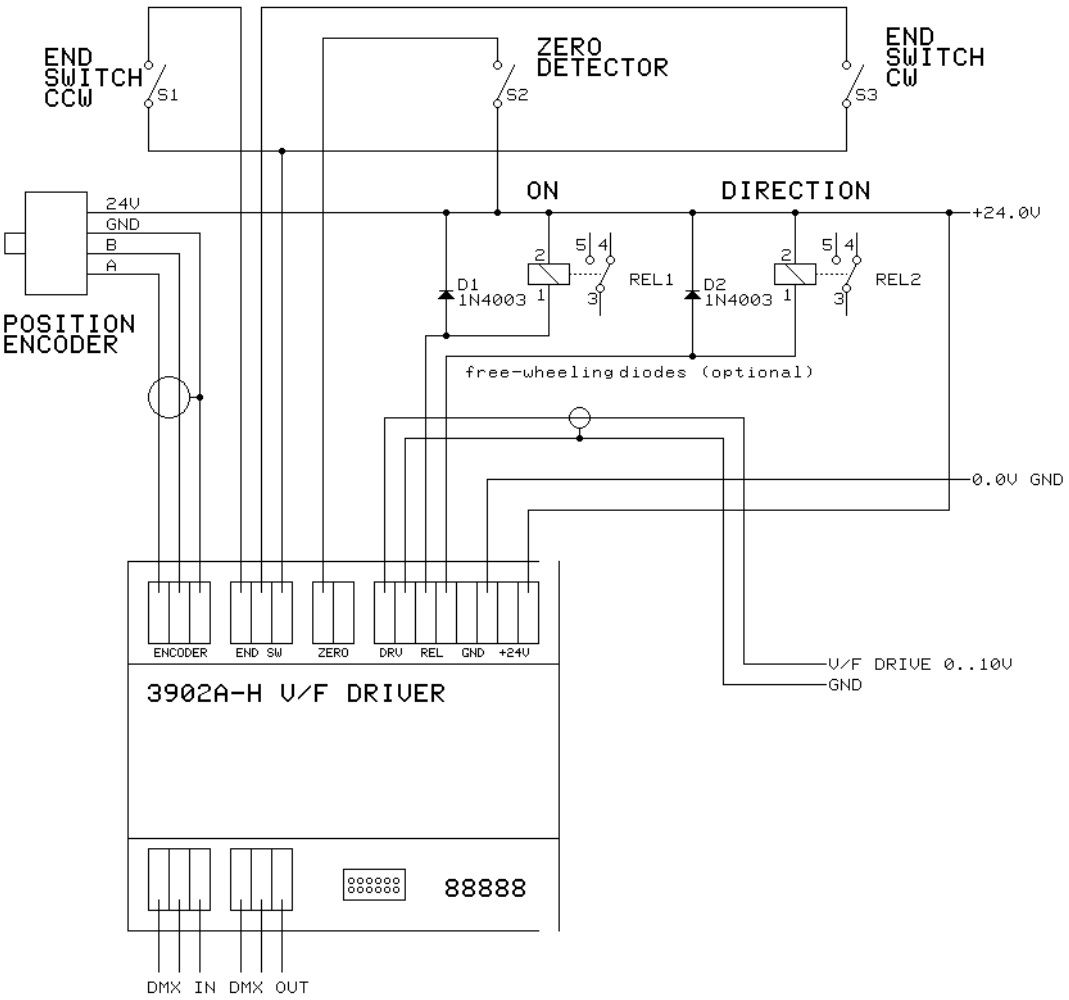
1) Initialization CCW

The decoder will be set to CCW direction and the output will be set to initialization speed (can be set by RDM command INITALIZATION_SPEED, PID $C008).
-> MID point detected: the counter will be reset (00000), the motor stops or moves to the preset position, if position HI/LO is other than 128/0
->End switch reached: the direction will be reversed (CW)

2) Initialization CW

The decoder will be set to CW direction and the output will be set to initialization speed (can be set by RDM command INITALIZATION_SPEED, PID $C008).
-> MID point detected: the counter will be reset (00000), the motor stops or moves to the preset position, if position HI/LO is other than 128/0
->End switch reached: machine stops, „Error“ displayed. Manual intervention is required since no mid / center position has been detected.

Wiring



Please refer to the wiring scheme to make the connections to the decoder. Make sure that all work must only be carried out in unpowered state - disconnect all power supplies before other connections are made.

All parts and components used with the 3902A-H controller must be capable to operate with and from 24VDC. Zero point sensor and end switches can compise of contact outputs or electronic outputs- refer to the connector description (see page 4) for more details.

To obtain the highest degree of flexibility in application of the 3902A-H, direction and motor control relays are not included and must be added externally. Any type (or electronic input) can be used.

Relay 1: "ON" engaged, when motor „ON“
When motor off, the speed output will also be set to 0V. If the spped input of the v/f converter used is using a threshold to detect the „stop“ state, relay 1 can be omitted.
Relay 2: "DIRECTION" engaged when turning left (CCW)

Display

The display shows these information:

1. **Position display**
In positioning mode, the current position will be displayed. Position is always referenced to center position (mid position, 00000). From center position, up to 9984 steps can be reached clockwise (display: „9984“) or 9984 steps counter-clockwise (display: „-9984“).

2. **Function display**
When the initialization is running, the current status will be displayed. Display is „init“ followed by a left or right turning symbol.

3. **Speed display**
In endless mode the display shows the speed setting in DMX format (000-255) and displays the curent direction als left or right turning symbol.

4. **Activity display**
With relay 1 disengaged „motor off“ the display shows all dots (no movement)

DMX RDM

The 3902A-H RDM 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, PID $80F1) 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)

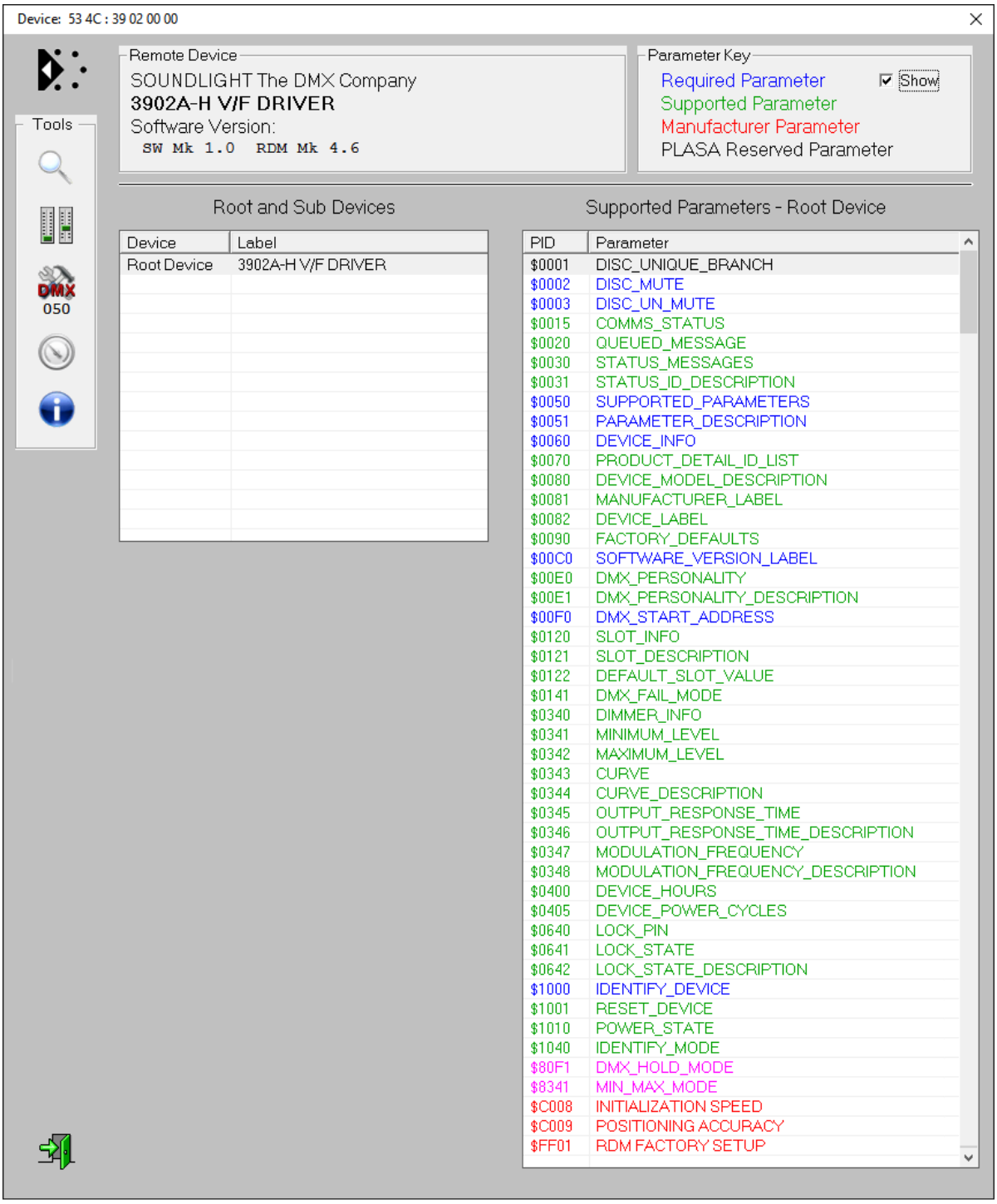
- Setting the DMX personality reflects setting of DIP switches 3 and 4 (and vice versa).

NOTE:

Once settings have been changed using DMX RDM, the address switches become inactive (blocked). To re-enable start address switches, temporarily set any address from 900...999 (simply set the "9xx" digit). This will re-enable switches.

DMX RDM Properties

The DMX C/V Driver 3902A-H RDM is fully compliant to DMX RDM Standard ANSI E1-20 V1.0. The device will be identified as MOTOR ROTATOR in SCENIC DEVICES category and can be configured to two modes of operation (DMX PERSONALITY):



- Positioning Mode (4 DMX data slots)
The motor will automatically drive to reach the preset position, given in 16 bit format and defined by DMX data slots 3 (HI) and 4 (LO). Please note, that all entries must be referenced to center position (hex 8000, dec. 32768)

- Continuous Mode (2 DMX data slots)
Direction and spped will be controlled using 2 DMX data slots.

Selecting the appropriate DMX PERSONALITY will set the required mode of operation.

Special RDM functions:

RESET_DEVICE:	calling with parameter =1 ($01) causes a warm reset calling with parameter = 255 ($FF) causes a cold reset
DEVICE_POWER_CYCLES:	reads the number of device startups

For more information about DMX RDM and its possibilities pls check *www.rdm.soundlight.de*

The 3902A-H v/f driver interfaces additionally makes use of some enhanced RDM functions, including:

FUNCTION $C008 INITIALIZATION SPEED

This function sets the fixed speed for the initialization routine (searching the zero point / mid point / center point). The speed is fixed and cannot be changed. Please note, however, that initialization will only run when the CONTROL fader (DMX slot 1) has been set to „on“.

Calls: GET <param = none> (no parameter needed)
Return: <param=Init_Speed [Byte]>

SET <param=Init_Speed [Byte]>
Return: <param=none> (no parameter returned)

Init_Speed = $00...$FF the value will be taken as speed

TIPP:
We recommend to operate the unit in personality 2 („endless mode“) and evalutate the best speed for the initalization routine. Use this setting for the speed programming.
WATCH OUT:
If mechanical end points must be obeyed, make sure not to drive beyond that point!

FUNCTION $C009 POSITIONING ACCURACY

This function sets the accuracy when parking in positioning mode. The function will only be used in positioning mode. The parking accuracy will be set in bits (default: 3 equalling 8 steps).

Calls: GET <param = none> (no parameter needed)
Return: <param=Accuracy_Bits [Byte]>

SET <param=Accuracy_Bits [Byte]>
Return:: <param=none> (no parameter returned)

Accuracy_Bits = $00...$07 the value will be taken as bit count

Bit Count	*Dead Zone*
$00	volle Auflösung
$01	dead zone 2 Steps
$02	dead zone 4 Steps
$03	dead zone 8 Steps
$04	dead zone 16 Steps
....etc until	
$07	dead zone 128 Steps

FUNCTION $C00A AUTO_INIT ENABLE

This function allows to disable the auto-initialization routine in positioning mode. The automatic initialization is enabled by default..

Calls: GET <param = none> (no parameter needed)
Return: <param=Auto_Enable [Byte]>

SET <param=Auto_Enable [Byte]>
Return:: <param=none> (no parameter returned)

Auto_Enable = $00	Automatic Initializaon OFF
Auto_Enable = $FF	Automatic Initialization ON (default)

More RDM Info

For more information on DMX RDM pls check the web pages of the DMX RDM protocol group (www.rdmprotocol.org), or visit: www.rdm.soundlight.de

Technical Data

Dimensions:	DIN rail module (REG) 6.5 units
Power supply:	24V DC
DMX IN:	1 Unit Load
DMX OUT:	fed thru
Protocol:	DMX512/1990, DIN56930-2, DMX512-A, DMX RDM
End Switch IN:	0,0V (potentialfreier Kontakt oder Open Collector TTL), max. -5mA Ruhespannung 24V DC
Zero Point Sensor IN:	+24VDC
Steps:	+/-9984 max.
Motor Out:	0...+10V, max. 2mA
Operating Temperature:	0...+50C
Order Code.:	3902A-H

CE CONFORMITY

This DMX interface is microprocessor controlled and uses high frequency. The interface has been tested in our EMC lab to comply with EN55015 and IEC65/144.

CE

To ensure the best performance regarding radiated and conducted emissions we suggest to install the interface in a closed, conductive (e.g. metal) housing, which must be connected to GND.
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.

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.

SERVICE

There are no parts within the DMX decoder 3902A-H 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 reached, 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 No. DE58883929).

INTERNET-HOTLINE

Please check our internet domain **http://www.soundlight.de** for new versions, updates etc. If you have any comments which may be worth considering, please send a message to ***support@soundlight.de***. We will check your message and reply accordingly.

Updated and foreign laguage manuals can be downloaded from www.manuals.soundlight.de

The 3902A-H product page can be found at www.soundlight.de/produkte/3902a-h

ACCESSORIES

To set the DMX start address and change the operating parameters, a DMX RDM controller or a start address board is needed. These boards are optionally available:

DMX START ADDRESS BOARD 3000P
www.soundlight.de/produkte/3000p

Three address BCD switches and a DIP switch to set operating parameters. This is the standard board, which is compatible wil all our decoders (both pcb and DIN rail mount)

DMX START ADDRESS BOARD 3006P
www.soundlight.de/produkte/3006p

Start address board with LCD display and rotary encoder to set the DMX start address. Adress is retained in nonvolatile onboard memory.

DMX RDM CONTROLLER GET/SET USBRDM-TRI
www.soundlight.de/produkte/usbrdm-tri

Intelligent controller software for use on Windows machines. Complete with USB connected interface connecting to DMX responders or introduce RDM control when working with other DMX control gear.

Start address boards are not contained with DIN rail mount decoders and must always be ordered separately!