



Installation and Operating Instructions

Premium Digital Decoder

Version 1.0

Address 03 is preset in the factory.

Premium Digital Decoder

General Properties

Premium Digital Decoder is the universally usable locomotive receiver: It can be operated both with Märklin® Digital as well as with systems conforming to DCC. The Premium Digital Decoder automatically detects the operating mode. It can be used with d.c. motors, bell-type armature motors (e.g. Faulhaber) or universal motors with HAMO magnets.

Premium Digital Decoder's unique capabilities give you the flexibility and reliability that you expect from a modern digital decoder. Future standards are no problem for the Premium Digital Decoder either: Its flash technology enables it to be updated at any time.

- Multi-protocol operation possible
- Fully utilisable in analog direct current and alternating current systems
- Fully automatic, on-the-fly change of all 4 operating modes (a.c. analog, d.c. analog, DCC digital, Märklin® digital)
- 3rd generation load regulation: With three CVs, adaptable to the locomotive motor
- Quiet clock frequency, gentle on the motor: >15.5 kHz
- Lenz, Märklin and ZIMO stopping distances supported
- 14, 28 and 128 running notches for DCC mode, 14 or 28 running notches for Motorola® mode
- Automatic detection of the running notch settings in most DCC systems
- 2 or 4-figure locomotive addresses
- Conforms fully to NMRA
- The settings can be comfortably changed: The locomotive does not have to be opened
- 2 directionally dependent light outputs, each loadable with 140 mA
- 2 freely available functional outputs (F1 and F2), each loadable with 140 mA
- Total current of all 4 outputs: 300 mA
- Shunting gear switchable with F3
- Deactivate the acceleration and braking periods with F4

- Motor output stage: Loadability 1.1 A, overcurrent protected
- Total loadability of the decoder: 1.2 ampere
- Size: 26.5 mm x 15.5 mm x 6.5 mm
- Long-term investment security: Firmware upgrade possible through flash memory

Important Warning Notice:

- The Premium Digital Decoder must only be used in model railways
- Avoid impact and pressure loads on the decoder
- Protect against water and dampness
- Never solder immediately on the decoder, if necessary extend cable
- Never cover the decoder with insulating tape as this prevents heat discharge, and could therefore cause it to overheat
- The locomotive must always be de-energised for the installation
- No cable must ever come into contact with the metal parts of the locomotive.
- When assembling the locomotive, ensure that no cables are pinched or that short circuits created.

Premium Digital Decoder

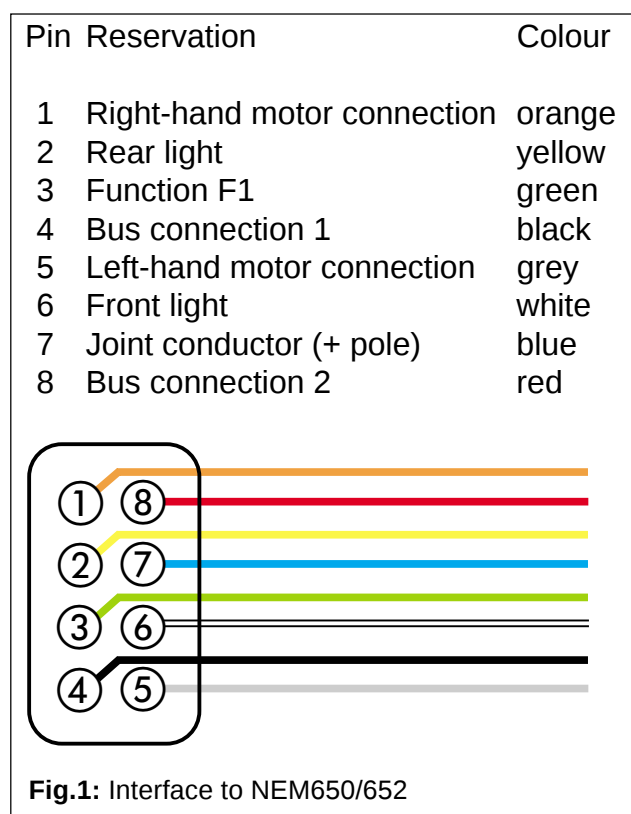
Installation Prerequisites

The locomotive must be in a perfect technical condition before the modification: Only a locomotive with faultless mechanics and clean analog running may be digitised. Wear parts such as motor brushes, wheel contacts, bulbs, etc. must be checked and cleaned or renewed if necessary.

All the installation works must always be carried out on vehicles that have been removed from the tracks, and must be de-energised. Ensure that no voltage can reach the locomotive while the modifications are being carried out – not even by accident.

Locomotives with NEM Interface

The Premium Digital Decoder is supplied with a digital interface to NEM650/652 (NMRA S9.1/9.2) (see Figure 1).



Installation in locomotives with a corresponding interface is therefore particularly easy:

- Remove the vehicle housing. Ensure that you follow the dismantling instructions for the locomotive!
- Pull out the interface connector or the analogue changeover relay. Carefully store the connector or changeover relay in a safe place.
- Now plug in the interface connector so that Pin 1 of the connector (this is the side of the decoder connector with the red/orange cable) is located at the side of the interface that is usually marked with an *, +, • or 1. Ensure that, that none of the legs cants or bends while plugging the connector in.

Do not rely on the fact that the connector cable should lead away on a certain side: The sole deciding factor is the Pin 1 marking of the interface.

- Place the decoder in a suitable place in the model, mostly provided for. Fix the Premium Digital Decoder with double-sided adhesive tape or (a very little) hot-melt adhesive.

Premium Digital Decoder

Locomotives without an Interface

First disconnect all the cable connections inside the locomotive to date and also note a connection via the housing earthing:

The two motor connections must always be free of potential, i.e. there must be absolutely no connection to the chassis or the wheels/current collectors. These are repeatedly overlooked, especially when modifying Fleischmann locomotives. After successfully connecting, remeasure all the connections using an ohmmeter; in particular you should search for short circuits between the motor and bus connections.

The next steps depend on how the light and special functions within the locomotive are wired up:

- a) The lamps/functions with their joint connection are isolated from the locomotive housing (i.e. free of potential). The connection required is shown in **Figure 2**.
- b) The lamps/functions are connected together against the locomotive earth (e.g. almost all Märklin® locomotives and older Fleischmann or ROCO locomotives). This case is illustrated in **Figure 3**.

- The red cable is connected to the right-hand wheel slider (or the middle slider in a.c. models),
- Connect the black cable to the left-hand wheel slider (or outer conductor in a.c. models).
- The orange cable is connected to the motor connection that was previously connected to the right-hand wheel slider (or middle slider in a.c. models),
- The grey cable is connected to the motor connection that was previously connected with the left-hand wheel slider (or external conductor in a.c. models).
- The reverse headlights are soldered onto the yellow cable and the forward headlights onto the white cable.
- Connect the green cable to the function that you wish to switch with F1.
- Connect the violet cable to the function that you wish to switch with F2.

If your locomotive is wired up according to variant b), the connection is complete.

Otherwise (see Figure 2), all the remaining connections of all the bulbs and functions must be connected together to the blue cable. This in turn must not have any contact with the locomotive chassis!

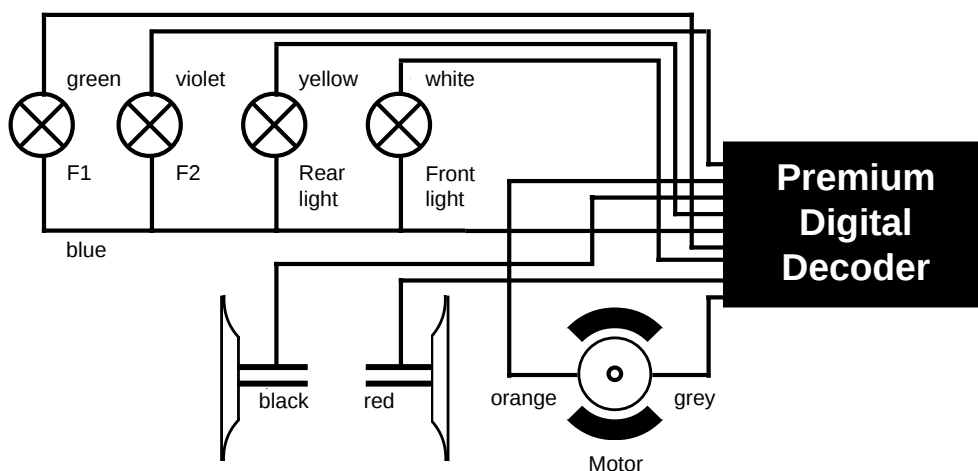


Fig. 2: Connection of the Premium Digital Decoder in locomotives with **isolated special functions**

Premium Digital Decoder

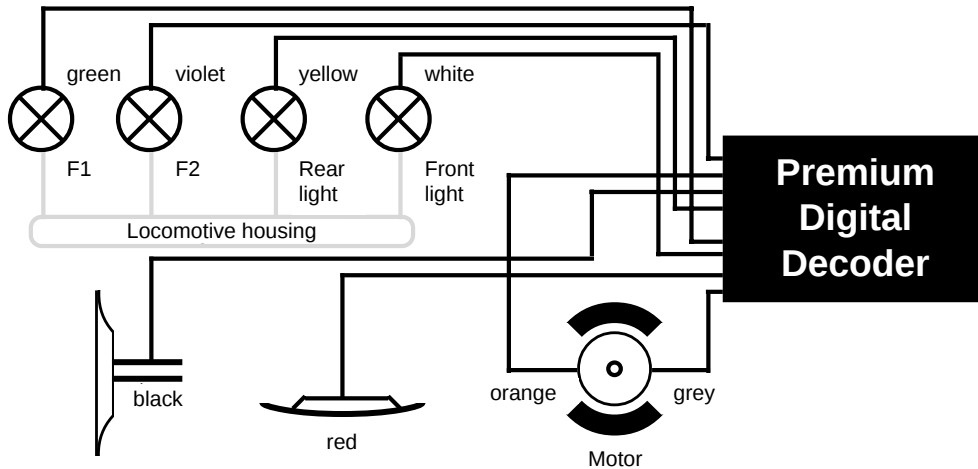


Fig. 3: Connection of the Premium Digital Decoder in locomotives with **special functions** wired to the **housing earthing**

Connecting Additional Functions

You can switch as many consumers as you wish to the light and function outputs, as long as you do not exceed the maximum power consumption. However, you must ensure that the decoder's overcurrent protection works very fast and that it switches off all functions together in case of emergency.

Therefore only use bulbs with 16V or higher and maximum 50 mA nominal current: Bulbs require a very high current when switched on, which could possibly trigger the overcurrent protection of the decoder.

Only use digital smoke generators in locomotives that are wired up according to **Figure 2**, e.g. Seuthe No.11.

Other smoke inserts may require too much current. Some smoke generators on the market have over 250 mA power consumption!

Locomotives that are wired up according to **Figure 3** continue to require an analogue smoke insert as before.

Ensure that the maximum permissible current for the function outputs is never exceeded and avoid short circuits between the outputs: The Premium Digital Decoder is protected, however they will be destroyed if an external voltage is applied at the outputs of the Premium Digital Decoder!

Start-up

We recommend that you carry out a functional test before reconnecting the locomotive.

- **The locomotive address 03 is preset in the factory.**

- Does the locomotive travel in both directions?
- Switch the light on: Are the lights lit up?

If you have installed the Premium Digital Decoder in a locomotive with interface connectors:

Check whether the connector has been inserted in the interface the right way round.

Premium Digital Decoder

Motorola Operation

The Premium Digital Decoder can be used with all Märklin® appliances or compatible systems. However, the functions F1 to F4 can only be used with the so-called “New Motorola® Format”. To activate this, the DIP switches 1 and 2 in the 6021 must be set to the upper position (“On”).

Delta system owners have the problem that there is no available light switch there. Therefore the Premium Digital Decoder can be modified so that the locomotive lights are permanently lit (dependent of course on the direction of travel).

You only have write the value 02 on CV 50 e.g. with the aid of a 6021.

DCC Operation

Remove any capacitors that might be incorporated in the connecting track (e.g. in the ROCO connecting track). These can disturb operation of the decoder.

The Premium Digital Decoder can be run with any system that conforms to DCC. The automatic running notch detection has been tested with the following appliances:

ROCO Lokmaus 2,
Uhlenbrock Intellibox,
Lenz Digital plus V2.3,
ZIMO MX1.

The detection does not function when operated with Lenz Digital plus V3.0 if you wish to run 14 running notches. Use 28/128 running notches.

Each time that the Premium Digital Decoder receives a current (i.e. after the system is switched on) and the light is switched on it tries to detect the running notches figure. If you switchover the running notches during operation you must briefly switch off the

current supply to the Premium Digital Decoder so that the automatic mode functions as desired. The detection takes up to 30 seconds.

The detection can be switched off using CV 64 (see the table on Page 10).

Changing the decoder parameters

The Premium Digital Decoder knows many parameters. A list is given at the end of these instructions. All the set values are stored in so-called CVs (configuration variables). These can be specifically changed, depending on the control centre used.

Märklin 6021

(The master controller must be set to 0. There must be no other locomotives on the tracks. Look for the **flashing signals** of the locomotives!)

- Press the “Stop”– and “Go” button of the 6021 simultaneously (together), until a reset is triggered. (Alternatively: briefly remove the transformer plug)
- Press the “Stop” button so that the rail voltage is switched off
- Enter the current decoder address (Alternative: “80”)
- Actuate reverse direction at the master controller (turn the master controller to the left beyond the limit stop, until you hear a click), hold the controller where it is and then press the “Go” button
- The Premium Digital Decoder is now in programming mode (**The vehicle lights are now flashing**)
- Now enter the number of the parameter (CV that you want to change (two-digit number).
- Actuate the reverse direction to confirm (**the lights now double-flash**)
- Now enter the new value for the CV (two-digit number)

Premium Digital Decoder

- Confirm by actuating reverse direction (**Lights light up for about one second and then flash again**)
- You can now enter other CVs that you wish to change
- Quit the programming mode by selecting CV “80” or by switching the bus voltage off and then back on again (Press the “Stop” button on the 6021, then repress the “Go” button)

DCC Systems (Lenz, Intellibox, etc.)

The CVs are much easier to change if you have a DCC-compatible digital system or an Intellibox. Please read the relevant chapter of your system manual (e.g.: Programming DCC decoders). The Premium Digital Decoder knows all the NMRA programming methods.

Tips and Tricks

Adjust load control

The Premium Digital Decoder load control can be adjusted to a wide range of different motors. The standard settings are very suitable for ROCO, Brawa, Kato, and Liliput locomotives; you might have to experiment with others for a while. The values for the very frequent cases are given below:

Parameters for Fleischmann

Locomotives with the Fleischmann circular motor require the following settings:

CV 2	=	5
CV 51	=	25
CV 52	=	20
CV 53	=	10

Parameters for Märklin® high-power motor

The Märklin® 5-pole high power motor (Series 37xxx) is very well suited for the Premium Digital Decoder, if you set the following parameters:

CV 51	=	40
CV 52	=	20
CV 53	=	15

Parameters for Märklin® motors with HAMO magnets

Märklin® universal motors can also be used with the Premium Digital Decoder following a modification with a HAMO magnet:

CV 2	=	6
CV 51	=	14
CV 52	=	20
CV 53	=	15

Premium Digital Decoder

Parameters for Locomotives with Bell-Type Armature Motors

Unfortunately, there are a large number of different bell-type armature motors in use (e.g. Faulhaber, Maxxon, etc) so that we can only give the values for those locomotives commonly found.

Für Märklin® BR55 / 17:

CV 51 = 25
CV 52 = 30
CV 53 = 08

Decoder Reset

You can reinstate the factory settings at any time if you cannot get any further:

Simply write the value 08 in CV 08

Stopping Distances

The Premium Digital Decoder detects the Märklin®, Lenz (LG100) and ZIMO (MX9, MXHLU) stopping distances.

Support of all stopping distances is active ex works.

However, we recommend that you switch off any stopping distances not required: For example, if you use a purely DCC environment, the Märklin® stopping distance is unimportant and should therefore be switched off.

CV 64 is responsible for the switching off.

CV 57 conceals a new function (ESU braking mode): This enables a path to be set that the locomotive passes through from the start of the braking section until it stops. This enables the locomotive to always come to a stop precisely in front of the red signal, independent of the locomotive's speed. The Premium Digital Decoder then calculates how strongly the locomotive should brake.

The larger the value in CV 57, the longer the stopping distances. If you enter a value of "0", the normal mode is reactivated.

Note: Enter "80" instead of "0" for the 6021.

Support and Assistance

Telephone Hotline:++49 (0)71 51 - 9 79 35 68
Thursdays from 13.00 until 15.30 CET

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D-73625 Remshalden

Premium Digital Decoder

CV	Name	Description	Range of values	Factory settings																		
1	Primary address	Locomotive address	01 – 127	03																		
2	Vstart (V = Velocity)	Specifies the minimum locomotive speed	01 – 63	03																		
3	Acceleration rate	This value multiplied by 0.869 gives the time taken to reach the maximum speed from a cold start	01 – 63	04																		
4	Deceleration rate	This value multiplied by 0.869 gives the time taken for the locomotive to come to a stop from the maximum speed	01 – 63	03																		
5	Vhigh	The maximum locomotive speed	01 – 63	63																		
6	Vmid	The locomotive's velocity at the mid running notch	01 – 63	25																		
17 18	Extended address	Extended address of the locomotive CV 17 contains the most significant bits of the two-byte address (Bit 6 and Bit 7 must always be active), CV 18 contains the least significant bits of the two-byte address. Only active if the function in CV 29 isswitched on (see below)	128 – 9999	0																		
29	Configurations supported	Diverse locomotive settings, only relevant in DCC mode Add the required values to determine the content of CV 29. E.g.: Enable 28 running notches + analog mode = 2 + 4 = 6. <table><tr><td>Function</td><td>Value</td></tr><tr><td>Normal direction of travel</td><td>0</td></tr><tr><td>Reversed direction</td><td>1</td></tr><tr><td>14 running notches in the DCC system</td><td>0</td></tr><tr><td>28 / 128 running notches in the DCC system</td><td>2</td></tr><tr><td>Switch off analog node</td><td>0</td></tr><tr><td>Enable analog mode</td><td>4</td></tr><tr><td>Short address (CV1) in DCC mode</td><td>0</td></tr><tr><td>Extended address (CV17+18) in DCC mode</td><td>32</td></tr></table>	Function	Value	Normal direction of travel	0	Reversed direction	1	14 running notches in the DCC system	0	28 / 128 running notches in the DCC system	2	Switch off analog node	0	Enable analog mode	4	Short address (CV1) in DCC mode	0	Extended address (CV17+18) in DCC mode	32	–	4
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49	Load control	Switch load control on or off: <table><tr><td>Load control On</td><td>1</td></tr><tr><td>Load control Off</td><td>2</td></tr></table>	Load control On	1	Load control Off	2	01 oder 02	01														
Load control On	1																					
Load control Off	2																					
50	Delta mode	Light control for Delta mode <table><tr><td>Switch lights with light button (normal)</td><td>1</td></tr><tr><td>Always switch on lights (Delta mode)</td><td>2</td></tr></table>	Switch lights with light button (normal)	1	Always switch on lights (Delta mode)	2	01 oder 02	01														
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Always switch on lights (Delta mode)	2																					
51	Load control Parameter 1	Parameter 1 (Control reference). Determines the voltage level that has to be returned by the motor. The better the efficiency of the motor, the higher this value can be. Reduce this parameter if the locomotive does not reach the maximum speed.	00 – 79	56																		
52	Load control Parameter 2	Parameter 2 (K-content). Determines the hardness of the controls. The larger the value the more strongly the Premium Digital Decoder controls the motor.	00 – 79	32																		
53	Load control Parameter 3	Parameter 3 (I-content). Determines the inertia of the motor. The more sluggish the motor is (i.e. when there is a lot of centrifugal mass or the motor has a large diameter), the larger this value must be.	00 – 79	24																		

Premium Digital Decoder

CV	Name	Description	Range of values	Factory settings
54	Dimmer	Determines the brightness of the functional outputs. The larger the value, the brighter the lamps	01 – 16	16
55	Analog modes	Determines which analog modes are permitted	1,2 oder 3	3
		Function	Value	
		Permit a.c. analog mode	1	
		Permit d.c. analog mode	2	
		Permit a.c. and d.c. analog mode	3	
56	Braking modes	Determines, which stopping distances are enabled	1,2,3 oder 4	3
		Function	Value	
		Enable Märklin braking mode	1	
		Enable ZIMO braking mode	2	
		Enable Märklin and ZIMO braking modes	3	
		Switch off all stopping distances	4	
57	ESU Braking mode	Setting for ESU braking mode. Note the text at the front of the instructions.	0 – 63	0
64	DCC settings	DCC running notch detection / ZIMO "Manual Bit" only relevant in DCC mode. Add the values given below to obtain the content of CV 64.	0,1,2 oder 3	3
		Function	Value	
		Running notch detection DCC off	0	
		Running notch detection DCC on (recommended)	1	
		"New" ZIMO Manual function (MX2000)	0	
		"Old" ZIMO Manual function (MX1)	2	

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