Class G1000

Instruction manual

3. Edition, August 2023

RailCom plus

M4

ESU

Engineering Edition

Content

1. Declaration of conformity

We, ESU electronic solutions ulm GmbH & Co. KG, Edisonallee 29, D-89231 Neu-Ulm, Germany, declare in sole responsibility that the product Product description: G1000 Part number: 31300-31306 complies with all relevant regulations of the Directive for Electromagnetic Compatibility (2004/108/EG). The following harmonised standards have been applied:

EN 55014-1:2006 + A1:2009: Electromagnetic Compatibility - requirements for household appliances, electric tools, and similar apparatus - Part 1: Emission - Product

EN 55014-2:1997 + A1:2001 + A2:2008 : Electromagnetic Compatibility - Requirements for household appliances, electric tools, and similar apparatus - Part 2: Immunity - Product family standard

Picture: J. Frickel

On August 23, 2015, V21 of the Mindener Kreisbahn jumps for the defective steam locomotive in front of the Minden museum train.

2. The prototype

At the beginning of the 2000s, the Austrian Federal Railways ÖBB ordered 90 shunting locomotives of the 2070 series from Maschinenbau Kiel MaK. The 12-cylinder diesel engine from Caterpillar produced 738 kW at 2100 rpm. The top speed is limited to 100 km / h.

These locomotives, known as MaK G 800 BB at MaK, form the basis of the 4. type program of the manufacturer. The locomotive construction department in Kiel was taken over by Vossloh. As a more powerful version of the G800, the G1000, equipped with an MTU 8V4000 diesel engine, came onto the market on the same chassis. The 1100 kW strong (at 1860 rpm) and 100 km / h fast locomotive can be ordered for axle loads from 18 to 20 t and with country packages for right and left-hand traffic.

Between 2002 and 2016, Vossloh delivered 103 copies to railways in Germany, France, Italy, Luxembourg and Switzerland. The locomotives are used in heavy shunting, but also in front of local freight trains. Some G1000 belong to locomotive rental companies such as Northrail in Germany or Ferrotract in France and are employed within the respective national borders, for example in all sectors of medium local freicht duty, but also in the factory traffic of large industrial companies or in sea and inland ports.

Various owners such as Spitzke Logistik (D) or Colas Rail (F) use the reliable four-axle vehicles in construction train traffic. The DB also occasionally falls back on borrowed G1000s for vehicle bottlenecks.

3. The model

3.1. Important remarks - please read this first

Congratulations to your purchase of the H0 diesel locomotive G1000. Your H0 model offers various innovative functions. This manual provides a step by step insight into the features of the G1000. Therefore we have one request:

Please read this manual prior to operating the model carefully. Although the model is quite robust, inappropriate handling could lead to injury of the operator or to damage of the locomotive. Do not indulge in "costly" experiments.

- This locomotive is not a toy and should only be operated under supervision.
- Protect the model against wet conditions and humidity.
- When working on the locomotive (maintenance) always make sure there is no power connected to the model.
- Replace the housing on the chassis prior to operating the locomotive after maintenance work.
- Make sure that no wires are squeezed or that no short circuit may occur.

3.2. Unpacking the model

Pull the blister insert with the model out of the cardboard box. Place the blister upright and open the flap at one end. Now the blister can be opened to remove the model.

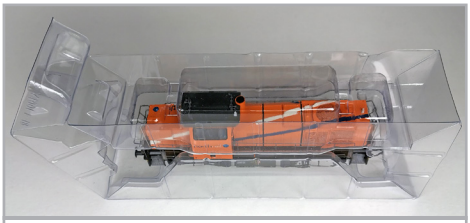

Figure 1: Unpacking the model

Please keep all parts of the packaging and this manual for later use. Only the original packaging guarantees proper protection against transport damage.

If you are an AC user, and you need a locomotive with a center pick-up, you can put the G1000 on the tracks and start running the loco immediately after entering address 3.

The center pick-up is responsible for the current consumption from the point contacts of track. The pressure switch in the locomotive bottom is located on the left below the cab and is accessible after the rear bogie has been turned. It is a pressure switch that is set to AC operation in the factory setting (position high). For DC operation, the switch must be pressed down. If you are a DC operator, you must first dismantle the pick-up shoe. The procedure is described in Section 3.2.1.

3.2.1. Mounting & removing the center pick-up

Removal: Put the locomotive on its roof. Then you apply the tool in such a way that the ends of the four wire brackets fit into the four holes below the base plate of the center pick-up. Carefully(!) squeeze the tool and then lever the center pick-up with a slight tug from its position.

Figure 2: Remove center pick-up

Now you have to press the switch below the third axis. The locomotive is now ready for operation on two-wire tracks.

Notes: If the switch is not in the low position, a short circuit is triggered.

Mounting: For re-converting your locomotive to a three-rail vehicle again hold the centre pick-up between thumb and index finger and place it in the receptacle. Finally press the centre pick-up until there is an audible "click".

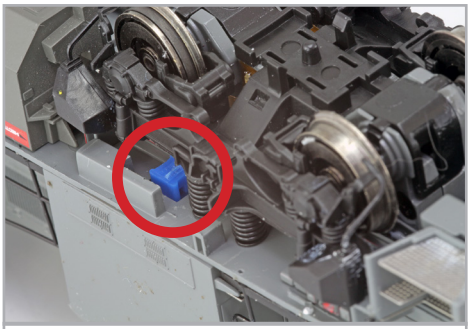

Figure 3: Switch on DC operation

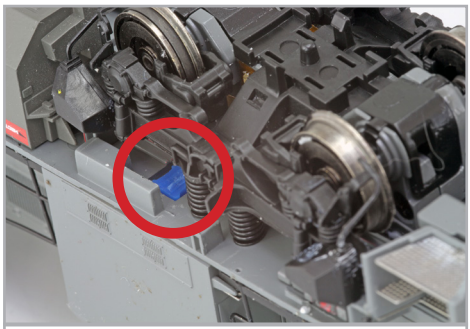

Figure 4: Slide switch to AC operation

Now you have to operate the pressure switch and bring it into the upper position.

3.3. Outward appearance and special functions

With your new G1000 you can operate your model trains prototypically like never before. There are many separately applied detail parts on the metal housing as well as on the metal chassis. All grab irons are made off sturdy plastic and are separately applied.

The two "sugarcube" speakers powered by the LokSound 5 decoder distributes its powerful sound through the cut-through radiator grills. The five pole motor with flywheel assure plenty of power and smooth running. All four axles are driven.

Two traction tires assure considerable tractive effort. In order to assure perfect driving dynamics and excellent sound without interruptions due to dirty tracks the locomotive is equipped with a "PowerPack" energy storage module.

Your G1000 has an automatic electric coupler inserted in the NEM shaft on both sides. Coupler is remotely controllable from the digital command station. Basically, all known bracket and universal couplings can be coupled. Remote controlled decoupling only works with couplers, containing brackets of a non-magnetic material. (See also chapter 4.6.2.).

In terms of its lighting the G1000 is just as prototypically versatile as its full scale counterpart. Of course there is directional lighting generated by warm white LEDs that can be turned off at one end, wherever the train is coupled to the locomotive. During shunting duty loco shows 3 white lights at both ends. In addition there is cab lighting as well as illuminated driver's cab-control panel. A working step downlight is also available. Some versions have working high beams.

4. The technology of the ESU model

The LokSound 5 decoder is a central part of your new G1000. Its circuitry is responsible for design and control of all running and sound functions of the loco:

- Driving forward and in reverse
- Lighting functions
- Sound functions

Besides M4 the LokSound 5 also supports DCC with RailComPlus, Motorola® and Selectrix® and also be operated on analogue layouts. Programming can be done either with DCC command stations or with Märklin® central units, etc. the decoder automatically detects the mode of operation; therefore you do not have to set anything in this regard.

In case you wish to change any of the default settings of the locomotive (such as the address or the sound volume) we recommend to first reading chapter 5. This chapter lists the most important parameters of the LokSound 5 decoder and how to change them with the various command stations available on the market.

4.1. Possible operating modes of the G1000

4.1.1. Analogue mode

The G1000 may also be operated on conventional (=analogue) DC or AC model train layouts. The number of available functions is, however, quite limited:

- Driving forward and backwards
- Directional lighting
- Engine sounds (automatic)

The engine sound sets in at about 6.5 V track voltage. At 8.5 V the locomotive slowly starts moving. Both DC transformers and AC transformers are suitable for analogue operation. Please note, that due to the large number of different systems on the market you may not achieve troublefree operation with electronic throttles employing PWM (pulse width modulation).

Attention: the G1000 must have come to a complete standstill before you activate the change-of-direction command! Never switch to the opposite direction while the locomotive is moving!

4.1.2. Digital mode

For prototypical operation we recommend using a digital command control system. The numerous functions are only available in digital mode.

The default address (ex work) is "03" (DCC and Märklin® Motorola®).

14 speed steps with Märklin® Motorola®.

In DCC mode the decoder automatically detects the speed steps set in the command station.

4.1.2.1. Digital operation with DCC systems

The G1000 can be operated with any DCC compliant system. Sounds and other functions of the G1000 can be triggered with the function buttons F0 through F31.

The number of functions actually available is determined by your central unit or the handheld controller used. Depending on the system, fewer function keys are available.

Function mapping (ex work):

Button	Function
F0	Headlights front
F1	Sound on/ off
F2	Primary horn
F3	Reverse light low
F4	Digital coupler
F5	Headlights off long hood end
F6	Headlights off short hood end
F7	Cab light
F8	Shunting mode
F9	Emergency stop signal
F10	High beam light
F11	Swiss directional lighting
F12	Curve sensor off
F13	3rd head light off
F14	Dashboard lights
F15	Step lights
F16	Heavy load mode
F17	Idling mode
F18	Ventilator
F19	Brake mode 1
F20	Horn 2
F21	Brake mode 2
F22	Air let off
F23	Radio transmission 1 + 2
F24	Compressor
F25	Bell
F26	Soundfader
F27	Brake sound off
F28	Brake off/ on
F29	Radio transmission 3
F30	Preheater

4.1.2.2. DCC with RailComPlus®

The LokSound 5 supports RailComPlus®, which was jointly developed by Lenz® and ESU. This means that the decoder automatically reports to RailComPlus® capable command stations. You will never ever have to change a locomotives

address manually! Simply put the locomotive onto the track. If you do not wish to have the automatic recognition, you can switch it off by deleting CV 28, bit 7.

4.1.2.3. M4 registration

If you use a Märklin® systems Central Station® or mobile station®, the locomotive will be automatically detected and

registered by the system once you have put it onto the track. This process occurs completely automatically, you do not have to adjust any settings.

DCC with RailComPlus® has the highest priority when registering the locomotive. Therefore the decoder will always register with RailComPlus® and DCC on an ESU ECoS command station even when M4 is active. If RailComPlus® is not available then M4 will be treated as the second priority. Therefore the decoder will register with M4 on a Märklin Central Station®. Based on the software version of your Central Station®, the number of available function buttons may be limited to 16.

4.1.2.4. Digital operating with Märklin® Digital (6021)

You may operate the G1000 with the Märklin® 6021 central unit without any problems. A special feature allows you to assign three more addresses besides the "actual locomotive address". They are known as following addresses. This enables you to access 16 functions with your 6021. Details on how to do this are described in chapter 5.3.3.1.

4.2. Your first ride

Most certainly you wish to test your new locomotive right away. We recommend going about this step by step. Put the locomotive onto the track call it up on your handheld throttle.

4.2.1. Lighting functions

First turn on the lights by pressing F0. Then the white forward headlights as well as the red rear lights of the G1000 should light up. If you wish you may switch on the cab lighting with F7 in order to better see the cab interior.

If you now press F14 then the illuminated driver's cab-control panel will come to life. You will clearly see this through the side windows of the cab.

Using F15, you can enable the step lights.

It is common practice to turn off the head and tail lights at the cab where a train is coupled to the locomotive. Press F5 if the train coupled to the long hood in order to switch off the head (tail) lights at that end.

When shunting without any vehicle coupled to the locomotive you should press F8 in order to have prototypical lighting for shunting.

When driving in the Benelux countries, the red tail lights are placed in the lower lamps. You can toggle this with F3. In addition, a high beam can be switched with F10.

F9 switches on emergency lighting (flashing lamps). For operation in Switzerland, the light change can be switched to the familiar 3 + 1 lighting with F11.

4.2.2. Sound functions, driving and brake functions

After pressing F1 (preliminary lubrication and starting sequence) your G1000 comes to life and continues with the typical sound of an idling diesel engine.

If you switch to the first speed step, the converter is filled and the locomotive starts moving without increasing the speed. The diesel engine only revs up when the second gear is engaged. When braking, the brake squeal sounds shortly before standstill.

With two new braking functions, driving is even more true to the original. With the locomotive brake F19 you decelerate the locomotive more than with the value stored in CV 4. At the same time, the engine acoustically idles. The locomotive decelerates to the equivalent of 30 km / h regardless of the throttle position. When the function is switched off, the locomotive accelerates back to the value corresponding to the speed controller position. The change of the values of F19 is described in chapter 4.2.8. shown. When applying rapid braking (F21), the locomotive brakes to a standstill more than with the deceleration set in CV4 and more than in F19. When the function is switched off, the locomotive accelerates back to the value set on the speed controller. See also chapter 4.2.9.

To simulate heavy loads, switch on F16. This function causes a higher engine speed, a stronger transmission noise and longer acceleration and deceleration times when driving. If you want your train to run at the speed you have reached without load, press F17 Idle mode.

Of course you may trigger various user sounds with your throttle (refer to the table on page 11). You may also adjust the volume of each individual sound sequence. How to do this is described in chapter 5.6.

4.2.3. PowerPack energy storage

The G1000 is equipped with a maintenance free "PowerPack" energy storage module. This facilitates uninterrupted power supply even on dirty tracks. The PowerPack is only active in digital mode. In analogue mode it will be automatically switched off.

After turning on the power supply the "PowerPack" must first be charged. This may take up to 60 seconds. Only then the full capacity will be available. The system supplies power to the lighting, the motor and the sound functions. The maximum time that the system should cover can be set (also refer to chapter 5.7.).

4.2.4. Digital coupler

Your G1000 has an automatic coupling inserted in NEM coupler shaft and remotely controllable from the digital controller. Basically, all known bracket and universal couplings can be coupled. Remote-controlled decoupling only works with mating couplings, the brackets of which are made of a non-magnetic material. Since this is not the case with the popular Märklin® close coupling, you will find two suitable ESU universal couplings for replacement in a kit bag. Further universal couplings can be obtained from your specialist dealer under item number 41000.

When the function key F4 is pressed, the rear coupling in the direction of travel is activated: the locomotive first presses the train lightly, the coupling is activated, and the locomotive advances a few millimeters and leaves the cars standing. The process is known as a clutch waltz among model railroaders. The clutch vibrates during the coupling phase. This is deliberate and not a malfunction.

4.2.5. Shunting operations

Use the F8 key to switch to maneuvering mode: the maneuvering lights immediately indicate this optically. CV 181 (factory setting: 40) indicates how much of CV 4 is removed when shunting is active. The larger the value, the faster the locomotive accelerates and brakes.

With CV 103 (factory setting: 96) you set the maximum speed that can be reached in shunting mode. The locomotive reaches 75% of its normal maximum speed ex works.

4.2.6. „Heavy train" operation

With F16 you can switch to „load operation" mode in order to increase the simulated load for the decoder. On the one hand, the engine speed increases (even when stationary), on the other hand, the braking and acceleration times are doubled .

4.2.7. Brake function 1

CV 179 (factory setting: 70) indicates how much of CV 4 is removed when the locomotive brake (F21) is active. The larger the value, the more the locomotive brakes. The vehicle can decelerate to 30 km/h. If function is switched off, the loco will accelerate up to speed set on the controller.

4.2.8. Brake function 2 (fast brake)

CV 180 (factory setting: 128) indicates how much of CV 4 is removed when the train brake (F19) is active. The larger the value, the more the locomotive decelerates until sped step 0. Warning - if the brake function is activated when the vehicle is stationary, the locomotive cannot start moving.

5. Decoder settings (Programming)

Chapter 5 covers setting various parameters of the LokSound decoder. Should you not be familiar with the handling of CVs please take the time to read these occasionally quite complex instructions. After an introduction into the world of parameters in chapter 5.1, we explain in the following section 5.2 how to change various parameters in DCC mode and with Märklin® central units. The following chapters explain which parameters have what kind of influence on the behavior of the LokSound decoder.

5.1. Configuration Variables (CVs)

LokSound decoders follow the CV concept developed in the US. CV stands for „configuration variable" and indicates that the storage cells described above are not only variable but they also determine the behavior of the decoder.

5.1.1. Standardization in the NMRA

The NMRA (National Model Railroad Association) has defined which CVs determine certain parameters of a decoder. The DCC standard allocates fixed numbers for certain CVs (adherence is obligatory). This greatly simplifies things for the user since decoders of most manufacturers comply with this stan-

dard and therefore dealing with CVs requires the same process with the same CV-numbers regardless of the manufacturer.

The DCC concept permits to enter numbers ranging from 0 to 255 into CVs. Each CV carries only one number.

While the position number is predetermined, the range of values may vary. Not all CVs must accept values ranging from 0 to 255. The permitted values for LokSound decoders are listed in the table in chapter 10.1. show all available CVs.

5.1.2. Bits and Bytes

Most CVs contain numbers: CV 1 for instance contains the locomotive address. This can be any number between 1 and 127. While most CVs expect numbers to be entered, some others are rather like a „collection point" of various „switches", that administer different functions in one CV (mainly „on" or „off): CVs 29 and 49 are good examples:

You must calculate the value for these CVs yourself. The value depends on which settings you want to program Have a look at the explanations for CV 29 in the table in chapter 10:

firstly, decide which options should be active. The column „Value" has two numbers for each option. If the option is switched off, the value is 0. Otherwise, it is a number between 1 and 128. Add all the values for the respective options to arrive at the correct value for this CV.

Example: Let us assume you want to run trains with the ECoS in DCC mode with 128 speed steps. Analogue detection should be active (because you also want to drive your locomotive in analogue mode). All other options are not active.

Therefore you must write the value 6 in CV 29 (0 + 2 + 4 +0 = 6).

5.2. Programming the decoder

In this paragraph we explain how you can program the decoder with the most commonly available digital systems.

5.2.1. Programming with DCC Systems

LokSound decoders support all NMRA programming modes. Programming on the Main enables you to program your decoders comfortably without having to remove the locomotive form the layout. In this case, the command station talks directly to the decoder by using its locomotive address, for instance: „Locomotive number 50, write the value 7 into CV 3!". Thus knowing the locomotive address is a precondition.

Using RailCom® you can read CV values on the main. This function is enabled by default (CV 28 = 3). Assuming you have a suitable DCC system you can read CV values on the programming track. You can also reprogram the locomotive address without knowing the old address since the command station simply transmits the command „Write value 7 in CV 3!". Each decoder receiving this command will execute it.

ESU counts the bits from 0 to 7 as laid out in the standards while others (e.g.: Lenz®) count the bits from 1 to 8.

5.2.2. Programming with Märklin® 6021

The Märklin® central unit 6021 works differently: Since it does not comply with the NMRA DCC standards, LokSound decoders start a special, obligatory programming procedure. Reading of values is not permitted.

There are two modes:

- In the short mode parameters with a number below 80 can be set provided the desired value is also lower than 80.
- In the long mode, all parameters with values from 0 to 255 are adjustable. Since the display of the 6020 /6021 is limited to two-digit numbers, values must be split and entered in two separate steps.

5.2.2.1. Changing in the programming mode

Enter the programming mode with the 6020/6021: The throttle must be set to „0". No other locomotives may be on on the layout. Watch out for flashing signals of the locomotive!

- Press the „Stop" and „Go" buttons of the 6021 simultaneously until a reset has been triggered (alternately pull the mains plug of the transformer). Press the „Stop" button in order to switch off the track voltage. Enter the current decoder address. If you do not know the current address, simply enter „80".
- Activate the change-of-direction button (turn the throttle knob to the left beyond the arrestor until you hear a click sound), hold it in this position and then press the „Go" button.

Please bear in mind that the 6020/6021 only permits you to enter values from 1 to 80. The value 0 is missing. Always enter „80" instead of „0".

5.2.2.2. Short mode

The decoder is in the short mode (the headlights flash periodically in brief intervals).

- Now enter the number of the CV that you want to adjust e.g.: „01". Always enter this number with two digits.
- For confirmation activate the change-of-direction routine (now the lights flash twice very quickly).
- Now enter the new value for the desired CV, e.g.: 15 (two digits).
- For confirmation activate the change-of-direction routine (now the lights light up for about one second).
- Then you can enter other CVs as desired.
- Selecting „80" allows you to exit the programming mode. Alternately you can switch off the track voltage and then on again (press the „Stop" button on the 6021, then the „Go" button).

5.2.2.3. Long programming mode

You access the long mode by entering the value 07 in CV 07 while in the short mode. The decoder confirms the change to the long mode by slowly flashing lights.

- Enter the hundred-digit and the ten-digit (decade) of the CV that you want to change. Example: If you want to adjust CV 124, you enter „12".
- For confirmation activate the change-of-direction routine (now the lights flash periodically: long – short – long – short - etc.)
- Now enter the unit of the CV („04" in this example).
- For confirmation activate the change-of-direction routine. Now the decoder expects the entry of the CV value. The lights flash periodically: long – short – short).
- Now enter the hundred-digit and the ten-digit (decade) of the new CV value (as a two-digit number). Example: You want to write the value 135. Therefore, you enter „13".
- For confirmation activate the change-of-direction routine. Now the lights flash periodically: long – short – short – short).
- Now enter the unit of the new CV value as a two-digit number („05" in this example).
- For confirmation activate the change-of-direction routine (now the lights light up for about one second).
- Now you can adjust more CVs in long mode.
- Exit the long mode by switching off the track voltage and then on again (press the „Stop" button on the 6021, then the „Go" button).

5.2.3. Programming with Märklin® central station® & Mobile Station®

LokSound 5 decoders can be programmed with all mfx® compatible command stations. However, most likely not all configuration options will be shown. This is because there are different versions of mfx® command stations available. Please refer to the instruction manual of your mfx® command station how to program decoders. Our decoders do follow the original Märklin® engines typically.

5.2.4. Programming with ESU LokProgrammer

The LokProgrammer 53451 offers the easiest and most comfortable way of setting the CVs of LokSound decoders: simply by a few mouse clicks on an MS-Windows® computer. The computer saves you to look for the various CV numbers and values. For the G1000, please make sure you are using software version 5.0.14 or later which is available for download from our website.

5.3. Address settings

Each LokSound decoder requires a definite address to be addressable for the central unit. Depending on the type of decoder and the digital system, there are several possibilities how to allocate addresses.

5.3.1. Short addresses in DCC mode

Normally you would control LokSound decoders with the short address that is stored in CV 1. In DCC mode, the permitted values range from 1 to 127.

In order to enable the decoder to „listen" to the short address you must delete bit 5 in CV 29. Some digital systems (e.g. ROCO® Lokmaus 2, Lenz® digital plus, Lenz® compact) only support values 1 – 99 as short address.

5.3.2. Long Addresses in DCC mode

You can operate LokSound decoders also with long addresses (4-digit addresses). The supported values range from 128 – 10239. The long address is stored in the CVs 17 and 18. You must activate the long address by setting bit 5 in CV 29.

Bit 5 in CV 29 switches between short and long address. The decoder can only respond to one address at a time.

If you want to use your LokSound with the long address it is practical to program this address directly with your digital system: most modern digital systems (e.g. ESU ECoS, Bachmann E-Z Command® Dynamis®, ESU CabControl) have a menu for programming long addresses. The command station not only programs CV 29 correctly but also assures the correct storage of the values for the long address in CV 17 and 18.

5.3.3. Motorola®-address

You can also operate many LokSound decoders with the Motorola® format. The address for this operating mode is stored in CV 1.

This address is identical to the short address in DCC mode as described in chapter 5.3.1. The LokSound decoder responds both to commands in DCC and in

Motorola® mode at the same time. Märklin® digital devices (6020, 6021, Delta®) can only work with addresses from 1 to 80. Should you have entered a higher value in CV 1 you will not be able to drive this locomotive with these central units.

5.3.3.1. Consecutive addresses for more functions

The extended Motorola®-Format covered only the lighting function (F0) and the auxiliary function F1 to F4. Of course, this is far too few for the many functions of the G1000. Therefore one can assign up to three additional addresses (4 addresses in total). The so called consecutive addresses follow immediately after the actual address stored in CV 1 and serve to trigger functions. Motor control is solely accomplished via the base address in CV 1.

Example: select address 66 for a class G1000 locomotive. You want to set 3 consecutive addresses. They are 67, 68 and 69. They will then switch the consecutive functions whenever you call up theses addresses on your 6021:

Name	Example address	Functions
Base address	66	F0, F1 – F4
Consecutive #1	67 (66+1)	F5 – F8
Consecutive #2	68 (66+2)	F9 – F12
Consecutive #3	69 (66+3)	F13 – F16

Please make sure that no other vehicle is programmed to any of the consecutive addresses Otherwise you will inadvertently run several vehicles at the same time!

The consecutive addresses are activated with bits 3 and 7 in CV 49. For reasons of compatibility they are not next to each other.

The relationship is as follows:

Bit 7	Bit 3	Description	Value to be added to CV 49
0	0	No consecutive addr.	0
0	1	1 consecutive addr. active	8
1	0	2 consecutive addr. active	128
1	1	3 consecutive addr. active	136

First read out the value in CV 49 (default value: CV 49 = 1) and the value shown in column 4. If, for instance, you wish to activate 3 consecutive addresses then you must write the value 136 + 1 = 137 into CV 49.

Consecutive addresses are only active in Motorola® mode.

5.4. Adapting the driving characteristics

5.4.1. Acceleration and deceleration

Acceleration and brake time can be set independently from each other. Therefore, you could for instance program a short acceleration and a much longer brake time.

The time for accelerating is adjusted in CV 3 while deceleration is set in CV 4. Permitted values are 0 (no delay) to 255.

The times set in these CVs work speed dependent. Therefore, the acceleration distance and the brake distance are longer at high speeds. In other words, the faster the locomotive moves, the longer is the distance until it stops.

5.4.2. Starting voltage, Vmax

LokSound decoders know internally 256 speed steps. They can be adapted to the characteristic of the locomotive and allocated to the actually available speed steps (14, 28, or 128).

Enter the start voltage in CV 2 and the maximum speed in CV 5.

The values of the start and maximum speed are dependent on each other. Selecting a maximum speed that is lower than the start speed could lead to some erratic driving performance. Therefore always adhere to the principle: start voltage < maximum speed.

5.5. Break sectors

Brake sectors have the purpose to slow down the locomotive independently from the commands issued by the command station. Frequently, this function serves for stopping a train in front of a red signal. If a LokSound detects a brake command, it will slow down with the programmed deceleration and stop then. After this enforced stop, the locomotive will accelerate again as per the programmed values in CV 3.

Depending on the type of digital system, there are several options on how to influence the decoder so that it stops the train.

5.5.1. DC break mode

In order to activate the DC brake mode you must set bit 3 in CV 27. The LokSound decoder will start brake once it moves from a digital sector into a DC sector provided the brake mode is active and the polarity of the track voltage does NOT match the current direction of travel. The locomotive will stop taking into account the programmed deceleration.

5.5.2. Märklin® brake mode

In principle, the Märklin® modules 72441 / 72442 apply a DC voltage to the track instead of the digital signals. Provided bit 3 and bit 4 in CV 27 is set, then LokSound decoders detect this voltage and will stop the train (CV 27 = Value 24).

The signal generated by these modules looks the same as DC from conventional DC-transformers. The LokSound could possible misinterpret this and switch to the analogue mode instead of brake.

If you wish to control the LokSound decoder with DCC signals and keep your Märklin® brake sectors then you should switch off the DC analogue mode by deleting bit 1 in CV 50. The LokSound will stop as desired.

5.5.3. Lenz® ABC brake mode

LokSound 5 decoders support the ABC braking technique introduced by Lenz®. In order to use this function a group of antiparallel diodes will be soldered to one half of the track. The resulting fall of voltage generates an asymmetrical DCC signal. LokSound decoders are able to detect the potential difference between the left and right half of the signal. If desired, the decoder will be stopped.

To be able to use the ABC technique you also need, beside the adequate LokSound decoder, an appropriate brake module. The ABC technique can only be operated with boosters offering an exactly symmetrical output. All command stations and boosters by ESU and Lenz® guarantee a symmetrical output. We don´t recommend to use other boosters for the ABC technique.

- If you wish to stop the LokSound decoder when the track signal is stronger on the right side than on the left side (and the diods are also installed on the left side), set bit 0 in CV 27.
- If you wish to stop the LokSound decoder when the track signal is stronger on the left side than on the right side (and the diods are also installed on the right side), set bit 1 in CV 27.
- If you want to stop the decoder no matter in which half of the track the diodes are set, please set bit 0 and bit 1 in CV 27 (CV 27 = 3)).

5.6. Adjusting the volume

The volume of all individual sounds of the G1000 can be independently adjusted. This enables you to tune the model optimally according to your preferences.

5.6.1. Overall sound volume

If you wish to reduce the overall volume simply enter a lower value in CV 63 (master volume). All sounds will be adapted in the correct ratio.

5.6.2. Adjust individual sounds

If you wish to adjust the volume of individual sounds you must set the volume for each individual sound by changing the value of its corresponding CV. In order to enable the decoder to describe these CVs correctly you must assure that the so-called "Index CV" CV 32 has the correct value:

Before you change any volume CV please make sure that CV 32 = 1.

The CVs for the sounds are defined as follows:

CV	Function	Value
259	Prime mover	200
275	Primary horn	130
283	Secondary horn	200
291	Ventilator	200
299	Compressor	75
315	Coupler sound	70
323	Air outlet	54
331	Radiotransmission #1, #2	110
339	Sanding	35
347	Cab door open/close	95
355	Set/release loco brake	63
363	Coupler #2	70
371	Curve squeal	95
379	Heavy load A	82
387	Track squeal	42
395	Switch squeal	100
403	Heavy load B	82
411	Turbo	25
419	Switch from line to switching mode	30
427	Direction switch	20
435	Bell	70
443	Pre heater (218)	55
451	Brake button	55
467	Radiotransmission #3	110
475	Torque converter (triggered)	41
483	Torque converter	41
491	Emergency brake	148
499	Set/release train brake	60
507	Motor valve	27
259	Brake squeal	35

If you wish not to hear a certain sound (for instance, no sanding) then you set the corresponding CV to the value of "0".

5.7. PowerPack

The PowerPack energy storage module continues to provide electric current to the decoder in case of a power interruption. Should you have installed isolate track sectors ahead of signal where the sector is disconnected form the power source if the signal aspect shows "red", the locomotive will still be powered by the "PowerPack" and will therefore continue to run. Of course, in such a situation this may be undesirable.

Therefore it is possible to adjust the buffer time in CV 113 as a multiple of 0.016384 seconds. The default value facilitates about 2 seconds. For smooth running the time should not be set to any value lower than 0.3 seconds.

5.8. Decoder reset

You may reset the decoder to default values at any time.

Simply write the value 8 in CV 8.

5.9. Brightness of the lighting

The brightness of all LEDs of the G1000 can be changed. The range is from value 31 (maximum brightness, default value) down to the value 0 (lights are almost off, very dark).

Please change the following CV values:

Description	Decoder output	Index CV31	Index CV32	CV	Value
White back lower left	Light front[1]	16	0	262	31
White at the bottom left BLINK	Light front [2]	16	0	422	31
White lower right back	Light back[1]	16	0	270	31
White at the bottom right BLINK	Light back[2]	16	0	430	31
White front lower left	AUX1[1]	16	0	278	31
White front lower left BLINK	AUX1[2]	16	0	438	31
White front lower right	AUX2[1]	16	0	286	31
White front lower right BLINK	AUX2[2]	16	0	446	31
Brake lights flicker	AUX3	16	0	294	31
White back above	AUX4	16	0	302	31
White front center (high beam)	AUX5	16	0	310	31
Red front bottom	AUX6	16	0	318	31
Driver's cab lighting	AUX7	16	0	326	31
Red at the bottom	AUX8	16	0	334	31
Red center back	AUX9	16	0	342	31
Red front center	AUX10	16	0	350	31
Tread lighting	AUX11	16	0	358	31
White at the top	AUX12	16	0	366	31
White back center	AUX 13	16	0	374	31
Driver's desk lighting	AUX14	16	0	382	31
Coupler front	AUX15	16	0	390	12
Coupler back	AUX16	16	0	398	12
Coupler back	AUX17	16	0	406	12

5.10. Selection of braking noise

With CV 165 one of 4 braking noises can be selected. Possible values are 0 - 3, the factory setting is 0.

5.11. Idle operation

With the help of CV 168 you can set the time in quarter of a second until idle mode is automatically exited when you reverse the system (roll time). After this time has elapsed or the regulator has been turned up, the motor starts up again. The factory value is 100.

5.12. Selection of rail joints sound

CV 169 selects the desired noise for the rail joints. Possible values are 0-3, the factory.

6. Maintenance

6.1. Removing the housing

Put the model on its roof. You will find three screws at the bottom of the chassis. Remove these screws and put the model back on its wheels. Now you can remove the housing. While carefully lifting the housing upwards, bend the railings in the area of the cab a little outwards so that the steps do not get caught. The red circles in Fig. 6 show the screws that have to be loosened to remove the housing.

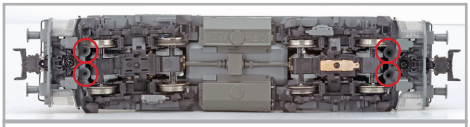

Figure 5: Remove the housing

6.2. Lubrication

We have equipped the G1000 with durable mechanical components. All moving parts have been permanently lubricated with durable grease and oil. Additional lubrication of these individual components is therefore usually not required.

6.3. Replacing traction tires

Traction tires do age and must be replaced sometimes. If mounted, remove the AC pickup first.

Insert the grinder removal tool into the front and rear openings in the gearbox and carefully pry off the gearbox cover.

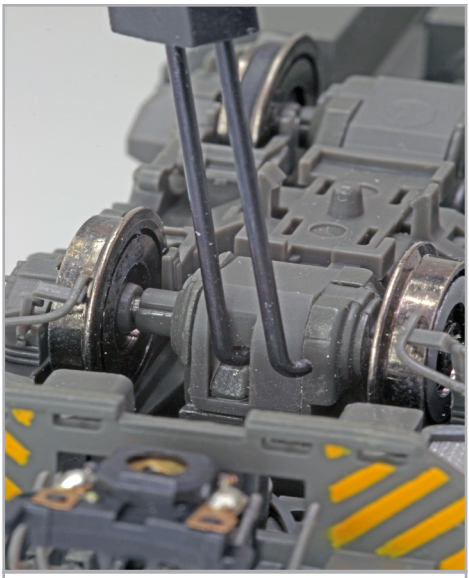

Figure 6: Replacing the traction tire

Now simply remove the wheel set with the traction tire. Now you can remove the damaged traction tire with thin tweezers.

Please make sure that the traction tires are put onto the wheel uniformly and without any tension in order to avoid out-of-round running characteristics of the model. It has proven quite useful to place the traction tires prior to mounting into some low surface tension water (a drop of dishwashing liquid is sufficient).

After reinserting the wheelset, put on the bogie cover and press on the gearbox above the axles until it clicks.

7. Technical support

Should you have questions regarding your G1000 to which you have not found the right answer in this manual please first contact your hobby shop. The people there are your competent contact for all questions relating to model trains.

Should you not be able to get an answer to your question look up our homepage in the www. We continuously publish topical questions and answers as well as the latest versions of manuals. Of course you will also see our postal address as well as our phone number on our site.

www.esu.eu

8. Spare parts

Due to the large number of parts built into your G1000 we have divided the spare parts in to component groups. Some parts belonging to large parts groups are also included in smaller groups. You can download the current spare part list from our website.

Please bear in mind that only the spare parts listed in the supplied spare part list are available ex works as spare parts. Enquiries for individual parts are pointless.

Should you require a spare part you must first identify the spare part group containing the needed part. For rarely needed parts you may have to purchase a larger component group. You must state the listed ESU part number when ordering spare parts from your hobby shop.

9. List of all important CVs

CV	Name	Description	Range	Value
1	Loco address	Address of the loco	1 - 127	03
2	Start voltage	Sets the minimum speed of the engine	1 - 75	03
3	Acceleration	This value multiplied by 0.25 is the time from stop to maximum speed	0 - 255	68
4	Deceleration	This value multiplied by 0.25 is the time from maximum speed to stop	0 - 255	52
5	Maximum speed	Maximum speed of the engine	0 - 255	180
8	Manufacturer's ID	Manufacturers's ID ESU - Writing value 8 in this CV triggers a reset to factory default values	-	151
17 18	Long address of the loco	Long address of engine CV 17 contains the high byte (Bit 6 and 7 must always be enabled), CV18 contains the Lowbyte. Active only if enabled in CV 29 (see below).	128 - 9999	192 128
19	Consist Address	Additional address for consist operation. Value 0 or 128 means: consist address is disabled	0-255	0
27	Brake mode	Allowed brake modes		24
		Bit: 0 — ABC braking, voltage higher on the right-hand side — 1		
		Bit: 1 — ABC braking, voltage higher on the left-hand side — 2		
		Bit: 2 — ZIMO HLU brakes active — 4		
		Bit: 3 — Brake on DC, if polarity against driving direction — 8		
		Bit: 4 — Brake On DC, if polaritiy like driving direction — 16		
28	RailCom® Configuration	Settings for RailCom®		131
		Bit: 0 — Channel 1 address broadcast not enabled — 0 Channel 1 address broadcast enabled — 1		
		Bit: 1 — Data transmission not allowed on Channel 2 — 0 Data transmission allowed on Channel 2 — 2		
		Bit: 2 — Command Acknowledgement on Channel 1 not allowed — 0 Command Acknowledgement on Channel 1 allowed — 4		
		Bit: 7 — RailComPlus® automatic loco recognition not active — 0 RailComPlus® automatic loco recognition active — 128		
29	Configuration register	This register contains important information, some of which are only relevant for DCC operation.		30
		Bit: 0 — Normal direction of travel — 0 Reversed direction of travel — 1		
		Bit: 1 — 14 speed steps DCC — 0 28 or 128 speed steps DCC — 2		
		Bit: 2 — Disable analog operation — 0 Enable analog operation — 4		
		Bit: 3 — Disable RailCom® — 0 Enable RailCom® — 8		
		Bit: 4 — - — 0 — 16		
		Bit: 5 — Short adresses (CV 1) in DCC mode — 0 Long addresses (CV 17 + 18) in DCC mode — 32		
48	Language selection	CV selects the language of the station announcement. See chapter 4.2.2.	0 - 255	0
49	Extended Configurations	More important adjustments for the decoder	0 - 255	17
		Bit: 0 — Enable Load control — 1 Disable Load control — 0		
		Bit: 1 — Reserved — 2		
		Bit: 2 — Reserved — 4		
		Bit: 3 — Märklin® Consecutive addresses, „low"-Bit" — 0 — 8		
		Bit: 4 — Disable automatic DCC speed step detection — 0 Enable automatic DCC speed step detection — 16		
		Bit: 5 — Disable LGB® function button mode — 0 Enable LGB® function button mode — 32		
		Bit: 6 — Reserved — 64		
		Bit: 7 — Märklin® Consecutive addresses, „high"-Bit — 0 Please note chapter 5.3.3.1. for explanation Bit 3, 7 — 128		

Important CVs

CV	Name	Description	Range	Value
50	Analogue mode	Selection of allowed analogue modes Bit: 0 — Disable AC Analogue Mode: 0; Enable AC Analogue Mode: 1 Bit: 1 — Disable DC Analogue Mode: 0; Enable DC Analogue Mode: 2	0 - 3	3
51	„K Slow“ Cutoff	Internal gear up to which the „K slow“ value set in CV 52 is used	0 - 255	10
52	Load control parameter „K slow“	„K“-component of the internal PI-controller for lower speed steps	0 - 255	05
53	Control Reference voltage	Defines the Back EMF voltage, which the motor should generate at maximum speed. The higher the efficiency of the motor, the higher this value may be set. If the engine does not reach maximum speed, reduce this parameter.	0 - 255	110
54	Load control parameter „K“	„K“-component of the internal PI-controller. Defines the effect of load control. The higher the value, the stronger the effect of Back EMF control.	0 - 255	40
55	Load control parameter „I“	„I“-component of the internal PI-controller. Defines the momentum (inertia) of the motor. The higher the momentum of the motor (large flywheel or bigger motor diameter), the higher this value has to be set.	0 - 255	10
56	Operating range of load control	0 – 100 % Defines up to which speed in % load control will be active.	0 - 255	255
63	Sound volume «Master»	Master volume for all sounds	0 - 192	192
67-94	Speed table	Defines motor voltage for speed steps. The values „in between“ will be interpolated.	0 - 255	-
113	Power Fail Bypass	The time that the decoder bridges via the PowerPack after an interruption of voltage. Unit: A multiple of 0.016384 sec.	0 - 255	61
116	EMF measuring period (sampling rate) at Vmin	Frequency of the EMF measurement in 0.1 milliseconds at speed level 1.	25 - 200	35
117	EMF measuring period (sampling rate) at Vmax	Frequency of the EMF measurement in 0.1 milliseconds at speed level 255.	25 - 200	50
118	Length of the blanking interval of the EMF voltage at Vmin	Length of the measurement gap in 0.1 milliseconds at speed step 1.	3 - 40	15
119	Length of the blanking interval of the EMF voltage at Vmax	Length of the measurement gap in 0.1 milliseconds at speed level 255.	3 - 40	20
125	Starting voltage Analogue DC		0 - 255	90
126	Maximum speed Analogue DC		0 - 255	130
127	Starting voltage Analogue AC		0 - 255	90
128	Maximum speed Analogue AC		0 - 255	130
138	Smoke generator - Blower	Adjusting the fan speed. The higher the value, the faster operates the fan and the more smoke will be ejected.	0 - 255	130
139	Smoke generator - Heating temperature	Adaption of the heating temperature of the smoke generator. The bigger the value, the higher the heating temperature.	0 - 255	128
253	Constant brake mode	Determines the constant brake mode. Only active, if CV254 >0 Function CV 253 = 0: Decoder stops linearly CV 253 > 0: Decoder stops constantly linear	0 - 255	0
254	Constant braking distance forward	A value > 0 determines the way of brake distance it adheres to, independent from speed.	0 - 255	0

10. Warranty Certificate

24 months warranty from date of purchase

Dear customer,

Congratulations on purchasing this ESU product. This quality product was manufactured applying the most advanced production methods and processes and was subjected to stringent quality checks and tests.

Therefore ESU electronic solutions ulm GmbH & Co. KG grants you a warranty for the purchase of ESU products that far exceeds the national warranty as governed by legislation in your country and beyond the warranty from your authorized ESU dealer. ESU grants an extended

Manufacturer's warranty of 24 months from date of purchase

Warranty conditions:

This warranty is valid for all ESU products that have been purchased from an authorized dealer.

No claims will be accepted without proof of purchase. We recommend keeping the receipt.

In case of claim please fill in the enclosed fault description as detailed and precise as possible and return it with your faulty product.

Extend of warranty/exclusions:

This warranty covers free of charge repair or replacement of the faulty part, provided the failure is demonstrably due to faulty design, manufacturing, material or transport. Please use the appropriate postage stamps when shipping the decoder to ESU. Any further claims are excluded.

The warranty expires:

1. In case of wear and tear due to normal use.

2. In case of conversions of ESU - products with parts not approved by the manufacturer.

3. In case of modifications of parts, particularly missing shrink sleeves, or wires directly extended on the decoder.

4. In case of inappropriate use (different to the intended use as specified by the manufacturer).

5. If the instructions as laid down in the user manual by ESU electronic solutions ulm GmbH & Co. KG were not adhere to.

Due to liability reasons any inspections or repairs can only be carried out on products that are not installed in a locomotive or carriage. Any locomotive sent to ESU for inspection will be returned without even touching it. There is no extension of the warranty period due to any repairs or replacements carried out by ESU.

You may submit your warranty claims either at your retailer or by shipping the product in question with the warranty certificate, the receipt of purchase and fault description directly to ESU electronic solutions ulm GmbH & Co. KG.

If you want to know the details how to handle warranty returns, please refer to our website **www.esu.eu**

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