

Class V160/BR218

Instruction manual

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RailCom
plus

M4



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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 „ESU H0-Diesellok V160/BR218“, 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

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Picture: M. Dimberger, Sg. J. Frickel

216 175 arrives in Bad Harzburg on May 27, 1991 with its short express train.

2. The Prototype

The development of the DB diesel locomotive family V160, to which the locomotives of the series V160 (later 216), 215, 217, 210 and 218 as well as the single piece 219 belong, goes back to 1956, the year of delivery of the first V200 series locomotives. At that time, the Federal Railway Central Office (BZA) in Munich commissioned the locomotive manufacturer Friedrich Krupp in Essen to develop a single-engine main-line diesel locomotive, which was to be in the hierarchy between the twin-engine V200 and the single-engine V100. The nine pre-series machines lovingly referred to as Lollo because of the conspicuous curvature of the end faces after the Italian film actress Gina Lollobrigida were handed over to the Deutsche Bundesbahn (DB) from August 1960. Since the rounded end faces were complex to manufacture, the V160 010 delivered in 1963 was given a more angular shape. The first series locomotives of the V160 were handed over to DB in 1964. Since it was already apparent that the V160, with its output of 1900 hp, a maximum speed of 120 km / h and the steam boiler installed for heating passenger trains, was often pushed to the limits of its performance, DB tried out various concepts for increasing performance with various locomotive factories. Common to the more powerful locomotives was the 40 cm longer overall length, which created space for a generator.

Since there was little experience with the electric train heating of the V162 and V169 in 1967 and a new, more powerful engine was to be tested, Krupp developed the 215 series, which was still equipped with steam heating, and which carried a new twelve-cylinder MA 12 V 956 TB10 from MAN. At the same time, the 218 series was developed, the 1st and 2nd series of which had the same engine as the 215, but was already equipped with a generator for the electric heating of the passenger trains ex works. The 398 copies of the 140 km / h fast 218 are used on all non-electrified routes of the former DB in front of passenger and freight trains.



Picture: R. Wiemann

218 143 stops with a sister locomotive in Heimat-Bw Hagen.

Model

3. The model

3.1. Important remarks - please read this first

Congratulations to your purchase of the H0 diesel locomotive V160/218. Your H0 model offers various innovative functions. This manual provides a step by step insight into the features of the V160/218. 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. Please make sure that the room has adequate ventilation when operating the smoke generator continuously!
- Keep the smoke distillate away from children. It contains substances that may damage your health if consumed. In case of contact with your eyes consult a doctor immediately.
- Please return the pipette only into the packaging after you have emptied it completely. Otherwise you may risk draining the smoke distillate.
- 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

Put the model screwed to the plastic holder with both hands out of the foam insert. In the box, you will find a hexagon spanner.

Now place the model on its side, hold the model and the plastic holder with one hand and release the hexagon bolt with the other hand.

Please keep all parts of the packaging and this manual for later use.

Only the original packaging guarantees proper protection against transport damage.

Please fix the locomotive by means of the hexagonal bolts to the plastic holder and place it into the foam insert and put it into the carton and the transport box prior to shipment.

If you are an AC modeler, i.e. need a locomotive with a center pick-up, you can place the V160/218 on the tracks and start driving immediately after entering address 3.

The pick-up shoe is responsible for the current consumption from the point contacts. The slide switch in the locomotive floor between the two air tanks must be set to AC for AC operation.

If you are a two-rail modeler, you must first dismantle the center pick-up.

3.2.1. Mounting & removing the centre 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 centre pick-up. Carefully (!) squeeze the tool and then lever the centre pick-up with a slight tug from its position.



Figure 1: Remove centre pick-up

Now you have to slide the slide switch in front of the air containers into the DC position.

The locomotive is now ready for operation on two-rail tracks.

Notes: If you do not slide the switch to the DC position, a short circuit will be 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".

Now you have to slide the switch into AC position.

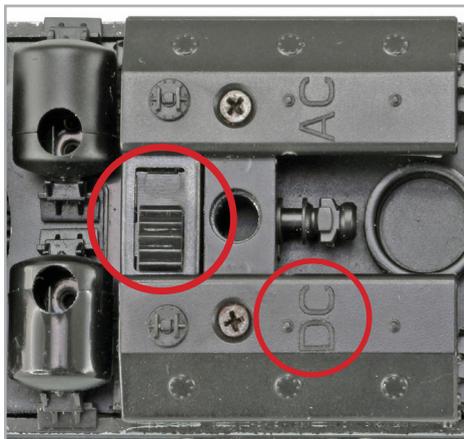


Figure 2: Set slide switch to DC operation

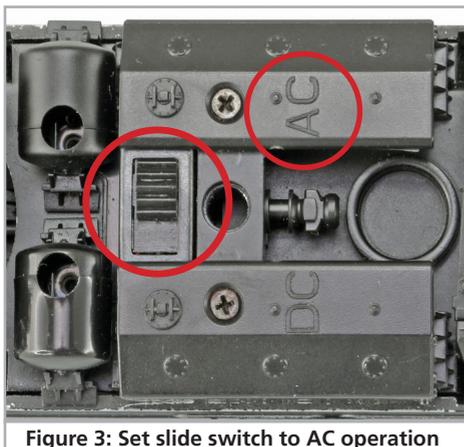


Figure 3: Set slide switch to AC operation

3.3. Outward appearance and special functions

With your new V160/218 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 in the roof.

The five pole motor with flywheel assure plenty of power and smooth running. Three 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 “Power-Pack” energy storage module.

In terms of its lighting the V160/218 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 a single white light at both ends. In addition there is cab lighting as well as illuminated driver’s cab-control panel.

4. The technology of the ESU model

The LokSound 5 decoder is a central part of your new V160/218. 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.

Operating modes

4.1. Possible operating modes of the V160/218

4.1.1. Analogue mode

The V160/218 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 V160/218 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 V160/218 can be operated with any DCC compliant system. Sounds and other functions of the V160/218 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 functions are available.

Function mapping (ex work) V160:

Button	Function
F0	Directional Headlights white/red
F1	Sound on/off
F2	Primary horn
F3	Smoke unit
F4	Directional cab light
F5	Lights off cab 1
F6	Lights off cab 2
F7	Directional dashboard light
F8	Shunting mode an shunting lights
F9	Horn
F10	Conductors whistle
F11	Coupler sound
F12	Curve sound off/on
F13	„Heavy load“ mode
F14	Air let off
F15	„Rolling“ mode
F16	Cab door open/close
F17	Brake function 1
F18	Station announcement #1
F19	Hand brake sound
F20	Radiotransmission #1
F21	Switch squeal
F22	Bell
F23	Steam heating boiler
F24	Compressor
F25	Sanding
F26	Sound fader
F27	Brake sound off
F28	Train brake off/on
F29	Radiotransmission #3
F30	Auxiliary diesel motor
F31	Rail joint sound

Function mapping (ex work) BR218:

Button	Function
F0	Directional Headlights white/red
F1	Sound on/off
F2	Primary horn
F3	Smoke unit
F4	Directional cab light
F5	Lights off cab 1
F6	Lights off cab 2
F7	Directional dashboard light
F8	Shunting mode an shunting lights
F9	Horn
F10	Conductors whistle
F11	Coupler sound
F12	Curve sound off/on
F13	„Heavy load“ mode
F14	Air let off
F15	„Rolling“ mode
F16	Cab door open/close
F17	Hydrodynamic brake
F18	Station announcement #1
F19	Hand brake sound
F20	Radiotransmission #1
F21	Switch squeal
F22	Radiotransmission #2
F23	Train heating
F24	Compressor
F25	Sanding
F26	Sound fader
F27	Brake sound off
F28	Train brake off/on
F29	Radiotransmission #3
F30	Preheater
F31	Rail joint sound

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 V160/218 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 V160/218 should light up. If you wish you may switch on the cab lighting with F4 in order to better see the cab interior.

If you now press F7 then the illuminated driver's cab-control panel will come to life. You will clearly see this through the side windows of the cab. It is common practice to turn off the head and tail lights at the cab where a train is coupled to the locomotive.

Sound functions

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.

4.2.2. Sound functions, driving and brake functions

After pressing F1 (preliminary lubrication and starting sequence) your V160/218 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 F17 brake function 1, the locomotive and train brakes contribute to the deceleration. In this way you achieve a greater delay than the value set in CV 4 of the decoder. When the brake is applied, the train decelerates faster to around 30 km/h, regardless of the throttle setting, the engine sound on the V160 / 216 automatically goes into fast idle. On the 218, the hydrodynamic brake is also activated. When the function is switched off, the locomotive accelerates again to the value corresponding to the speed controller position. The change of the values of F17 is described in chapter 4.2.6. shown.

To simulate heavy loads, switch on F13. This function causes the engine speed to increase by one step and the acceleration and deceleration times to be extended. Read about the adjustment of the function in chapter 4.2.7. If the train is to roll without engine power, switch on F15 operation „roll“ and the sound „falls“ into the increased idle for some time before it automatically adapts to the set speed level.

Of course you may trigger various user sounds with your throttle (refer to the table on page 6/7). You may also adjust the volume of each individual sound sequence. How to do this is described in chapter 5.6.

4.2.3. Synchronised smoke generator

The V160/218 is equipped with a load dependent, synchronised smoke generator that can be controlled with your command station respectively handheld throttle. The system consists of a holding tank for the smoke distillate, an evaporator unit with temperature control and a blower that exhausts the smoke in a controlled manner.

This system can adjust both the amount and the intensity of the smoke discharged subject to the operating conditions and thus assures prototypical performance. This system has been especially tuned for the loco and also comprehensively tested.

Please bear in mind the following remarks in order to assure safe operation:

Only use the ESU smoke distillate part NO. 51990. Other liquids may lead to damage of the paint finish, choking the system or a faulty heating unit due to unwanted deposits. Only activate the smoke generator while observing the model and in a well ventilated room.

4.2.3.1. Filling the smoke generator holding tank

First take the pipette from the packaging of the model and pull about 0.3 ml smoke distillate into it. Please observe the index markers on the pipette in order to establish the appropriate quantity.

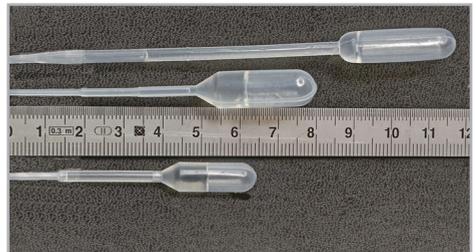


Figure 4: Maximum fluid level in pipette

Carefully inject the distillate into the diagonally offset exhaust openings (V160-216) or into one of the two exhaust stacks (218).

After filling, blow briefly but vigorously into the filled exhaust to remove any bubbles that may have formed.

Do not exceed the maximum quantity of the holding tank of 0.3 ml. If in doubt rather put less liquid into the system!

Due to the integral temperature sensor the smoke generator will not be damaged even if there is no liquid in the system!

Fill the smoke system only while the locomotive is on a horizontal sector but never on a gradient. Do not turn the locomotive with liquid in the tank sideways or upside down! This avoids the drainage of the distillate.

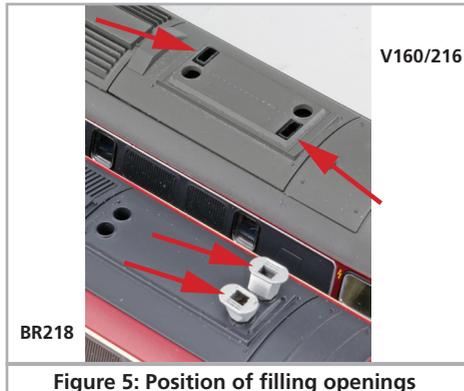


Figure 5: Position of filling openings

4.2.3.2. Operating the smoke generator

The smoke generator only works in conjunction with the sound. Smoke without sound is not possible.

First activate the smoke generator with the function button F3. As long as the engine (prime mover) is not running nothing happens just like with the prototype. After pressing F1 you will hear the sounds of the starter motor. As soon as the prime mover is firing acoustically the diesel locomotive blows a strong cloud of smoke from the exhaust into the "model sky". Like with the prototype the intensity of the smoke from the exhaust is reduced as soon as the prime mover begins to idle.

More intense smoke will be emitted during acceleration and, of course, there is no smoke when the locomotive slows down.

In order to protect the model the smoke generator is turned off automatically after 6 minutes. Thus overheating is avoided in case there is no distillate in the holding tank. Switch off the F3 button and then on again in order to reactivate the smoke function.

The maximum capacity of the holding tank is 0.3 ml and is sufficient for about 10 to 15 minutes operation.

In some instances it may happen that the system is clogged up due to an excessive amount of distillate in the holding tank. Simply blow some air through the exhaust opening in order to remove the drops of condensation.

The smoke generator system as well as the entire locomotive gets quite warm. Let the model cool down before putting it back into its packaging.

4.2.4. PowerPack energy storage

The V160/218 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.).

4.2.5. Shunting operations

Use the F8 key to switch to maneuvering mode: the maneuvering lights immediately indicate this optically.

With CV 101 (factory setting: 64) you set the maximum speed that can be reached in shunting mode. The locomotive reaches 70% of its normal maximum speed ex works.

4.2.6. Brake function #1

CV 179 (factory value: 70) indicates how much of CV 4 is removed when the locomotive brake (F17) is active. The higher the value, the more the locomotive brakes. Without changing the speed level on the speed controller, the locomotive automatically decelerates to a speed of the equivalent of 30 km/h. If you turn the speed controller to 0, the vehicle brakes to a standstill.

Decoder settings

4.2.7. Heavy load operation

With F13 you can switch to the „heavy load“ mode to simulate the journey with a heavy train. On the one hand the motor speed increases acoustically, on the other hand deceleration and acceleration times double. With CV 104 you determine by how many acoustic levels the motor turns higher than the speed set on the speed controller. Value 128 = no increase in speed level, value 255 = motor acoustically runs five levels higher than the speed level set on the speed controller.

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 standard 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 9 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“). CV 29 is an good example:

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 63. 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).

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 from 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 31". 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).

Decoder settings

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 V160/218, 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 V160/218. 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 V160/218 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 these 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 address	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 brake 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.

Decoder settings

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 diodes 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 diodes 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 V160/218 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	V160	218
		Value	
259			
427	Prime mover	220	160
491			
259	Brake squeal	120	100
275	Primary horn	160	160
283	Secondary horn	180	150
291	Ventilator	110	110
299	Compressor	52	65
307	Radiotransmission #2	128	128
315	Coupler sound	60	60
323	Air outlet	54	54
331	Conductor's whistle	80	80
339	Sanding	40	40
347	Cab door open/close	80	80
355	Set/release loco brake	63	63
363	Radiotransmission #5	210	230
371	Curve squeal	100	100
379	Bell	160	n.v.
387	Track squeal	80	80
395	Switch squeal	100	100
403	Radiotransmission #10	128	128
411	Auxiliary Diesel	90	n.v.
419	Switch from line to switching mode	30	30
427	Direction switch	30	25
435	Radiotransmission #4	90	115
443	Steam heating boiler (V160) Pre heater (218)	128	35
451	Brake button	60	55
459	Radiotransmission #3	90	115
467	Radiotransmission #1	90	115
483	Set/release hand brake	80	80
491	Turbo	30	60
499	Set/release train brake	40	40

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 from 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 of 60 facilitates about 1 second. 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 V160/218 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
Rear white lower right light	Front light [1]	16	0	262	31
Rear white lower left light	Back light [1]	16	0	270	31
Rear light red	AUX1[1]	16	0	278	31
Driver's desk lighting at the rear	AUX2[1]	16	0	286	31
Rear cab lighting	AUX3	16	0	294	31
Cab lighting in front	AUX4	16	0	302	31
Light front lower right white	AUX5	16	0	310	31
Light front lower left white	AUX6	16	0	318	31
Front light red	AUX7	16	0	326	31
Driver's desk lighting in front	AUX8	16	0	334	31
White rear light	AUX9	16	0	342	31
White front light	AUX10	16	0	350	31
Brake light bogies	AUX11	16	0	358	31

5.10. Selection of braking noise

BR216/V160: With CV 165 one of 4 braking noises can be selected. Possible values are 0 - 3, the factory setting is 0.

BR218: With CV 170 one of 4 braking noises can be selected. Possible values are 0 - 3, the factory setting is 0.

5.11. Selection of rail joints sound

BR216/V160: CV 164 selects the desired noise for the rail joints. Possible values are 0-3, the factory.

BR218: CV 169 selects the desired noise for the rail joints. Possible values are 0-3, the factory.

6. Maintenance

6.1. Removal of the housing

Before you put your 218 on the roof for work, remove the exhaust stacks on the roof. The V160 does not have such parts and is immediately placed on the roof. In the locomotive bottom you will find a total of four screws at the level of the inner axles of both bogies. You loosen these and put the model back on the wheels. Now the body can be lifted off chassis. The yellow circles in Fig. 06 (Fig. 06_6.1. Position of screws to remove body from chassis) show the screws that have to be loosened to remove the housing.

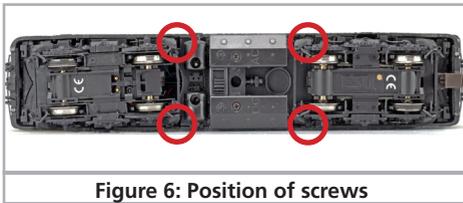


Figure 6: Position of screws

6.2. Lubrication

We have equipped the V160/218 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 gear box cover



Figure 7: Levering off the gear box cover

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 V160/218 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 V160/218 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	100
4	Deceleration	This value multiplied by 0.25 is the time from maximum speed to stop	0 - 255	100
5	Maximum speed	Maximum speed of the engine	0 - 255	240
8	Manufacturer's ID	Manufacturers's ID ESU - Writing value 8 in this CV triggers a reset to factory default values	-	151
17	Long address of the loco	Long address of engine	128 -	192
18		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).	9999	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	Function	Value
		0	ABC braking, voltage higher on the right-hand side	1
		1	ABC braking, voltage higher on the left-hand side	2
		2	ZIMO HLU brakes active	4
		3	Brake on DC, if polarity against driving direction	8
	4	Brake On DC, if polarity like driving direction	16	
28	RailCom® Configuration	Settings for RailCom®		131
		Bit	Function	Value
		0	Channel 1 address broadcast not enabled	0
			Channel 1 address broadcast enabled	1
		1	Data transmission not allowed on Channel 2	0
			Data transmission allowed on Channel 2	2
		2	Command Acknowledgement on Channel 1 not allowed	0
			Command Acknowledgement on Channel 1 allowed	4
	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	Function	Value
		0	Normal direction of travel	0
			Reversed direction of travel	1
		1	14 speed steps DCC	0
			28 or 128 speed steps DCC	2
		2	Disable analog operation	0
			Enable analog operation	4
		3	Disable RailCom®	0
			Enable RailCom®	8
	4	-	0	
			16	
	5	Short addresses (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	01
		Bit	Description	Value
		0	Enable Load control	1
			Disable Load control	0
		1	Reserved	2
		2	Reserved	4
		3	Märklin® Consecutive addresses, „low“-Bit“	0
				8
		4	Disable automatic DCC speed step detection	0
			Enable automatic DCC speed step detection	16
		5	Disable LGB® function button mode	0
		Enable LGB® function button mode	32	
	6	Reserved	64	
	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	0 - 3	03		
		Bit			Function	Value
		0			Disable AC Analogue Mode Enable AC Analogue Mode	0 1
		1			Disable DC Analogue Mode Enable DC Analogue Mode	0 2
51	„K Slow“ Cutoff	Internal gear up to which the „K slow“ value set in CV 52 is used	0 - 255	20		
52	Load control parameter „K slow“	„K“-component of the internal PI-controller for lower speed steps	0 - 255	20		
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	120		
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	25		
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	40		
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	50		
116	EMF measuring period (sampling rate) at Vmin	Frequency of the EMF measurement in 0.1 milliseconds at speed level 1.	25 - 200	40		
117	EMF measuring period (sampling rate) at Vmax	Frequency of the EMF measurement in 0.1 milliseconds at speed level 255.	25 - 200	100		
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	150		
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	100		
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	160		
253	Constant brake mode	Determines the constant brake mode. Only active, if CV254 >0	0 - 255	0		
		Function				
254	Constant braking distance forward	CV 253 = 0: Decoder stops linearly CV 253 > 0: Decoder stops constantly linear	0 - 255	0		
		A value > 0 determines the way of brake distance it adheres to, independent from speed.				

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



ESU P/N 00920-22569

