Uhlenbrock Elektronik

IntelliDrive Function Mini 73 800

for DCC and Motorola II

Switches auxiliary functions such as horn, whistle, light and smoke.

Characteristics 73 800

- Multi-protocol Function decoder for DCC and Motorola II
- Suitable for the new DCC Protocol for function decoders with up to 32000 special functions
- 4 Function outputs 0.4 A each, up to 0.6A in total
- All outputs can be configured individually:
  - Direction dependent outputs
  - Time limited outputs
  - Blinking outputs
- The outputs can be dimmed in pairs by PWM
- Programming with a DCC or Motorola digital center
- Programmable in register or page mode in DCC

Description

The function decoder 73 900 is a small efficient Multi-protocol decoder. It can be used with DCC and Motorola-II Digital systems. The decoder cannot be used as a function decoder with the old Motorola data format.

The function decoder has 4 outputs with a load capacity of up to 0.6A each. For smaller loads with voltage lower than 20V the output can be reduced when using the outputs in pairs (A1 and A2 as well as A3 and A4).

The outputs can be configured individually. Each output can be activated for only one travel direction. It can be programmed to switch on after a set time or switch on and off by a blink generator.

In analogue operation you can determine which outputs are to be switched on. Direction dependent outputs are toggled by the DC power on the track.

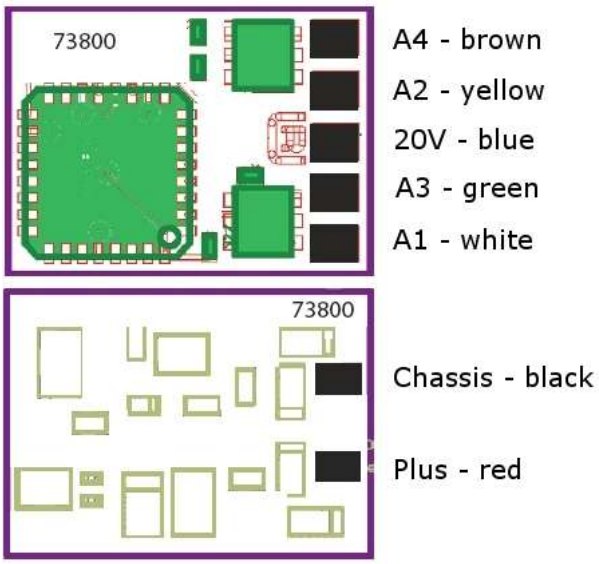
In the factory default state, the decoder automatically recognizes the DCC and Motorola data formats as well as analogue operation. The operation type can also be set up manually.

Installation of the Function decoder 73 800

Connecting the wires

When the decoder is installed in a vehicle, the black wire is connected to the left wheel pickup (2-rail) or to the vehicle chassis (3-rail). The red wire is connected to the right wheel pickup (2-rail) or to the vehicle's third rail pickup (3-rail).

The loads are soldered directly to the circuit board of the decoder. As you can see in the diagram one side of each load is connected to a function output and the other side to either the black wire (vehicle chassis) or the solder pad for 20V return.



Fastening the decoder in the Vehicle

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

Start-up

Double check the correct installation with a continuity tester or an Ohmmeter.

When placing the device make sure it does not come in contact with any conducting surfaces in the vehicle. Also ensure that a short circuit cannot occur when the locomotive is closed, 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!

Digital operation

Allocation of the special functions to the switching outputs via CV35 to 42

In each case 2 CVs serve to allocate a function to an output. All functions from 0 (light) to 32767 can be used (Motorola: 0-4, DCC: 0-32767). CVs 35, 37, 39 and 41 contain the high order byte and the CVs 36, 38, 40 and 42 the low order byte of the function code.

Calculation: Function number = high order byte x 256 + low order byte

If an output is to be switched by Functions 0-28, the high order byte must have the value of 128.

Example 1: Special function f12 is to switch output A1.

CV35 = 128 (factory setting)

CV36 = 12

For higher Functions the high order byte receives the appropriate CV.

Example 2: Special function 2000 is to switch output A1.

- Divide the address value by 256 (2000/256 = 7 remainder 208).
- Enter the result (7) into CV35.
- Enter the remainder value (208) into CV36.

For Experts: *The decoder controls all functions which are defined in the newest version of the NMRA DCC standard. Only the CVs 35 to 42 deviate from the NMRA DCC standard.*

There are the functions 0-28, as well as two further possible switching functions, for transfer to a vehicle decoder which is marked with Binary State control (BSC). If CVs 35, 37, 39 or 41 (High byte) are given a value of 128 then the matching outputs of the decoder are controlled by the DCC special function commands (0-28). If CVs 35, 37, 39 or 41 have a value smaller than 128 the matching output of the decoder is controlled via BSC and function numbers 29-32767 can be used.

Direction dependent Outputs

In CVs 52 and 53 you can specify if the state of an output is to depend on the travel direction or not. If the Bit for the respective output is set to "1" the output matching this CV direction sensing is turned off. CV52 is for the forward direction and CV53 is for the reverse direction,

Delayed Outputs

In CV54 you can specify if an output activation is to be delayed or not. If the Bit for the respective output is set to "1" the output will be switch with a delay. The delay can be specified in CV55 in 0.5sec intervals. This delay is common to all outputs activated in CV54.

Blinking Outputs

In CV56 you can specify if an output that is switched on is to operate on a blinking cycle or not e.g. for a blinking light. If the Bit for the respective output is set to "1" then it will blink. CV57 contains the time constants of the blinking cycle. A value of 1 means the output will blink 10 times per second. A value of 10 means the output will blink on and off once per second. The time constants apply to all outputs that are set to blinking in CV56.

Analogue operation

For analog operation CV13 determines which outputs are switched on. Outputs that are programmed to be direction dependent in CV52 and CV53 will be switched independently of the direction in DC analogue operation.

Programming

***Note**:* So that the decoder can be read on a DCC programming track a load must be connected to output A1.

Configuration variables (CVs) form the basis of all programmable settings of the decoder in accordance with the DCC standard. The decoder can be programmed with the Intellibox, DCC centres and Motorola centres.

Programming with an 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 decoder addresses 80 to 255 in the Motorola data format

The Intellibox supports an address range up to 255 in the Motorola data format. Addresses 1 to 80 can also be programmed (problem free) using DCC Programming. If, however, an address above 80 is to be used it must always be programmed as outlined in the chapter “Programming with a Märklin Centre”.

After this programming is complete, the CV1 will contain a value of 0 and the decoder will respond to a Motorola address above 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 of 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

If several different settings on the decoder are to be changed in a particular CV, the value which is to be entered is calculated using the CV table, and the values of the desired functions are simply added.

Example: Outputs A1 and A4 are to blink.

OutputA1 blinks	Value = 1
OutputA2 does not blink	Value = 0
OutputA3 does not blink	Value = 0
OutputA4 blinks	Value = 8

The total value is 9.

This value is programmed into CV56.

Bit	Function CV56	Value
0	A1 doesn’t blink, A1 blinks	0 1
1	A2 doesn’t blink, A2 blinks	0 2
2	A3 doesn’t blink, A3 blinks	0 4
3	A4 doesn’t blink, A4 blinks	0 8

Programming with a Märklin Centre

All CVs can be programmed with a Märklin Centre but they cannot be read.

1. Turn the centre on and off
2. Select the decoder's address and turn the light on.
3. With stationary locomotive (speed step 0) switch the direction 5 times in a row until the light turns on.
4. Enter the number of the CV to be programmed (as for the locomotive address).
5. Quickly switch the direction. This time the rear light will blink quickly 4 times.
6. Enter the desired value for the CV (like the locomotive address).
7. Quickly switch the direction. The rear lamp will blink 4 times slowly.

If more CVs are to be programmed, repeat points 5-8.

When programming is complete set the Centre to "STOP" or enter address "80" and quickly switch direction. As a Motorola digital centre can only program values from 01 to 80, a value of "0" must be given as address "80".

Page Register for entering a CV number greater than 79

CV addresses above 79 can only be programmed with the help of the page register. The page register is CV66. If CV66 is set to a value greater than 0 then the following programming values have 64 added to them. The entered value must be between 1 and 64.

When leaving Motorola programming mode, the page register (CV66) is automatically reset to Zero.

Example

If CV82 is to be programmed with the value 15, CV66 must first be set to a value of 1. Subsequently CV18 can be programmed with the value 15. A value of 15 will now be programmed to decoder's CV 82 (which is obtained from the addition of the contents of CV66 (in Example 1) multiplied by 64 and adding the entered CV address (18).

Offset Register for entering CV values above 79

CV values greater than 79 can only be programmed with the help of an offset register. CV65 is the offset register. If CV65 is set to a value > 0 the following programmed values are multiplied by 4 and added to the value entered for the CV.

When leaving Motorola programming mode, the offset register (CV65) is automatically reset to Zero.

Example

If CV49 is to be programmed with a value 157, CV65 must first be programmed with a value of 25. Subsequently CV49 can be programmed with a value of 57. The decoder will now be programmed to value 4 * 25 + 57.

Note: When programming CV65 and CV66 the contents of the offset and page registers are ignored.

Factory settings

The decoder is preset to address 03, in 28 speed step operating mode and can be run and programmed in DCC and Motorola data formats. It switches between both data formats automatically. Additionally the decoder can be operated with a DC controller on a conventional layout.

Table of individual CV's (Configuration Variables)

CV	Description		Value range	Factory default
1	**Decoder address**		DCC 1-127 Mot 1-80	3
7	**Software version** (The processor used can be updated)		-	varies
8	**Manufacturer ID**		-	85
13	**Output state in analogue mode** Bit 0=0 A1 off Bit 0=1 A1 on Bit 1=0 A2 off Bit 1=1 A2 on Bit 2=0 A3 off Bit 2=1 A3 on Bit 3=0 A4 off Bit 3=1 A4 on	Value 0 1 * 0 2 * 0 * 4 0 * 8	0-15	3
17 18	**Long Decoder 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		1-127	0
29	**Configuration DCC Standard** Bit 1=0 14 speed steps Bit 1=1 28 speed steps Bit 2=0 only digital operation Bit 2=1 automatic analogue/digital switching Bit 5=0 Short Address (CV 1) Bit 5=1 Long Address (CV 17/18)	Value 0 2 * 0 4 * 0 * 32	0 - 38	6
35 36	**Output mapping A1** High byte Low byte		0-128 0-255	128 0
37 38	**Output mapping A2** High byte Low byte		0-128 0-255	128 0
39 40	**Output mapping A3** High byte Low byte		0-128 0-255	128 1
41 42	**Output mapping A4** High byte Low byte		0-128 0-255	128 2
49	**Decoder Configuration** Bit 3=0 Data format DCC and Motorola Bit 3=1 Data format only DCC Bit 4=0 Data format DCC and Motorola Bit 4=1 Data format only Motorola Bit 6=0 Don't swap light outputs Bit 6=1 Swap light outputs ***Note**: When Motorola data format is turned off via Bit 3 and the DCC data format is switched off via Bit 4 the decoder will not accept any switch commands but can still be programmed.*	Value 0 * 8 0 * 16 0 * 64	0, 8, 16, 24, 64, 74, 80, 88	0
50	**Dimming of Outputs A1 and A2**		0-63	32
51	**Dimming of Outputs A3 and A4**		0-63	32
52	**Outputs for forwards direction** Bit 0=0 A1 forwards on Bit 0=1 A1 forwards off Bit 1=0 A2 forwards on Bit 1=1 A2 forwards off Bit 2=0 A3 forwards on Bit 2=1 A3 forwards off Bit 3=0 A4 forwards on Bit 3=1 A4 forwards off	Value 0 * 1 0 2 * 0 * 4 0 * 8	0-15	2

53	**Outputs for reverse direction**	Value	0-15	1
	Bit 0=0 A1 reverse on	0		
	Bit 0=1 A1 reverse off	1 *		
	Bit 1=0 A2 reverse on	0 *		
	Bit 1=1 A2 reverse off	2		
	Bit 2=0 A3 reverse on	0 *		
	Bit 2=1 A3 reverse off	4		
	Bit 3=0 A4 reverse on	0 *		
	Bit 3=1 A4 reverse off	8		
54	**Outputs time restricted**	Value	0-15	0
	Bit 0=0 A1 no time restriction	0 *		
	Bit 0=1 A1 time restricted	1		
	Bit 0=0 A2 no time restriction	0 *		
	Bit 0=1 A2 time restricted	2		
	Bit 0=0 A3 no time restriction	0 *		
	Bit 0=1 A3 time restricted	4		
	Bit 0=0 A4 no time restriction	0 *		
	Bit 0=1 A4 time restricted	8		
55	**On time** in 0.5sec steps (2 = 1 second)		0-255	2
56	**Outputs blink**	Value	0-15	0
	Bit 0=0 A1 no blinking	0 *		
	Bit 0=1 A1 blinks	1		
	Bit 0=0 A2 no blinking	0 *		
	Bit 0=1 A2 blinks	2		
	Bit 0=0 A3 no blinking	0 *		
	Bit 0=1 A3 blinks	4		
	Bit 0=0 A4 no blinking	0 *		
	Bit 0=1 A4 blinks	8		
57	**Time Constant for Blink Generator** 1 = 10 times per second, 10 = 1 time per second		0-255	10
59	**Reset to Factory Settings** If this CV is set to 1 the decoder is reset to its factory defaults		0, 1	0
65	**Offset Register** For programming CV with a Motorola center		0-255	0
66	**Page Register** For programming CV with a Motorola center		0-255	0

*Factory default values are indicated with an *.*

Technical Data

Addresses: 1-9999 (long DCC Address)
Maximum Total Load: 0.6 A
Function Outputs: each 0.4 A
Dimensions: 11 x 8 x 2.4 mm

Guarantee declaration

Each component is tested for its complete functionality before distribution. If a fault should arise within the guarantee period area 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, the component may only be installed in vehicles which carry the CE logo.

Uhlenbrock digital

Our Contact Details:

We are available if you have any questions!

Internet: FAQs can be found at www.uhlenbrock.de

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Premium Hotline: +49 (0)900 1858327 When it is urgent …. Mon – Fri 10:00 to 16:00

Service: In the event of a defect or failure send the unit together with the invoice and a short description of the fault back to us for repair.

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Electronic devices do not belong in household rubbish

Part No. 73 800