Uhlenbrock digital

SUSI

IntelliSound 3 Decoder 33100, 33110, 33120, 33150

Multi-protocol Sound decoder with Load regulation for Locomotives with DC- and Faulhaber motors

Features

- Regulated Multi-protocol decoder for DCC and Motorola
- Suitable for DC and Bell armature motor up to 0.7 A
- Quiet motor running with 18.75KHz control frequency
- 14, 27, 28, 128 speed step, depending on the data format
- Short (1-127) and long (128-9999) Addresses
- NMRA compatible
- Minimum, maximum and middle speeds adjustable
- Main line programming (DCC)
- Switchable shunting speed (half speed)
- Switchable start and braking inertia
- Direction dependent, switchable, dimmable lighting
- 2 Special switchable, dimmable function outputs A1 and A2
- Function Mapping f0 - f12 for lighting, A1 and A2
- Train lighting can be switched off
- With provision for connecting a backup capacitor
- Reacts to DCC compliant brake signal or brake sections in DC operations
- All outputs have short circuit protection
- Conventional DC operation with automatic switching to particular mode
- All CVs are programmable with digital devices that use DCC and Motorola formats
- Updatable using Flash memory

Description

This Sound decoder is a small, efficient, multi-protocol decoder. It can be operated in DCC and Motorola digital systems and also runs in DC analogue mode. The operating mode will be detected automatically but can also be locked manually.

The decoder operates with a frequency of 18.75KHz and is therefore well suited for DC and especially for Bell armature motors (e.g. Faulhaber, Maxon, Escap) up to a maximum power load of 0.6A. Short burst start up currents are tolerated.

Motor characteristics can be controlled either by setting the minimum, maximum and middle speeds or via various CVs for individual speed steps.

Load regulation can be controlled via regulation parameters to a variety of individual motors.

The decoder provides two direction dependent lighting outputs as well as two additional special function outputs. Train lighting can be switched off if desired.

Using F3 and F4 a shunting mode for slow speeds and Start/braking inertia can be activated. The assignment of the switching operations such as lights, special function outputs, Shunting mode and switchable start/brake inertia can be freely assigned to F0 - F12 by the digital controller (Function mapping).

Installation of the Sound Decoder

Fastening the decoder in the Vehicle (not 33150)

Using the double sided adhesive pad provided. Affix the decoder to the desired location in the locomotive. The adhesive pad protects the decoder from contacting conducting surfaces and holds it in place.

Double check the correct installation with a continuity tester or an Ohmmeter. When placing the device make sure it does not come into contact with any conducting surfaces in the vehicle. Also ensure that a short circuit cannot occur when the locomotive is closed and that the wire is not cinched.

A short circuit with the Motor, lighting, third rail pickup and wheels can destroy the device and eventually the locomotive's Electronics!

Connecting the Decoder

Remove the bridging plug from the locomotive, if present, and plug the decoder's interface plug into the vacant socket (take care with coding).

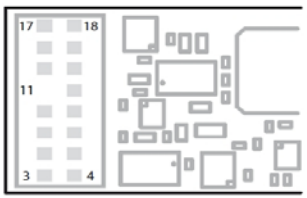
The description of the usable loudspeakers and all the Sound settings can be obtained from the manual for corresponding Sound module.

Connecting the Special Functions

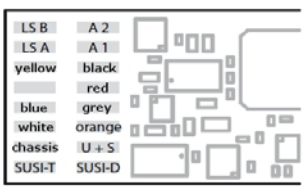
On the 33 150 the Special function outputs A 1 and A 2 are integrated into the 16-way PluX Interface. The remaining Sound decoders are connected by cable or solder pads.

Decoder pin assignment

Pin	PluX16-Interface socket
3	SUSI - Clock
4	SUSI - Data
5	Decoder Chassis (post rectifier)
6	U+ S (15V for Sound module)
7	Light front
8	Motor output 1
9	U+ (post rectifier)
10	Motor output 2
11	Missing = coding
12	2-Rail.: Track right
13	Light rear
14	2-Rail.: Track left
15	Loudspeaker connection A
16	Special function output A1
17	Loudspeaker connection B
18	Special function output A2



33 150 PluX 16



33 100 Cable
33 110 NEM 651
33 120 NEM 652

Connection a Backup Capacitor

A backup capacitor can be connected to the Sound decoder (e.g. 2200µF 25V). This is connected to contact 5 (-) and 6 (+, only for Sound) or 5 (-) and 9 (+, Motor and Sound).

Attention: When connecting a backup capacitor it is important to take care with the polarity!

Digital and analogue running

Enter address 3 on the controller. The Decoder runs according to the selected Data format, in Motorola operation or in DCC operation with 28 speed steps.

If the Decoder is used on a conventional layout, then it can run in DC. The operating mode is automatically identified by the decoder.

Function outputs on analogue mode

Prior programming with a digital center, can determine which function outputs, light to A2, is switched on in analogue mode. For this CV13 must be programmed according to the CV Table. For each output one of Bits 0 to 2 must be set.

If only the light (Bit 0 = 1) and function output A1 (Bit 1 = 1) are to be on, then Bits 0 and 1 are set. So a value of 3 is programmed into CV13.

Switch Train front and rear lights off

CV107 (front) and CV108 (rear) can be programmed with the number of the special function 1-12, which can switch the front and rear, white and red lights off. On which function output the red train end light is switched off can also be programmed here.

The function numbers entered here must be set up, using function mapping, so they do not switch other outputs on. It must also be ensured that the outputs used for the red lights can not be controlled by other function keys, due to function mapping, i.e. the function mapping of function keys set up here must be set to zero. So that the lights are switched off correctly, both CVs 107 and 108 must always be programmed accordingly. If one of CVs 107 or 108 is programmed with a value of 0, the function is deactivated.

The value for programming CVs 107 and 108 is determined by two factors. Firstly, on which of the outputs A1 o A2 the light is to be switched off, and secondly, with which function key f1 to f12 is the light to be switched. Since a CV can only be programmed with a single value, these factors are combined into the value according to the following schema:

Light Assinment: A0f = white light front, A0r = white light rear
CV107 for red light front
CV108 for red light rear
Calculation: Output * 16 + Function key

Example: The front red light is to be connected to A1 and switched with f5.
CV 107 = 1 * 16 + 5 = 21

The rear red light is to be connected to A2 and switched with f6.
CV 108 = 2 * 16 + 6 = 38

Märklin braking section

The decoder reacts to a Märklin brake section (brakes with analog power on the track), if CV29 bit 2 and CV49 bit 7 are set to 1 (factory setting 1 and 0).

Programming the Sound decoder

In factory default state, all decoder options are changed using configuration variables (CV's) according to the DCC standard. The decoders can be programmed by an Intellibox, DCC Centre and Motorola Centre.

Programming with the Intellibox

Irrespective of the format to be driven later, we recommend that the decoder be programmed via the programming menu for DCC decoders.

The Intellibox supports DCC programming with a simple input menu. Long addresses do not have to be laboriously calculated, they can be entered directly. The Intellibox automatically calculates the values for CV17 and CV18.

For the exact process please read the appropriate chapter in the Intellibox manual.

Special case locomotive addresses 80 to 255 in Motorola format

In Motorola format the Intellibox supports an address range of 255. Addresses 1 to 80 can also be programmed easily using DCC programming mode. If an address above 80 is to be programmed however, it must be done as described in the chapter "Programming with a Märklin Centre".

With this programming technique CV 1 will be set to 0 and the decoder will use the Motorola addresses higher than 80.

Programming with DCC devices

Use the programming menu in your DCC Centre to program the decoder CVs in either register, direct CV or page programming mode. It is also possible to program the decoder on the main line using a DCC Centre.

Refer to the manual for your control centre for full instructions on the process.

Programming of long Addresses without the Programming Menu

For programming with a centre which does not support programming with an input menu, the value for CV17 and CV18 must be calculated. Here is an example for programming the address 2000.

- Divide the addresses by 256 (2000:256 = 7 remainder 208).
- Take the result (7) and add it to 192.
- Program this value (199) into CV17.
- Program the remainder (208) into CV18.

***Important**: Set Bit 5 of CV 29 to 1, so the decoder uses the long address.*

Calculating the CV value

With CV29 and CV49 various characteristics of the decoder may be established.
The required values are easily calculated using the CV table and simple addition.

Example CV 29:

Normal travel direction Value = 0
28 Speed steps Value = 2
auto. Analogue/Digital switching Value = 4
Short address Value = 0
The total value is 6.
This value is the factory default for CV29.

Bit	Function CV29	Value
0	Normal travel direction Reverse travel direction	0 1
1	14/27 speed steps 28/128 speed steps	0 2
2	Only digital operation Auto digital/analog switching	0 4
5	Short address (CV1, Register 1) Long address (CV17 and CV18)	0 32

Programming with a Märklin Center

With a Märklin center all CV's can be programmed, but not read.

1. Switch Center off and on.
2. Select the address of the decoder until the light blinks.
3. Operate the direction change-over 5 times in quick succession with the stationary locomotive (speed step 0), until the light turns off.
4. Set the speed control to “Zero”. The rear light will slowly blink 4 times.
5. On the controller, enter the number of the CV to programmed, like a locomotive address.
6. Quickly switch the reversing switch. The rear light will quickly blink 4 times.
7. Enter the desired value for the CV, like a locomotive.
8. Quickly switch the reversing switch. The rear light will slowly blink 4 times.

If further CVs are to be programmed repeat points 5-8.
If programming is to be terminated, switch the center to "STOP" or set the address to "80" and briefly operate the direction change-over.
Note: *Since a Motorola digital center from Märklin only accepts inputs of 01 to 80, the value "0" must be entered by entering the address as "80".*

Page-Register for inputting CV-Numbers greater than 79

CV addresses larger than 79 can only be programmed with the help of the page register, CV66. If CV66 has a value higher than 0, then the contents of CV66 times 64 will be added to every address entered. The entered value must lie in the range 1 to 64. When leaving Motorola programming mode the page register (CV66) is automatically reset to zero.

Example:

If for example CV82 is to be programmed with a value of 15, then CV66 must first be programmed with a value of 1. Subsequently, CV18 can be programmed with a value of 15. The decoder places the value 15 into CV82, which is derived from multiplying the contents of CV66 (in the example 1) by 64 (thus 64) and then adding the entered CV address (18).

Offset-Register for entering CV values greater than 79

CV values larger 79 can be programmed only with the help of the offset register. The offset register is CV65. If CV65 contains a value > 0, then all following programmed values are calculated by multiplying the contents of CV65 by 4 and adding the result to the entered value. When leaving the Motorola programming mode the offset register (CV65) is automatically reset to zero.

Example:

If for example CV49 is to be programmed with a value of 157, then CV65 must first be programmed with the value of 25. Subsequently, CV49 can be programmed with a value of 57. The decoder places the value 4 * 25 + 57 into CV49.

Note: *When programming CV65/CV66, the contents of the offset and page registers have no effect.*

Table of the Decoder CVs (Configuration Variables)

CV	Description	Value Range	Default
1	**Locomotive address**	DCC 1-127 Mot. 1-80	3
2	**Minimum speed value**	1-63	1
3	**Start Inertia**	1-63	2
4	**Braking inertia**	1-63	2
5	**Maximum Speed** (must be larger than CV 2)	1-63	48
6	**Middle Speed** (must be larger than CV 2, smaller than CV 5)	1-63	24
7	**Software Version**	-	Various
8	**Manufacturer**	-	85
13	**Function outputs in Analogue operation** Bit 0 = State for light outputs, Bit 1 = A1, Bit 2 = A2	1-7	1
17 18	**Long Locomotive address** 17 = High Byte / 18 = Low Byte	1-9999 192-231 / 0-255	2000 199 / 208
19	**Consist Address** (Double traction) 0 = Consist Address is not active when Bit 7 = 1 the travel direction is reversed	1-127	0
29	**Configuration DCC Standard** Bit 0=0 Normal driving direction (Value 0*) Bit 0=1 Reversed driving direction (1) Bit 1=0 14 Speed steps (0) Bit 1=1 28 Speed steps (2*) Bit 2=0 only Digital operation (0) Bit 2=1 automatic Analogue/Digital detection (4*) Bit 3/4 not used (–) Bit 5=0 Short Address (CV 1) (0*) Bit 5=1 Long Address (CV 17/18) (32) Bit 6/7 not used (-)	0-255	6
33-46	**Assignment of Function Outputs, which are activated with light and special function keys.** CV 33 Light (function) forwards (1) CV 34 Light (function) reverse (2) CV 35 Special function key f1 (4) CV 36 Special function key f2 (8) CV 37 Special function key f3 (16) CV 38 Special function key f4 (32) CV 39 Special function key f5 (0) CV 40 Special function key f6 (0) CV 41 Special function key f7 (0) CV 42 Special function key f8 (0) CV 43 Special function key f9 (0) CV 44 Special function key f10 (0) CV 45 Special function key f11 (0) CV 46 Special function key f12 (0) **Assignment of individual Bits** Bit 0 Light output front (1) Bit 1 Light output rear (2) Bit 2 Special function output A1 (4) Bit 3 Special function output A2 (8) Bit 4 Shunting Mode (16) Bit 5 Start/Brake Inertia (32)	0-63	
49	**Locomotive decoder Configuration** Bit 0=0 Motor regulation On (Value 0*) Bit 0=1 Motor regulation Off (1) Bit 1=0 Light / A1 / A2 (PluX 16) DO NOT change! (0*) Bit 1=1 Light / A1 / A2 (NEM 651) DO NOT change! (2) Bit 3=0 Data format DCC and Motorola (0*) Bit 3=1 Data format only DCC (8) Bit 4=0 Data format DCC and Motorola (0*) Bit 4=1 Data format only Motorola (16) Bit 6=0 Do not swap Light outputs (0*) Bit 6=1 Swap Light outputs (64) Bit 7=0 Brake only with brake signal (0*) Bit 7=1 Brake with analogue voltage (128) ***Note:*** *When Motorola Format is disabled by Bit 3 and the DCC Format by Bit 4, the Decoder will no longer accept driving commands and can only be programmed.*	0-255	0*
50	**Dimming of Light outputs**	1-32	16
52	**Dimming of Function outputs A1 / A2**	1-32	32
53	**Repetition rate of load regulation**	0-63	40

54	**Motor Regulation: Configuration** Bit 2=0 Repetition rate of Motor regulation constant Bit 2=1 Repetition rate of Motor regulation changes with Speed step Bits 0, 1, 3-7 do not change	128, 132	132
58	**Time slot for AD transducer measurement**	0-63	8
59	**Reset to factory default** If this CV is set to 1 the decoder is reset to factory settings.	0, 1	0
60	**Short circuit monitor Motor outputs** 0 = switched off, 28 = switched on (Do Not change)	0, 28	28
65	**Offset register** for CV programming with a Motorola digital controller	0-255	0
66	**Page register** used in DCC page mode	0-255	0
100	**Error register** 0 = No error (reset error register) 1 = Motor short circuit 2 = Light short circuit	0-3	0
107	**Light output front of train switched off**	0-44	0
108	**Light output rear of train switched off**	0-44	0

*The factory default values are marked with *.*

Technical Data

Addresses:	1 - 9999 (long DCC Address)
Total load / Max. Motor current:	0.7 A* / 1.2 A
Function outputs:	each 0.4 A
Maximum duration of stored Sounds:	320 Seconds
Sound channels for Replay:	4
Dimensions:	25 x 11 x 4.8 mm

* Constant load can vary according to installation.

Ex-factory state

The decoder is preset to address 03 and can be run and programmed in DCC data format with 28 speed steps and in Motorola data format. It automatically switches between both formats.

The decoder can also be run with a DC controller on analogue DC layouts.

Guarantee declaration

Each component is tested for its complete functionality before distribution. If a fault should arise within the guarantee period of 2 years, we will repair the component free of charge upon production of proof of purchase. The warranty claim is void if the damage was caused by inappropriate treatment.

Please note that according to EMV law (where applicable) the component may only be operated within vehicles which carry the CE certification.