

Operating instructions for the HelvestTMFlex DCC100-E module

1. GENERAL PRESENTATION OF THE PRODUCT

1.1 Warnings

The boards are not toys and are not suitable for children under 14 years of age. They contain small pieces that can be swallowed.

Do not leave the product unattended in a position accessible to children.

Read the instructions for use carefully before using the boards.

Take care to make the electrical connections as described. Incorrect connections can cause damage to the circuit boards or be dangerous to the user.

Under no circumstances must the products be powered in any mode different from those specified in the instructions, and in particular never exceed a voltage of 16V. Power supply with inadequate voltages can lead to serious risks for the user and fire hazard.

The product has functional edges and sharp parts.

Do not leave the product powered without supervision.

At the end of the product's life cycle, do not throw it in the waste but dispose of it according to the provisions for WEEE waste.

1.2 Declaration of conformity

We, Helvest Systems GmbH, Route des Pervenches 1, CH-1700 Fribourg (Switzerland), declare under our responsibility that the products:

Description and number: HP100, DCC100-E, ES400, GAW400, UPW400 comply with the requirements of the Electromagnetic Compatibility Directive (2004/108/EG).

The product complies with the standards of the harmonised standards EN55032:2015 and EN55024:2010+A1:2015.

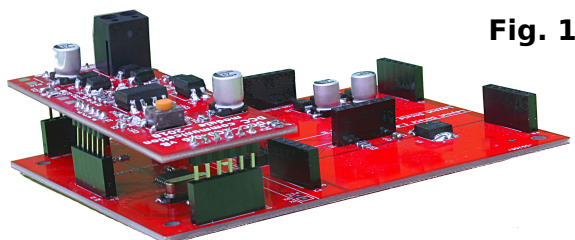


Fig. 1

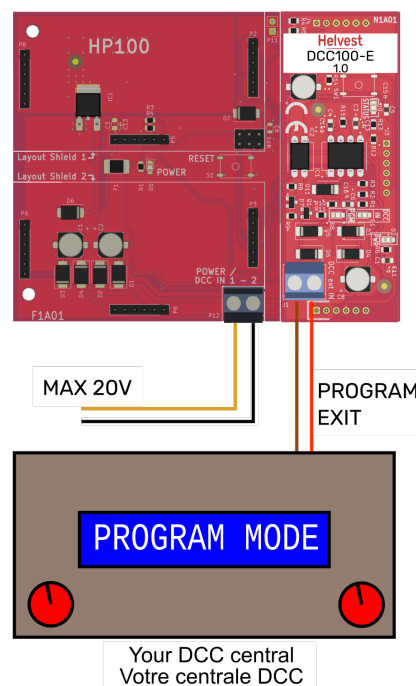
1.3 Using the DCC100-E module

This module is part of the Helvest Flex system and allows you to easily mount an accessory box and flexibly configure it according to your needs.

The module works in combination with an HP100 motherboard (figure 1). It must be connected by inserting it into the "net" type housing. Please take care to insert it with the correct alignment without forcing the connectors.

This module deals with communication with any DCC control unit, i.e. it receives its commands (any control unit conforming to the DCC standard is required) to control switches, signals or other accessories on the layout of the through the "layout" modules.

Fig.2



1.4 How to install the module

The DCC100-E module must be connected to the two wires coming from the control unit that carry the DCC signal. The wires used may differ between the programming phase and normal operation.

The power supply wires must instead be connected to the HP100 board. Figure 2 shows example connections for the programming phase. For normal operation, connect the same wires that are connected to the track in place of the programming output. The module is now ready to receive signals from the control unit.

To connect accessories (points, signals, or other devices), refer to the instructions for the "layout" module.

1.5 Mounting on the layout

The decoder must be not touch anything else during operation. In particular, it CANNOT come into contact with any metallic material.

For temporary installations, it can be placed on a non-flammable insulating surface (plastic, glass, ceramic floor, etc...).

For fixed installation, it is recommended to mount it by screwing the HP-100 on a wooden surface with the screws and spacers provided. This should be done before inserting the DCC-100 (if additional modules have already been inserted they can be removed gently without worries).

1.6 Normal operation of the DCC decoder

After connecting everything as described, activate the DCC signal with the controller. Green LEDs 1 and 2 will light up, indicating that the connections are correct and the decoder is on. (figure 3).

According to DCC-NMRA, the accessories can be addressed in two ways:

a) Decoder address. Each decoder has its own address and drives 4 accessories, each of which has two states (A and B). The accessories are identified by the address of the decoder and by the position (1-4) relative to that decoder. So, for example, an accessory is located in position 2 of the decoder with address 1, and another accessory can be found in position 2 of the decoder with address 5.

If you use this configuration, the default addresses are "1" for Layout Module 1 and "2" for Layout Module 2.

b) Addressing by accessory: each individual accessory has its own address, and no address is assigned to the decoder. For example, if an accessory on a decoder has address 2, no other accessory can have that address, even on other decoders.

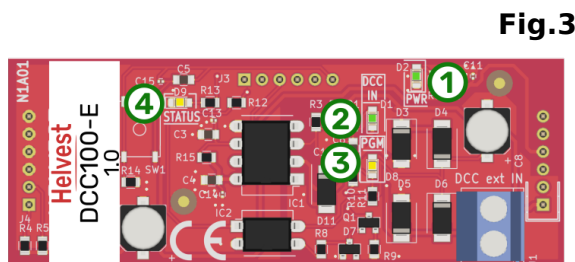


Fig.3

In this case, the default addresses are 1 to 4 for the layout module "1" and 5 to 8 for the layout module "2".

The choice between the two modes depends on the settings of the digital control unit. The decoder responds indifferently to both situations.

To change the addresses, simply follow the procedure indicated in the chapter 2 of this manual.

To operate the accessories, please use the controls on your digital control unit.

2. PROGRAMMING OF THE DECODER

2.1 Programming connections

The DCC module can be programmed in any of the modes available in the DCC control units: (by CV, by page or by register).

The procedure for programming the decoder is as follows:

- Mount the DCC module on the HP100 board as for normal operation.
- Connect the programming wires to the HP100 board. In some control units these come from the same output used for power supply, while other control units have a separated output for a programming track. In this case, the HP100 board must be connected to the programming track output.
- Disconnect any layout modules installed.

This operation is necessary only for some digital control units because of the low power that they provide in programming mode. Leaving the layout modules connected, the decoder is programmed correctly even if the control unit signals an error. It is advisable to remove them to confirm that programming has taken place and to read the CVs correctly.

- Program the decoder according to the procedure provided for any locomotive or accessory decoder. The programming procedure depends on your central unit.
- The system also allows you to read the CV values and have an acknowledgement of programming, without any additional connection and without the need to connect anything to the outputs.
- The flashing of LED no. 3 on the DCC100-E module (fig. 3) means that it is responding to the control unit during programming.

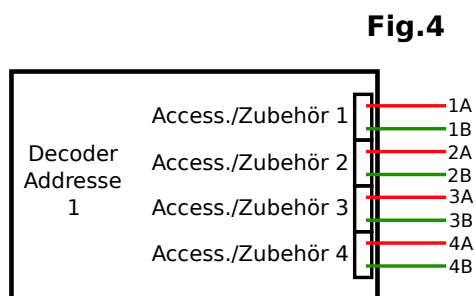


Fig.4

2.2 Addressing mode in the DCC

There are two ways for the DCC standard to address boards, as already specified above: decoder address (base address) and accessory address (output address). The fact that the controller "calls" the entire decoder or the individual accessory depends on the settings of the control unit.

2.3 Addressing the decoder

DCC standards require for each decoder to have 4 outputs (each corresponding to a turnout, signal or other accessories), and each of the outputs has two positions (e.g. correct track or diverting, red/green for a signal, on/off for other devices, etc...). Each of the two "layout" modules that can be installed acts as an independent decoder, with its own address. The "layout 1" module has the preset address 1, the "layout 2" module has the preset address 2: If no changes are made, the modules will work with these addresses.

The basic address is divided between two different CVs according to DCC standards. To change the address, therefore, you must write on these two CVs.

The addresses can be found in CV1 and 9 for the "layout1" module, and in CV35 and 36 for the "layout" module 2.

In section 3.2 there is a table with the correspondence between the address and the CVs for the smaller addresses. You can find the complete table on our website www.helvest.ch.

2.4 Addressing the individual accessory outputs

If the control unit is set to address the individual accessories, an address can be automatically programmed for each single output of the "layout" modules.

By assigning a value to CV1 and 9 (for the "layout 1" module) and CV35 and 36 (for the "layout 2" module), the outputs will automatically acquire an address according to table in section 5.1.

If you prefer assigning an address to each accessory output, write it in CV 120, 130, 140, 150 for Layout 1, and 160, 170, 180, 190 for Layout 2.

The decoder acquires addresses according to the last programming mode set. That is, when a global address is set, any individually programmed addresses are

overwritten. Conversely, setting the address of even a single output automatically resets CV 1+9 or 35+36 to zero.

The correspondence between the address of the outputs and the address of the board can be found in the table in section 3.2, for the smaller addresses. You can download a complete table on our website www.helvest.ch

2.5 Easy programming with LocHaus

A very simple and straightforward way to program decoders is through the free computer software LocHaus. This allows you to activate most options without the complications of DCC programming.

The entire procedure is [explained in this article](#).

2.6 Switching time

It is possible to adjust the motor drive time for decoders that drive motors (switches or similar). Signal and lighting decoders provide a constant power supply over time, so they do not need this type of control.

The LED no. 4 in fig. 2 stays on as long as the decoder is switching an accessory. To make a precise adjustment of the times it is advisable to operate the accessory, and check that the switching is complete. For example, in the case of a switch, check that the needle has reached the end of the stroke when the motor stops and LED no. 4 turns off. In order to keep a reasonable safety margin, it is advisable to check that LED n.4 goes off a few tenths of a second after switching. If the switching is not complete, increase the switching time.

If you notice that LED 4 lights up significantly longer than the switching time (more than half a second), it is advisable to reduce the switching time not to force the motor.

2.7 How to program a single switching time for all outputs

You can either set a single time for all eight outputs (global time) or set different times for each of them. The time is calculated by multiplying the value of these CVs by 0.02 seconds (1 second = 50, the maximum value 255, corresponds to about 5 seconds).

The CV37 sets the time valid for all outputs of the Layout1 module and the CV38 sets the switching time for all outputs of the Layout2 module.

2.8 How to program a different switching time for each individual output

If you want to program a different or specific switching time for each output, you must act on the CV 122, 132, 142 ...192 . These control the switching time of the individual output.

The switching time of the individual outputs must be programmed after the global switching time. If a different global time is programmed (see section 2.5), all specific programming times are overwritten.

The calculation of the switching time is exactly the same as for the global time: It is obtained by multiplying the value of these CVs by 0.02 seconds (1 second = 50, maximum value 255, i.e. about 5 seconds).

2.9 Addressing with Roco® Control Units

Roco control units calculate addresses differently from other standard DCC/NMRA controllers. To ensure correct operation, please note that the programmed address for the various outputs must be increased by 4. For example, if an accessory has the address 43, to activate it you must select address 47. More information is available in this article.

3. CV AND ADDRESSES TABLES

3.1 List of supported CVs

CV	Description	Range	Preset value
1	Layout 1 address LSB ("short")	1-63	1
7	SW version (read-only)		--
8	Manufacturer ID (read only) To completely reset the decoder, write 255 in this CV.		167
9	Layout 1 address MSB	0-7	0
29	Configuration (read only)		128

35	Layout 2 address LSB ("short")	1-63	2
36	Layout 2 address MSB	0-7	0
37	Layout 1 Overall time for accessories	0-255	100
38	Layout 2 Overall time accessories	0-255	100
120	Output 1 address LSB 0-2044	0-252	1
121	Output 1 address MSB 0-2044	0-7	0
122	Output 1 Switching time	0-255	100
130	Output 2 address LSB 0-2044	0-252	2
131	Output 2 address MSB 0-2044	0-7	0
132	Output 2 Switching time	0-255	100
140	Output 3 address LSB 0-2044	0-252	3
141	Output 3 address MSB 0-2044	0-7	0
142	Output 3 Switching time	0-255	100
150	Output 4 address LSB 0-2044	0-252	4
151	Output 4 address MSB 0-2044	0-7	0
152	Output 4 Switching time	0-255	100
160	Output 5 address LSB 0-2044	0-252	5
161	Output 5 address MSB 0-2044	0-7	0
162	Output 5 Switching time	0-255	100
170	Output 6 address LSB 0-2044	0-252	6
171	Output 6 address MSB 0-2044	0-7	0
172	Output 6 Switching time	0-255	100
180	Output 7 address LSB 0-2044	0-252	7
181	Output 7 address MSB 0-2044	0-7	0
182	Output 7 Switching time	0-255	100
190	Output 8 address LSB 0-2044	0-252	8
191	Output 8 address MSB 0-2044	0-7	0
192	Output 1 Switching time	0-255	100

3.2 Association of board address/accessories address and related CVs

The following table shows the correspondence between the address given to the layout module, the relative CVs to be programmed and the address of each of its four outputs for the individual accessories, according to the DCC standards. For a more detailed example, see paragraph 3.3.

The complete table can be downloaded from www.helvest.ch

Decoder address	Values for "Layout 1" module		Values for "Layout 2" module		For both modules			
	CV 1	CV 9	CV 35	CV 36	Output address			
					n. 1	n. 2	n. 3	n. 4
1	1	0	1	0	1	2	3	4
2	2	0	2	0	5	6	7	8
3	3	0	3	0	9	10	11	12
4	4	0	4	0	13	14	15	16
5	5	0	5	0	17	18	19	20
6	6	0	6	0	21	22	23	24
7	7	0	7	0	25	26	27	28
8	8	0	8	0	29	30	31	32
9	9	0	9	0	33	34	35	36
10	10	0	10	0	37	38	39	40
11	11	0	11	0	41	42	43	44
12	12	0	12	0	45	46	47	48
13	13	0	13	0	49	50	51	52
14	14	0	14	0	53	54	55	56
15	15	0	15	0	57	58	59	60
16	16	0	16	0	61	62	63	64
17	17	0	17	0	65	66	67	68
18	18	0	18	0	69	70	71	72
19	19	0	19	0	73	74	75	76
20	20	0	20	0	77	78	79	80
21	21	0	21	0	81	82	83	84
22	22	0	22	0	85	86	87	88
23	23	0	23	0	89	90	91	92
24	24	0	24	0	93	94	95	96
25	25	0	25	0	97	98	99	100
26	26	0	26	0	101	102	103	104
27	27	0	27	0	105	106	107	108
28	28	0	28	0	109	110	111	112
29	29	0	29	0	113	114	115	116
30	30	0	30	0	117	118	119	120

The choice of

having two possible ways to activate the accessories depends on the control unit used. it is also possible to assign individual addresses, but in this case please refer to the instructions in paragraph 5.

3.3 How to use the table and programming example

- Choose the address to assign to the module "layout 1" and according to that program the CV1 and CV9.

For example, if you want to assign address 10, program CV1 with 10 and CV9 with 0.

- To know the addresses of the four corresponding outputs refer to the last four cells of the same line.

In the example, for address 10 of the module you have outputs n. 37, 38, 39, 40.

- Choose the address to assign to the module "layout 2" and according to that program the CV35 and CV36.

For example, if you want to assign address 5, program CV35 with 5 and CV36 with 0.

- To know the addresses of the four corresponding outputs refer to the last four cells of the same row.

In the example, for address 5 of the module you have outputs n. 17, 18, 19, 20.

4 . Troubleshooting

To troubleshoot powering/connection issues etc. related to the "layout" modules, please see troubleshooting of the layout module or HP100 manual.

To completely reset the decoder, write the value 255 in the CV8. This restores the factory settings as in list 3.1.

Problem	Possible cause and solution
DCC signal arrives (DCC LED is on) but the module does not respond to commands.	<p>The signal from the controller does not correspond to the DCC standards. Check controller instructions</p> <p>The card is incorrectly inserted. Check for correct insertion.</p> <p>An incorrect address was set by mistake. Program CV1 and CV9 with a new address (see chapter 2).</p> <p>Some parameters have been set incorrectly due to an error. You can reset the decoder to the factory settings.</p>
The control unit returns "error" or "no loco" after programming.	<p>The connection to the control unit is not correct (for example, the control unit has a programming track output and it has not been connected). Check the connections and fix them if necessary.</p> <p>The layout modules are still connected on the main board. Disconnect the modules and repeat the procedure.</p>
The single accessory does not switch.	<p>The accessory output has an address different from the global one (CV 120, 121 etc...). Reprogram the decoder as desired.</p> <p>The mechanical accessory you want to control (e.g. an switch) is not free to move. Try disconnecting the motor from the decoder, removing it from the accessory and driving it unloaded with a suitable power source, such as a battery. (NEVER operate accessories with other power sources when connected to the layout board!) This can happen if the motor travel is wider than the movement of the blades and the motor does not reach the end of its range. Adjust the motor accordingly.</p> <p>The accessory absorbs too much current and the decoder switches to protection mode: The accessory can be controlled by a relay and a module ES400, GAW400 or UPW400 (see relative instructions).</p>



Warning:

NEVER operate accessories with other power sources when connected to the layout board!

5. ADVANCED SETTINGS (for experienced users)

5.1 Addressing individual outputs

Setting a base address automatically assigns an address to the outputs, as shown in Table 3.2, but you can assign a specific address to each individual output. The address of the single outputs is recorded in the CVs as shown in the following table.

Module	Output 1		Output 2		Output 3		Output 4	
	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB
Layout 1	CV 120	CV 121	CV 130	CV 131	CV 140	CV 141	CV 150	CV 151
Layout 2	CV 160	CV 161	CV 170	CV 171	CV 180	CV 181	CV 190	CV 191

The value can range from 1 to 2044. For programming, divide the desired value by 256, the result of the division must be written in the MSB, while the rest must be written in the LSB.

Example: you want to assign the value 1136 to the output 2 of the layout 1 module.
 $1136 : 256 = 4$ with rest 112. So the value 112 must be written in CV 130, and the value 4 in CV 131.

The default values of the output addresses depend on the base address of the two modules. If "n" is the base address, the values automatically assigned to the outputs are $(n-1) \times 4 + 1$, $(n-1) \times 4 + 2$, $(n-1) \times 4 + 3$, $(n-1) \times 4 + 4$.

All these calculations can be simplified with the calculation tool on the website.

5.2 Independent power supply of the motherboard

For large layouts, and generally also for smaller ones when possible, it is advisable not to use the command station's power to operate accessories. Instead, a separate power source is connected. This way, the command station's power is reserved for the trains, and the DCC bus only transmits the signals. This is exactly the purpose of the DCC100-E module. More information is available on the website, in the "Helvest Journal" section.

5.3 Programming of a large layout

In the case of large systems it is possible to reprogram the CVs of the individual Helvest Flex decoders with a very simple procedure that allows to minimize the electrical connections.

- 1) Prepare an additional DCC100-E module dedicated to programming with separate power supply.
- 2) Connect the DCC terminal of this module to the programming output of a control unit. This control unit must NOT be connected in any way to the other decoders.
- 3) Move closer to the decoder to be programmed, disconnect all the layout modules and the DCC module. Connect the DCC100 programming module.

4) Power the decoder normally (also with a DCC signal, provided that it comes from a different control unit than the one used for programming). Program the decoder with the control unit following the normal procedure.

5) Disconnect all power supplies, reconnect the layout modules and the original DCC module. The decoder is ready, go on to program the next one.

6. TECHNICAL SPECIFICATIONS

Board Type:	HP-100 Motherboard DCC Decoding Module
Power supply:	provided by the motherboard
Decoding:	NMRA-compliant DCC signal from the motherboard or supplied as input.
Programming:	According to NMRA standards, with ACK built into the board.
Signalling LED:	main power, DCC signal, programming ACK, DCC status.
Firmware HP100	>1.2

User manual rev. 1.0.1 (2025).

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