[B] Uhlenbrock Elektronik

Multiprotocol-decoder 76 500

DIGITAL 2

Digital Operation on Layouts using either DCC- or Motorola-Format for Locos with DC-Motors.

Properties 76 500

- Compensating multiprotocol-decoder for DCC or Motorola data format
- Suited for permanent-magnet and can motors of up to 1 amp current consumption
- Quiet running due to 18,75 KHz chopper
- 14, 27, 28, 128 speed steps, dependent of data format used
- Short (1-127) und extended (128-9999) addressing modes
- NMRA compatible
- Settable minimal, intermediate, and maximal speeds
- Customizing speed table for 14 and 28 speed steps
- Programming on the main (DCC only)
- Switching speed (half maximum) activated by F3 function
- Acceleration/Deceleration activated by F4 function
- Direction-dependent, dimmable headlights activated by F0 function
- 2 dimmable ancillary outputs activated by F1 and F2 functions
- Braking invoked by DCC braking signal (e.g. Power 3) or sections fed by DC
- Protected against overheating
- All outputs are short-circuit protected
- Conventional DC or AC operation with automatic changeover to digital or analog mode possible
- All CVs may be programmed by DCC- or Motorola-compatible control units
- All DCC programming modes (register, CV, or direct) accessible
- Flash-memory controller can be updated any time

Description

The 76 500 is a powerful, small-outline, multi-protocol-decoder. It can be used in DCC- or Motorola-systems as well as in analog DC-mode or AC-operation using the overvoltage pulse for reversal (Märklin-System).

The decoder employs a chopper frequency of 18,75 KHz and is therefore not only suited for all standard DC-motors, but also for instrument motors such as Faulhaber, Maxon or Escap, drawing up to 1 amp continuous current. Surges of short duration are also tolerated.

The speed characteristics are either set by the minimal, intermediate, and maximal speed CVs or by the individual speed step CVs.

The load compensation parameters can be trimmed to match the individual loco's properties.

The decoder features two direction-dependent headlight outputs, and two additional ancillary outputs controlled by F1 und F2.

The function keys F3 und F4 may activate switching mode with an extended slow-speed range, and acceleration/deceleration. All tasks of output switching and calling up of functions may be freely assigned to any function key (Function Mapping).

The decoder can be programmed by Intellibox, or any DCC or Märklin/Motorola control unit. All CVs can be accessed.

By default, the decoder recognizes DC, AC, or digital operation and adjusts itself automatically. The operation mode can be manually selected, too.

Fitting of the loco-decoder 76 520

Connection of the unit

Remove the shorting plug from the loco socket and insert the decoder plug into the loco socket.

Should the headlights be lit in the wrong direction, the plug must be turned by 180°.

Important: If both the driving direction as well as the lights are "wrong" - meaning that they agree with each other but they do not agree with what is shown to be "forward" on the command station - then one can simply change the value of Bit #0 of CV #29.

Wire assignment of the NEM 652 plug

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1 ●  ● 8
2 ●  ● 7
3 ●  ● 6
4 ●  ● 5
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1 Motor (orange)
2 Rear headlight - (yellow)
3 N.c. (green)
4 Left rail (black)
5 Motor (gray)
6 Front headlight (white)
7 Com. headlight power source + (blue)
8 Right rail (red)

Connection of Ancillary Outputs

Other effects, e. g. a smoke generator, may be connected instead of the lamps.

Direction-independent operation is achieved by paralleling the light outputs.

Hint: When the loco's direction does not match the control unit's indication, it can be reversed by setting bit 0 of CV 29.

Additional features like smoke generator, remote uncoupling, or a cab lighting have to be connected to outputs A1 and A2. The input must be soldered directly to the corresponding pad on the decoder. The return is either via the blue cable or directly to ground.

Fixing the unit in the model

Use the supplied adhesive pad for fixing where there is room for the unit. The pad keeps the unit insulated and fixed in its position.

Safety first

Check for proper wiring after installation using a wiring checker or an ohmmeter. Make sure that the shell will not touch the unit and that no wires can be "caught" (pulled, cut) when loco shell is placed back again on the loco frame.

> **A short circuit from motor brushes or ancillary outputs
> to pickup shoes, frame, or wheels may destroy the device!**

Digital and Analog Operation

Digital operation is possible for both DCC- and Motorola-formats. DCC operation is preset for 28 speed steps.

On conventional layouts the decoder can be run with DC or AC (Märklin). All operating modes are automatically recognized.

Programming

The base of all possible settings are the CVs as defined in the DCC standard. The decoder can be programmed by Intellibox, DCC central-units, or Motorola central-units.

Programming by Intellibox

We recommend to select the DCC-programming menue regardless of the digital format that is used for controlling the loco.

Intellibox supports programming with a comfortable menue. Extended addresses need not be calculated for CV 17 and 18. Let Intellibox do it automatically.

For the exact procedure refer to the appropriate chapter in the Intellibox Manual.

Programming by DCC Central Unit

Employ the programming menue of your unit to program the CVs in the mode it specifies. It is also possible to program on the main.

Use the exact procedure as specified in the operating manual.

Programming of extended addresses without menue

Should your central unit not support extended address programming, you have to calculate the values of CV17 and 18 yourself. Here is an example of how to calculate these values for address 2000.

- Divide the address by 256 (2000:256 = 7 remainder 208).
- Add 192 to the quotient (7).
- Insert the result (199) in CV 17.
- Insert the remainder (208) in CV 18.
- *Important*: Bit 5 of CV 29 must be set to 1 in order to activate extended address operation.

Calculating the configuration variables' values

CVs 29 and 49 are used to configure your decoder. The value is the sum of the desired functionalities per CV-table.

Example

Normal direction	Value = 0
28 speed steps	Value = 2
autom. analog-/digital recognition	Value = 4
Speed table by CV 2, 5, 6	Value = 0
Short address	Value = 0

The sum is 6.

This value is the factory setting of CV 29.

Bit	Configuration CV 29	Wert
0	Normal direction Inverted direction	0 1
1	14 / 27 speed steps 28 / 128 speed steps	0 2
2	Digital mode only autom. analog-/digital recognition	0 4
4	Speed table by CV 2, CV 5, and CV 6 Speed table by CV 67-94	0 16
5	Short address (CV 1, Register1) Extended address (CV 17 and 18)	0 32

Programming by a Märklin Central Unit

A Märklin central unit can only program, but not read, any CV.

1. Switch off and back on.
2. Select decoder's address and press F0 to have the headlights come on.
3. Move control knob to reversing position (approx. 10 secs) until headlights go off.
4. Set speed to zero. Rear lights will slowly flash four times.
5. Key in the CV number like a loco address.
6. Again, shortly move control knob to reversing position. The rear lamps will quickly flash four times.
7. Key in the CV value like a loco address.
8. Again, shortly move control knob to reversing position. Rear lights will slowly flash four times.

Repeat steps 5 - 8 for any other CV you want to program.

Finish the programming procedure by switching the central unit to „STOP" or key in address „80" and shortly move control knob to reversing position.

Because a Märklin central unit accepts only inputs between „01" and „81", a value of zero must be keyed in as „80".

Using the page-register to access CV addresses greater than 79

CV-addresses greater than 79 can only be accessed by the page-register. This is CV 64. It holds the address offset that will be added to any address keyed in when programming CVs.

Example

Consider CV 82 to be programmed for a value of 15. First CV 64 must be set to a value of 60. Now CV 22 can be set to a value of 15. The decoder will be programmed at CV 82, as the offset held in CV 64 will be automatically added to the CV address selected. After programming, reset the contents of CV 64 to zero in order to avoid unwanted offsets.

Using the offset-register to set CV values greater than 79

CV-values greater than 79 can only programmed by employing the offset-register. This is CV 63. It holds a value offset that will be multiplied by 4 and added to all CV values keyed in.

Example

Consider CV 49 to be programmed for a value of 157. First CV 63 must be set to a value of 25. Now CV 49 must be set to value of 57. The decoder will hold 157 in CV 49, because the offset of CV 63 will be multiplied by 4 (=100) and added to 57. After programming, reset the contents of CV 63 to zero in order to avoid unwanted offsets.

Observe: When programming CV 63 and CV 64 the mutual contents are ignored.

Technical Data

Adress range:	1-9999 (extended DCC address)
Max. motor current:	1 A
Ancillary outputs:	1 A each
Total load:	1 A
Size:	22 x 12,5 x 5 mm

The factory settings are address 03, 28 speed steps, and the decoder automatically recognizes DCC- and Motorola-formats.

Factory Default Settings

As delivered the decoder automatically recognizes DCC/Motorola. Moreover the decoder can be operated on conventional 2-rail DC or 3-rail AC (Märklin) layouts.

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Warranty Statement

Every item is fully tested for functioning before shipment. If a defect occurs within two years after purchase, the item will be repaired free of charge against presentation of purchase proof.

Damages caused by overload or improper treatment are not covered by this warranty.

For EU only: Please note that decoders may only used in models carrying the EC conformance label.

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Table of the CVs (Configuarion Variables)
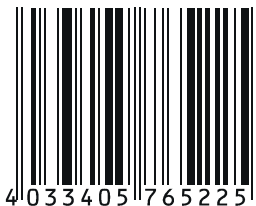
CV	Description	Range	Default
1	Address	DCC 1-127 Mot 1-80	3
2	Minimal speed	1-63	1
3	Acceleration The value per increment is 5 ms for a speed change of 1 For an internal speed setting of 200 (CV 5=50 or CV 94=200) the acceleration will be 1 second	1-63	2
4	Deceleration (same factor as CV 3)	1-63	2
5	Maximal speed (must be greater than CV 2)	1-63	48
6	Intermediate speed (must be greater than CV 2 and lesser than CV 5)	1-63	24
7	Version number (The used controller can be updated.)	-	3
8	Manufacturer ID	-	85
17 18	Extended address 17 = high byte / 18 = low byte	1-9999 192-231 / 0-255	2000 199 / 208
19	Consist Address (doubleheading) 0 = no consisting if bit 7=1 direction inversion will occur, desired CADR + 128 = direction inversion	1-127	0
29	Configuration per DCC-specification Value Bit 0=0 Normal direction 0 * Bit 0=1 Inverted direction 1 Bit 1=0 14 Speed steps 0 Bit 1=1 28 Speed steps 2 * Bit 2=0 Digital operation only 0 Bit 2=1 automatic analog-/digital recognition 4 * Bit 3 n/a - Bit 4=0 Speed table by CV 2, CV 5, und CV 6 0 * Bit 4=1 Speed table by CV 67 .. CV 94 16 Bit 5=0 Short address (CV 1) 0 * Bit 5=1 extended address(CV 17/18) 32 Bit 6/7 n/a	0-255	6
33	Mapping table for F0 when going forward. Bit 0 front light 1 * Bit 1 rear light 2 Bit 2 Ancillary output A1 4 Bit 3 Ancillary output A2 8 Bit 4 Switching (half) speed range 16 Bit 5 Acceleration/Deceleration active 32	0-63	1
34	Mapping table for F0 when going backwards. See CV 33.	0-63	2
35	Mapping table for F1. See CV 33	0-63	4
36	Mapping table for F2. See CV 33	0-63	8
37	Mapping table for F3. See CV 33	0-63	16
38	Mapping table for F4. See CV 33	0-63	32
39	Mapping table for F5. See CV 33	0-63	0
40	Mapping table for F6. See CV 33	0-63	0
49	Decoder configuration Value Bit 0=0 compensation on 0 * Bit 0=1 compensation off 1 Bit 1 n/a - Bit 2=0 decelerate to 0 in braking section 0 * Bit 2=1 decelerate to speed set in CV 52 4 Bit 3=0 data format DCC and Motorola 0 * Bit 3=1 data format DCC only 8 Bit 4=0 data format DCC and Motorola 0 * Bit 4=1 data format Motorola only 16 Bit 5=0 no dimming for A1 and A2 0 Bit 5=1 dimming on for A1 and A2 32 * Bit 6=0 lamp connection straight 0 * Bit 6=1 lamp connection swapped 64 Bit 7=0 braking invoked by signal 0 * Bit 7=1 braking invoked by analog voltage 128 *Attention: When both digital formats are inactivated, the decoder will not respond to any signal and can only be programmed*	0-255	32

CV	Description	Range	Default
50	Dimming of outputs A1, A2 and headlight	0-63	32
51	Analog operation 1 = AC only 2 = DC only 3 = AC/DC with automatic recognition	1-3	3
52	Speed at end of deceleration Valid if CV 49 Bit 2=1 and Bit 7=1	0-255	30
53	Sampling rate for compensation (CV 49, Bit 0=1) Rate = value * 53 us Should the loco run erratically, it can be adjusted to values between 60 and 255.	0-255	200
54	Compensation parameter: voltage increment	0-255	2
55	Compensation parameter: voltage decrement	0-255	1
56	ADC factor - do NOT change	0-255	0
57	N/a	-	-
58	Time slot for ADC sampling	0-255	25
59	Reset to factory default if set to 1	0, 1	0
60	Overload monitor (do NOT change) 0 = off, 250 = active	0, 250	250
61	Overtemperature threshold in °C (90°C) 0 = inactive	0-255	Decoder dependent
62	N/a	-	-
63	Offset-Register for CV-progr. using a Motorola central unit	0-255	0
64	Page Register for CV-progr. using a Motorola central unit	0-255	0
67	Speed setting for step 1	0-255	5
68	Speed setting for step 2	0-255	7
69	Speed setting for step 3	0-255	10
70	Speed setting for step 4	0-255	12
71	Speed setting for step 5	0-255	15
72	Speed setting for step 6	0-255	32
73	Speed setting for step 7	0-255	20
74	Speed setting for step 8	0-255	22
75	Speed setting for step 9	0-255	25
76	Speed setting for step 10	0-255	27
77	Speed setting for step 11	0-255	30
78	Speed setting for step 12	0-255	32
79	Speed setting for step 13	0-255	35
80	Speed setting for step 14	0-255	37
81	Speed setting for step 15	0-255	42
82	Speed setting for step 16	0-255	50
83	Speed setting for step 17	0-255	55
84	Speed setting for step 18	0-255	60
85	Speed setting for step 19	0-255	65
86	Speed setting for step 20	0-255	70
87	Speed setting for step 21	0-255	75
88	Speed setting for step 22	0-255	80
89	Speed setting for step 23	0-255	85
90	Speed setting for step 24	0-255	90
91	Speed setting for step 25	0-255	95
92	Speed setting for step 26	0-255	100
93	Speed setting for step 27	0-255	105
94	Speed setting for step 28	0-255	110

*Die ab Werk eingestellten Werte sind mit einem * versehen .*