Uhlenbrock Elektronik

IntelliDrive Comfort Mini *73 410*

**Multi-protocol decoder with load regulation
for DC and Faulhaber motors**

Features

- Regulated Multi-protocol decoder for DCC, Motorola
- Suitable for DC and Bell armature motors up to 0.5A
- Quiet motor running with 18.75KHz control frequency
- 14, 27, 28, 31 and 128 speed steps depending on the data format
- Short (1-127) and long (128-9999) addresses
- NMRA compatible
- Minimum, maximum and middle speeds adjustable
- Speed step table for 14, 28 and 31 speed steps
- Main line programming (DCC)
- Shunting speed (half speed) switched with F3
- Direction dependent, dimmable lighting switched via F0
- With solder pads for connecting Uhlenbrock IntelliSound modules or LISSY Mini transmitter
- Reacts to DCC brake signal (e.g. from Power 3) "Brake diode" or braking section in DC operation.
- All outputs have short circuit protection
- Conventional DC operation with automatic switching between DC and digital mode
- All CVs programmable by digital devices with DCC and Motorola formats
- Programmable via register, direct CV or page mode in DCC operation
- Updatable using Flash memory
- 6 pole NEM 651 connector

Description

Locomotive decoder 73 410 is a small efficient multi-protocol decoder. It can be operated in DCC, and Motorola digital systems and also runs in DC analog 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 control via regulation parameters to a variety of individual motors.

The decoder provides two direction dependent lighting outputs.

Using F3 and F4 a shunting mode for slow speeds and Start/braking inertia can be activated.

The decoder can be programmed with the Intellibox, DCC and Märklin controllers. CVs can be programmed with all devices.
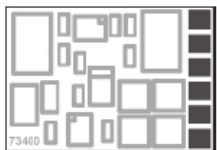
Installing a 73 410 locomotive decoder

Connecting the motor

Remove the bridging plug from the locomotive and push the plug from the decoder into the vacant socket.

If locomotive does not react then re-insert the decoder after turning it over 180℃

Pin out for NEM 651 connector

1 Motor connection 1
2 Motor connection 2
3 Track pickup right
4 Track pickup left/chassis
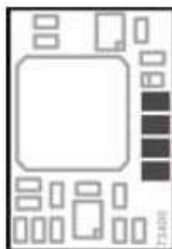5 Light front
6 Light rear

Connecting an Uhlenbrock IntelliSound module

The mini-decoder can have <u>either</u> an IntelliSound module or a LISSY mini transmitter connected to it. Connection is made via the solder pads on the circuit board.

Remove the 4 pole connector from the sound module and solder the 4 wires to the decoder as shown in the diagram.

To operate the sound module you must also change CV 49. Set Bit 1 to 1 and Bit 2 to 0.

Connecting a LISSY mini transmitter

The mini-decoder can have <u>either</u> an IntelliSound module or a LISSY mini transmitter connected to it. Connection is made via the solder pads on the circuit board.

Remove the 4 pole connector from the LISSY mini transmitter and solder the 4 wires to the decoder as shown in the diagram.

4 Black
3 Grey
2 Blue
1 Red

To operate the LISSY mini transmitter you must also change CV 49 and set Bit 1 to 0 and Bit 2 to 1.

Start-up

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 shot circuit cannot occur when the locomotive is close 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!

Starting up the decoder

Select address 3 on the controller. The decoder will operate in the data format in which it is addressed, in Motorola or DCC mode with 28 speed steps.

If the decoder is used on a conventional analog layout it can be controlled with either DC power. All the operating modes are automatically recognized by the decoder.

Programming

In factory default state all decoder options are changed using configuration variables (CVs) 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 255. Addresses 1 to 80 can also be programmed easily using DCC programming mode. If an address above 80 is to be programmed, it must, however, be done as described in the chapter "Programming with a Märklin Centre".

After this programming technique CV 1 will be set to 0 and the decoder will use the Motorola address 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 simply addition.

Example:

Normal travel direction	Value = 0
28 speed steps	Value = 2
Auto digital/analog switching	Value = 4
Speed steps via CV 2, 5, 6	Value = 0
Short address	Value = 0

The total value is 6.

This value is 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
4	Speed steps in CV2, CV5 and CV6 Characteristics read from CV67-94	0 16
5	Short address (CV1, Register 1) Long address (CV17 and CV18)	0 32

Programming with a Märklin Center

With a Märklin center all CVs can be programmed, but not read.

1. Switch Center off and on.
2. Select the address of the decoder and 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. Enter the number of the CV that is to be programmed.
5. Briefly operate the direction change-over. The rear light flashes fast 4 times.
6. Enter the desired value for CV e.g. a locomotive address.
7. Briefly operate the direction change-over. The rear light flashes slowly 4 times.

If further CVs are to be programmed repeat points 4-7.

If programming is to be terminated switch the center to "STOP" or set the address to "80" and briefly operate the direction change-over.

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 the Motorola programming mode, the page register (CV66) is automatically reset to zero.

Example

If 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

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 and CV66 the contents of the offset and page registers have no effect.

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).

Technical Data

Addresses:	1-9999 (long DCC address)
Max. current consumption:	0.5 A, Short Term 1A
Function outputs:	0.2 A each
Size:	10.8 x 7.5 x 2.4 mm

The decoder is preset to address 03, and 28 speed step mode and can be used and programmed in DCC and Motorola data format.

Factory defaults

The factory setting places the decoder in DCC/Motorola operating mode. It automatically switches between both formats. Additionally, the decoder can operate on conventional analog layouts with a DC controller.

Table of individual CVs (Configuarion Variables)

CV	Description	Value range	Factory default
1	**Locomotive address**	DCC 1-127 Mot 1-80	3
2	**Minimum speed value**	1-63	1
3	**Start Inertia** 1 means every 5ms the speed will be increased by 1 Sets the internal maximum speed e.g. 200 (CV5=50 or CV94=200) then starts the locomotive from 0 to Fmax in 1sec	1-63	2
4	**Braking inertia** (time factor like CV3)	1-63	2
5	**Maximum speed** (must be lager than CV2)	1-63	48
6	**Middle speed** (must be higher than CV2 and lower than CV5)	1-63	24
7	**Software version** (The processor used can be updated)	-	varies
8	**Manufacturer ID**		85
17 18	**Long address** 17 = Long address high byte /18 = Long address low byte	1-9999 192-231/0-255	2000 199/208
19	**Consist address** (Multi-traction) 0 = Consist address is inactive When Bit 7=1 the driving direction is reversed So the desired CADR + 128 = driving direction reversed	1-127	0
29	**Configuration DCC Standard** Value Bit 0=0 Normal driving direction 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 auto digital/analog detection 4 * Bit 3 not used - Bit 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
49	**Decoder Configuration** Value Bit 0=0 Load regulation on 0 * Bit 0=1 Load regulation off 1 Bit 1=0 sound module not connected 0 * Bit 1=1 configured for sound module connection 2 Bit 2=0 LISSY mini transmitter not connected 0 * Bit 2=1 configured for LISSY mini transmitter 4 Bit 3=0 Data format Motorola and DCC 0 Bit 3=1 Data format only DCC 8 " Bit 4=0 Data format Motorola and DCC 0 * Bit 4=1 Data format only Motorola 16 Bit 6=0 Don't 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 analog voltage 128 *Note*: When Motorola format is disabled by Bit 3 and DCC data format is disabled by Bit 5 the decoder will no longer accept diving commands and can only be programmed.	0-255	0
50	**Dimming** of the function outputs	0-32	16
53	**Repetition rate of load regulation** Lower if the locomotive does not run smoothly	0-255	40
54	**Decoder configuration** 128 = Repetition rate using the load regulation constant 132 = Repetition rate dependant on the speed step. Slower with high speed steps	128,132	132
58	**Time slot for AD transducer measurement** Increase if the locomotive does not run smoothly at low speeds Decrease if the top speed is too low after CV53 has been lowered	0-255	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, 15 = switched on (Do Not Change)	0,28	28
62	**Short circuit monitor Light outputs** 0 = switched off, 15 = switched on (Do Not Change)	0,18	18

CV	Description	Value range	Factory default
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	0-2	0

The factory default values are marked with *.

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 regulation the component may only be installed in vehicles which carry the CE logo.

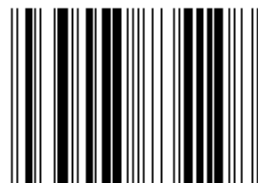*The trade names mentioned are registered trade marks of the respective companies.*

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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.