

Copyright 1998-2007 by ESU electronic solutions Ulm GmbH & Co KG. Electrical characteristics and dimensions are subject to change without prior notice. All rights reserved. ESU may not be held responsible for any damage or consequential loss or damage caused by inappropriate use of the product, abnormal operating conditions, unauthorized modifications to the product, etc. Not suitable for children under 3 years of age. Inappropriate use may result in injury due to sharp points and edges. Märklin® is a registered trademark of the company Gebr. Märklin® und Cie. GmbH, Göppingen, Germany.



**DIGITAL**  
**((((SOUND)))**

**CLASS 60**

☑ CE 15V ===



Hornby Hobbies Limited, Margate, Kent CT9 4JX. Tel: +44 (0) 1843 233525

For more information visit: [www.hornby.com](http://www.hornby.com)

6 7 8 9 10 11 12

**Operating Manual**

# HORNBY®

## 1. Introduction

The LokSound V3.5 decoder by ESU represents a key component of your newly acquired CLASS 60. The LokSound V3.5 Circuitry is responsible for all drive control functions as well as special functions of the Hornby CLASS 60:

- Motor control forwards and reverse
- Sound and special sound functions

The LokSound V3.5 decoder supports the most commonly used control systems: Analogue operation with DC or AC, digital operation with Märklin® digital (Motorola-Format) or DCC-Systems (i.e. Lenz, etc.).

The CLASS 60 is preset at the factory for immediate operation (the LokSound V3.5 decoder recognizes the required operating mode automatically).

Nevertheless we kindly ask you to first read these instructions before you set this locomotive onto a power track.

Chapter 2 provides an overview of the permitted operating mode and which functions may be activated in which mode (many functions can only be utilized in digital operation).

If you intend to change the factory settings (i.e. the address, or the sound volume), we strongly recommend to study chapter 3 first. There you will find out about all parameters of the LokSound V3.5 decoder and how to set them with the commonly available digital command stations. You will also find instructions of how to reprogram the factory settings.

In Chapter 4 we provide answers to frequently asked questions.

Chapter 5 is written for the experts amongst our customers who want to know more about the LokSound V3.5 decoder and its technology, which has been awarded many distinctions.

Should you still have questions please study Chapter 6, which tells you how to obtain support and assistance.

We wish you lots of fun with your new Hornby CLASS 60.

ESU electronic solutions ulm GmbH & Co. KG

## Contents

<b>1. Introduction</b>	<b>3</b>
<b>2. Set-up and Installation</b>	<b>3</b>
2.1 Permitted Operating Mode of the CLASS 60	4
2.1.1 Analogue Operation	4
2.1.2 Digital Operation	4
<b>3. Programming of Parameters for Digital Operation</b>	<b>5</b>
3.1 Programming with DCC-Systems (Hornby, Lenz, ZIMO)	6
3.1.1 Which Settings may be changed?	6
3.1.2 How to set parameters	6
3.1.3 Decoder Reset	6
3.2 Programming with Märklin® 6021	7
3.2.1 How to program using the 6021	7
<b>4. Frequently asked questions</b>	<b>10</b>
<b>5. Additional Information</b>	<b>10</b>
<b>6. Service - Support and Assistance</b>	<b>11</b>

### Important Warning:

- This LokSound V3.5 decoder is designed for use in Hornby's CLASS 60 only
- Do not expose to wet and humid conditions
- Don't remove the heat shrink sleeve on the decoder
- Always disconnect the circuit when installing the decoder. Please install the body shell before applying voltage.
- Make sure that not any blank wire ends may come into contact with the locomotive (a risk of short circuit).
- Make sure that no wires are squeezed or cut by the model's transmission parts when reassembling the locomotive.
- Handle the speaker with extreme care: Do not touch the membrane or apply pressure!

## 2. Set-up and Installation

The CLASS 60 can be operated straight out of the box. The selection of the appropriate operating mode happens automatically. You do not have to change any parameters.

For more information visit: [www.hornby.com](http://www.hornby.com)



## 2.1 Permitted Operating Mode of the CLASS 60

The CLASS 60 may be operated on conventional (analogue) as well as on digital layouts. The number of functions available varies considerably:

### Analogue Operation

Motor control forwards-stop-reverse

Directional lighting

### Digital Operation

Motor control forwards-stop-reverse

Digital address: "03" (DCC and Märklin Motorola)

14 Speed steps with Märklin® Motorola automatic recognition of 28 or 128 speed steps

F0: Light on / off	F5: Compressor	F10: Ventilator
F1: Sound on/off	F6: Shunting Mode	F11: Airhorn short 1
F2: Airhorn 1	F7: Brake Release	F12: Airhorn short 2
F3: Airhorn 2	F8: Diesel Notch Up	F13: Train Brakes
F4: Coupler	F9: Diesel Notch Down	F14: Conductor's Signal

### 2.1.1 Analogue Operation

Any DC (i.e. The Hornby HM2000) or AC controller (i.e. from Märklin®, Titan) is suitable for analogue operation.

**Note:** Not all electronic controllers which supply pulsed DC (PWM Operation) guarantee 100% reliable operation. Since there are so many different products commercially available we can only recommend to carry out your own tests.

### DC Operation

DC Operation is possible without any difficulties, however, there is one difference compared to operating DC vehicles without decoder:

### AC Operation (Märklin®)

This works in the same way as you know it from other models: Speed control is achieved through turning the control knob.

Change of direction is achieved by pushing the control knob beyond the stop position towards the left.

The CLASS 60 must have come to a complete standstill before you may activate the change of direction command. Never try to change direction while the locomotive is still moving.

Sound effects cannot be activated in AC operation.

### 2.1.2 Digital Operation

For prototypical operation we recommend the use of a digital command control system. Besides the fact that special functions are only available in digital mode, the LokSound V3.5 decoder offers silent, load compensated motor control.

The LokSound decoder "understands" commands from the Märklin® 6021 command station based on the widely used Motorola-Protocol as well as from DCC-systems from Hornby, Lenz and Uhlenbrock, which

are based on the NMRA-DCC-Protocol. Therefore it does not matter which commercially available system you use since LokSound V3.5 decoders auto-detect the protocol and then operate accordingly.

Nevertheless, there are considerable differences between the various commercially available digital systems. Therefore the remainder of chapter 2 is focusing purely on driving the CLASS 60 with different systems and also to highlight typical problems and limitations.

Please read Chapter 3 if you intend to change the factory settings of the LokSound V3.5 decoder.

### Digital Operation with DCC-Systems

The LokSound V3.5 Digital Decoder can be run with any system that conforms to DCC. The automatic speed step detection has been tested with the following appliances: Hornby, ROCO Lokmaus 2, Uhlenbrock Intellibox, Lenz Digital plus, ZIMO MX1.

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

Each time that the LokSound V3.5 Digital Decoder receives a current (i.e. after the system is switched on) and the light is switched on it tries to detect the speed steps settings. If you switchover the speed steps settings 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.

Functions F1 to F8 allow you to activate the various sound effects when using DCC-systems.

### Digital Operation with Märklin® Digital (6021)

The CLASS 60 will operate reliably with the Märklin® 6021 command station. However, the LokSound V3.5 decoder offers a special feature: Besides the normal locomotive address (factory default: 03) the decoder "listens" also for the next address.

If you use this address with your 6021, you can activate the functions F5 to F8 by pressing F1 to F4. To enable the second Motorola -address, you may change CV49, Bit 3 (see chapter 3). Please write a value of "27" in CV49.

## 3. Programming of Parameters for Digital Operation

Even though the LokSound V3.5 decoder has been adapted optimally to the Class 60 you may adapt many of the characteristics to suit your own preferences. All parameters are internally stored as numbers (values) in the LokSound V3.5 decoder. According to the NMRA-DCC Standards all parameters are stored in memory cells called CV's (Configuration Variable). Whenever you change a CV the decoder will adjust its behavior accordingly. All CV's may be changed by programming with the aid of a digital command control station. Depending on which type of command station you have the procedure varies:

- If you use a DCC command station i.e. Hornby, Lenz Digital plus, ZIMO MX1 or Uhlenbrock Intellibox, please refer to Chapter 3.1.
- Users of the Märklin® 6021 find relevant information in Chapter 3.2.
- If you prefer to change the settings of the CLASS 60 by using the LokProgrammer by ESU we recommend to first study Chapter 5. There you will find out many important details.

## 3.1 Programming with DCC-Systems (Hornby, Lenz, ZIMO)

Any digital command station, which offers the programming features according to the NMRA-DCC specification, can be used to program the LokSound V3.5 decoder. Depending on the type and features of your command station you may be able to read and write CV's (Hornby Elite, Lenz LH100, Uhlenbrock Intellibox, ZIMO MX1, Arnold digital) or you may only be able to write CV's (Lenz digital compact, Lenz LH200, ROCO LokMaus II).

### 3.1.1 Which Settings may be changed?

Figure 1 on page 8/9 shows the adjustable parameters.

CV's 29, 49, 50 and 51 are different to other CV's: Generally you would write a value into a CV whereas for CV29, 49, 50 or 51 the actual value has to be calculated. This depends on the desired settings:

First you decide which option should be switched on or off. In the column value you find two numbers for each option. If the option is switched off the value is zero otherwise the value is any number between 1- 32. Add all the values for each option to get the total which has to be written into the CV.

**Example:** You want to activate the Märklin® brake section while load compensation remains active. Therefore you write (1) in CV51. Now you have to deactivate the analogue recognition CV29 since it is not advisable to activate the Märklin® brake section and analogue operation at the same time. Therefore you write  $0 + 0 + 0 + 0 = 0$  in CV29.

### 3.1.2 How to set parameters

We cannot provide a general instruction for programming with all DCC-systems since there are so many differences in the way they operate. You should always try to use the DCC direct mode if possible (Byte-wise CV-programming with Uhlenbrock) or the DCC paged mode.

The relevant information for users of the Intellibox are found in Chapter 9 "programming" of the technical manual. You should take particular notice of Chapter 9.5 "Programming of DCC-decoders". Programming should always be done in "CVprogramming byte-wise".

### 3.1.3 Decoder Reset

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

Set CV8 to value 8 for automatic resetting

#### Lenz digital plus

There are various software versions available of the Lenz digital plus command station. You need firmware version 2.3 or higher in order to program LokSound V3.5 decoders. Contact Lenz for more details regarding upgrades of older versions.

## 3.2 Programming with Märklin®6021

With the Märklin® command station you cannot modify standard CV's as it does not comply with the NMRA DCC standards.

However, the most important CV's of LokSound V3.5 decoders may be changed.

### 3.2.1 How to program using 6021

To get into programming mode: Press the "stop" and "go" keys simultaneously on 6021 to activate a reset (or pull the plug of the power pack). To switch off the track voltage, press the "stop" key. Enter the current decoder address (alternative "80").

- Activate the change of direction feature (turn the control knob far left until you hear a "click"), hold the knob in position and press the "go"-key.
- The Loksound decoder is now inprogramming mode (the headlights are flashing for indication).
- Enter the CV number you want to change. Make sure you always enter a two digit number (e.g. "01" and not "1")
- To confirm any entry turn the knob far left (change of direction feature).
- Now enter a new value for the CV as a two digit number.
- Turn the knob far left to confirm. (the headlights are on for about 1 second).



# Programming Table

CV	Name	Description	Range	Default																										
1	Locomotive Address	Motorola-address of locomotive	1-127	03																										
2	Start voltage	Sets the minimum speed of the locomotive	0-75	03																										
3	Acceleration	This value multiplied by 0.869 is the time from stop to maximum speed	0-64	11																										
4	Deceleration	This value multiplied by 0.869 is the time from maximum speed to stop	0-64	14																										
5	Maximum speed	Maximum speed of locomotive	0-64	27																										
6	Vmid	Medium speed of locomotive	0-64	13																										
13	Analogue mode F1-F8	Status of functions F1 to F8 in analogue mode	0-255	01																										
		<table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Function F1</td> <td>1</td> </tr> <tr> <td>1</td> <td>Function F2</td> <td>2</td> </tr> <tr> <td>2</td> <td>Function F3</td> <td>4</td> </tr> <tr> <td>3</td> <td>Function F4</td> <td>6</td> </tr> <tr> <td>4</td> <td>Function F5</td> <td>16</td> </tr> <tr> <td>5</td> <td>Function F6</td> <td>32</td> </tr> <tr> <td>6</td> <td>Function F7</td> <td>64</td> </tr> <tr> <td>7</td> <td>Function F1</td> <td>128</td> </tr> </tbody> </table>	Bit	Description	Value	0	Function F1	1	1	Function F2	2	2	Function F3	4	3	Function F4	6	4	Function F5	16	5	Function F6	32	6	Function F7	64	7	Function F1	128	
Bit	Description	Value																												
0	Function F1	1																												
1	Function F2	2																												
2	Function F3	4																												
3	Function F4	6																												
4	Function F5	16																												
5	Function F6	32																												
6	Function F7	64																												
7	Function F1	128																												
17 18	Extended Locomotive address	long address of locomotive CV17 contains byte with higher value (Bit 6 and Bit 7 must always be active), CV18 contains byte with lower value. Only active when function in CV 29 is switched on. (see below).	192-999	192																										
29	Configuration register	The most complex CV within the DCC standards. This register contains important information, which is only relevant in DCC operation.	–	06																										
		<table border="1"> <thead> <tr> <th>Bit</th> <th>function</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Reverse direction of travel (forward becomes reverse) normal direction reversed direction</td> <td>0 1</td> </tr> <tr> <td>1</td> <td>speed steps (only for DCC operation) 14 speed steps 28 or 128 speed steps</td> <td>0 2</td> </tr> <tr> <td>2</td> <td>analogue operation analogue operation switched off analogue operation permitted</td> <td>0 4</td> </tr> <tr> <td>4</td> <td>selection of speed curve speed curve through CV 2,5, 60 speed curve through CV 67-9616</td> <td></td> </tr> <tr> <td>5</td> <td>selection of loco address (only for DCC operation) short addresses (CV 1) in DCC operation long addresses (CV 17 + 18) in DCC operation</td> <td>0 32</td> </tr> </tbody> </table>	Bit	function	Value	0	Reverse direction of travel (forward becomes reverse) normal direction reversed direction	0 1	1	speed steps (only for DCC operation) 14 speed steps 28 or 128 speed steps	0 2	2	analogue operation analogue operation switched off analogue operation permitted	0 4	4	selection of speed curve speed curve through CV 2,5, 60 speed curve through CV 67-9616		5	selection of loco address (only for DCC operation) short addresses (CV 1) in DCC operation long addresses (CV 17 + 18) in DCC operation	0 32										
Bit	function	Value																												
0	Reverse direction of travel (forward becomes reverse) normal direction reversed direction	0 1																												
1	speed steps (only for DCC operation) 14 speed steps 28 or 128 speed steps	0 2																												
2	analogue operation analogue operation switched off analogue operation permitted	0 4																												
4	selection of speed curve speed curve through CV 2,5, 60 speed curve through CV 67-9616																													
5	selection of loco address (only for DCC operation) short addresses (CV 1) in DCC operation long addresses (CV 17 + 18) in DCC operation	0 32																												

# List of most important CVs

CV	Name	Description	Range	Default														
49	Extended Configuration	Additional configuration options	–	03														
		<table border="1"> <thead> <tr> <th>Bit</th> <th>description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>load control activated</td> <td>1</td> </tr> <tr> <td>1</td> <td>Motor PWM (0=15kHz, 1=30kHz)</td> <td>2</td> </tr> <tr> <td>3</td> <td>Enable second Motorola address</td> <td>8</td> </tr> <tr> <td>4</td> <td>DCC automatic speed step detection</td> <td>16</td> </tr> </tbody> </table>	Bit	description	Value	0	load control activated	1	1	Motor PWM (0=15kHz, 1=30kHz)	2	3	Enable second Motorola address	8	4	DCC automatic speed step detection	16	
Bit	description	Value																
0	load control activated	1																
1	Motor PWM (0=15kHz, 1=30kHz)	2																
3	Enable second Motorola address	8																
4	DCC automatic speed step detection	16																
50	Analogue mode	Selection of desired analogue mode	0-3	0-3														
		<table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>AC analogue mode AC analogue mode off AC analogue mode on</td> <td>0 1</td> </tr> <tr> <td>1</td> <td>DC analogue mode DC analogue mode off DC analogue mode on</td> <td>0 2</td> </tr> </tbody> </table>	Bit	Description	Value	0	AC analogue mode AC analogue mode off AC analogue mode on	0 1	1	DC analogue mode DC analogue mode off DC analogue mode on	0 2							
Bit	Description	Value																
0	AC analogue mode AC analogue mode off AC analogue mode on	0 1																
1	DC analogue mode DC analogue mode off DC analogue mode on	0 2																
51	Brake mode	Selection of desired brake mode																
		<table border="1"> <tbody> <tr> <td>0</td> <td>Märklin® brake mode Märklin® brake mode off Märklin® brake mode ON</td> <td>0 1</td> </tr> <tr> <td>1</td> <td>Zimo brake mode Zimo brake mode off Zimo brake mode on</td> <td>0 1</td> </tr> <tr> <td>2</td> <td>not used</td> <td></td> </tr> <tr> <td>3</td> <td>Lenz DC brake mode Lenz brake mode off Lenz brake mode on</td> <td>0 8</td> </tr> </tbody> </table>	0	Märklin® brake mode Märklin® brake mode off Märklin® brake mode ON	0 1	1	Zimo brake mode Zimo brake mode off Zimo brake mode on	0 1	2	not used		3	Lenz DC brake mode Lenz brake mode off Lenz brake mode on	0 8				
0	Märklin® brake mode Märklin® brake mode off Märklin® brake mode ON	0 1																
1	Zimo brake mode Zimo brake mode off Zimo brake mode on	0 1																
2	not used																	
3	Lenz DC brake mode Lenz brake mode off Lenz brake mode on	0 8																
63	Sound volume	0 = low, 64 = max. volume	01-64	60														

- Enter further CVs you want to modify.
- Exit the programming mode by selecting CV "80" or switch the track voltage off and on (press "stop" - key and then "go" - key on 6021). Note that you may only enter values 01 to 80 with the 6021. Value "0" is missing, enter instead "80".

## 4. Frequently asked questions

**“I would like to install LokSound V3.5 decoders in other locomotives.**

**Are suitable decoders available for particular locomotives?”**

- LokSound V3.5 decoders are designed for HO/OO gauge model trains. Several types are available and most likely one of them will fit into your model.  
Please contact your local dealer to obtain information on all available decoders as well as our installation service. A list of qualified dealers/hobby shops is available on our website <http://www.loksound.de>.

**“I already know your decoders, but the type installed in the CLASS 60 seems to offer less options regarding the settings of parameters than the others?”**

- The decoder installed in the CLASS 60 has been specifically adapted to this locomotive and the requirements of Hornby.  
It is based on the LokSound V3.5 technology and offers more options than can be described in this short manual.  
Please read the following chapter 5 for more information.

## 5. Additional information

The LokSound V3.5 decoder installed in your CLASS 60 locomotive offers more options than described in this manual. However, they have already been optimally adjusted to the model and thus there is no need to adjust them.

The experts amongst you can use the information as outlined in the comprehensive “LokSound V3.5 Installation and Operating Manual”. You can download this manual free of charge from our website <http://www.esu.eu> under the section “Downloads”, subsection “Instruction manuals”.

## 6. Service - Support and Assistance

Your first contact should always be the model train or hobby shop where you have purchased your Hornby CLASS 60. Your dealer is your competent partner for all your questions regarding model trains and also LokSound V3.5 decoders.

You may also contact us directly. For enquiries please use either email or fax (don't forget to provide your own fax-no.) and we will reply within a few days.

We also offer a telephone hotline service. However, please call our hotline only in case of complex enquiries that can't be dealt with by email or fax. The hotline is often very busy and you may encounter delays.

Also check our website for more information. You will find many hints regarding FAQ and even feedback from other users.

Of course we are always available to provide support:

**by phone: ++49 (0)700 - LOKSOUND  
++49 (0)700 - 56576863**

**Tue from 10am to 12am**

**by Fax: ++49 (0)700 - 378 725 38**

**by email: [support@loksound.de](mailto:support@loksound.de)**

**by mail: ESU electronic solutions ulm GmbH  
- Technischer Support -  
Industriestrasse 5  
D-89081 Ulm**

**Internet: [www.esu.eu](http://www.esu.eu)**