

Z21 Maintenance Tool User Manual

Legal notices, exclusion of liability

Modelleisenbahn GmbH expressly states that it shall under no circumstances be legally liable for the content in this document or for any additional information specified in this document.

The legal responsibility lies exclusively with the user of the data provided or with the publisher of the additional information in question.

The company Modelleisenbahn GmbH (of Plainbachstrasse 4, A-5101 Bergheim, Austria) expressly accepts no liability for any and all damages caused by the use or by the non-use of the information provided.

Modelleisenbahn GmbH, Plainbachstrasse 4, A-5101 Bergheim, Austria, accepts no responsibility for the up-to-dateness, correctness, completeness or quality of the information provided. No liability claims relating to damages of a material, immaterial or conceptual nature due to the use or non-use of the information shall be accepted.

Modelleisenbahn GmbH, Plainbachstrasse 4, A-5101 Bergheim, Austria, reserves the right to modify, supplement or delete the information provided without prior notice.

All brand names and trademarks mentioned in the document and where applicable protected by third parties, are subject without restriction to the provisions of the applicable trademark law and the ownership rights of the respective registered owners.

The copyright for published information provided by Modelleisenbahn GmbH, Plainbachstrasse 4, A-5101 Bergheim, Austria remains with Modelleisenbahn GmbH, Plainbachstrasse 4, A-5101 Bergheim, Austria.

Reproduction or use of the information provided in other electronic or printed publications is not permitted without express permission.

Should parts or individual formulations of the liability disclaimer not, no longer or not completely comply with the applicable legal position, the remaining parts of the disclaimer remain unaffected in their content and validity.

Publishing info

Apple, iPad, iPhone, iOS are trademarks of Apple Inc., registered in the U.S. and other countries.

App Store is a service mark of Apple Inc.

Android is a trademark of Google Inc.

Google Play is a service mark of Google Inc.

Motorola is a registered trademark of Motorola Inc., Tempe-Phoenix, USA

LocoNet is a registered trademark of Digitrax, Inc.

RailCom is a registered trademark of the company Lenz Elektronik GmbH.

XpressNet is a registered trademark of the company Lenz Elektronik GmbH.

All rights reserved; errors, omissions and delivery options excepted.
Specifications and illustrations subject to amendment. Subject to alteration.

Publisher: Modelleisenbahn GmbH, Plainbachstrasse 4, A-5101 Bergheim, Austria

Revision history

Date	Document version	Revision
07/02/13	1.00	Description for program version V1.00
20/03/13	1.01	Description for program version V1.01
19/04/13	1.02	Modifications for program version V1.02 Z21 FW V1.21; new "R-BUS" chapter created.
12/07/13	1.03	Modifications for program version V1.03 with smartRail FW V1.14
27/08/13	1.04	Modifications for program version V1.04 multiMAUS-Update, LNCV
07/11/13	1.05	Modifications for program version V1.05 with Z21 FW V1.22 and smartRail FW V1.15 Sniffer, LocoNet, CV programming
12/02/14	1.06	Modifications for program version V1.06 with Z21 FW V1.23 and smartRail FW V1.15 Settings, MM programming
21/05/14	1.07	Modifications for program version V1.07 with Z21 FW V1.24 and smartRail FW V1.15 Settings for short circuit detection
05/08/14	1.07.1	Error corrections
11/11/14	1.08	Modifications for program version V1.08 with Z21 FW V1.25 LocoNet, R-BUS, CV programming
26/02/15	1.09	Z21 firmware version V1.26
21/04/15	1.10	Z21 firmware version V1.27 Reset of the IP address for reset to factory settings
14/07/16	1.11	Z21 firmware version V1.28 z21start Unlock-Code Stop-Start Setting Decoder Update
21/08/17	1.12	Z21 firmware version V1.30 CAN feedback module
13/04/18	1.13	first English edition Z21 firmware version V1.32 multiMAUS firmware V1.05 (F0 to F28) CAN feedback module firmware version V3.1.20 Settings: DCC turnout-addressing according to RCN-213, DCC turnout invert straight/branch
19/12/18	1.14	Z21 firmware version V1.33 CAN booster
01/02/21	1.15	Z21 firmware version V1.40 Options, DCCext zLink Booster and Decoder
11/08/21	1.16	Z21 firmware version V1.41 MS decoder update
06/04/22	1.17	Z21 firmware version V1.42 and smartRail FW V1.16 Advanced settings, DCC CV calculator, CAN booster management, multiMAUS firmware update info
02/06/22	1.17.2	multiMAUS firmware V2.00 (F0 to F31, 2048 turnouts)
22/06/23	1.18	Z21 firmware version V1.43 Fast clock, DCC system capabilities, Z21 XL BOOSTER

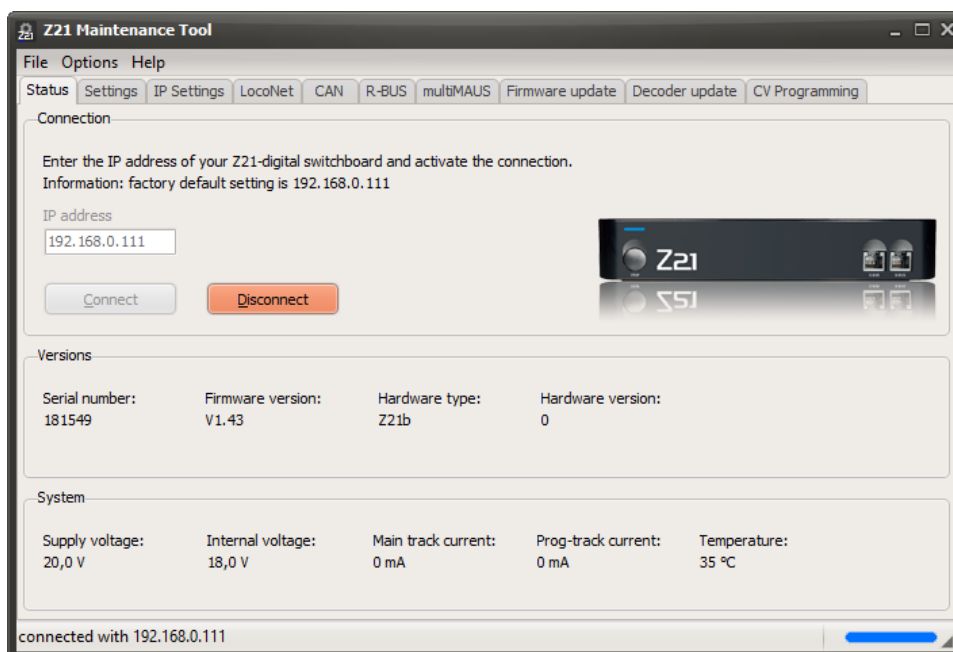
Contents

1	INTRODUCTION	6
2	CONNECTION FROM THE PC TO THE Z21	7
2.1	Connection options	7
2.1.1	Connection using Ethernet cable via the router included as standard	8
2.1.2	Connection using WI-FI via the router included as standard	10
2.1.3	Direct connection via Ethernet cable without router	13
2.2	Firewall	15
2.3	Making and testing the connection	16
2.3.1	Successful connection established with control centre	16
2.3.2	Connection problems	17
3	Z21 MAINTENANCE TOOL FEATURES	19
3.1	Status	19
3.1.1	z21start Unlock Code	20
3.2	Settings	22
3.2.1	Common settings	23
3.2.2	Programming settings	24
3.2.3	Advanced Settings	25
3.3	IP settings	28
3.4	LocoNet	31
3.5	CAN	34
3.5.1	Z21 CAN Detector	35
3.5.2	Z21 CAN Booster	37
3.6	R-BUS	42
3.6.1	Feedback BUS	42
3.6.2	XpressNet	44
3.7	multiMAUS Update	45
3.7.1	multiMAUS Error Messages	46
3.8	Firmware Update	47
3.9	Decoder Update	49
3.9.1	Notes on MX decoder update	51
3.9.2	Notes on MS decoder update	52
3.10	Program CV	55
3.10.1	Programming DCC decoders	55
3.10.2	Programming MM decoders	57
3.10.3	Programming CV-Sets	58
3.10.4	DCC CV Calculator	59

3.11 Options	60
3.11.1 Detector Monitor	60
3.11.2 RailCom Monitor	61
3.11.3 Loco List	62
3.11.4 Loco Controller	62
3.11.5 Signal Box	63
3.11.6 Fast clock	65
3.12 smartRail	68
3.12.1 smartRail Status	68
3.12.2 smartRail Settings	69
4 ZLINK	71
4.1 Z21 BOOSTER	72
4.1.1 Status	72
4.1.2 Settings	73
4.1.3 Firmware Update.....	73
4.2 Z21 switch DECODER	74
4.2.1 Status	74
4.2.2 Controlling	75
4.2.3 Settings.....	75
4.2.4 Firmware Update.....	76
4.2.5 CV Programming	76
4.3 Z21 signal DECODER	77
4.3.1 Status	77
4.3.2 Controlling	79
4.3.3 Settings.....	80
4.3.4 Firmware Update.....	80
4.3.5 CV Programming	81

1 Introduction

The Z21 Service Application "Z21_Maintenance.exe" has been created at the request of the Z21 Community. With this application you can configure and maintain your Z21 system equipment (white and black Z21, smartRail) via Ethernet or WI-FI.



In addition to the settings that you may be familiar with from the app, advanced users can also change the network settings (at your own risk!) or update the Z21 firmware.

Even more settings are also offered for smartRail.

In addition, a Zimo decoder update is provided for the Z21. However, as there are numerous possible sources of problems here – from inadequate contact on the track to conversions with buffer capacitors on the decoder – the information provided is also provided at the user's own risk.

Please take into account in the settings of your Windows firewall and potentially also of your virus scanner, that "Z21_Maintenance.exe" must be able to access the ports 21105, 21106 and 34472 via UDP in order to communicate with your Z21. Very strict settings on the virus scanner and firewall may cause communication on these ports to be reported as "suspicious network traffic" and be blocked.

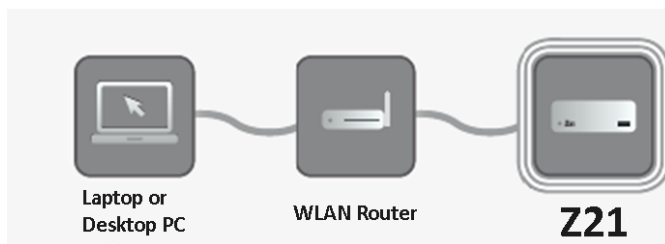
The application can be started directly after downloading. No installation is required. However, certain network settings need to be implemented; these are described in the sections below.

2 Connection from the PC to the Z21

2.1 Connection options

There are numerous options to connect the PC to the Z21:

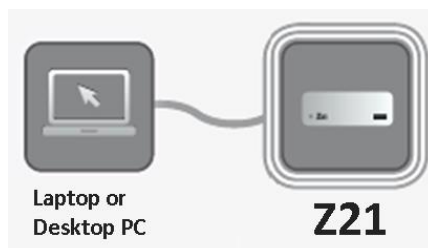
- **Cable connection from PC via the router included as standard.**
The connection is the easiest to set up. Both the PC and the Z21 are connected to the WI-FI router via Ethernet cable.



- **Connection using WI-FI via the router included as standard.**
To do this, the PC must be registered on the WI-FI router and the Z21 connected to the WI-FI router via Ethernet cable. With smartRail, only a connection via WI-FI is possible.



- **Direct connection without router using patch cable from the Ethernet port on the PC directly to the LAN port on the Z21.** This is the most stable connection. Omitting the router and manually configuring the PC interface eliminates many potential sources of problems. This type of connection is recommended for firmware and decoder updates should unexpected problems occur during the update.



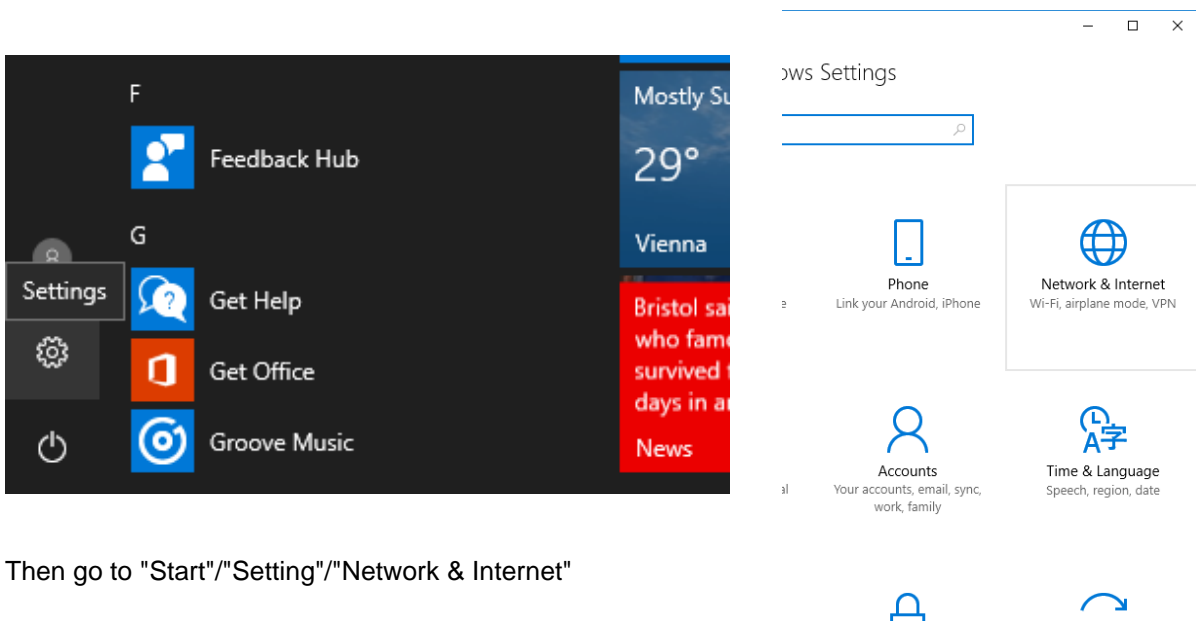
In all examples shown in this manual, it is assumed that the IP settings have not been changed in the Z21 and, where appropriate, the WI-FI router supplied is being used.

2.1.1 Connection using Ethernet cable via the router included as standard

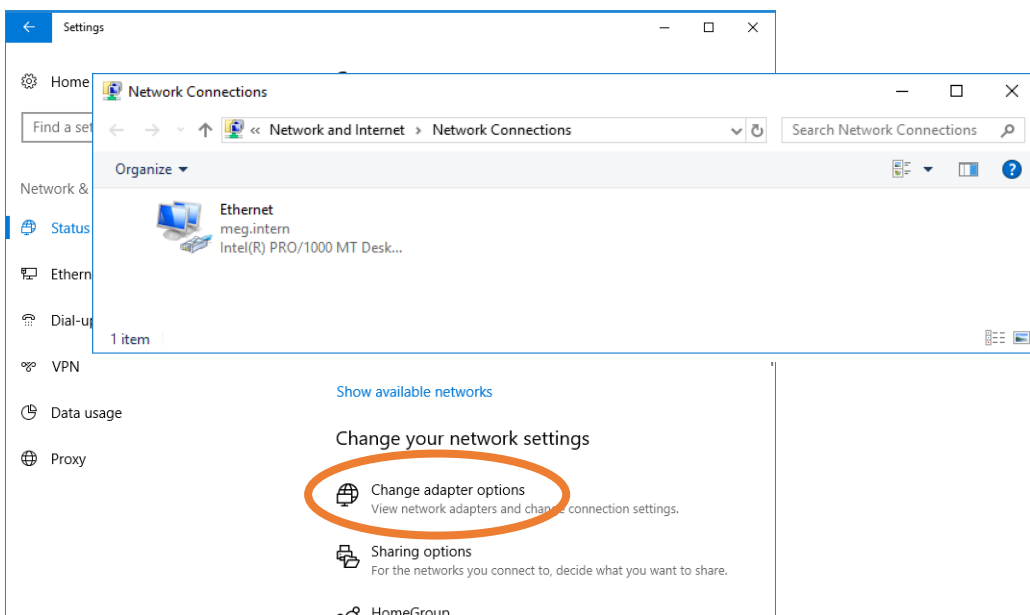
The connection is the easiest to set up. Where necessary, first disconnect any Ethernet cables already connected to the Ethernet port (100 MBit/s) on your PC.

Then insert an Ethernet cable (patch cable) into a free, yellow Ethernet port on the router supplied and connect the other end to the Ethernet port on your PC. The Z21 is also connected to a yellow port on the router.

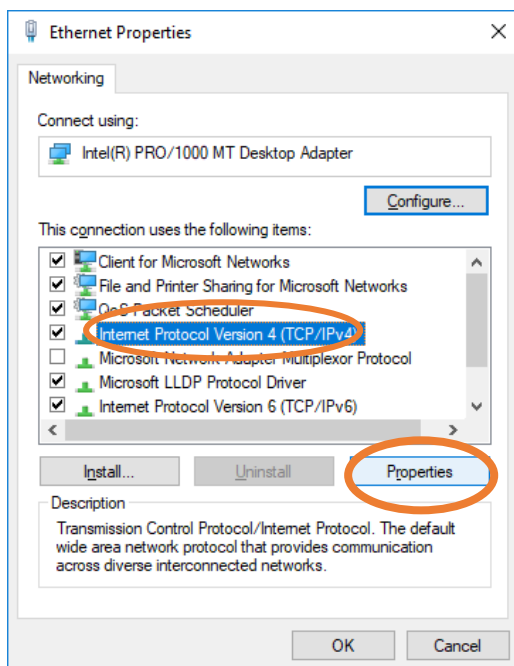
The PC should now be assigned an IP address by the router. If this is not the case, the network settings of the PC have been changed. Please check the following setting in the event of a problem:



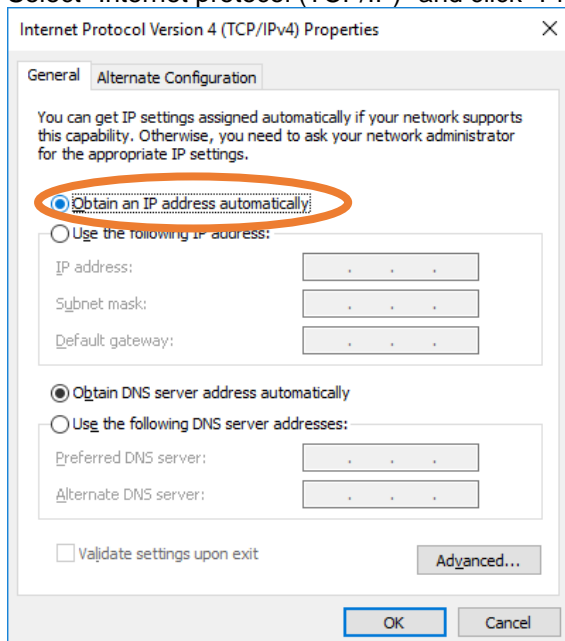
Then go to "Start"/"Setting"/"Network & Internet"



Select the option "Change adapter options"
 Select "Properties" for the port to which the Z21 now relates (right mouse button).



Select "Internet protocol (TCP/IP)" and click "Properties".

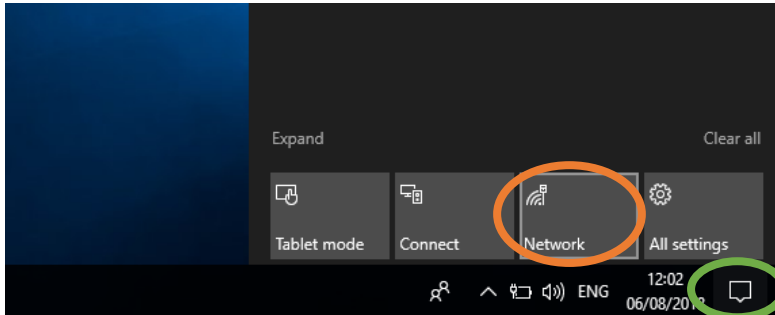


The default setting is "Obtain IP address automatically".

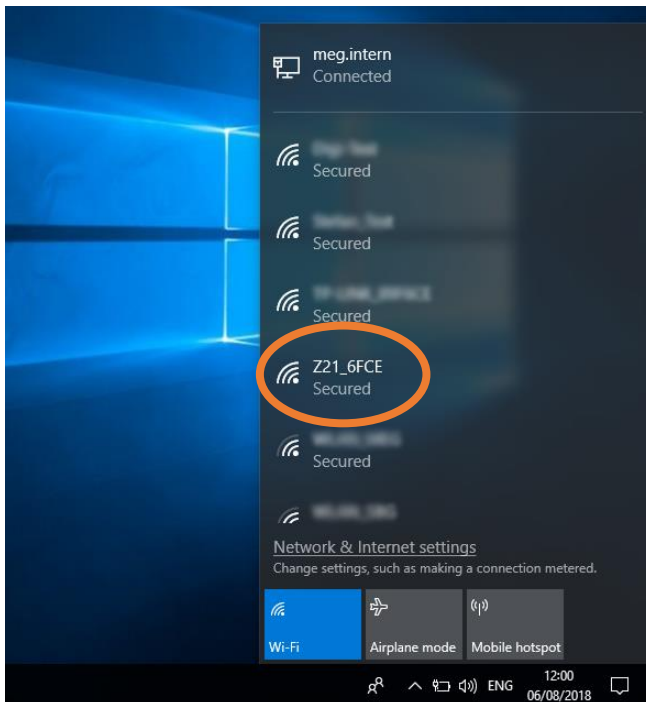
If the firewall is activated on your PC, you can now continue with step 2.2 "Firewall", otherwise go to step 2.3 "Making and testing the connection".

2.1.2 Connection using WI-FI via the router included as standard

Switch on Z21 and router.



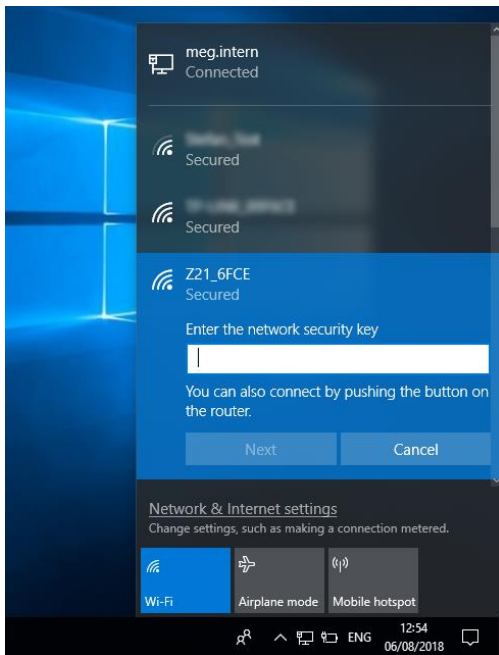
Click the mouse on the bubble (circled green) at the very bottom of the task bar and then on the network settings above.



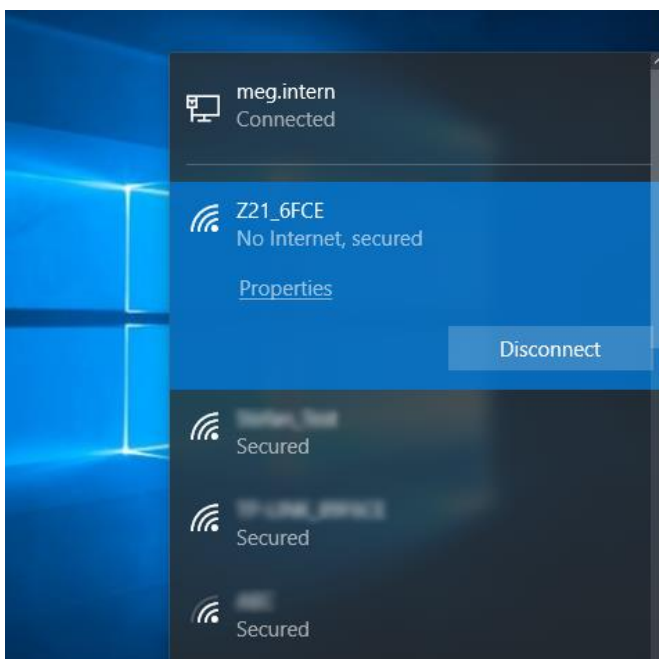
You can see a list of available networks

The name of the WI-FI network of the WI-FI router is “**Z21-wxyz**”, where wxyz are the end digits of the router serial number (see “S/N” field on the underside of the router).

Click on the relevant Z21 network.



Then enter the password for the network login.
This can be found in the "PIN" field on the underside of the router.
Then click "Next".

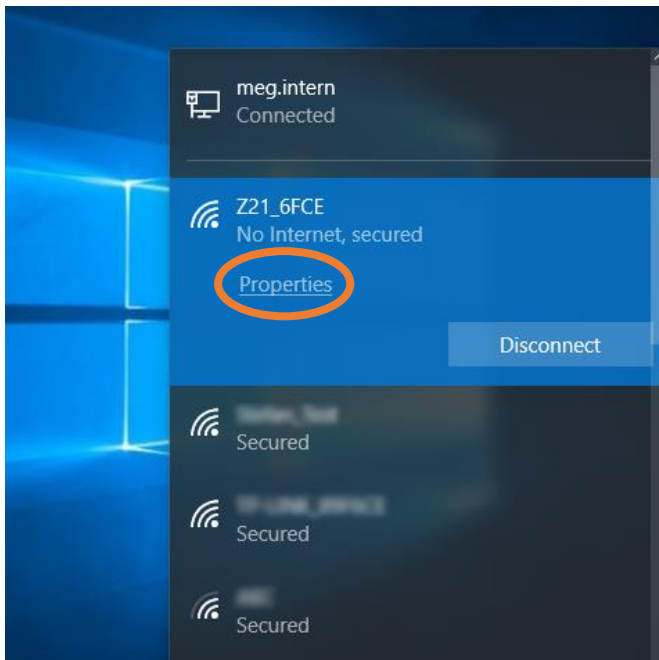


Now the WI-FI router is connected.

TIP!

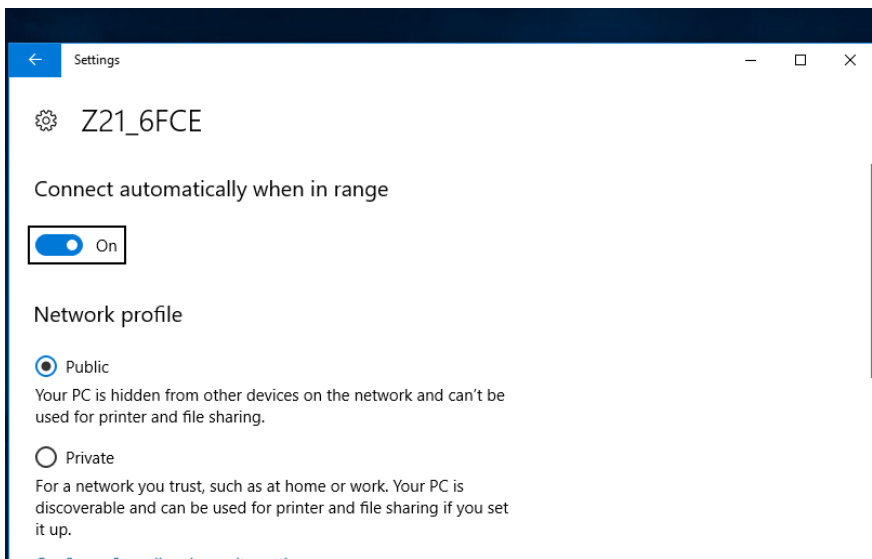
You probably don't want your PC to automatically connect to the Z21's wireless router in the future. This could be quite annoying when you want to use the wireless port on your PC for your normal internet connection. For this reason, proceed as follows:

In the dialogue shown above, select "Change advanced settings" (marked orange in the screenshot above).



Go to the "Wireless networks" list again.

Select the wireless router to which the Z21 is connected and select "Properties".



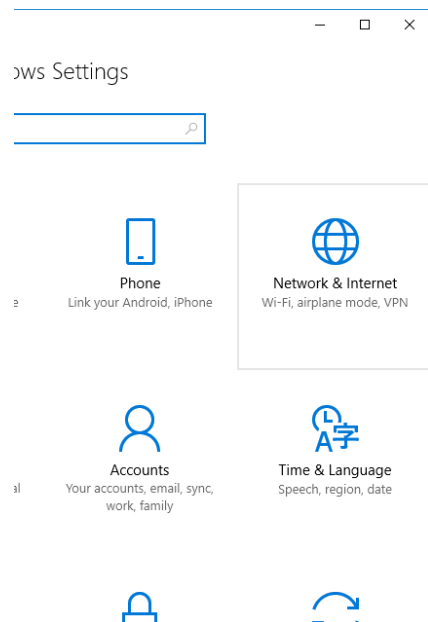
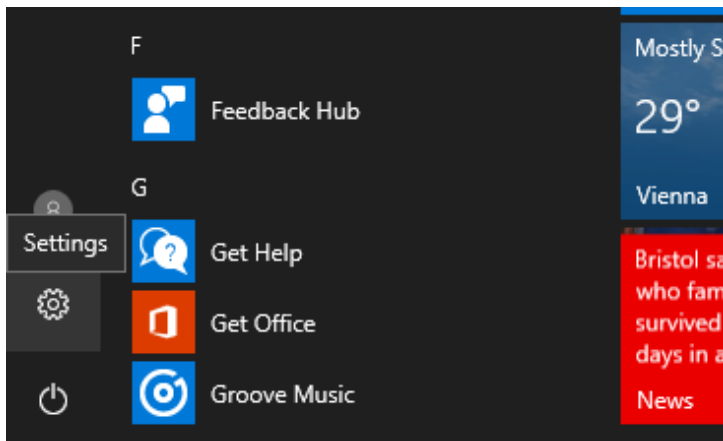
On the "Connection" tab, uncheck *"Connect automatically when this network is in range"*. Then close the dialogue with "OK". This means that the connection to the Z21-WI-FI needs to be actively set manually when you actually want to use it.

If the firewall is activated on your PC, you can now continue with step **2.2** "Firewall", otherwise go to step **2.3** "Making and testing the connection".

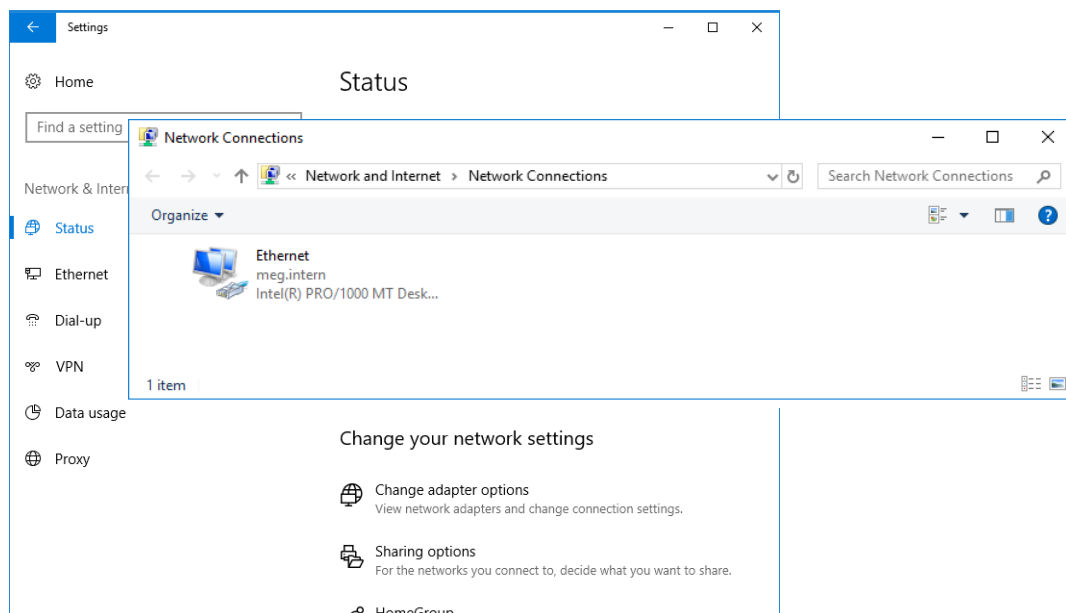
2.1.3 Direct connection via Ethernet cable without router

The most stable connection to your Z21 can be made via a direct connection using a network patch cable. Omitting the router will remove a further potential source of error.

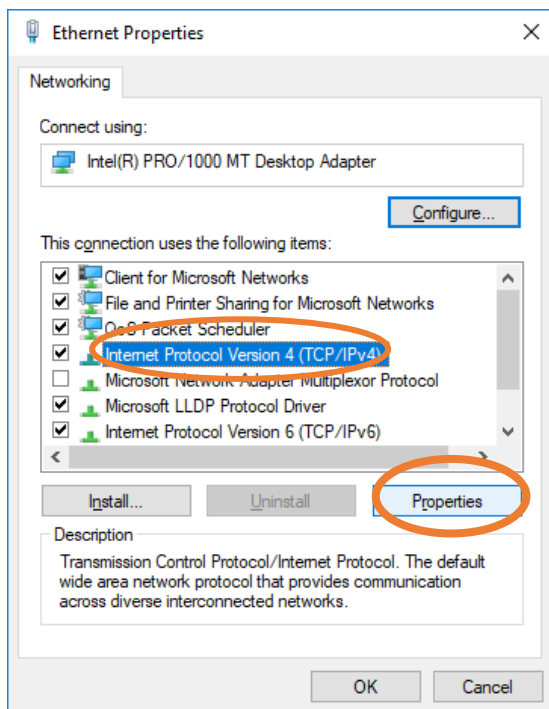
Where necessary, first disconnect any Ethernet cables already connected to the Ethernet port (100 MBit/s) on your PC. Then plug a patch cable into the LAN port on the Z21 and plug the other end into the Ethernet port on your PC.



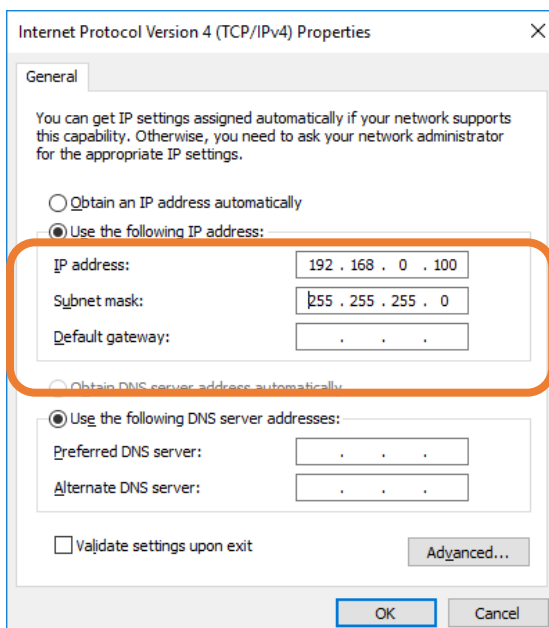
Then go to "Start" / "Settings" / "Network & Internet".



Select the option "Change adapter options"
 Select "Properties" for the port to which the Z21 now relates (right mouse button).



Select "Internet protocol (TCP/IP)" and click "Properties".



Warning! MAKE A NOTE OF YOUR CURRENT SETTINGS BEFORE CHANGING THEM SO THAT YOU WILL BE ABLE TO RECONFIGURE THIS PORT FOLLOWING MAINTENANCE ON THE Z21.

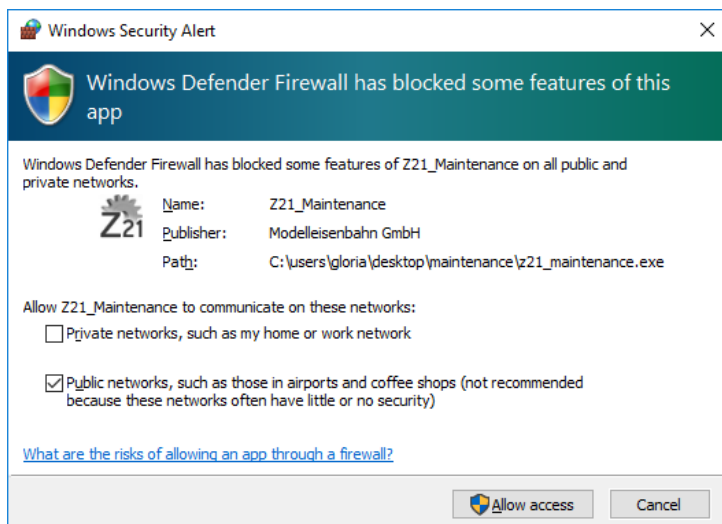
In this dialogue, configure the properties exactly as shown in this screenshot and confirm with "OK".

Warning! Do not forget to reconfigure this network port in accordance with the settings you previously noted down after working with the Z21 Maintenance Tool.

If the firewall is activated on your PC, you can now continue with step 2.2 "Firewall", otherwise go to step 2.3 "Making and testing the connection".

2.2 Firewall

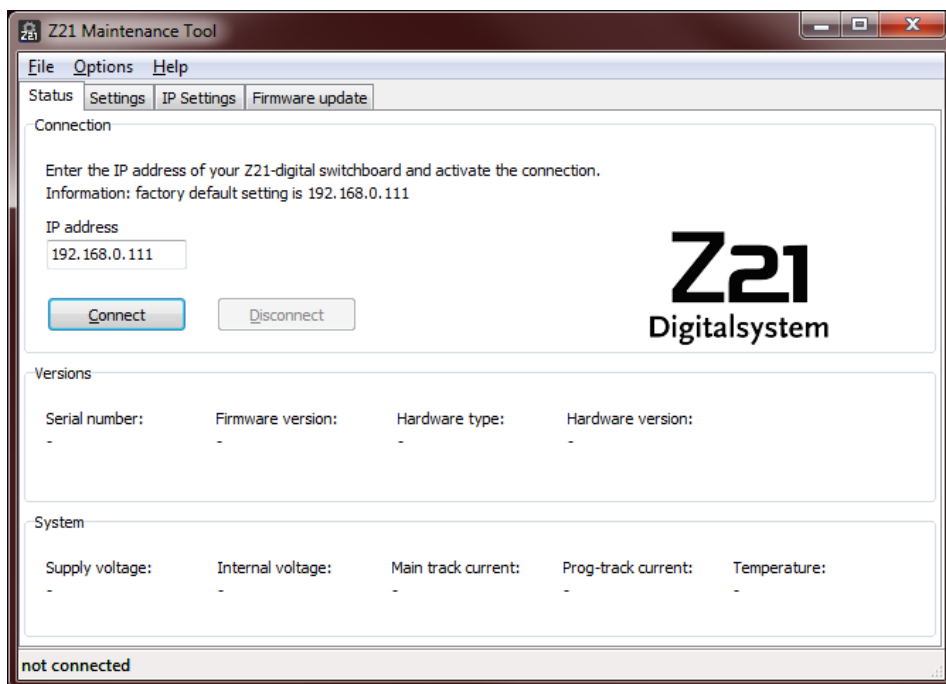
If the following message appears when you have activated the Windows firewall and when first starting "Z21_Maintenance.exe", the firewall settings must be modified for the Z21 Maintenance Tool:



The context to this message is that "Z21_Maintenance.exe" communicates with the Z21 via **UDP** using the **IP ports 21105, 21106 and 34472**. It may even be that very strict settings on a virus scanner mean that an alarm is issued due to "*suspicious network traffic*". Communication via these ports is a little different in comparison to a "normal" PC application, but you already know that the Z21 likes to do things a little differently!

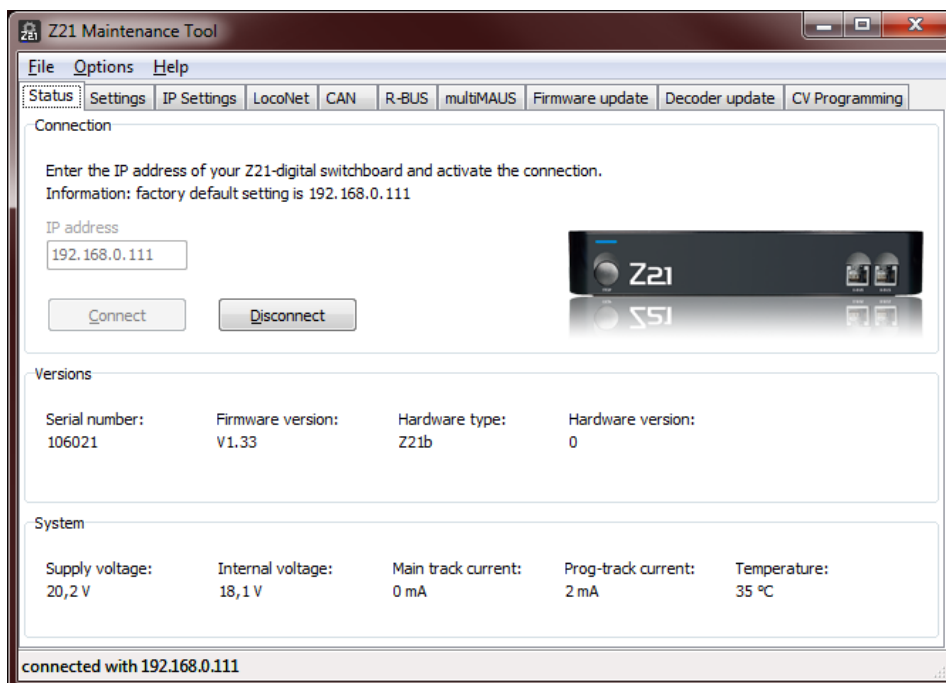
The simplest option is to click "*Do not block*" in the dialogue shown above. If you are using a different firewall, it is very likely that a similar message will be displayed and you will be able to set up a similar rule that achieves the same purpose.

2.3 Making and testing the connection



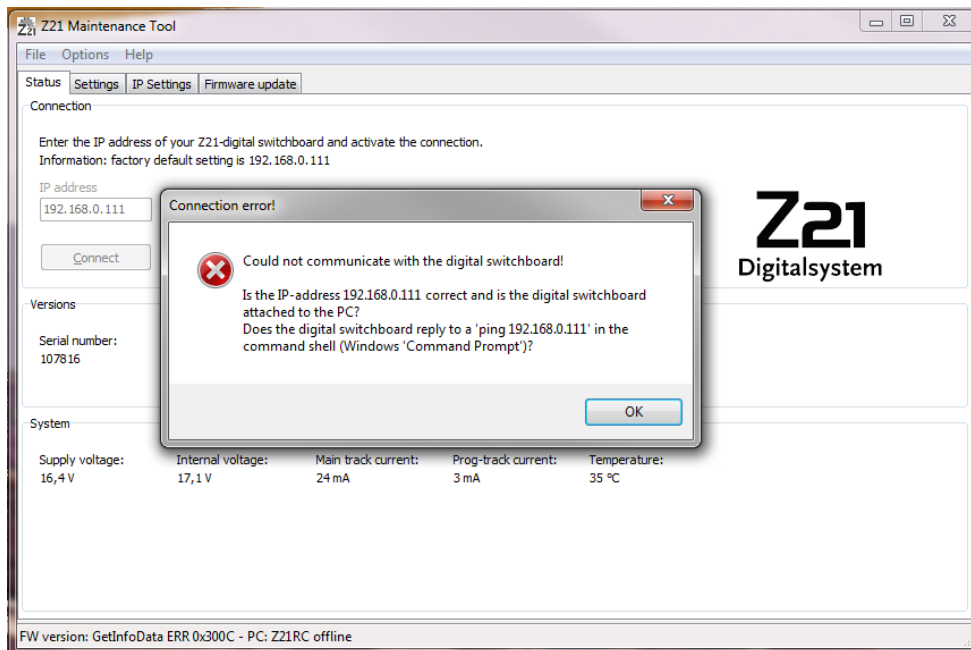
Start Z21_Maintenance.exe and click "Connect".

2.3.1 Successful connection established with control centre



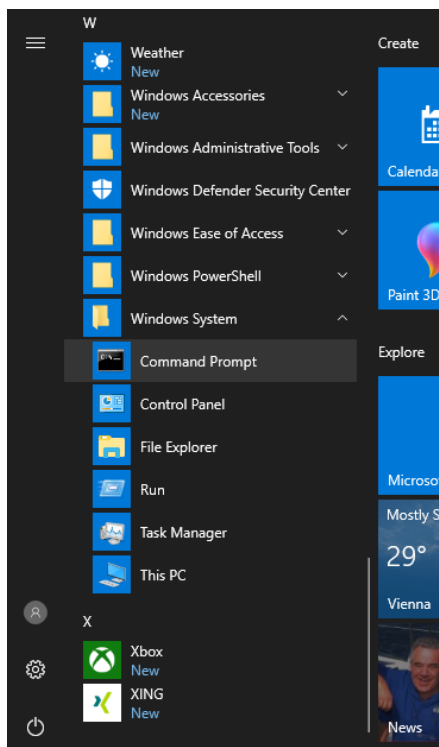
Ideally this image will appear: The Z21 is detected and the connection is established.

2.3.2 Connection problems

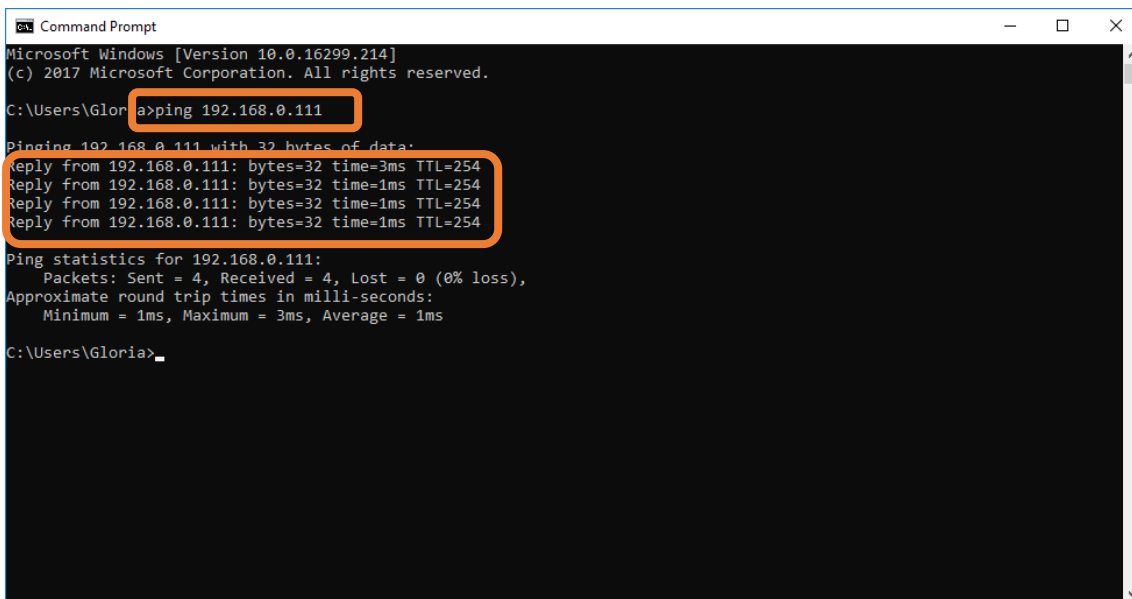


This image shows you that the connection cannot be established.

Check the connection using "ping":



To do this, launch the Windows command prompt.
In the command prompt, enter the command **"ping 192.168.0.111"** and press the Enter key.



```
Command Prompt
Microsoft Windows [Version 10.0.16299.214]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\Gloria>ping 192.168.0.111

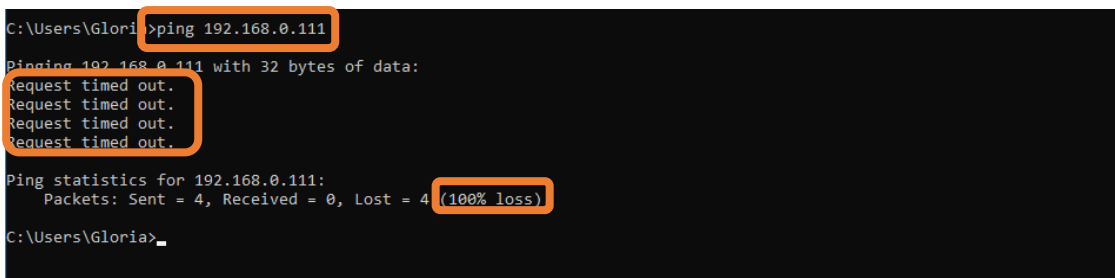
Pinging 192.168.0.111 with 32 bytes of data:
Reply from 192.168.0.111: bytes=32 time=3ms TTL=254
Reply from 192.168.0.111: bytes=32 time=1ms TTL=254
Reply from 192.168.0.111: bytes=32 time=1ms TTL=254
Reply from 192.168.0.111: bytes=32 time=1ms TTL=254

Ping statistics for 192.168.0.111:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 3ms, Average = 1ms

C:\Users\Gloria>
```

In this case, the connection is already working in principle. Check the firewall settings (see previous section) and the virus scanner (log, where applicable).

Try connecting again in the Z21_Maintenance.exe file. Often Windows needs a little more time after plugging in the cable until the connection is completely established. The status of the network can usually be seen in the Windows task bar (bottom right, if necessary click on the corresponding network icon).



```
C:\Users\Gloria>ping 192.168.0.111

Pinging 192.168.0.111 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.0.111:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss)

C:\Users\Gloria>
```

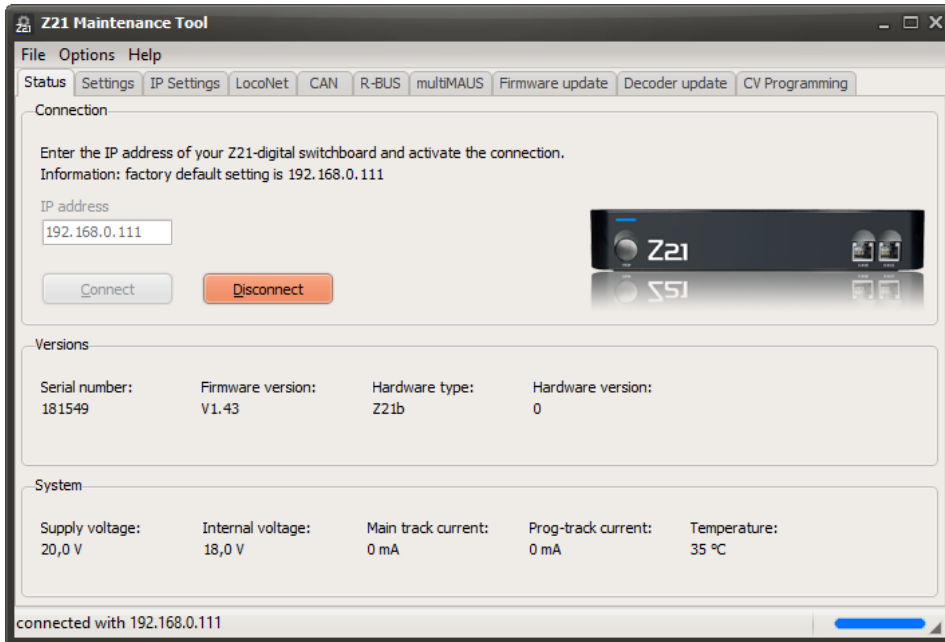
If the control centre does not respond to a ping, the Z21_Maintenance.exe file can be ruled out as the cause of the problem, but instead relates to the network or the network configuration.

Check the connection again, paying attention to unimportant details and things that seem obvious.

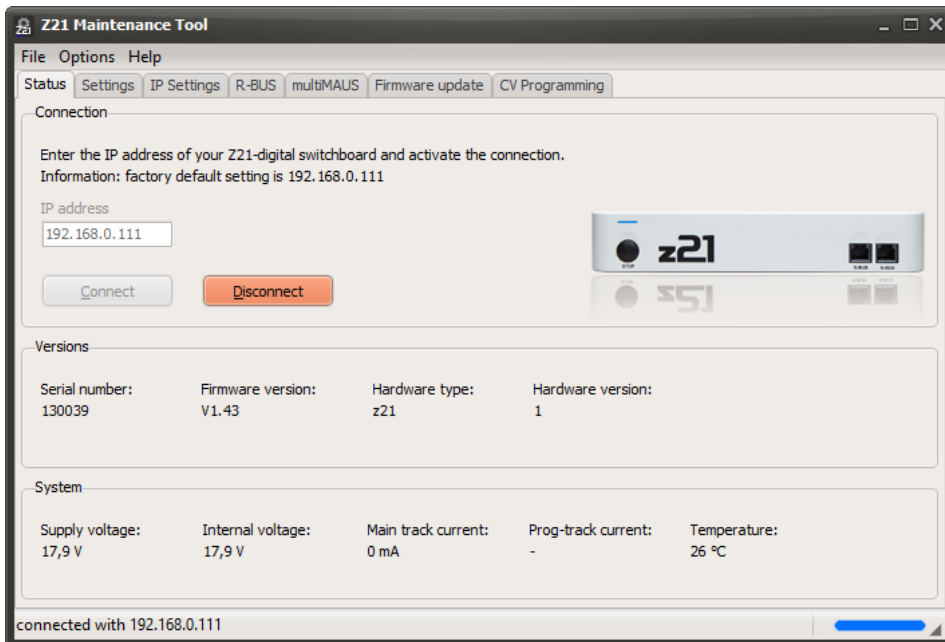
- Is the cable plugged into the correct ports and is there a power supply to the Z21?
- Does this network cable normally work?
- Is it possible to access the router, where a wireless network is set up (ping to 192.168.0.1, for example)?
- Is the port being blocked by the firewall or the virus scanner?
- Repeat and check the network port settings (as described in the previous sections) until the ping works.

3 Z21 Maintenance Tool Features

3.1 Status

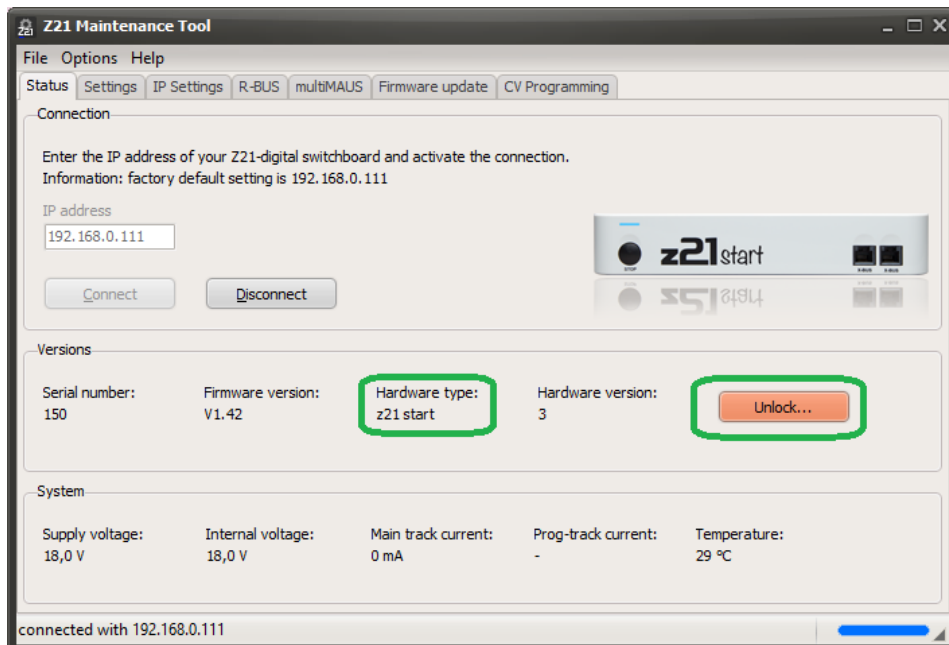


When the connection is successfully established, you can check the FW version and other operating parameters of your control centre. The "internal voltage" corresponds to the current track voltage. The Z21 Maintenance Tool automatically detects which type of hardware it is connected to.



3.1.1 z21start Unlock Code

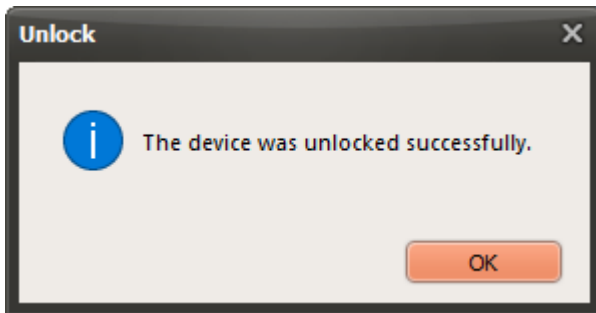
If the z21start is not yet unlocked, an "Unlock..." button will be displayed after connection. If the button is greyed out, then the z21start is already unlocked.



This button can be used to open the dialogue window where you can enter the activation code (article number 10814).

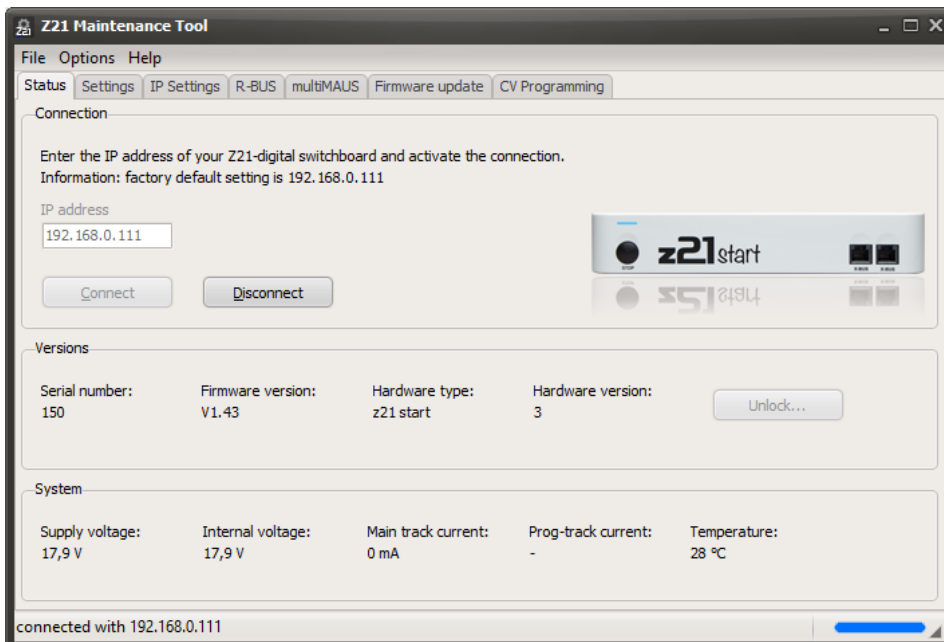


The unlock process can take up to 10 seconds.



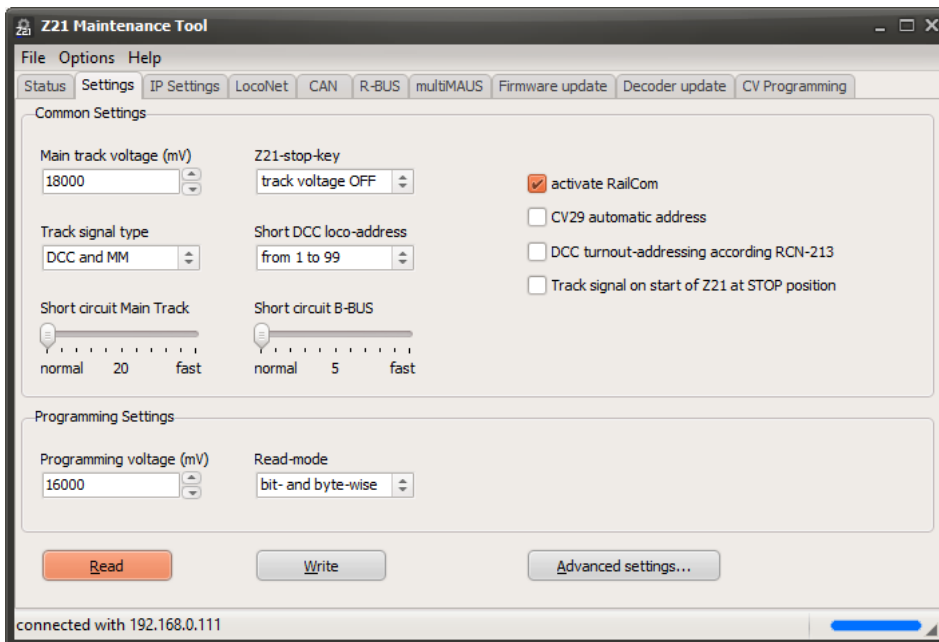
This means that the z21start picks up the loco and turnout commands via the LAN port and processes them.

If the z21start has been successfully unlocked, the "Unlock..." button remains greyed out.

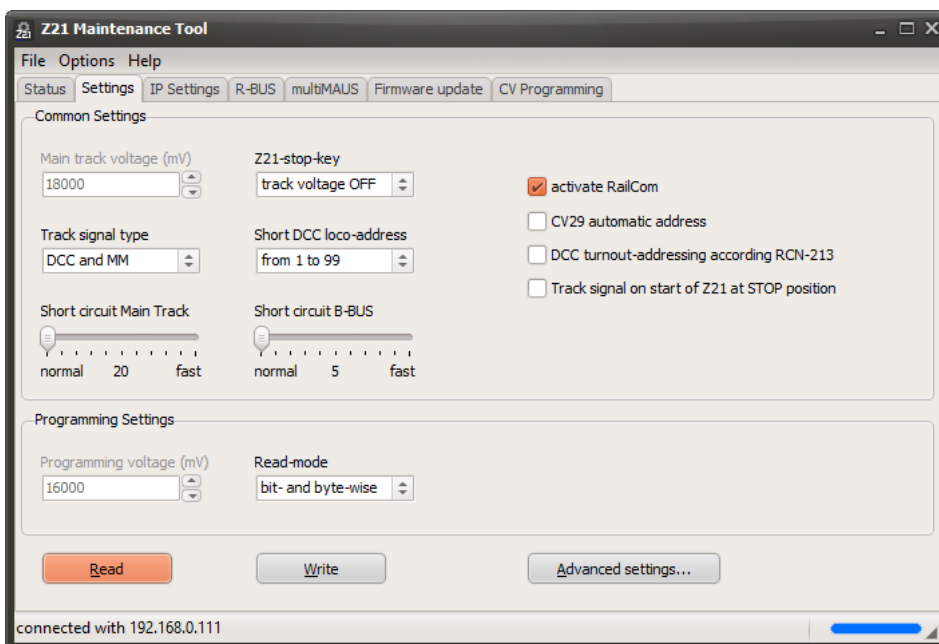


3.2 Settings

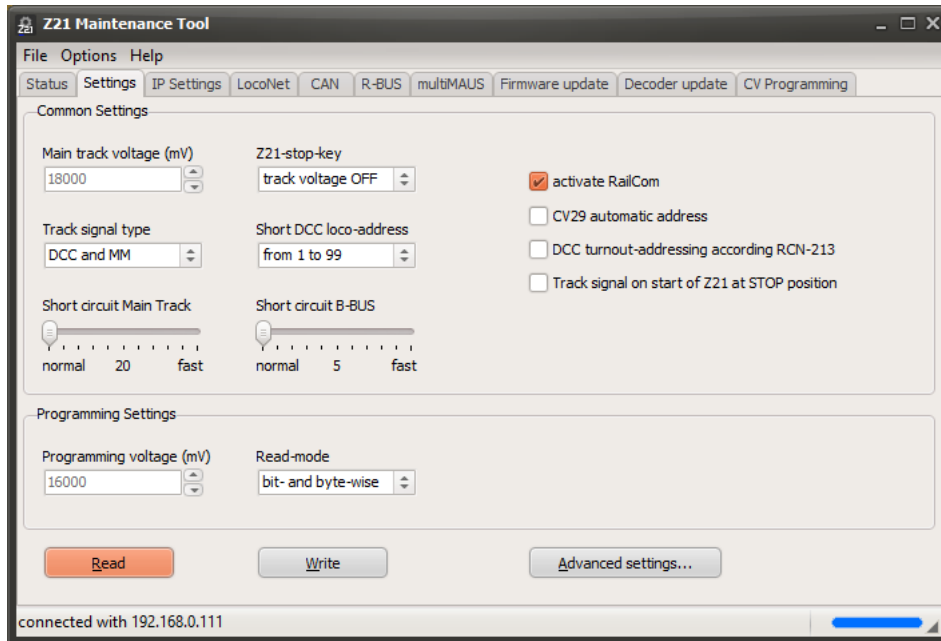
The available setting options are automatically modified according to the detected hardware type.



Settings for the "Z21 version for experts" (black box)



Settings for the "z21 version for beginners" (white box)



Settings for the "Z21XL" (for large tracks 0, 1, 2/G)

3.2.1 Common settings

Main track voltage: the track voltage on the main track can be set here on the black Z21. However, the main track voltage cannot be higher than the voltage from the power supply unit. With the white z21 and z21start, the track voltage cannot be set by the hardware and is instead specified by the voltage from the power supply unit.

Z21 stop key: This option is used to set the function of the STOP key on the control centre. Either the **track voltage can be switched off**, or with the power supply maintained, an **emergency stop** command can be sent to the locomotives.

Track signal type: This option can be used to select the command type on the track.

- **DCC and MM:** The Z21 functions as a multi-protocol control centre and sends the data packets of the corresponding vehicle/turnout in DCC or Motorola format. The format of the individual vehicles/turnouts can be configured via the app. This setting remains permanently stored on the Z21.
- **DCC only:** Regardless of the vehicle/turnout setting, the data packets are only issued in DCC format.
- **MM only:** Regardless of the vehicle/turnout setting, the data packets are only issued in Motorola format.

This option is available from Z21 firmware V1.23.

Short DCC loco address: This option can be used to set the address range in which "short addresses" are generated for DCC locos on the track output. This should be taken into account in the loco decoder (see decoder descriptions CV1, CV17, CV18, CV29).

- **From 1 to 99:** This is the backward compatible default setting of the Z21. For locos with addresses from 1 to 99, DCC packets with short addresses are generated; from address 100, DCC packets with long addresses are generated.
- **From 1 to 127:** For locos with addresses from 1 to 127, DCC packets with short addresses are generated; from address 128, DCC packets with long addresses are generated.

This option is available from Z21 firmware V1.23.

Short circuit main track and Short circuit B-BUS: These options can be used to increase the response speed of the short circuit detection on the main track (DCC Main) and on the B-BUS (Booster-Bus). This can be used for systems on track N in particular.

Activate RailCom: RailCom, in other words communication from the decoder to the control centre is required, for example, if you also want to export a RailCom-compatible decoder in the main track programming (POM) or if the feedback module 10808 is to report the locomotive addresses. With some, generally very old decoders developed before the introduction of RailCom, however, incompatibilities may occur when operating with RailCom. For this reason, RailCom can normally be deactivated here.

CV29 automatic address: This option is only important for operation with the multiMAUS. If you are using the multiMAUS to program a short or long address, this option on the decoder can be used to set or delete bit 5 in CV29 ("long address") automatically.

DCC turnout-addressing according RCN-213 (identical to previous option "**DCC turnout addressing +4**"): This option can be used to correct incompatibilities relating to the numbering of turnout and signal addresses. Roco numbers the turnouts from module 0 (each with 4 turnouts), other DCC control centre manufacturers only from module 1. This different numbering has originated historically from a weakness in the **NMRA S-9.2.1** specifications where neither of the two numbering systems could essentially be called "incorrect". The numbering of the turnout addresses has only been clearly defined since the more recent specifications from the RailCommunity **RCN-213** (2015).

The default setting for this option is "deactivated" to remain backward compatible with older Roco devices. When switching from an existing third-party system to the Z21, it can therefore happen that the previously known turnout addresses appear shifted by the value 4 due to the different counting method of the module groups. If a turnout on the former third party system has been set below 1, for example, it is addressed on the Z21 as 1+4=5. To make it easier for our customers to change over, this option has now been introduced that can be used to re-use the turnouts and signals with former known turnout addresses or address them in accordance with RCN-213.

This option is available from Z21 firmware V1.21.

From Z21 firmware V1.22, the setting not only affects the DCC packets on the track output, but also determines how turnout switching commands are interpreted on the Sniffer BUS input.

Track signal on start of Z21 at STOP position: With this option the track output on the Z21 or z21 remains switched off after the control centre is started.

This option is available from Z21 firmware V1.28.

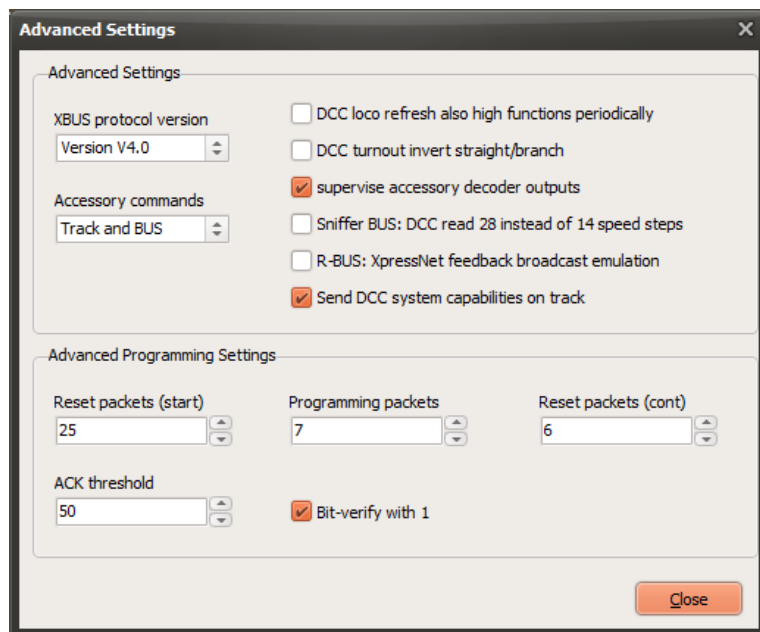
3.2.2 Programming settings

Programming voltage: in this case the black Z21 can be used to set the track voltage for the CV programming process on the programming track. However, this voltage cannot be higher than the voltage from the power supply unit. With the z21 and z21start, however, there is no separate programming output with a voltage that can be set.

Read mode: One CV of a decoder can be exported either bitwise or bytewise on the programming track. While only a few accesses are required for **bitwise** reading, with **bytewise** reading all possible values can be tested until the correct value is found. This can take a long time depending on the value, as in the worst case scenario up to 256 attempts are required. Very old decoders can only be exported bytewise. Proceed as follows for the "**Bitwise and bytewise**" setting: An attempt is first made to export the CV bitwise. Bytewise reading is only started as a second attempt if bitwise is not successful.

3.2.3 Advanced Settings

The **Advanced Settings** button opens a pop-up window with further setting options that are only actually needed in special cases.



After closing the window, do not forget to save any changed settings into the Z21 by using the **Write** button in the main form.

XBUS protocol version

With this option the X-BUS protocol version can be selected. This setting can be useful if, contrary to expectations, some X-BUS device proves to be incompatible with protocol version 4.0.

1. **Version 4.0:** On the X-BUS, driving and switching commands are used, which are compatible with XpressNet V4.0 (e.g., LH101 FW V2.10). This is the default setting from Z21 firmware V1.42.
 - **Version 3.6:** The X-BUS uses driving and switching commands that are compatible with XpressNet V3.6. This was the protocol version used in Z21 firmware V1.24 to V1.41.

This option is available from Z21 firmware V1.42.

Accessory Commands

This option was created by customer request and can be used to prevent the output of commands for accessory decoders (e.g., switch decoders, signal decoders, ...) onto the main track and booster. This can be useful if you only use accessory decoders connected with CAN-BUS or LocoNet and want to reserve the available bandwidth on the track for vehicle decoder commands.

- **Track and BUS:** Commands for accessory decoders are sent on the main track as well as forwarded to X-BUS, LocoNet, CAN and LAN.
- **BUS only:** Commands for accessory decoders are only forwarded to X-BUS, LocoNet, CAN and LAN. There is no output on the main track or booster for accessory decoders.

This option is available from Z21 firmware V1.42.

DCC loco refresh also high functions periodically

Function commands for vehicle decoders from F0 to F12 are sent periodically (priority-controlled) on the main track – just like the current speed step and direction of travel. Higher function commands from F13 onwards, on the other hand, are only sent three times on the main track after a change of its state, and then, regarding the limited bandwidth on the main track and according to RCN-212, are no longer repeated periodically, until a next change of its state occurs. However, this can lead to problems with *permanent functions* from F13 onwards. Example: the interior lighting of a vehicle is activated with F19, and then there happens to be a somewhat longer interruption in the power supply to the vehicle. The

interior lighting goes off ... and stays off. All permanent functions from F13 are "forgotten" by the decoder because functions from F13 are not sent on the main track periodically.

By activating this option, you can force the Z21 to send also function commands from F13 onwards periodically, *while they are active*. This means that bandwidth is only consumed on the track if that high function is actually switched on. Thanks to the priority-controlled output of locomotive commands on the main track, this should be possible with smaller systems (e.g., up to 10 vehicles at the same time) without noticeable drawbacks. However, for larger model train layouts (clubs, ...) with many vehicles and many permanent functions from F13 onwards at the same time, activating this option is less recommended.

This option is available from Z21 firmware V1.42.

DCC turnout invert straight/branch: This option was created by customer request and can be used to invert the logic of the DCC switching commands for turnouts (straight/branch) and signals (green/red). This option can be useful for users who are switching their current system from an older third-party system to the Z21.

This option is available from Z21 firmware V1.31.

Supervise accessory decoder outputs: This option is used to monitor the outputs of function decoders using a timer and where necessary shut them down automatically after several seconds assuming a faulty controller (handheld controller, app, PC control, ...) has not already done so. This prevents overheating of the drive coils.

This option is available from Z21 firmware V1.20.

DCC read 28 instead of 14 speed steps on Sniffer BUS: With Z21 firmware version V1.22, the Sniffer BUS has been implemented. This means that you can also control the locos on the Z21 using an older DCC control centre by simply connecting the track output on the old control centre to the Sniffer BUS on the Z21. The Z21 attempts to map the format of the old control centre to the format of the loco set on the Z21 as far as possible. This makes it possible to use a very old control centre that only utilises the DCC format "14 speed steps" to control a modern loco with 128 speed steps or even one loco with MM decoder (Motorola).

However, it is not always technically possible to reliably detect the format "14 speed steps" and "28 speed steps" on the Sniffer input (comparison: loco decoder CV29 Bit 1) and to map it to the sets output format. In case of doubt, the Z21 uses "14 speed steps":

Setting of loco speed steps on the Z21:		14	28	128
Speed steps of loco n on the Sniffer input:	14	Ok	(a)	Ok
Speed steps of loco n on the Sniffer input:	28	(b)	OK	(b)
Speed steps of loco n on the Sniffer input:	128	Ok	OK	OK

(a) The light cannot be switched on because the Z21 also takes on the format "28 speed steps" with the "28 speed steps" loco setting for this loco on the Sniffer input, and for this reason has a futile wait for the light info in DCC function group1.

(b) Front light flickers with speed step. This can be corrected as follows:

- either the format in the third party control centre and as far as possible in the Z21 is configured appropriately (ideally with 128 speed steps),

- or in the third party control centre for this loco, the light (F0) is switched on to support automatic format detection,

- or in the Maintenance.exe file, the setting "DCC read 28 instead of 14 speed steps on Sniffer BUS" is activated.

This option is available from Z21 firmware V1.22.

R-BUS: XpressNet feedback broadcast emulation

This option was created by customer request and can be used for forwarding R-BUS feedback messages to X-BUS devices. Feedback messages from the R-BUS are then forwarded to the X-BUS as XpressNet messages ("feedback broadcast, adress type feedback module") and can then be watched on an LH101, for example.

For this purpose, however, the XpressNet feedback addresses 65 to 84 are used for the corresponding R-BUS feedback modules 1 to 20. But that means, that the turnouts 257 to 336 can practically no longer be switched properly via X-BUS, if this option is activated. This option should therefore only be activated if these XpressNet messages are really required in your system.

This option is available from Z21 firmware V1.42.

Send DCC system capabilities on track

With this option, the capabilities and settings of the DCC central station are periodically sent to the track with a new DCC command created specifically for this purpose (RailCommunity **RCN-211**). In this way, the decoders can then automatically adjust to the various options and peculiarities of the DCC central station in the future, e.g., RailCom and POM read, the maximum number of locomotive functions available or the exact way of addressing locomotives and accessories like turnouts and signals.

This option is available from Z21 firmware V1.43.

Advanced Programming Settings

Reset packets (start): Determines the number of DCC reset packets right at the start of the CV programming sequence (CV read/write). The higher this value is, the more time the decoder has to restart.

Programming packets: Determines the number of DCC read/write commands in the CV programming sequence (RP-9.2.3).

Reset packets (continue): Determines the number of DCC reset packets within the programming sequence.

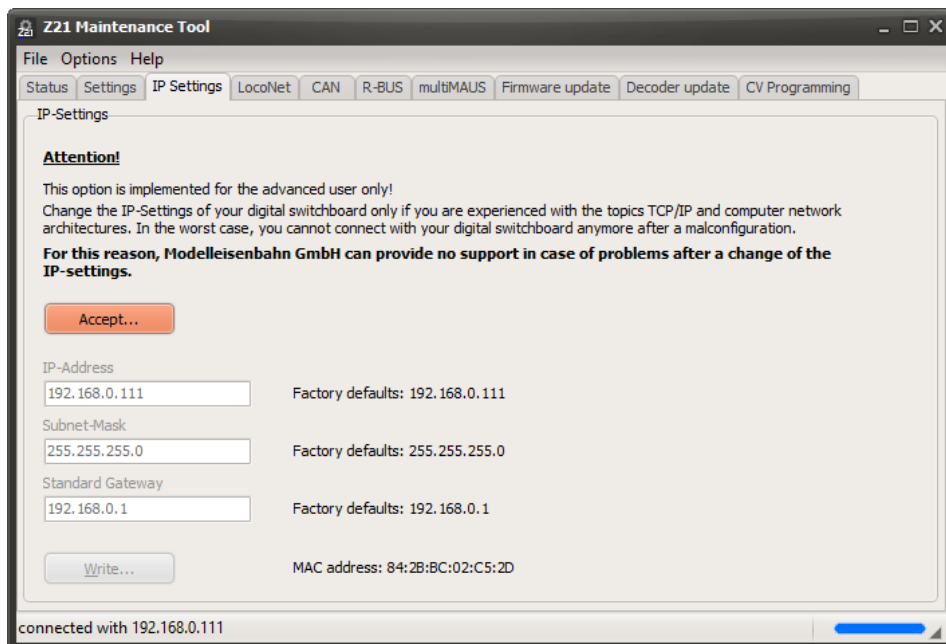
If you have problems during CV read/write with a specific decoder, you can change this packet number, e.g. 25/10/10 or 30/15/15.

ACK threshold: A loco decoder responds to CV read and CV write queries with a slightly increased power supply in accordance with "*Basic Acknowledgement*" from RP-9.2.3: "... *increased load (positive-delta) on the programming track of at least 60 mA for 6 ms +/- 1 ms*".

Although the Z21 is already set slightly more sensitively from FW V1.20, in practice it can unfortunately occur even more often that some decoders deviate from the standard and cannot therefore be read. However, this can also occur when a buffer capacitor is used. To be able to successfully export these decoders, the threshold for detecting the "*Basic Acknowledgement*" can be set lower here, or even higher if necessary.

This option is available from Z21 firmware V1.20.

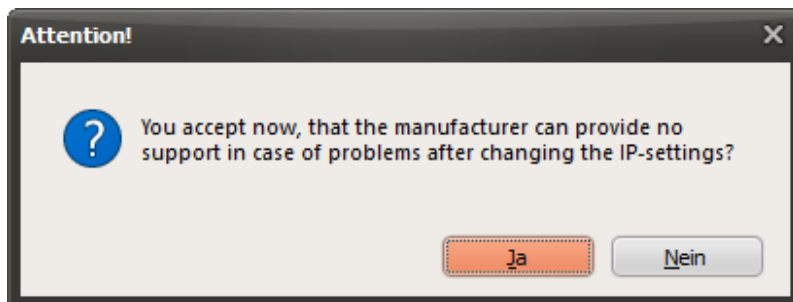
3.3 IP settings



As requested by some customers, the IP address of the Z21 can be changed.

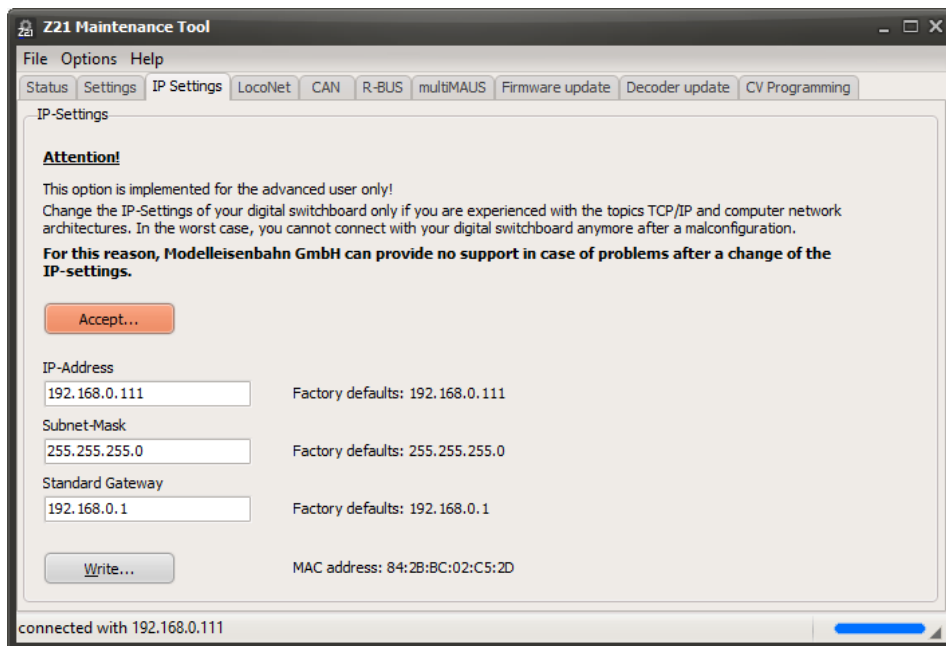
This is not required for the average consumer and is definitely not recommended by the manufacturer. Please note the relevant notes in the screenshots.

Known issues: The routers from some internet service providers may reserve certain LAN ports for IP-TV. Old HUBs can also cause communication problems.

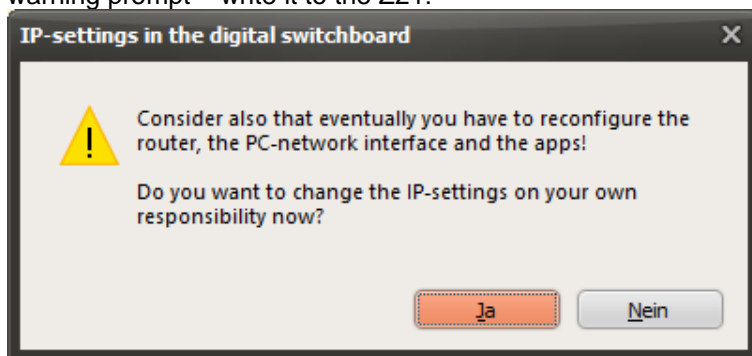


Before the user can enter a new IP address, the compulsory disclaimer must first be explicitly accepted:

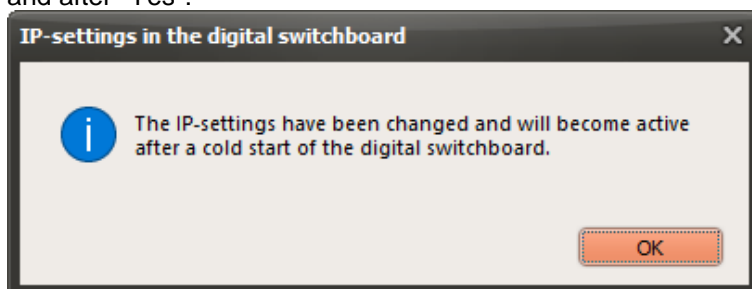
The input fields only become active once the user has clicked "Yes".



Only then is it possible to change the address to "192.168.0. **123**" for example and – following another warning prompt – write it to the Z21:

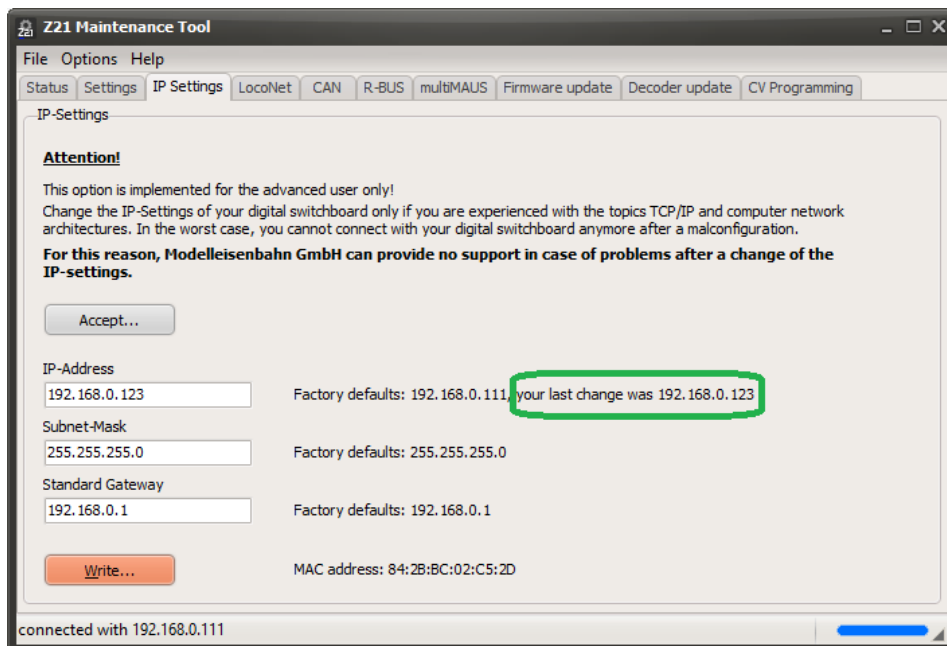


and after "Yes":



Important: The new IP address is only active in the Z21 following a cold start (i.e. disconnect supply voltage) on the control centre!

The last change is also displayed in the program as "Your last change was...".



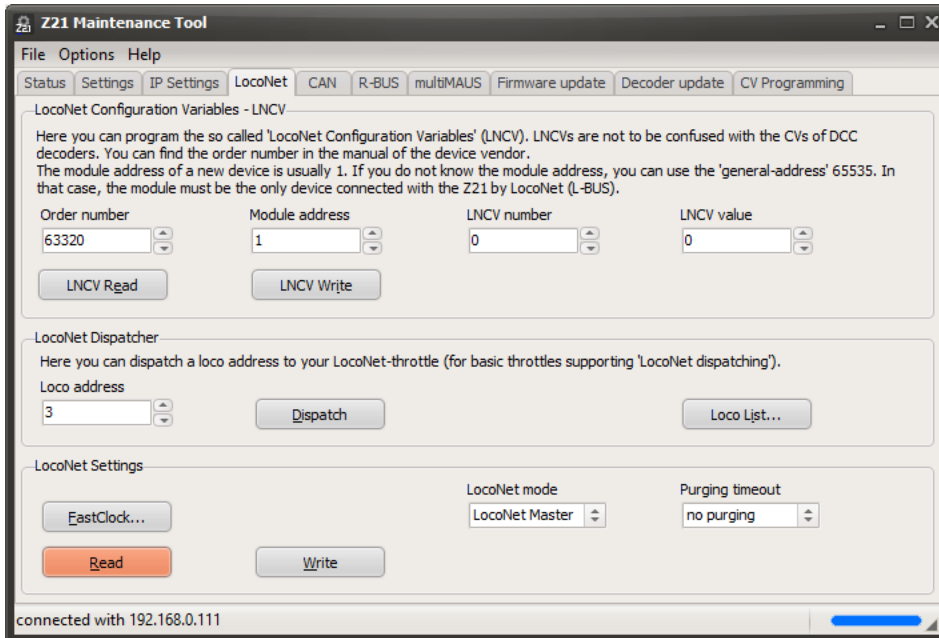
Please note that every change in the IP address on the Z21 also might require a network reset, beginning with the subnet masks, router, own Ethernet port on the PC to the app settings on the smartphone or tablet, etc.

The following applies up to firmware V1.26: This modified IP address is retained even after resetting to the factory settings (hold down stop key until LED flashes purple).
From V1.27 the IP settings are reset to the factory setting.

3.4 LocoNet

LocoNet is enabled from Z21 firmware V1.20.

With firmware V1.20 the first step was completed on the Z21 towards LocoNet integration.

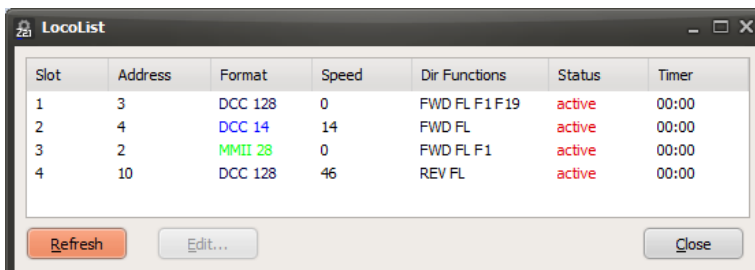


LNCV Read and **LNCV Write** can be used to program what are known as "LocoNet Configuration Variables" that are used in some LocoNet accessory articles (e.g. Uhlenbrock 63410 "LocoNet Switch Module"). Details and meanings of the individual LNCVs can be found in the relevant operating instructions from the manufacturer.

LocoNet Dispatch can be used to prepare a loco address which you can then transfer using the LocoNet Dispatch process to your LocoNet handheld controller (e.g. FRED).

From [Z21 firmware V1.25](#) the **Loco List** provides you with an overview of all vehicles that have been used since the last time the Z21 was switched on. In addition to the vehicle address, the rail format used, the speed and the active functions used are displayed. "Edit..." or the right mouse button can be used to change the rail format of the selected loco. The LocoNet Dispatch can also be initiated in the loco list using the right-hand mouse button.

The *Status* and *Timer* columns relate to what is known as "Purging", see below.



Slot	Address	Format	Speed	Dir Functions	Status	Timer
1	3	DCC 128	0	FWD FL F1 F19	active	00:00
2	4	DCC 14	14	FWD FL	active	00:00
3	2	MMII 28	0	FWD FL F1	active	00:00
4	10	DCC 128	46	REV FL	active	00:00

Below the table are buttons for 'Refresh', 'Edit...', and 'Close'.

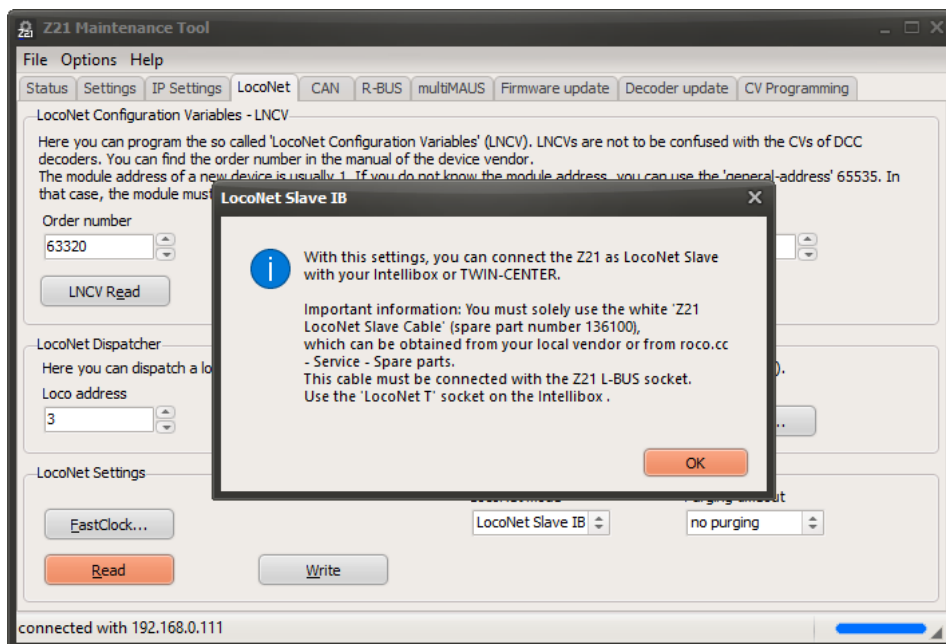
In **LocoNet Settings** you can activate the LocoNet fast clock ("model time") and configure its rate by pressing the button **FastClock**. Description see chapter 3.11.6 *Fast clock*.

From [Z21 Firmware V1.22](#) you can use **LocoNet Mode** to configure the Z21 as "LocoNet Master" (default setting) or as "LocoNet Slave on Intellibox".

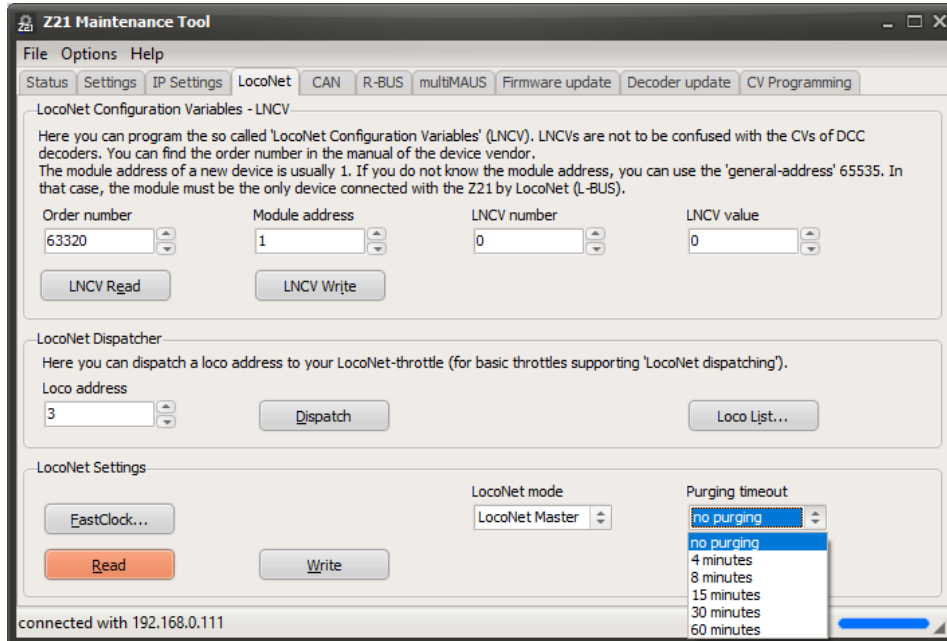
In contrast to original plans, we have implemented a LocoNet Slave Mode based on customer requests relating to the Z21. This means you can connect the Z21 (Slave, L-BUS interface) via LocoNet to a TWIN-CENTER or Intellibox (Master, LocoNet T-jack). The Z21 then establishes the interface between the app and Intellibox. This means it is possible to control your system simultaneously both with the TWIN-CENTER and any LocoNet control devices present, as well as with the Z21 App on a smartphone or tablet and multiMAUS!

Important information: Because as mentioned above, no LocoNet Slave was originally planned for the Z21, it is essential to observe the following points: To prevent the Z21 and the existing master from supplying in the supply voltage on the LocoNet bus at the same time, which can cause considerable electrical problems in the control centres, the supply voltage at the L-BUS interface on the Z21 must be isolated from the rest of the LocoNet. To do this, please use the white "**Z21 LocoNet slave cable**" with art.no. **136100** that has been produced specifically for this purpose.

This cable is available from your dealer or online in the [spare parts shop for Roco](#).



From [Z21 Firmware V1.25](#) you can use the **Purging timeout** option to configure what is known as **Purging**. "Purging *n* minutes" means that for a *stationary* loco, no more drive commands are sent via the track to the decoder if it has not been used by the user or by a control program for *n* minutes. As soon as the locomotive is used again, the repeat cycle of the drive commands for that vehicle is reactivated and the purging timer restarts.

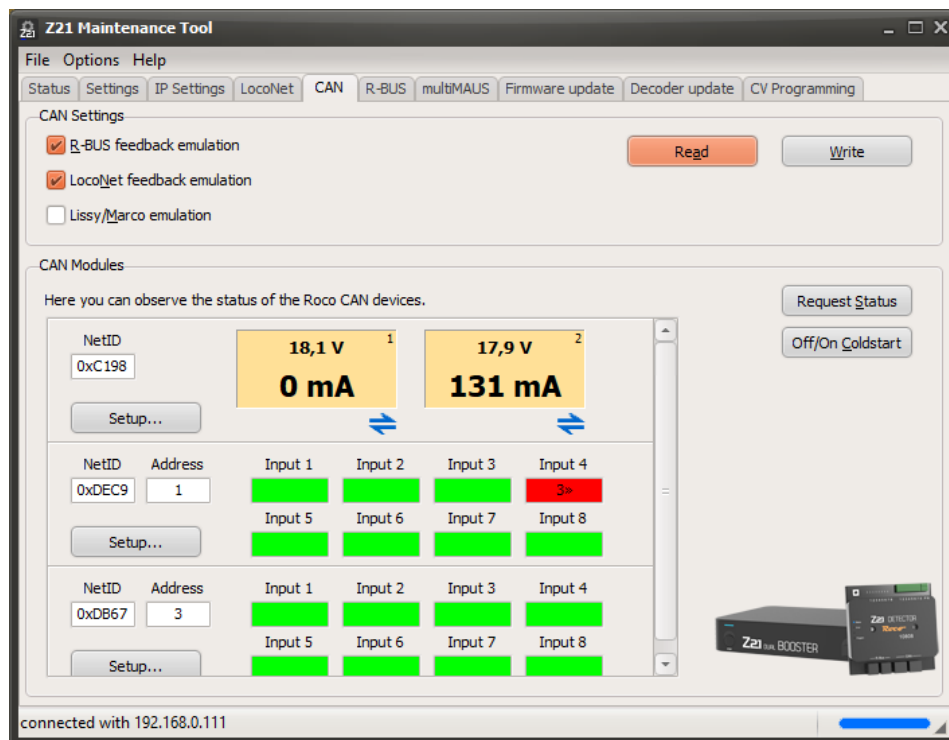


Purging increases data throughput for the vehicles actually being used. Purging can be of interest for particularly large systems or modular group meetings with many participants, where there are significantly more than 50 vehicles on the system at the same time. For the normal operation of smaller and medium-sized systems with fewer than 50 vehicles, the priority-regulated repetition cycle of the drive commands on the Z21 will normally be sufficient even without purging.

You can see the status of the loco and the current value of the purging timer in the loco list, see above. The purging can also be specifically deactivated for individual locomotives here.

3.5 CAN

If the Z21 Detector and Booster are connected to the Z21 via CAN, they appear automatically in the Z21 Maintenance Tool under each other in the tab sheet "CAN".



For the detector modules connected via CAN, the Z21 offers R-BUS and LocoNet emulation. This means that these feedback modules can be used immediately in existing PC software for model railroad computer control without having to wait for its CAN implementation. The feedback modules can be configured in the PC software or in the Z21 app either like a Roco 10787 or like a LocoNet feedback module.

- R-BUS feedback emulation**
 This option enables the emulation of the R-BUS. The 10808 can be used in the PC controller as for a Roco 10787.
 The factory setting is "on".
- LocoNet feedback emulation**
 This option enables the emulation of LocoNet feedback modules. The corresponding LocoNet occupancy messages are generated with locomotive address information.
 The factory setting is "on".
- Lissy/Marco emulation**
 Corresponding Lissy/Marco messages are generated with locomotive address information.
 The factory setting is "off".

You can transfer these emulation settings from and to the Z21 using the **Read** and **Write** buttons.

3.5.1 Z21 CAN Detector

The detector module Roco 10808 is supported on CAN by Z21 Firmware V1.30 or higher.

The detector module Roco 10808 can be operated either via the R-BUS or the CAN-BUS. The CAN-BUS offers more options in comparison to the R-BUS:

- Transmission of the detected RailCom loco addresses
- Configuration of the feedback module
- Firmware update of the feedback module

In the **CAN Module** section, you can view the connected Roco 10808 feedback modules.

The **Request status** button can be used to request the status of all connected feedback modules. The **Off/On Coldstart** button can be used to re-start the feedback module by switching the track voltage briefly off and on again. This will also update the status again.

NetID	Address	Input 1	Input 2	Input 3	Input 4
0xDEC9	1	Green	Green	Green	Red 3*
		Input 5	Input 6	Input 7	Input 8
		Green	Green	Green	Green

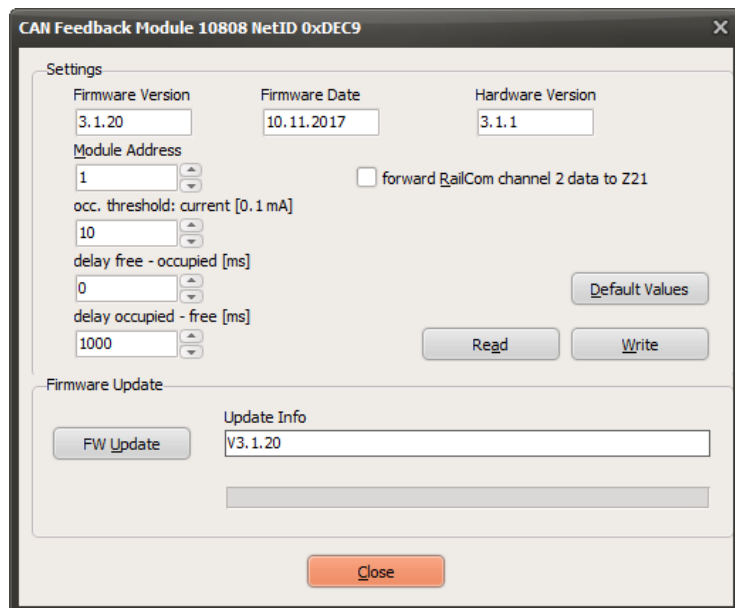
In the list of feedback modules, you will see the relevant permanent **NetID**, the programmable module **address** as well as the **Status** of the inputs with the detected RailCom-**loco addresses**. A small arrow next to the loco address indicates the **direction information** to the loco.

- Red means "occupied".
- Green means "free".
- Grey means "no current occupancy information yet received" (e.g., if the feedback module is not being supplied with voltage).

The **Setup** button is used to go to the corresponding feedback module setup dialogue.

3.5.1.1 Roco 10808 feedback module setup

In the feedback module setup dialogue, you can configure the selected feedback module Roco 10808 or perform an update on the feedback module firmware.



Under **Module address** you can assign a new address. Please note that all feedback modules on your system are each assigned a different module address. As an alternative, you can also use the hardware button on the feedback module and a turnout command following swiftly afterwards to change the module address.

Forward RailCom channel 2 data to Z21 can be used to activate forwarding of the RailCom data from channel 2 (speed, POM-Read-Result, QoS, etc.) to the Z21. Normally this should not be necessary, however, as this task is already carried out by the RailCom Global Detector on the Z21. The forwarding of the RailCom loco address does not depend on this option, incidentally. With feedback module firmware V3.1.20 or higher, POM-Read-Results are always forwarded to the control centre.

The **Occupancy threshold: Current** defines the sensitivity of the inputs of the feedback module in increments from 0.1 mA (= 100 μ A). The factory setting when the feedback module is supplied is "10" (i.e. 1 mA).

The **delay free – occupied** function determines the time response of the feedback module for the transition from "free" to "occupied" in milliseconds. The factory setting is 0 ms.

The **delay occupied – free** function determines the time response of the feedback module for the transition from "occupied" to "free" in milliseconds. The factory setting is 1000 ms.

Default values can be used to restore the factory settings of the feedback module in the dialogue window input fields.

The values of the input fields are transferred to the feedback modules using the **Write** button.

Read is used to read and display the settings from the feedback module.

FW Update can be used to update the firmware on the feedback module. In the Update Info field, the target version or information on the update progress is displayed.

3.5.2 Z21 CAN Booster

The boosters Roco 10806 and 10807 are supported on CAN by Z21 Firmware V1.33 or higher.

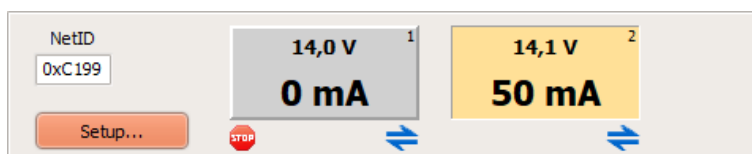
The Z21 Single Booster 10806 and Z21 Dual Booster 10807 can be connected either with the B-BUS or the CAN-BUS.

However, using the CAN-BUS offers more options in comparison to the B-BUS:





- The received RailCom data (RailCom channel 2) are also transmitted from the booster to the Z21 via CAN by means of the ZCAN20 protocol. This makes it possible to e.g. read out a vehicle decoder using the POM read command not only on the main track of the control centre, but also in the booster sections.
- The track voltage and the RailCom settings can be automatically read from the Z21 (Auto-Settings) and applied on the boosters.
- Configuration of the booster
- Firmware update of the booster

If the Z21-Booster is connected to the Z21 via CAN, it appears automatically in the Z21 Maintenance Tool under each other in the tab sheet "CAN". For each booster, there are one or two panels (depending on the booster type) presenting the actual voltage and current for the corresponding track output.

From booster firmware V1.11 and Z21 firmware V1.42 onwards, the corresponding track outputs can be individually deactivated and reactivated (**booster management**) by clicking on the panels. A deactivated track output is shown in grey color.



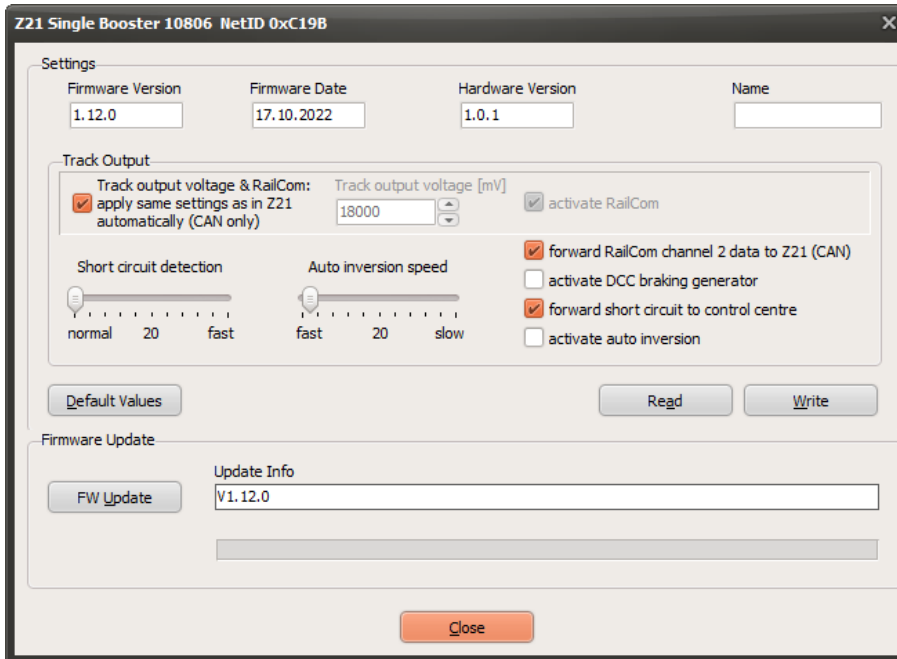
The icons under each panel show the status of the track output:

-  Track output off
-  Short circuit detected
-  Brake generator mode active
-  "RailCom active" (i.e. the RailCom cutout is generated in the DCC track signal).

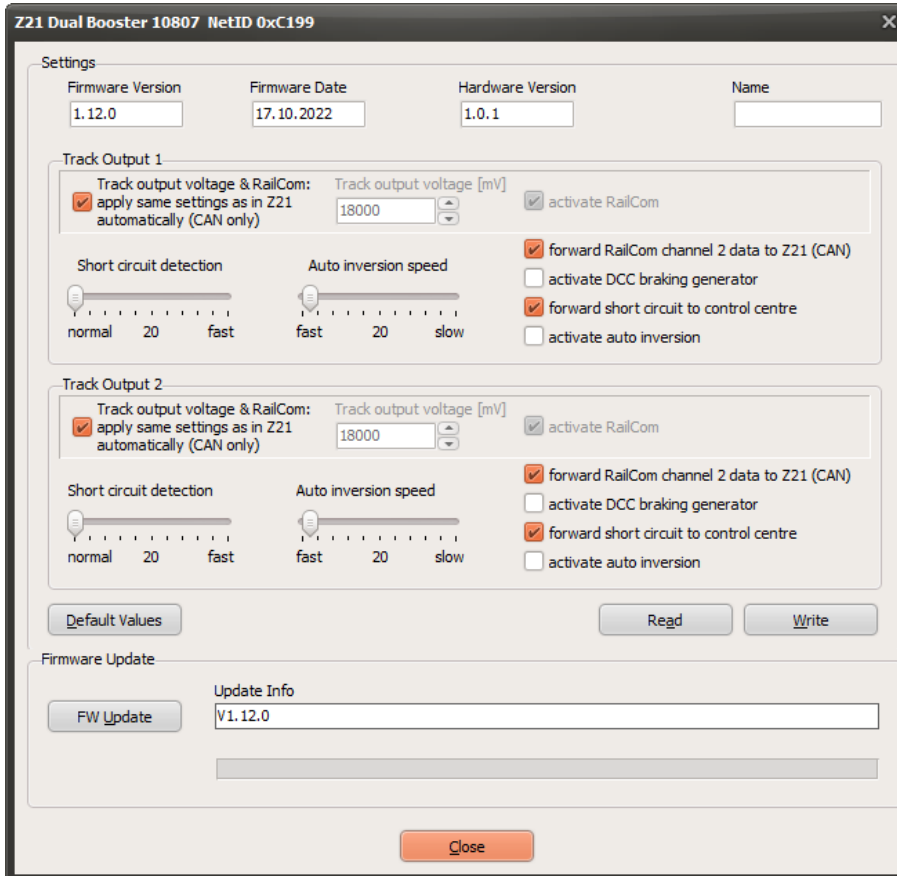
The **Setup** button is used to go to the corresponding booster setup dialogue.

3.5.2.1 Roco 10806 and 10807 booster setup

In the booster setup dialogue you can configure the selected Z21 Single Booster 10806 or Z21 Dual Booster 10807. You can also perform an update of the booster firmware.



For the Z21 dual booster 10807, both of the track outputs can be configured individually:



Track voltage & RailCom: read settings from the Z21 control centre automatically via CAN (=“Auto-Settings”).

If the Z21-Booster is connected to the control centre via the CAN-Bus, the booster can automatically read the track voltage and RailCom settings from the Z21 control centre (“Auto-Settings”). If the booster is unable to read those settings (because the booster is connected via the B-Bus or the CDE port), then the track voltage and RailCom settings stored in the booster will be used.

If necessary, you can deactivate these “Auto-Settings” by deactivating this option. This enables you to force a setting of the booster that deviates from that of the control centre (not recommended).

Track voltage

The desired value for the track voltage can be set here. This entry field is greyed out as long as the “Auto-Settings” (see above) are activated. This desired value for the track voltage will be used only, if the settings of the control centre cannot be read automatically (i.e. B-Bus, CDE), or if the “Auto-Settings” are deactivated.

Activate RailCom

With this option, you can activate or deactivate the generating of the RailCom cutout. This checkbox is greyed out as long as the “Auto-Settings” (see above) are activated. This RailCom setting will be used only, if the settings of the control centre cannot be read automatically (i.e. B-Bus, CDE), or if the “Auto-Settings” are deactivated.

IMPORTANT: This option must be deactivated if neighboring booster sections do not generate a RailCom cutout. See also booster manual.

Forwarding RailCom Channel 2 to the control centre

The forwarding of the RailCom data (RailCom Channel 2, i.e. speed, POM-Read-Result, QoS, etc.) received by the booster is activated with this option. The Z21-Booster 10806 is equipped with one RailCom receiver, and the 10807 is equipped with one RailCom receiver for each of the track outputs. Both are able to forward the received data to the Z21 via the CAN-Bus. This way it is possible e.g. to not only readout a loco decoder by means of POM read commands on the main track of the control centre, but also in the booster sections.

Activate DCC brake generator

This option makes it possible to use the track output of the Z21-Boosters as a replacement for item 10779 “brake generator”. See also booster manual.

Forward short circuit to control centre

If this option is deactivated, short circuits are not reported to the control centre. The operations can continue in the booster sections that are not affected or at the main track of the control centre respectively.

The Z21-Booster then deactivates only the concerned track output and attempts to reactivate it every 3 seconds automatically.

Activate auto-inverting

This option activates the auto-inverting, i.e. an automatic reversing of the polarity of the track signal if the booster is used as a terminal loop module for example. It can also be useful because it ensures that you do not permanently need to ensure that the track signal is correctly poled.

IMPORTANT: In the case of neighboring booster sections, this option is only to be activated for one of them, else both of them would be reversing the polarity, resulting in a short circuit.

Short circuit detection

With this option, you can increase the reaction speed of the short circuit detection of the booster track output. This can especially make sense when using systems in track N.

Auto inversion speed

Here you can change the reaction time for the automatic reversing of the polarity. Our long-term tests have shown that auto inverting values of under 15 (very fast polarity reversal) and exceeding 200 (very slow polarity reversal) can cause difficulties. We therefore recommend that you retain the standard setting of 20 and that you only change this value should there be conflicts.

Default values can be used to restore the factory default settings in the dialogue window input fields.

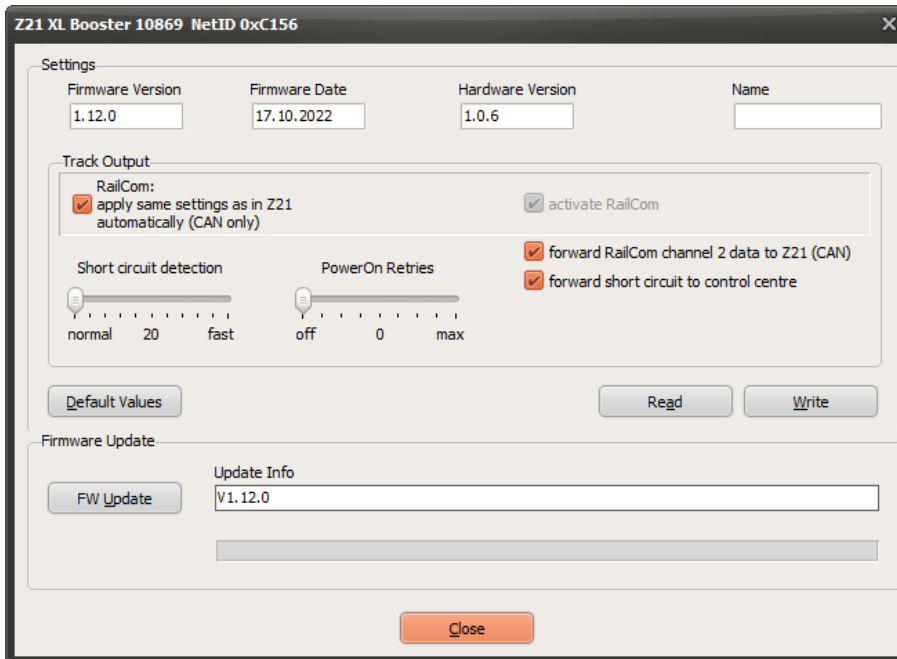
The values of the input fields are transferred to the booster by pressing the **Write** button.

Read is used to read and display the settings from the booster.

FW Update can be used to update the firmware of the booster. In the Update Info field, the target version or information concerning the progress of the update is displayed.

3.5.2.2 Roco 10869 XL Booster setup

In this booster setup dialogue, you can configure the selected Z21 XL Booster 10869. You can also perform an update of the booster firmware.



RailCom: read settings from the Z21 control centre automatically via CAN (=“Auto-Settings”).

If the Z21-Booster is connected to the control centre via the CAN-Bus, the booster can automatically read the RailCom settings from the Z21 control centre (“Auto-Settings”). If the booster is unable to read those settings (because the booster is connected via the B-Bus or the CDE port), then the RailCom settings stored in the booster will be used.

If necessary, you can deactivate these “Auto-Settings” by deactivating this option. This enables you to force a setting of the booster that deviates from that of the control centre (not recommended).

Activate RailCom

With this option, you can activate or deactivate the generating of the RailCom cutout. This checkbox is greyed out as long as the “Auto-Settings” (see above) are activated. This RailCom setting will be used only, if the settings of the control centre cannot be read automatically (i.e. B-Bus, CDE), or if the “Auto-Settings” are deactivated.

IMPORTANT: This option must be deactivated if neighboring booster sections do not generate a RailCom cutout. See also booster manual.

Forwarding RailCom Channel 2 to the control centre

The forwarding of the RailCom data (RailCom Channel 2, i.e. speed, POM-Read-Result, QoS, etc.) received by the booster is activated with this option. The Z21 XL Booster 10869 is equipped with a RailCom receiver, and it is able to forward the received data to the Z21 via the CAN-Bus. This way it is possible e.g. to not only readout a loco decoder by means of POM read commands on the main track of the control centre, but also in the booster sections.

Forward short circuit to control centre

If this option is deactivated, short circuits are not reported to the control centre. The operations can continue in the booster sections that are not affected or at the main track of the control centre

respectively. The Z21-Booster then deactivates only the concerned track output and attempts to reactivate it every 3 seconds automatically.

Short circuit detection

With this option, you can increase the reaction speed of the short circuit detection of the booster track output.

PowerOn-Retries

This option can help in case of problems with short-circuit messages when switching the booster track output (again) on, if the passenger cars or layout lighting are still equipped with incandescent lamps. When switched on, the inrush current in a cold **metal wire incandescent lamp** can be up to fifteen times the normal value for a brief time. By increasing the PowerOn retries, the Z21 XL BOOSTER becomes more fault-tolerant towards excessive inrush current peaks, without unnecessarily overloading the electronic components.

For a detailed description see user manual 10869 Z21 XL BOOSTER.

The button **Default values** can be used to restore the factory default settings in the dialogue window input fields.

The values of the input fields are transferred to the booster by pressing the **Write** button.

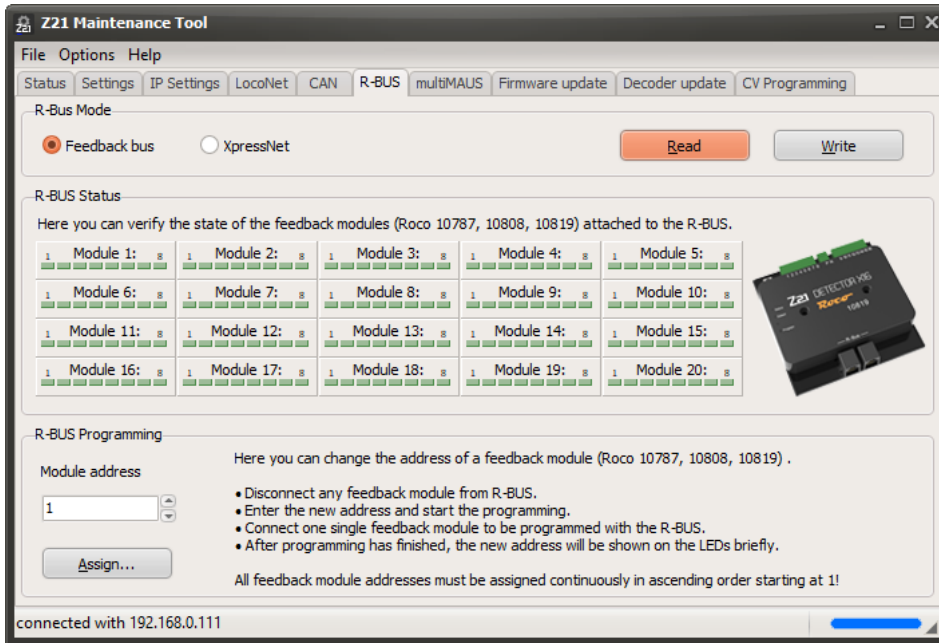
The button **Read** is used to read and display the settings from the booster.

The button **FW Update** can be used to update the firmware of the booster. In the Update Info field, the target version or information concerning the progress of the update is displayed.

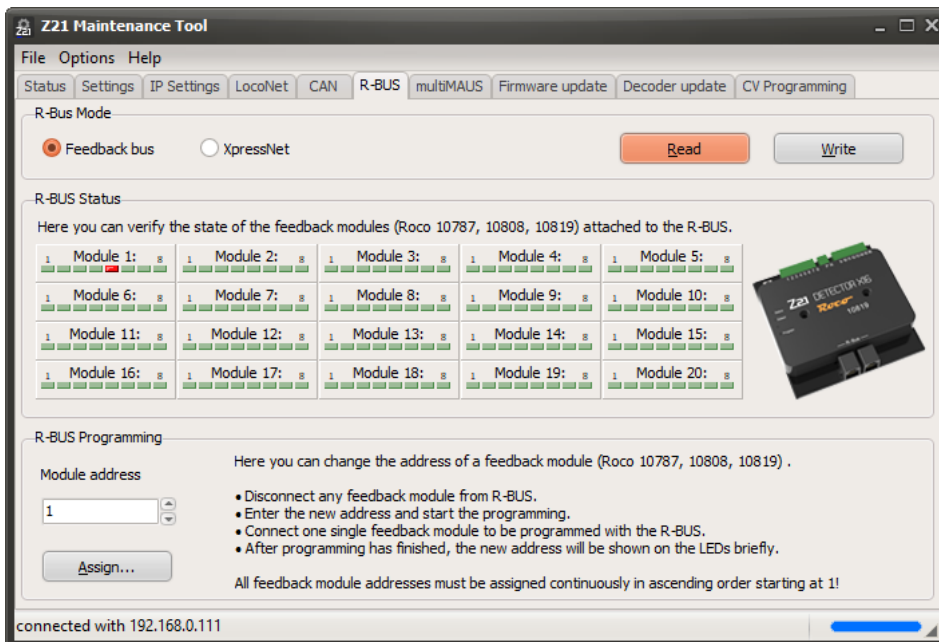
3.6 R-BUS

3.6.1 Feedback BUS

From Maintenance Tool V1.02 you can view the current status of the inputs of your feedback modules (Roco 10787, 10808 and 10819) as well as assign a new module address to individual feedback modules.



An active feedback input is presented with red colour (“occupied”).
An inactive feedback input is presented with green colour (“free”).



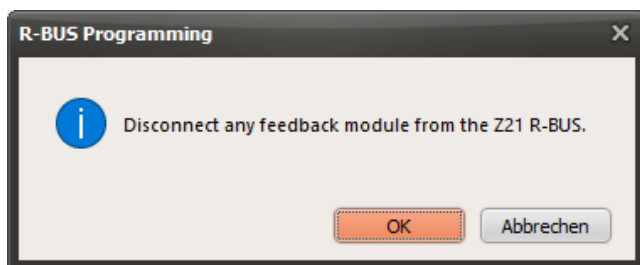
Example with activated input 5 on module 1.

See also section 3.11.1 *Detector Monitor*.

As already mentioned, the module address of a feedback module (Roco 10787, 10808 and 10819) can also be changed here. It is important here that before this process all other feedback modules are disconnected from the R-BUS on the Z21 to prevent these from also being re-programmed to the new address.

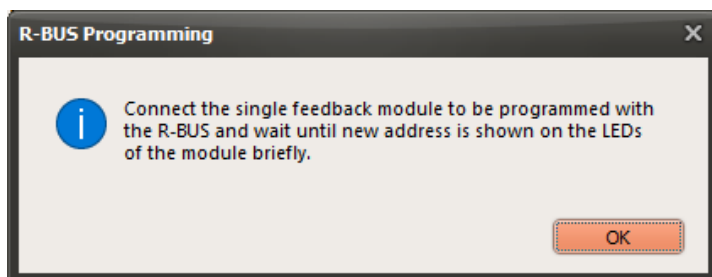
Enter the desired new module address; the permitted range here is 1 to 20. Please also note that the feedback modules are numbered in ascending order from 1 onwards. See also the operating instructions for the module. The factory setting is 1.

Then press "Programming..." and follow the dialogues.



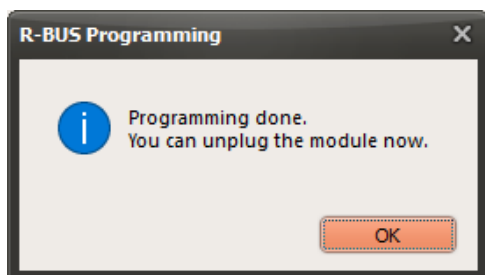
Once all modules are disconnected from the R-BUS port on the Z21, press "OK".

The Z21 then switches the R-BUS into programming mode and the next dialogue appears.



Plug the 10787 to be programmed as a single module into the R-BUS. The eight status LEDs on the module first light up in sequence. The old module address is then displayed on the LEDs and shortly afterwards the new address is shown to confirm successful programming. The address coding via the LEDs can be found in the operating instructions for the feedback module. Click "OK" in the display shown at the top first.

The following message will be displayed:

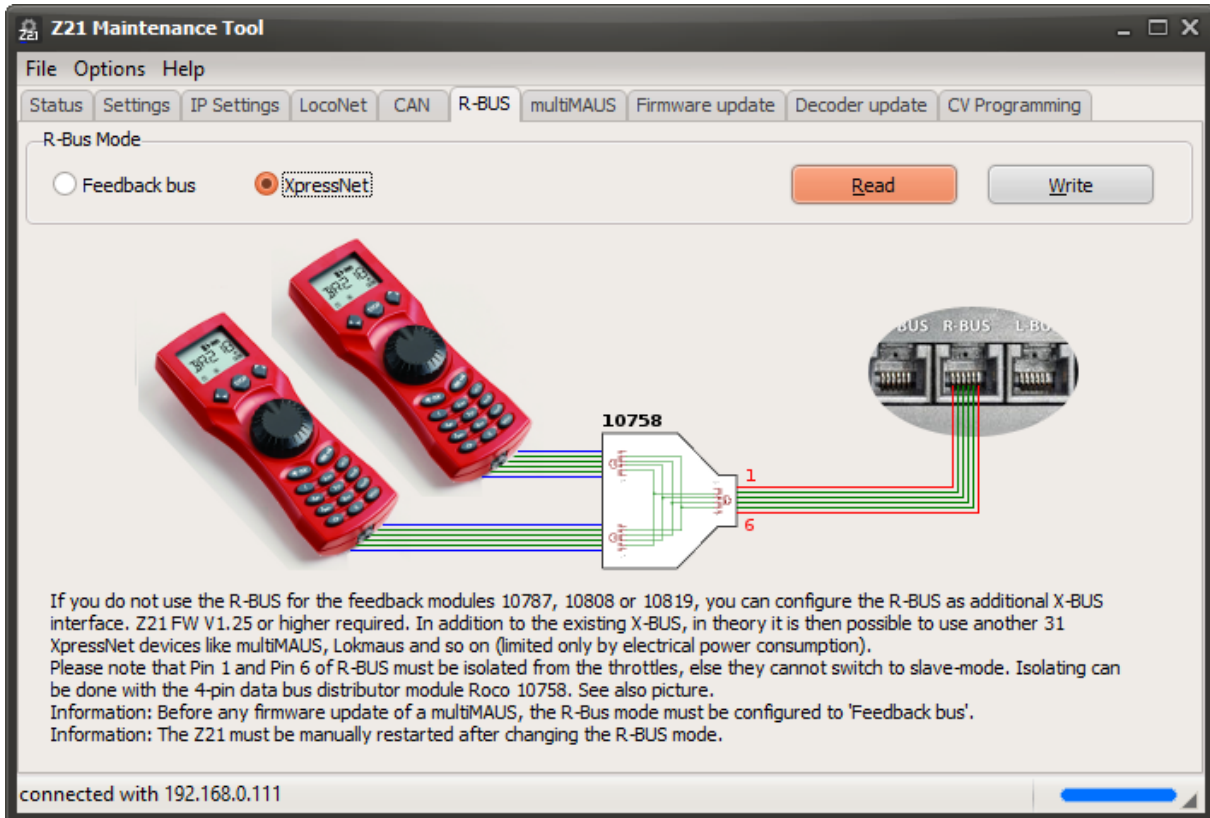


The module is now fully programmed and can be disconnected.

After closing this last dialogue, programming mode on the R-BUS is exited and the system changes to normal mode. You can now re-connect all feedback sensors to the Z21.

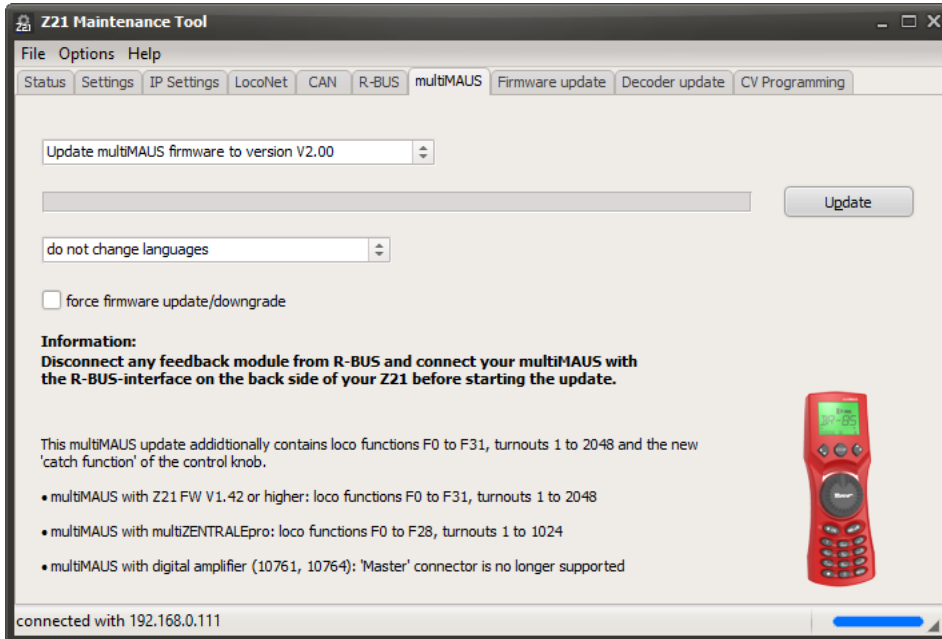
3.6.2 XpressNet

If you are not using feedback sensors on the R-BUS and if at the same time the existing X-BUS is not adequate for your requirements, from [Z21 firmware V1.25](#) as an alternative you will be able to use the R-BUS as a further X-BUS for additional handheld controllers. This could be useful for club meetings with more than 31 X-BUS handheld controllers, for example.



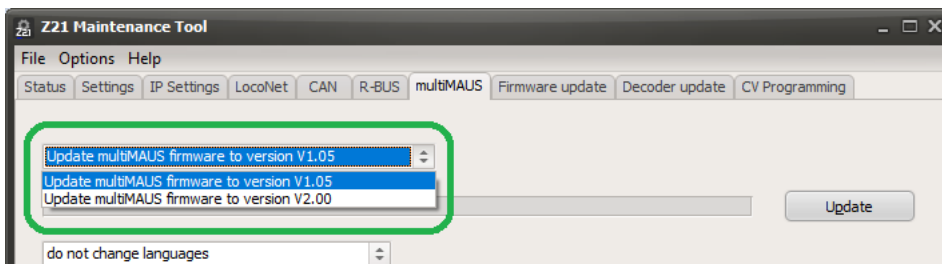
Please carefully read through the information relating to Pin1 and Pin6 in the dialogue window as well as the note on the firmware update for the multiMAUS.

3.7 multiMAUS Update

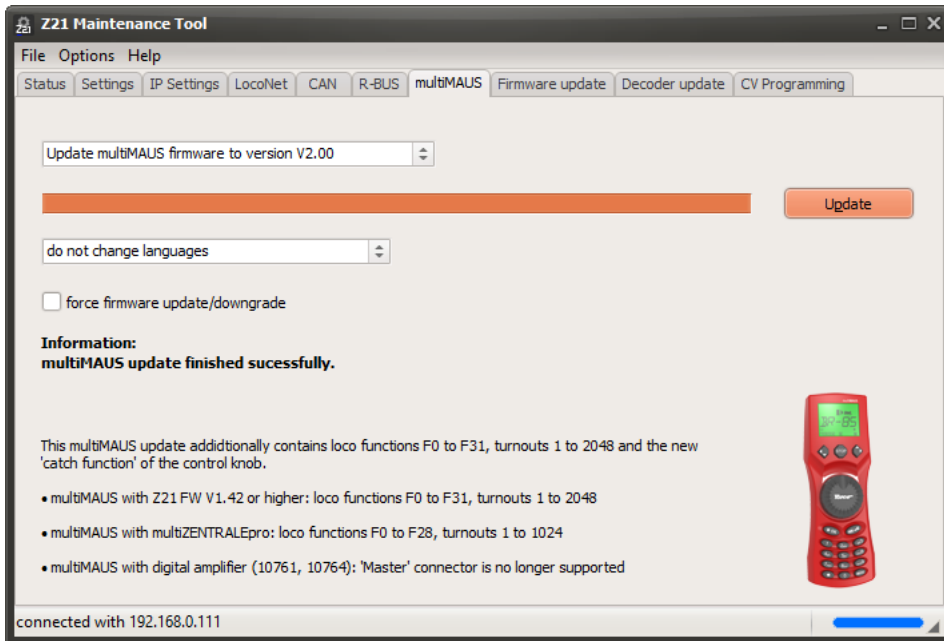


Here you can update your multiMAUS (Roco 10810, Roco 10835, Fleischmann 686810) to the latest firmware version **V2.00**. With this new firmware, you can now use the multiMAUS with the Z21 (from Z21 FW V1.42) not only to switch the **loco functions F0 to F31** and access **CV1 to CV1024** (previously only F0 to F20 and CV1 to CV255), but also to switch **2048 turnouts** (previously only 1024) and use the new "catch function" of the control knob.

ATTENTION: To be able to implement the new features in the small program memory of the multiMAUS, the X-BUS master and the DCC master had to be removed from the multiMAUS. This means that from version **V2.00** on, the multiMAUS **can only be used on the slave connector of the digital amplifier** (Roco 10761 and 10764, both no longer available). We recommend updating to version **V1.05** only if you absolutely must use the multiMAUS on the **master connector** of such a digital amplifier. This older version is also included in the Z21 Maintenance Tool and can be selected for the update. A downgrade from multiMAUS V2.00 to V1.05 is of course possible at any time.

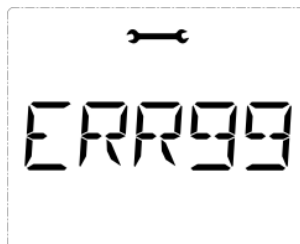


With the firmware update, you can either leave the languages on your multiMAUS unchanged or alternatively choose one or six language packages, each including four languages. Then connect the multiMAUS to the feedback bus as a single device (R-BUS port) and click "Update". Do not unplug the multiMAUS during the update. Wait until the update has been completed.

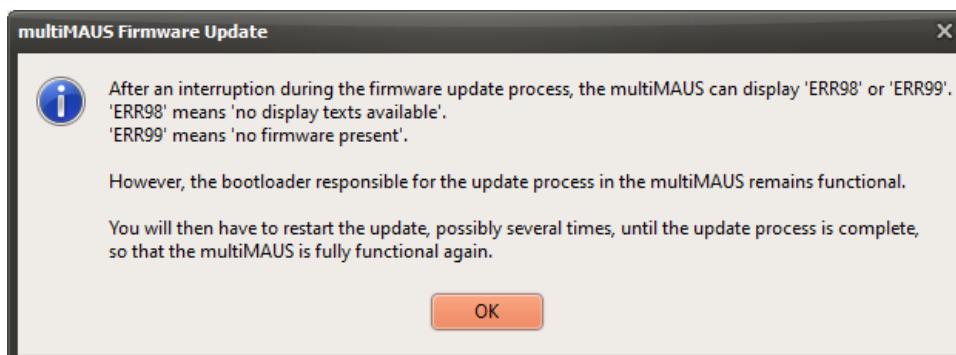


3.7.1 multiMAUS Error Messages

If there is a connection problem during the firmware update process or if the firmware update is aborted for any other reason, then this is usually not a major problem. The multiMAUS then might show "**ERR98**" (no display texts available) or "**ERR99**" (no valid firmware available).

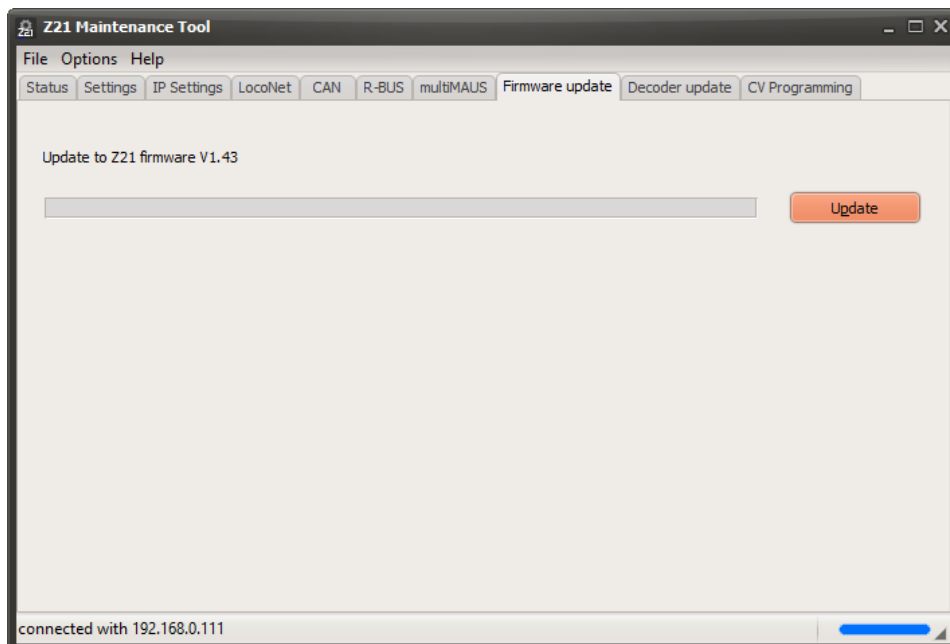


However, the bootloader in the multiMAUS responsible for the update process remains functional. You then must start the update again - in the worst case, several times - until the update process goes through completely, so that the multiMAUS becomes fully functional again.



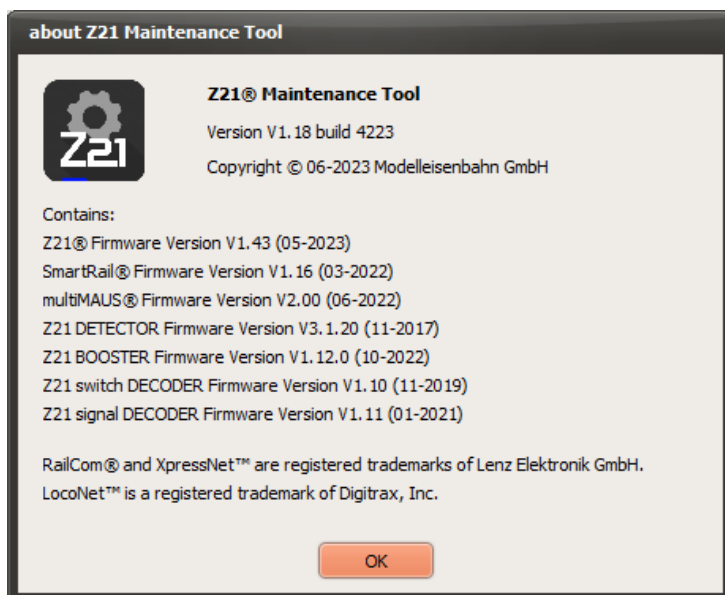
To perform the multiMAUS firmware update, the Z21 firmware version V1.42 or higher is recommended.

3.8 Firmware Update

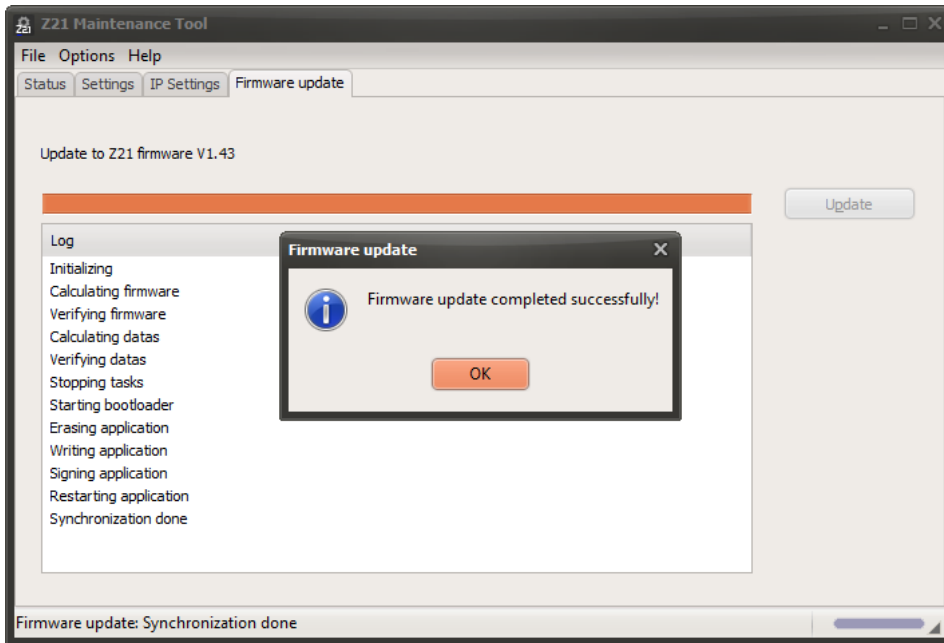


The firmware on the Z21 or smartRail can be updated here (depending on which device is connected to the PC; automatic detection)

The information about the included firmware versions can be found in the Help – About menu:



Future firmware updates will be included in new versions of the Maintenance Tool.



After the FW update of the control centre.

If a connection problem occurs during the update, or if anything goes wrong for any reason, that's not a big problem. The bootloader responsible for the update inside the device cannot be deleted. So, you can always restart the update. (Note: The control centre can log on with FW V1.0x if necessary, following a failed update).

Following a failure, the best option is to cold start the Z21, then give Windows enough time until the network port is ready again (icon at the bottom right of the task bar, ping as necessary) and then run the firmware update again.

In the event of repeated problems, we recommend using a direct cable connection instead of wireless if possible.

3.9 Decoder Update

The *Decoder Update* feature is intended solely for Zimo MX and MS decoders supported by Roco.

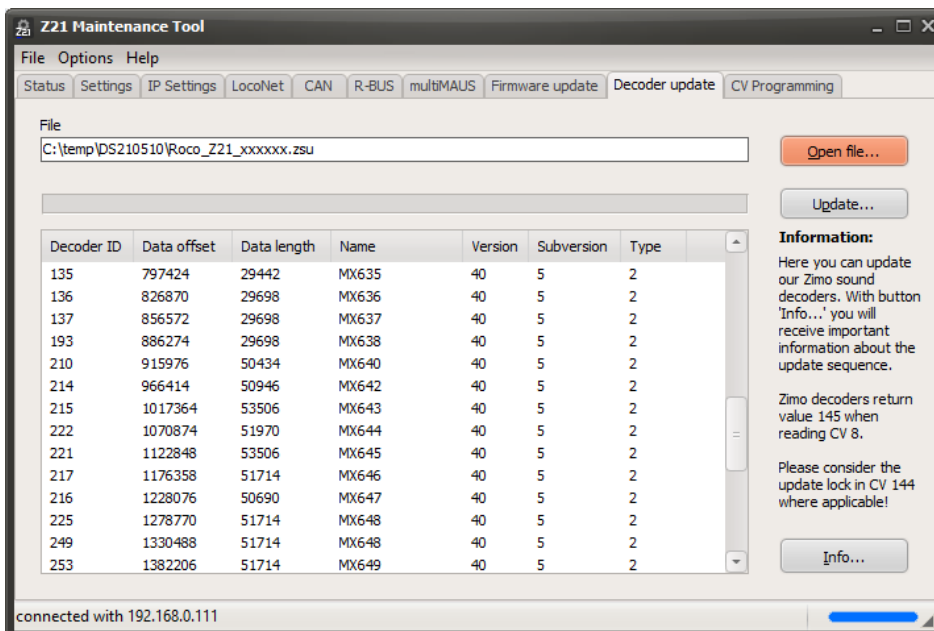
This feature can be used to import both *Decoder* updates (file extension "zsu") as well as *Sound* updates (file extension "zpp"). Please ensure excellent contact from the Z21 to the decoder. A direct cable connection from the PC to the control centre is also recommended to avoid wireless network problems of all types.

Also observe the notes from Zimo in the relevant decoder manuals.

The Zimo firmware must first be downloaded from Zimo (www.zimo.at – Update & Sound – Update MX-Decoder, or Update MS-Decoder) and unzipped on the PC.

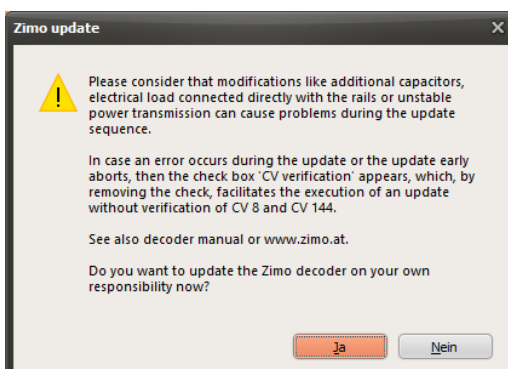
The same applies to sound projects; these must first be downloaded and unzipped from Zimo (www.zimo.at – Update & Sound – ZIMO Sound Database).

First open the Zimo firmware file already downloaded and unzipped.

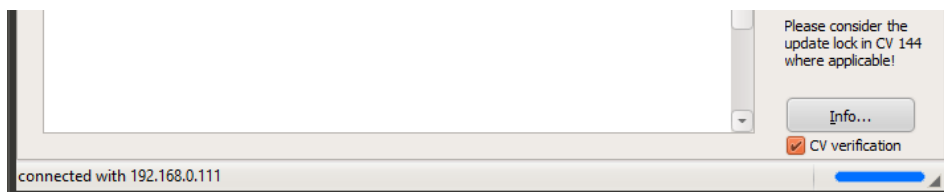


The list shows which decoders are included in this Zimo firmware file. The decoder is automatically detected and selected during the update.

For "Update..." the compulsory disclaimer shows up.

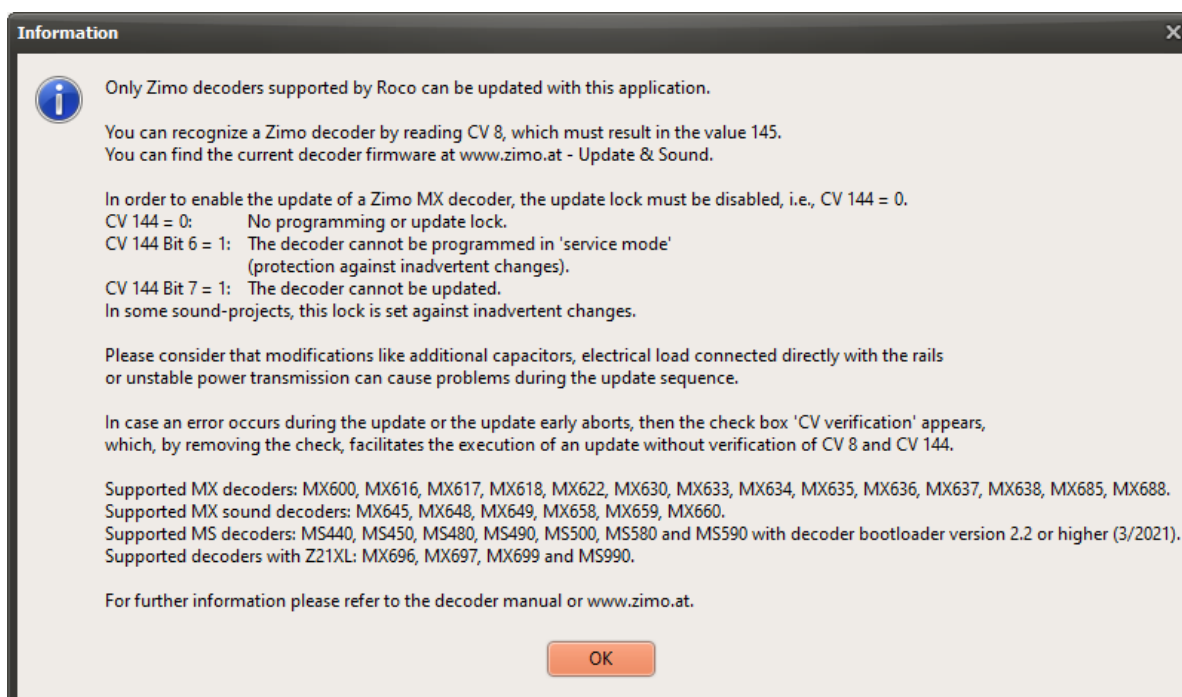


When starting the update process, the manufacturer of the decoder (CV 8) and, if applicable, also the update lock (CV 144) or the decoder type (CV 250) will be checked automatically.



If there are any CV reading problems during the check, this can be circumvented by deactivating the "Read CV" checkbox.

Please also mind the information shown after pressing the "Info..." button.

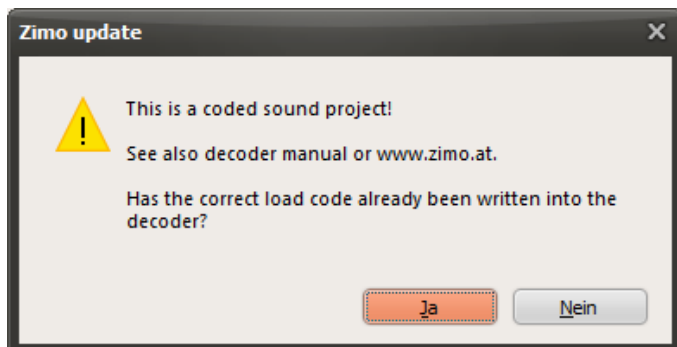


Hint:

If the decoder update fails, check the contact with the decoder and try again. In case of persistent problems, try plugging the decoder into another loco if possible. It may well be that it works better on another loco PCB (capacitors, etc...).

Hint:

if you want to transfer a so called "coded sound project" into the decoder, then you must write the load code before starting the sound update. Please mind the notes from Zimo in the decoder manuals.



The Z21 Maintenance Tool identifies a coded sound project automatically and a popup window will be shown before the actual update starts.

Hint:

For updating decoders for large scales we recommend using a **Z21XL**, where the programming amplifier is dimensioned for the higher currents of these powerful decoders.

Switch off decoders with large energy capacitors (e.g., MX699, MS990) after the update for one minute (e.g., by removing the decoder and locomotive from the track) in order to empty all buffer capacitors before the next restart.

If the error message "error while sending number of blocks" should appear at the beginning of the update, then the cause may be an excessively high ACK current pulse from the decoder. In that case you can limit the current with a 4.7 Ohm (5 Watt) resistor, which you connect in series with the decoder.

3.9.1 Notes on MX decoder update

To enable the update of a Zimo MX decoder, the so called "update lock" must be disabled, which usually means, that **CV 144** should be set to 0.

- CV 144 = 0 No programming or update lock.
- CV 144 Bit 6 = 1 The decoder cannot be programmed in 'service mode', (protection against inadvertent changes)
- CV 144 Bit 7 = 1 The decoder cannot be updated.

In some sound-projects, this lock is set against inadvertent changes.

MX decoders supported by Roco are capable of the so-called "fail-safe update". This means that the decoder remains still responsive even after the update process is aborted. The update can therefore be repeated by the user until it finishes successfully. However, some obsolete and already discontinued MX decoders (e.g. MX620, ...) are not capable of this "fail-safe update" and therefore remain explicitly blocked for the update with a Z21.

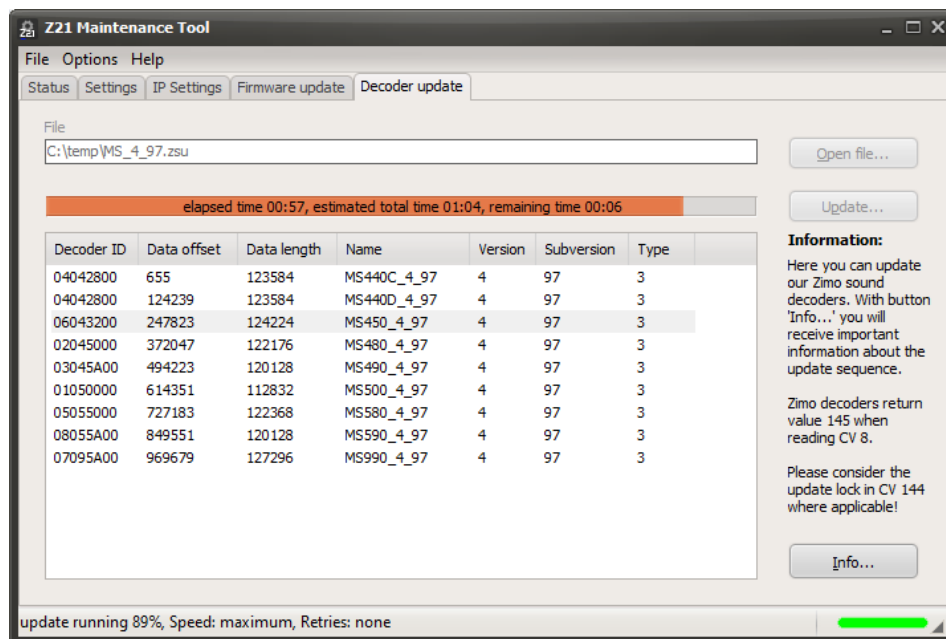
3.9.2 Notes on MS decoder update

The MS decoder update procedure is supported from Z21 firmware V1.41.

ATTENTION! Updating MS decoders that were produced before March 2021 is not permitted with the Z21, because in these older MS decoders, the bootloader, firmware, and hardware partially are not stable enough for providing a safe and reliable update process! For this reason, such older MS decoders were not sold by Roco. Due to the instabilities, Roco cannot guarantee a successful decoder update with these older MS decoders.

- MS decoder firmware update is supported only with MS decoder bootloader V2.2 or higher. You can verify the bootloader version of your MS decoder via CV 248 and CV 249. MS decoders delivered by Zimo since March 2021 contain the bootloader version 2.2 or higher, whereas problems can occur especially with older MS450.
- MS decoder sound update is supported only with MS decoder firmware V4.97 or higher. You can verify the firmware version of your MS decoder via CV 7 and CV 65. Thus update the MS decoder firmware before doing the sound update where required.

3.9.2.1 MS decoder firmware update



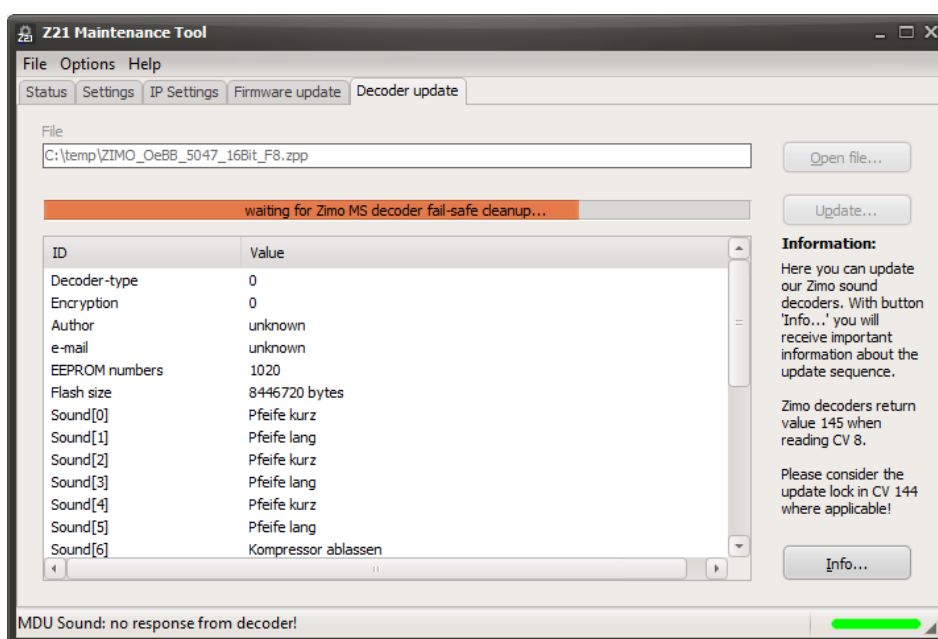
ATTENTION! The firmware update process for MS decoders is only fully supported with MS decoder bootloader version V2.2 (delivered from March 2021) or higher.

An update of older MS decoders via the Z21 is therefore **explicitly not permitted!** If necessary, contact the decoder manufacturer or obtain the suitable update device from the decoder manufacturer if you absolutely insist on updating such old MS decoders.

3.9.2.2 MS decoder sound update

ATTENTION! The **sound update** process for MS decoders is only supported with **MS decoder firmware version V4.97** (released in June 2021) or higher, because older decoder firmware versions do not react reliably **"fail-safe"** to connection breaks! A sound update via the Z21 with older MS decoder firmware versions is therefore **explicitly not permitted!** Therefore, if necessary, update to at least firmware version V4.97 or higher before starting the sound update.

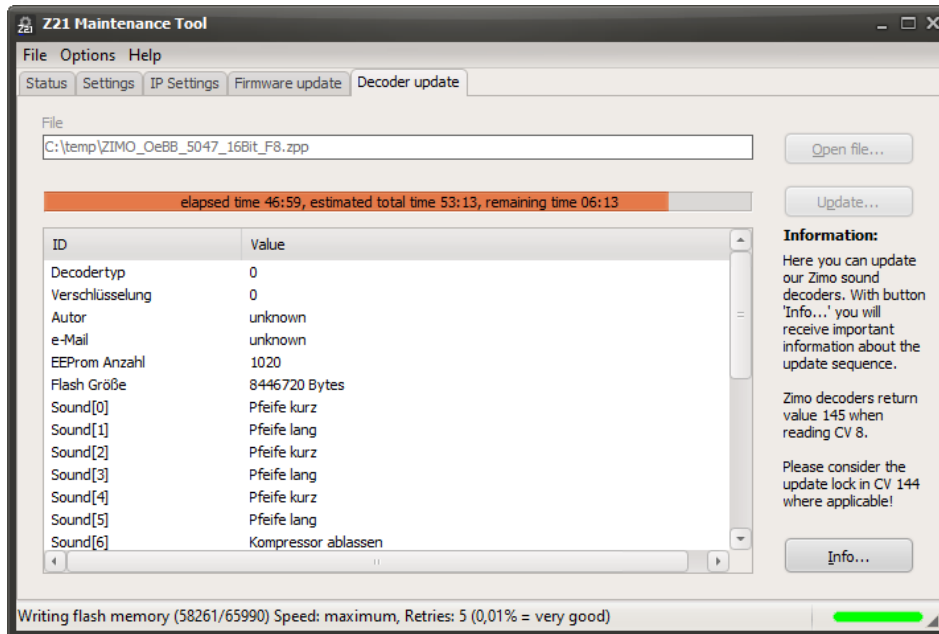
"Fail-Safe" means with the Zimo MS decoder: if the connection should be broken during the sound update with decoder firmware version V4.97 (or higher), for example due to poor track contact, this is automatically recognized and the decoder goes into a so-called "fail-safe" state at the next restart, where the decoder remains at least accessible for a new update attempt. With older MS decoder firmware versions, it could happen that the decoder is no longer responsive after a sound update has been interrupted.



However, for the MS decoder to go into the "fail-safe" state, it is important that the MS decoder remains supplied with voltage for at least 30 seconds during its initialisation when restarting. During this period, a progress bar is displayed in the Z21 Maintenance Tool. Afterwards you can retry the update.

Note: It should be clear that a 16-bit sound project for the MS decoder is *significantly* larger than a comparable 8-bit sound project for a MX decoder, and that therefore the sound update process via the track also takes a *very much longer* time (about 7 min per megabyte). The sound update via the programming track of the Z21 (implemented at the express customer request) is therefore only recommended for occasional private use. However, if you want to load sound projects into MS decoders frequently, you should consider purchasing a suitable update device from the decoder manufacturer, with which a sound update can be carried out much faster via the SUSI interface of the MS decoder.

In the Z21 Maintenance Tool, the estimated total time and remaining time are displayed in the progress bar during the update process.



The status line also contains information on the transmission quality, such as the transfer speed and the number of data packets that had to be repeated due to detected transmission errors. A retry-rate in the low per thousand range is normal and harmless.

Hint:

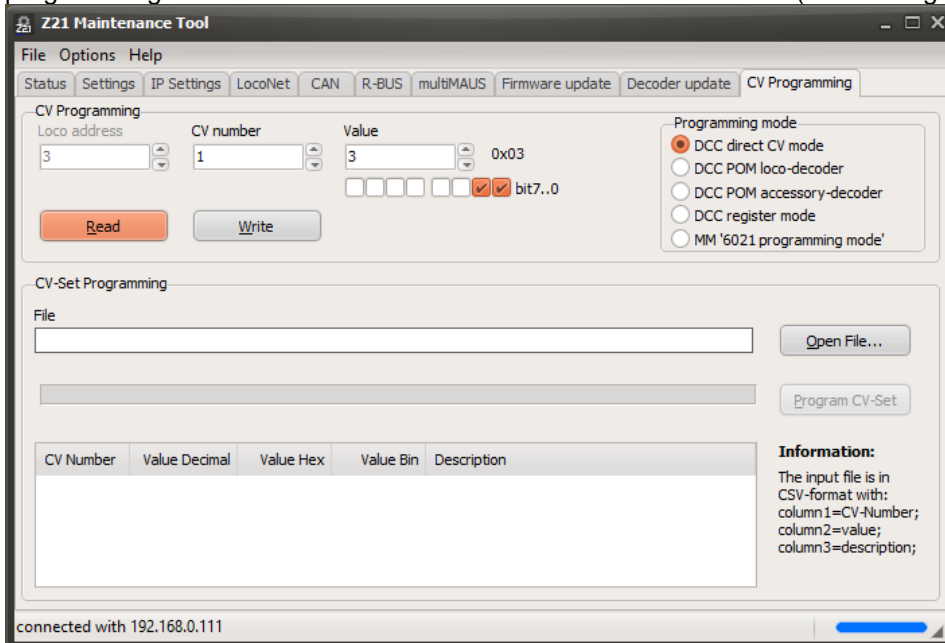
After the successful sound update, give the MS decoder a few more seconds to initialize its configuration variables.

3.10 Program CV

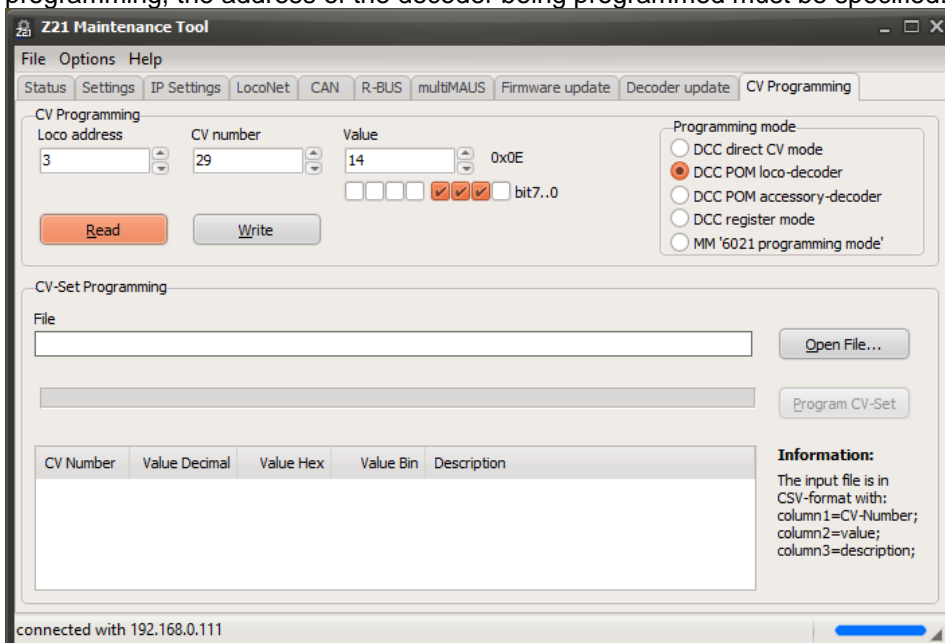
The "Program CV" dialogue is displayed from Z21 firmware V1.22.

3.10.1 Programming DCC decoders

On this dialogue you can program the CV of loco and switching article decoders – both on the programming track in **DCC direct CV mode** and on the main track (POM "Programming on Main").



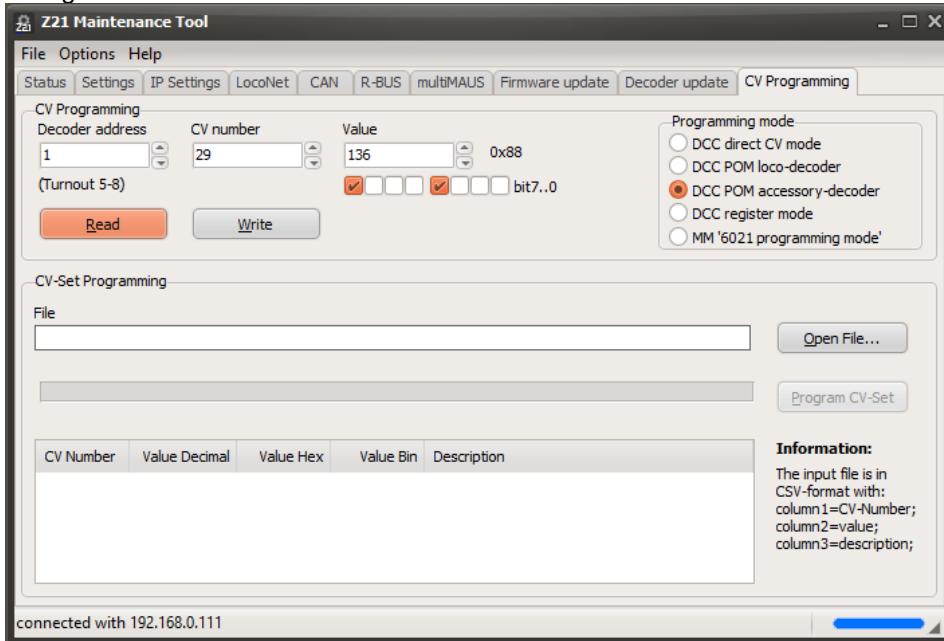
By selecting the **DCC POM loco-decoder** option, it is also possible to write the CV on the main track (POM) and even export the CV if RailCom is activated both on the Z21 as well as on the RailCom-compatible decoder (normally CV28=3 and CV29 bit 3=1, see also decoder instructions). With main track programming, the address of the decoder being programmed must be specified.



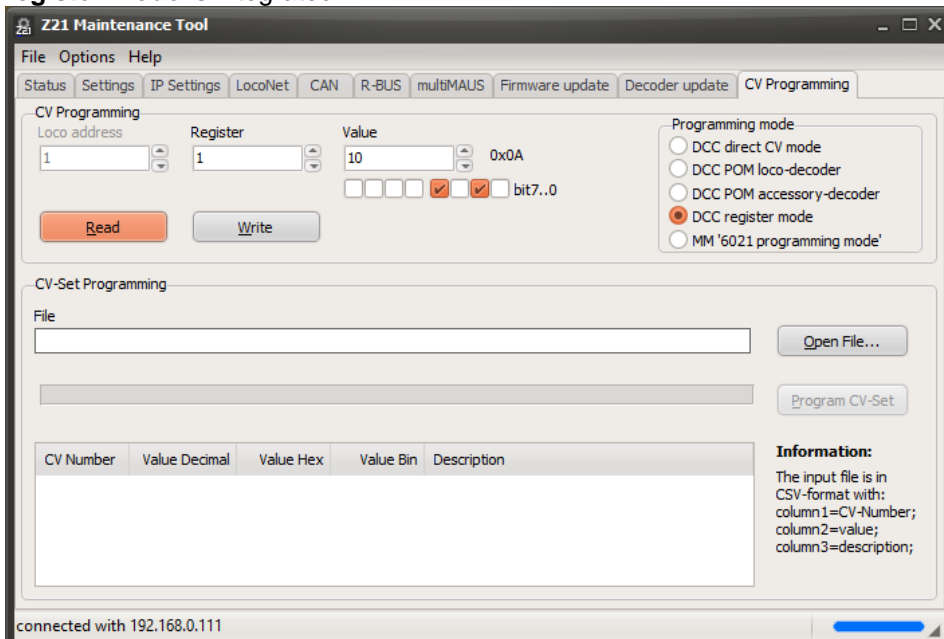
Some modern accessory decoders (switch decoder, signal decoder) also permit CV programming on the main track (see also decoder instructions). The latest turnout decoders even permit the export of the CVs on the main track using RailCom. To do this, RailCom must be activated both on the Z21 and in the

RailCom-compatible decoder (e.g., Z21 switch DECODER CV28=6 and CV29 Bit 3=1). For programming the accessory decoder, select the **DCC POM accessory-decoder** options.

It is now necessary to know the address of the decoder. The *decoder address* should not be confused with the *turnout number*. Up to four different turnouts are actuated under one decoder address. To visualise the assignment for you, the corresponding turnout numbers are displayed automatically in the dialogue under the selected decoder address.

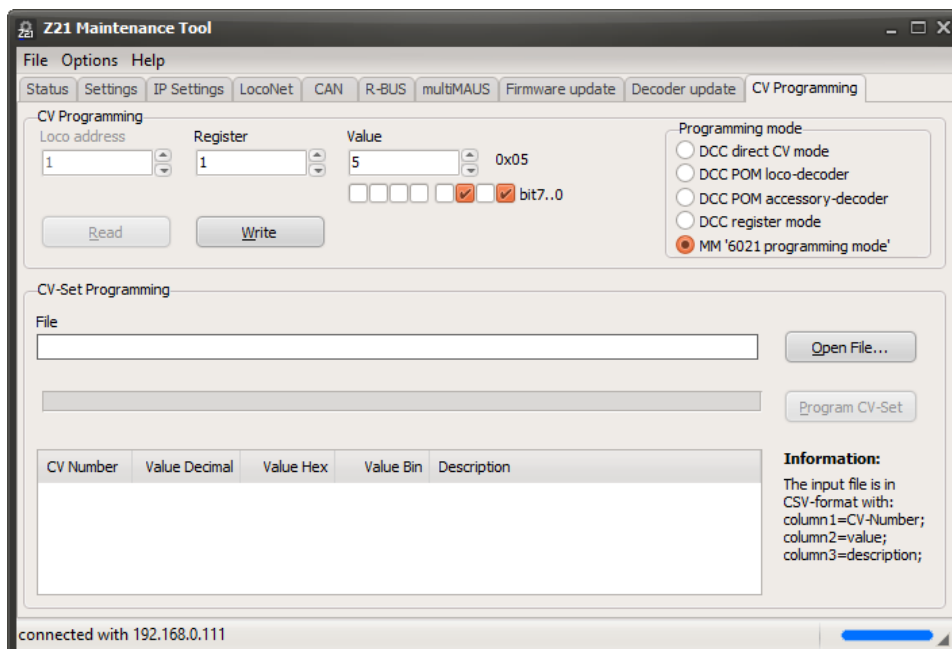


Very old DCC loco decoders do not have any CV programming in "DCC Direct CV mode". So that you can also program these decoders, from [Z21 firmware V1.25](#) programming in what is known as **DCC register mode** is integrated.



3.10.2 Programming MM decoders

From Z21 firmware version V1.23, you can also select **MM '6021 programming mode'** to program modern **Motorola decoders**.



The programming of Motorola decoders was not intended in the original Motorola format, however. For this reason, there is no standardised and binding process for programming Motorola decoders.

For programming Motorola decoders, what is known as the "6021 programming mode" introduced later on has been implemented on the Z21. This permits the writing of values, but not exporting. In the same way, the success of the write operations cannot be checked automatically.

This programming process works for many decoders from ESU, Zimo and Märklin, but not necessarily for all decoders. For example, Motorola decoders cannot be programmed with DIP switches. Unfortunately we do not have any details on the part of the decoder manufacturers on which of their decoders support this programming process and which don't.

The permitted range for CV numbers is 1 to 79. Some decoders only accept CV values from 0 to 80, other values from 0 to 255. For more info, see the relevant decoder description.

For multiprotocol decoders, DCC CV programming is very much recommended due to the greater range of options!

3.10.3 Programming CV-Sets

The **CV-Set Programming** option can be used to automate frequently used programming sequences. Here's how it works: Using a basic text editor you can create what is known as a CSV file. Each row then corresponds to a CV write command and has the following format:

```
CV number ; Value ; Description
```

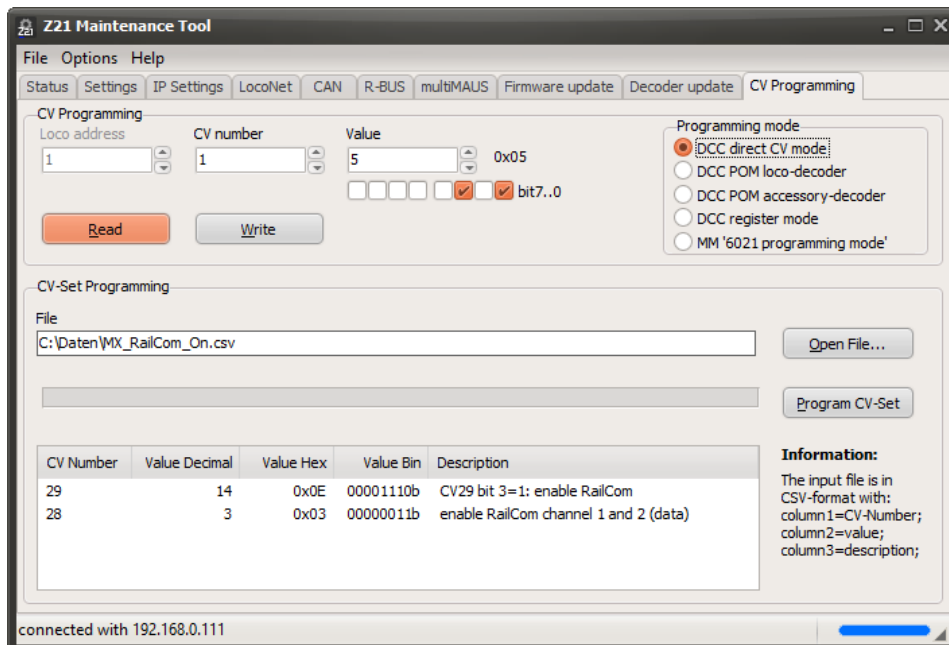
Enter *CV number* and *Value* as decimal figures. The *Description* is any text. Separate each entry with a semicolon. Empty spaces are permitted. Advanced users can also specify the desired value in hexadecimal notation if preferred (e.g. **0x1C**).

Example for activating RailCom on a Zimo decoder:

```
29 ; 14 ; CV29 bit 3=1: enable RailCom
28 ; 3 ; enable RailCom channel 1 and 2 (data)
```



Save the file in the editor with the extension *.csv. Then select that same file in the Z21 Maintenance Tool.



Clicking "Program CV-Set" will write this programming sequence to the loco decoder.

3.10.4 DCC CV Calculator

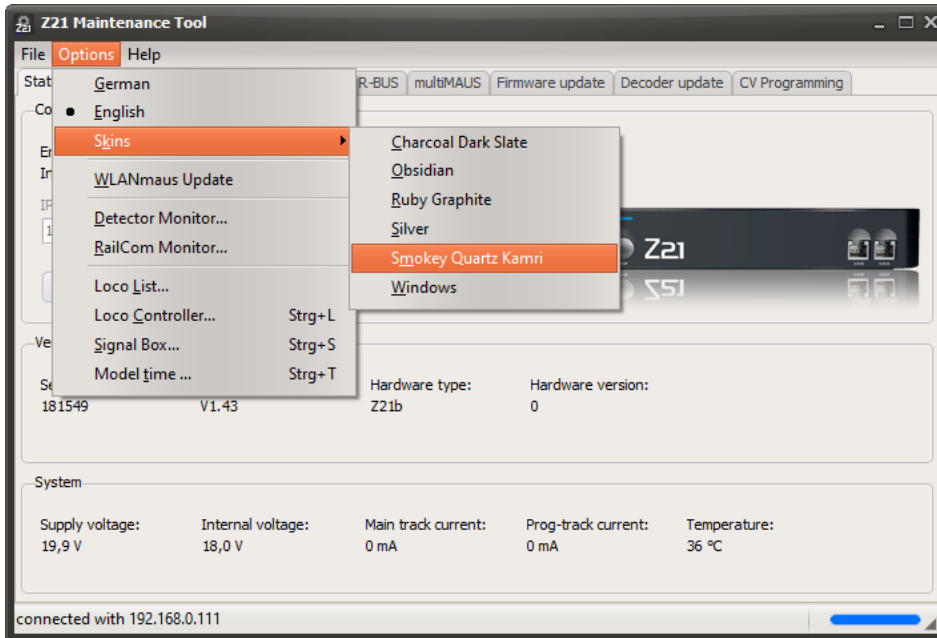
In the main menu – Help you can find the **DCC CV calculator**. It can be used as a calculator tool and quick reference for the often-required configuration variables CV#1, CV#17 and CV#18 in order to calculate the so-called long locomotive address up to 9999, as well as for the various setting options in CV#29.

The screenshot shows the 'DCC CV Rechner' window. The 'Fahrzeugdecoder' tab is active. The 'Lok Adresse' is set to 3. The 'Kurze Lokadressen' are set to 'von 1 bis 99'. The 'CVs berechnen' button is highlighted. The 'CV#1' is 3, 'CV#17' is 192, and 'CV#18' is 3. The 'CV#29 (RCN-225)' section shows the following configuration: Bit0 (unchecked), Bit1 (checked), Bit2 (checked), Bit3 (checked), Bit4 (unchecked), Bit5 (unchecked), Bit6 (unchecked), and Bit7 (unchecked). The 'CV#29' value is 14. The 'Schließen' button is at the bottom right.

The **DCC CV calculator** is based on the RCN-225 standard for DCC configuration variables. However, it can happen that some older decoders do not fully meet this standard. Therefore, also observe the operating instructions for your decoder before you write the values calculated here into your decoder.

3.11 Options

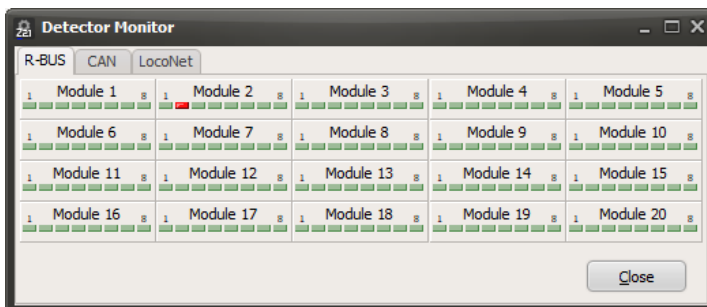
In main menu – Options you can find the language settings and a choice of several different skins for the user interface.



Furthermore, there exist other menu items that can be useful for setting up and testing hardware components around the Z21, and which are described in the following sections.

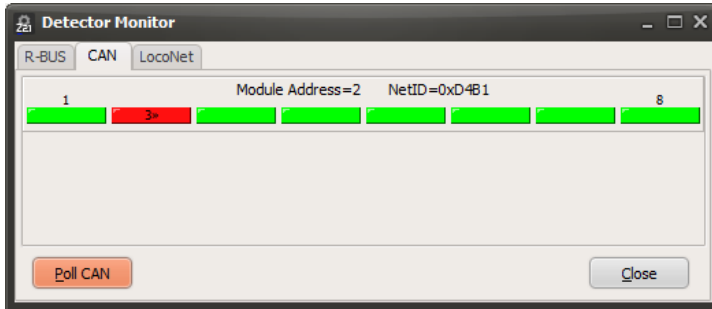
3.11.1 Detector Monitor

All R-BUS feedback modules are displayed in this window.

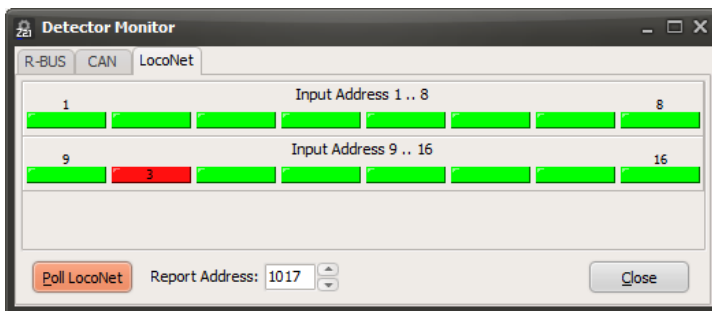


A red field means "occupied" and a green box stands for "free".

In the CAN and LocoNet tabs, all track occupation detectors found in the system are automatically displayed.



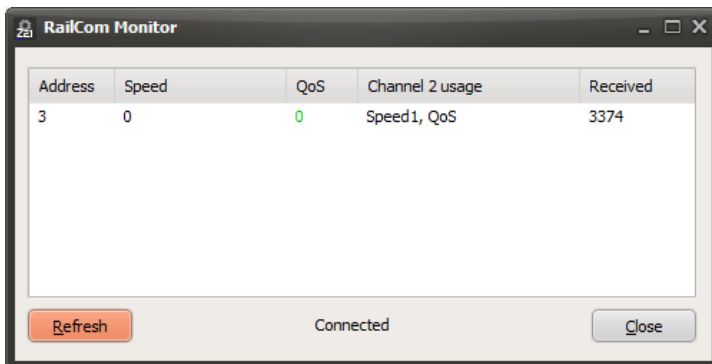
If the used detector and the locomotive are able to do so, then the locomotive address determined by RailCom is also displayed inside the red field.



You can request the status of the detectors with the button "Poll". The "Report Address 1017" is the default value used for polling the Uhlenbrock 63320 feedback modules. See user manual Uhlenbrock 63320.

3.11.2 RailCom Monitor

In the RailCom Monitor you can see the feedback data from RailCom-enabled loco decoders.



In addition to the **address** and the number of **packets received**, the current **speed** and **QoS** (Quality of Service) are also displayed, subject to the condition that the decoder actually sends this kind of data.

The displayed speed should theoretically correspond to "km/h" and can usually be scaled with a factor in the decoder.

With QoS, a decoder can report its number of incorrectly received DCC packets per total number. The lower the numerical value, the better the reception in the decoder. Higher values, on the other hand, can indicate poor contact, e.g., due to dirty tracks.

Please note that the locomotive decoders still behave quite differently concerning the feedback data, and some even do not report any data at all. In some cases, it is necessary to activate the feedback in the decoder via CV (CV28, CV29, ...). More information can be found in the manuals for the decoder. Thus, the RailCom Monitor can only be used for information and testing purposes. It depends on the decoder, whether reported values make sense or not.

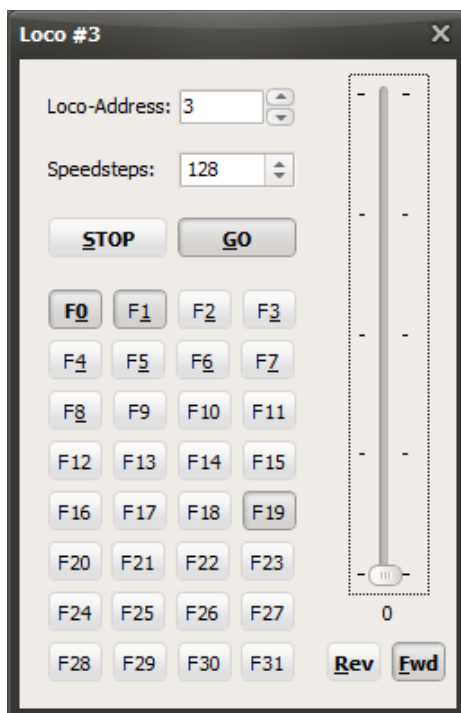
3.11.3 Loco List

Description see chapter 3.4 *LocoNet*.

3.11.4 Loco Controller

If you want to try out your changes to the decoder CVs straight away or simply want to control a loco via the PC simply as a test, you can do this via the loco controller. It is even possible to use multiple controllers simultaneously with different loco addresses.

The loco controller is opened in the Z21 Maintenance Tool via the main menu → Options → Loco controller or by using the key combination Ctrl+L.



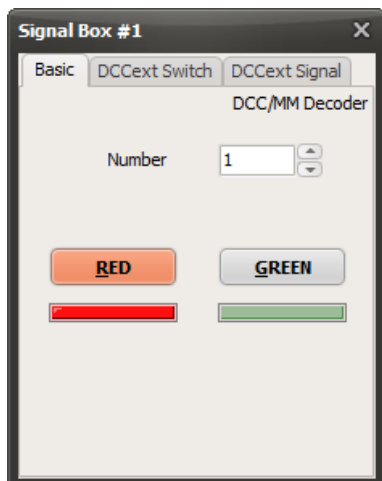
You can then enter the desired loco address on the controller. It is also possible to regulate the set speed steps of the loco and to change them. When you send a drive command or a function to the loco, the set speed steps are saved on the Z21.

The loco can be operated with the PC mouse and the keys R, F, S, G and 0 to 9. The speed can be changed via the cursor keys.

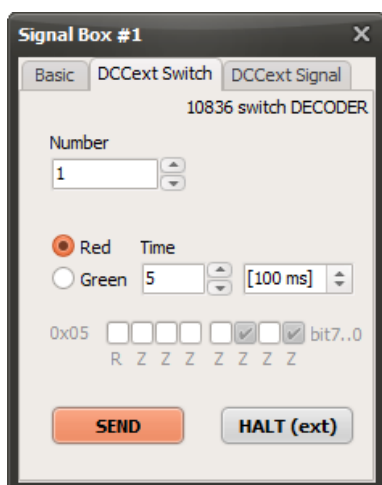
From Z21 firmware V1.42, also **F29 to F31** are available here. Note, however, that currently only few decoders actually understand and execute the DCC commands for F29 to F31.

3.11.5 Signal Box

The signal box is used for testing turnouts and signals connected to accessory decoders. This window can be opened in the Z21 Maintenance Tool via the main menu → Options → Signal Box or by using the key combination Ctrl+S.

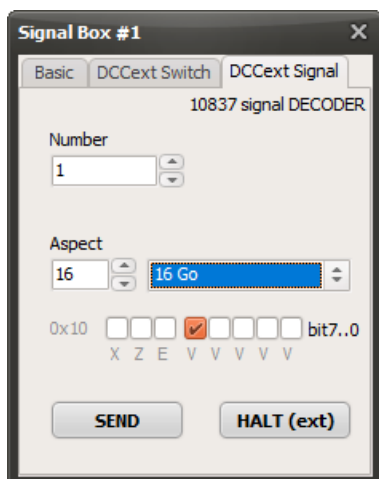


In the tab "**Basic**", turnouts or very simple light signals can be operated with the so-called switching commands for "basic accessory decoders" existing since the early days of DCC, e.g. inside the multiMAUS. "Red" also stands for "branch" and "green" for "straight".



Starting with Z21 FW version 1.40, the Z21 switch DECODER (10836) can also be controlled in the tab **DCCext Switch** via the switching commands in the new "extended accessory decoder control packet format". DCCext stands for "extended DCC". Here you can specify in one single command the turnout position and also the time for how long the magnetic drive (coil) should be switched on. The value 0 stands for "turn off" and 127 is "permanent-on", and both values can be used e.g. for street lamps, but never for magnetic drives without limit-switching (auto-power-off)! Again, "red" is also used for "branch" and "green" for "straight".

ATTENTION: When testing, be sure not to overload the coils of your turnout drives by a very long switch-on time, if these drives do not have a limit-switchin inside for stopping the operation automatically! Use the shortest possible time allowing yet a reliable operation. In case of doubt, start with the value 1, which corresponds to the shortest possible switch-on time of 100ms.



Starting with Z21 FW version 1.40, the **DCCext signal** of the Z21 signal DECODER (10837) can also be controlled via the switching commands in the new "extended accessory decoder control packet format". DCCext stands for "extended DCC". The desired signal aspect is transmitted in only one switching command. The valid range of values depends to a large extent on the concrete signal in use, but common values are, for example:

- 0 ... Stop
- 4 ... Go with speed limit max 40 km/h
- 6 ... Go with speed limit max 60 km/h
- 16 ... Go
- 65 (0x41) ... shunt go
- 66 (0x42) ... signal dark (for example approach signals)
- 69 (0x45) ... substitution (permission to pass a defect signal)

The concrete DCCext value for the desired signal concept of your signal can be found for the Z21 signal DECODER under <https://www.z21.eu/en/products/z21-signal-decoder/signaltypen>.

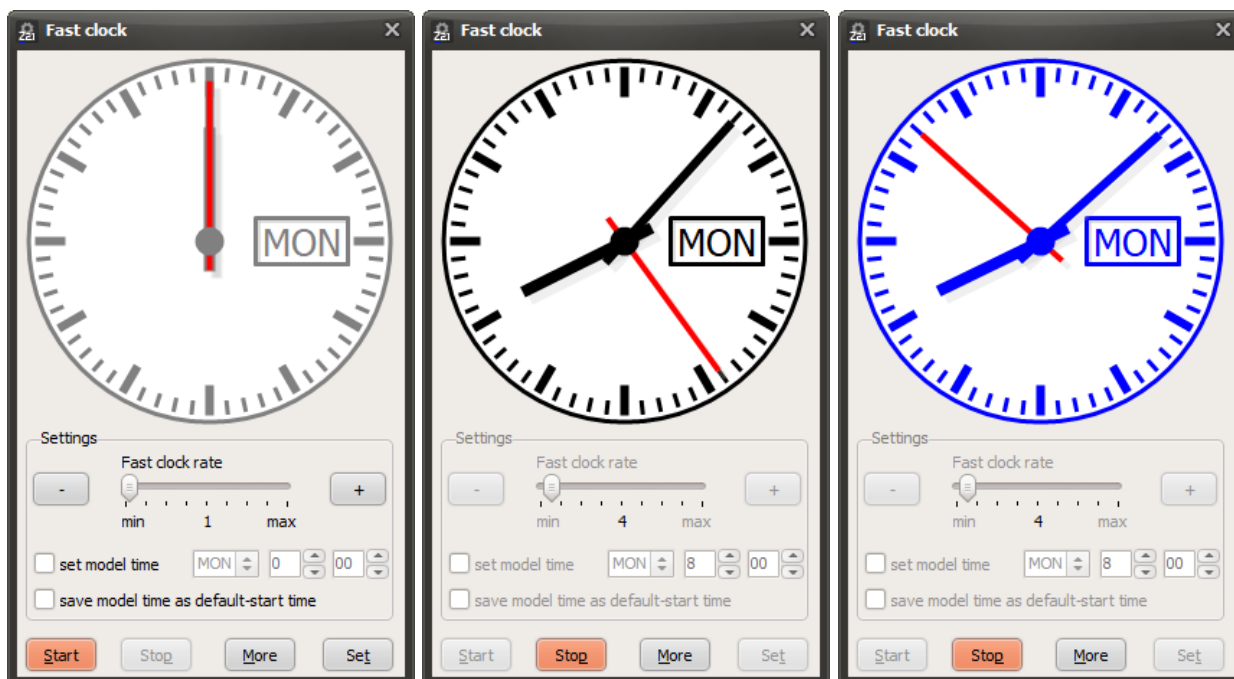
DCCext switching commands are available from Z21 firmware V1.40.

3.11.6 Fast clock

The model clock is available from Z21 firmware V1.43 (default setting: deactivated).

The **Fast clock** window is used to display and configure the fast clock (model time) integrated in the Z21. A fast clock allows operation according to a railway timetable even with shortened distances between the model stations, due to its adjustable time acceleration factor (fast clock rate). The current model time can also be sent to the track (DCC), network and buses (X-BUS and LocoNet).

Note: Since the Z21 does not have an internal real-time clock hardware, the fast clock begins with a configurable default start time, every time it is powered on. If the fast clock was activated when the Z21 was powered off, the fast clock will be automatically re-activated on next power-on.



The fast clock can be displayed on the screen in three different colors:

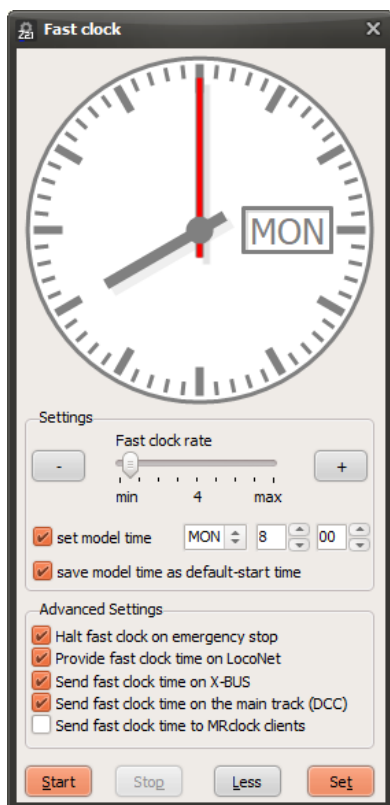
- gray: the fast clock is stopped (deactivated).
- black: the fast clock is activated and runs at the configured fast clock rate.
- blue: the fast clock is frozen due to an emergency condition (e.g. track voltage off, short circuit, ...) and is then automatically resumed again when the system returns to normal operation.

The fast clock is started / continued with the **Start** button.

The fast clock is stopped (deactivated) with the **Stop** button.

With the **Set** button, the settings are written to the Z21 and applied there. The settings can only be changed and written when the fast clock is stopped.

With the button **More** or **Less**, the advanced settings become shown or hidden.



Settings

The "**Fast clock rate**" determines the speed of the fast clock. Factor 1 means normal speed, factor 4 means four times the speed of model time, and so on.

Check the "**set model time**" checkbox if you want the given time to be used as the new current model time. Do not check this box if, for example, you only want to adjust the fast clock rate while the model time should remain unchanged.

Only check the "**save model time as default-start time**" checkbox if you want the given time to be used as the new start time at power-on. Do not check this box if, for example, you only want to adjust the fast clock rate while the default start time should remain unchanged.

Advanced settings

Check the "**Halt fast clock on emergency stop**" checkbox if you want the fast clock to be frozen during an emergency stop or short circuit. The problem can then be solved by the user without messing up the railway timetable.

Check the "**Provide fast clock time on LocoNet**" checkbox if the fast clock time should also be displayed on a LocoNet handheld controller (e.g. DT402; refer to the operating instructions of the respective manufacturer).

Check the "**Send fast clock time on X-BUS**" checkbox if the fast clock time should also be displayed on a X-BUS handheld controller (e.g. LH101; refer to the operating instructions of the respective manufacturer). Note: a multiMAUS does not display any model time.

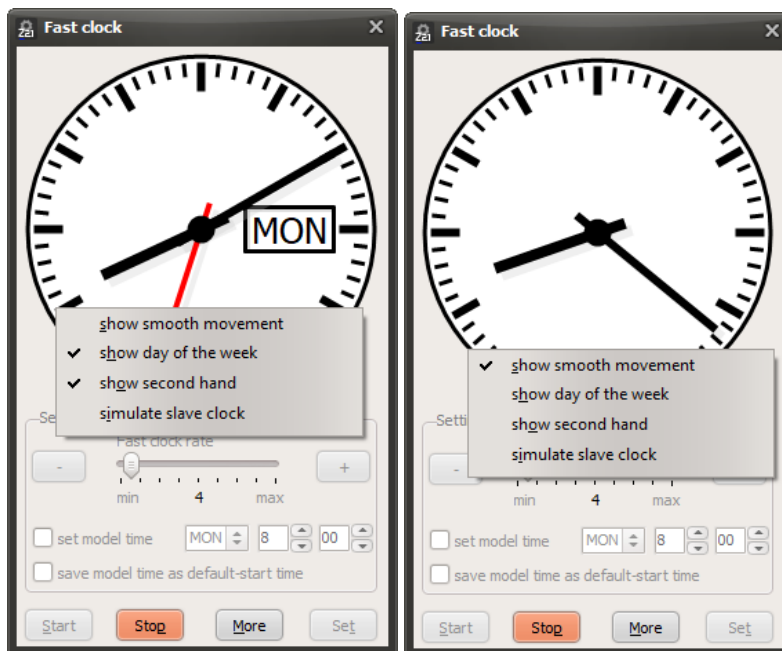
Check the "**Send fast clock time on the main track (DCC)**" checkbox if the fast clock time is to be sent periodically on the track with a new DCC command specially created for this purpose (RailCommunity **RCN-211**). Intended for future decoder developments.

Check the **"Send fast clock time to MRclock clients"** checkbox if the fast clock time should also be sent periodically on the LAN interface as "MRclock" multicast messages. Doing so allows the use of MRclock clients such as the Android MRclock app to display the current fast clock time. When activated, the MRclock multicast is then sent once per model minute (but at least three times per real minute) to the address 239.50.50.20, port 2000.

ATTENTION: Due to very mixed integration test results with MRclock clients on different devices and operating systems, Roco cannot guarantee smooth operation with MRclock clients, because not all MRclock clients run reliably on every platform. This feature is therefore to be considered "experimental".

Fast Clock Presentation

The screen presentation of the analog clock can be adjusted by clicking with the right mouse button on the clock face:



When using a high fast clock rate, the jumps of the clock hand can be perceived as annoying. Check the **"show smooth movement"** menu item to achieve a more graceful motion of the clock hand.

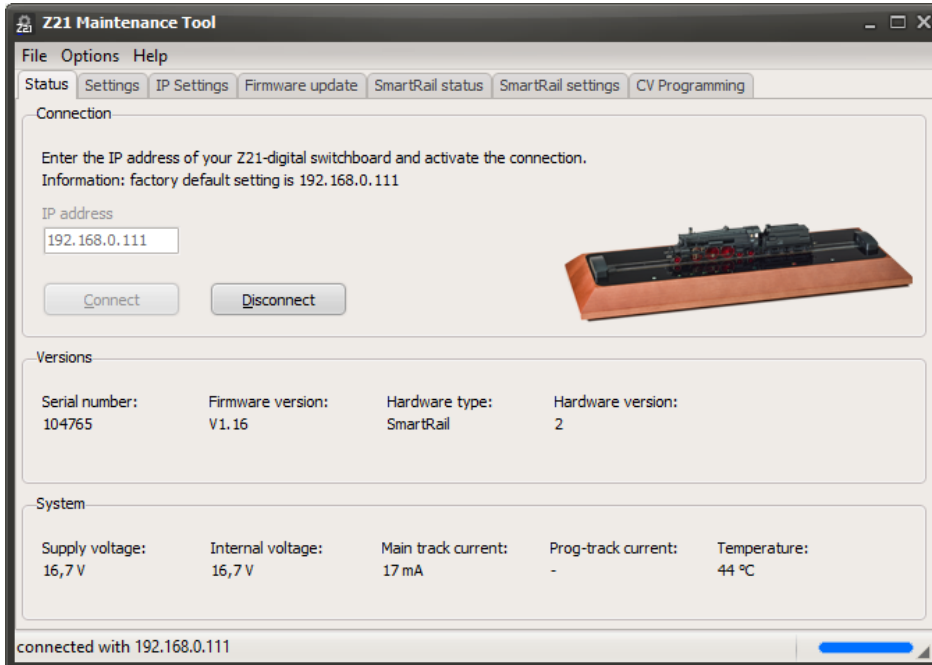
Uncheck the menu item **"show day of the week"** to hide the day of the week in the clock face.

With a very high fast clock rate, the rapidly circling second hand can be quite annoying. Uncheck the menu item **"show second hand"** to hide the second hand.

Checking the menu item **"simulate slave clock"** then shows the typical visual effect with the leading second hand pausing briefly at the full minute, while waiting for the next minute impulse from the master clock. This behaviour is known from various clocks in the railway station areas. For an optimal visual effect, also choose a rather low clock rate and enable the "show smooth movement" option.

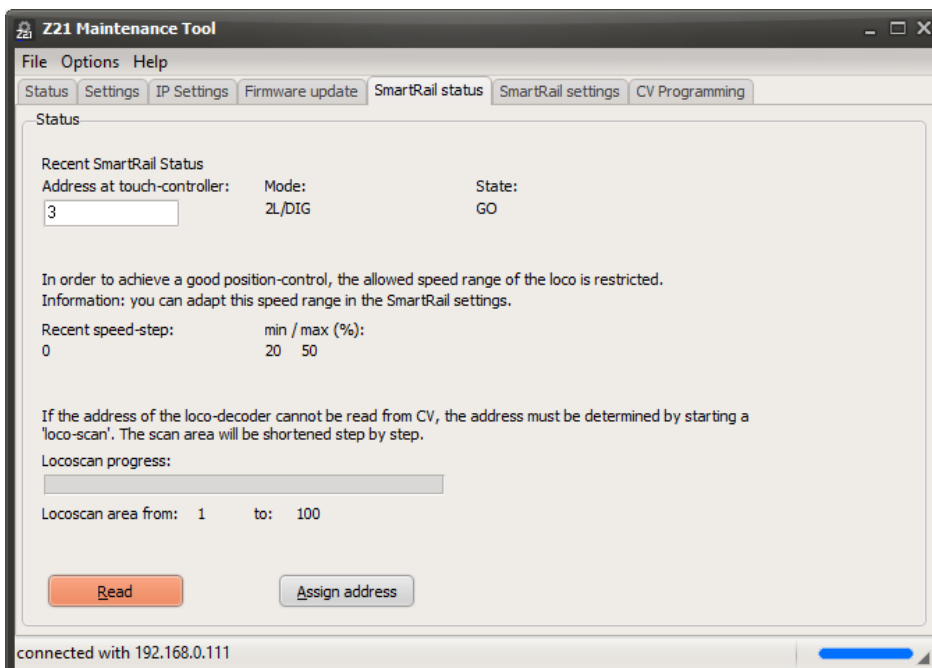
3.12 smartRail

The Z21 Maintenance Tool automatically detects the type of hardware it is connected to.



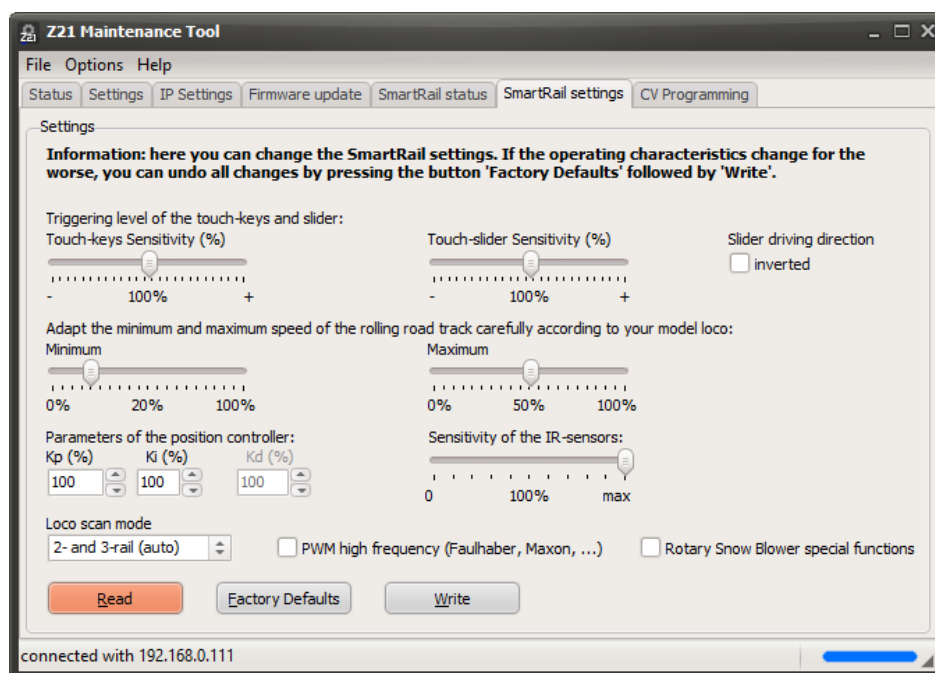
In addition to the already presented tabs Status, Settings, IP Settings and CV Programming, two additional tabs appear in the case of smartRail, which are now described.

3.12.1 smartRail Status



The current operating status of your smartRail can be imported here. In addition, the touch user interface can be assigned a specific loco address (only in "GO" status, which is also the case with CV Programming).

3.12.2 smartRail Settings



Here the user can make various fine adjustments for smartRail, such as the touch sensitivity, as required.

If the drive characteristics become poorer as a result, all changes can be reversed by clicking "Factory settings", followed by "Write".

New from smartRail firmware V1.14 are the options that can be used to reverse the occupancy of the slider for the "forward" and "backwards" **driving direction** and restrict the **Loco scan mode** for your own collection. This normally makes the scan process slightly faster, and there are fewer potential sources of error. There are the following setting options:

- **2- and 3-rail (auto):** An attempt is made to detect both digital 3-rail locos (MM II, DCC) and digital (DCC) and analogue (PWM) 2-rail locos automatically. This is the default setting for smartRail.
- **3-rail only:** The scanning process for 2-rail locos is omitted.
- **2-rail only (DCC, PWM):** The scanning process for 3-rail locos is skipped. An attempt is made to detect automatically whether there is a digital or analogue 2-rail loco on the smartRail.
- **2-rail DCC only:** The scanning process for 3-rail locos and analogue 2-rail locos is skipped.
- **2-rail PWM only:** After measuring the loco length, the system changes immediately to analogue 2-rail mode (PWM).

Analogue locos are controlled on the smartRail using low frequency pulse width modulation (PWM). The low frequency is essential due to interference suppression capacitors installed in the analogue locos. Depending on the model and manufacturer, these capacitors may be of different sizes and can result in unnecessarily high power consumption and excessive heating at high frequency. Low frequency PWM is not suitable for **coreless motors** (e.g. from Faulhaber, Maxon, ...). The new "**PWM high frequency**" option has been added so that you can also operate your high-quality models equipped with coreless motors on the smartRail. **Note:** This feature is in the test phase and is expressly not recommended for analogue locomotives with conventional DC motors.

New from smartRail firmware V1.15 is the "**Rotary Snow Blower special functions**" option. If this option is activated, an advanced loco scan is performed to detect the Beilhack snow blower. If a snow blower is detected, special handling of the touch function keys F0 and F4 is activated.

A short press of the F0 key activates the normal front lights as usual. A long press of the F0 key will switch on the step lights for around two seconds. After a further two seconds, the rear red warning lights are activated.

The F4 key is used to start rotating the coachwork. This is only possible with speed step 0. During the rotating process, the conveyor is braked to prevent uncontrolled movement due to the geometry change in the model being monitored.

4 zLink

The **zLink interface**, introduced for the first time with the Z21 single BOOSTER, allows, among other things, to integrate even devices with very small microcontrollers such as signal decoders into your Wi-Fi network. Devices with zLink interface are at present (06/2023):

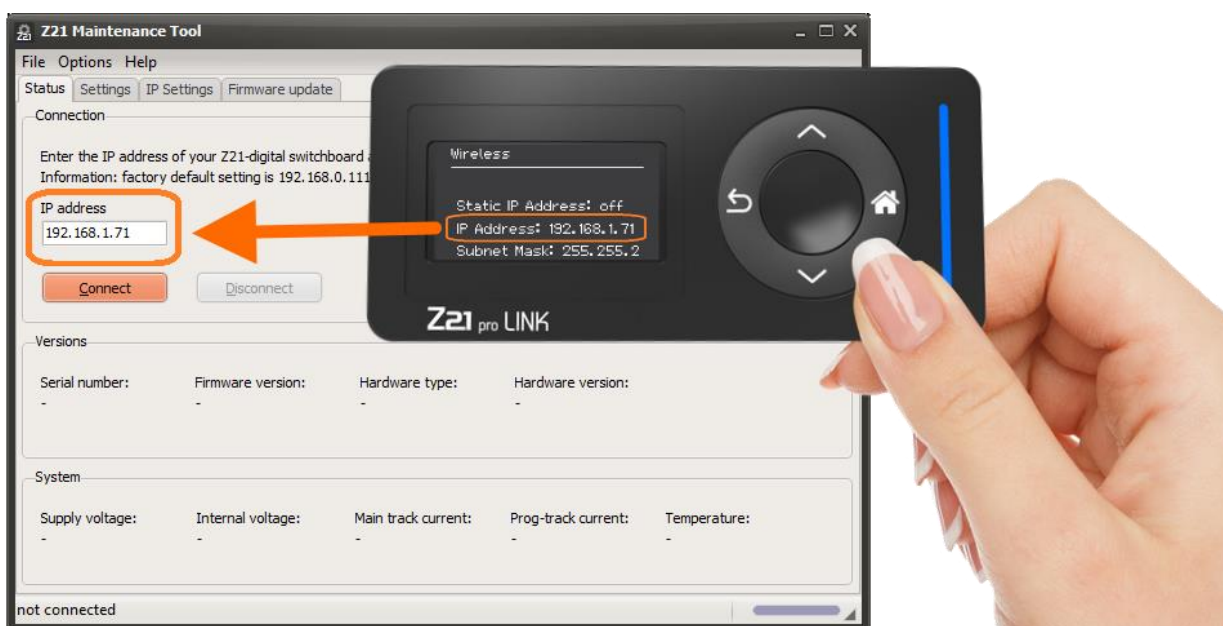
- 10806 Z21 single BOOSTER, 10807 Z21 dual BOOSTER, 10869 Z21 XL BOOSTER
- 10836 Z21 switch DECODER
- 10837 Z21 signal DECODER

The 10838 **Z21 pro LINK** can be connected to this zLink interface of these end devices. It works as a gateway between WI-FI and zLink and can be used for the following purposes:

1. **Configuration** of the end device
2. **Firmware update** of the end device
3. **Controlling** and operating the end device by Wi-Fi clients, for example for testing and placing new hardware into operation.

All these tasks can also be performed with the Z21 Maintenance Tool by connecting the Z21 pro LINK in **client mode** to the same Wi-Fi network, in which your PC or laptop with the Z21 Maintenance Tool is already logged in. See also the instruction manual of the 10838 Z21 pro LINK.

After all devices are now registered in the same Wi-Fi network and the Z21 pro LINK is connected to the desired end device such as booster or decoder, then use the buttons on the Z21 pro LINK to go into the menu "**Wireless**" and to scroll down to the line "**IP Address**". **Note:** During startup, the Z21 pro LINK dynamically receives its IP address from the Wi-Fi access point, and of course it can differ in your network from our example. It could also be 192.168.0.103 or something else. Therefore, it is important to mind the information shown on the display carefully.



Now enter the IP address shown on your Z21 pro LINK into the Z21 Maintenance Tool, and then press the button "Connect".

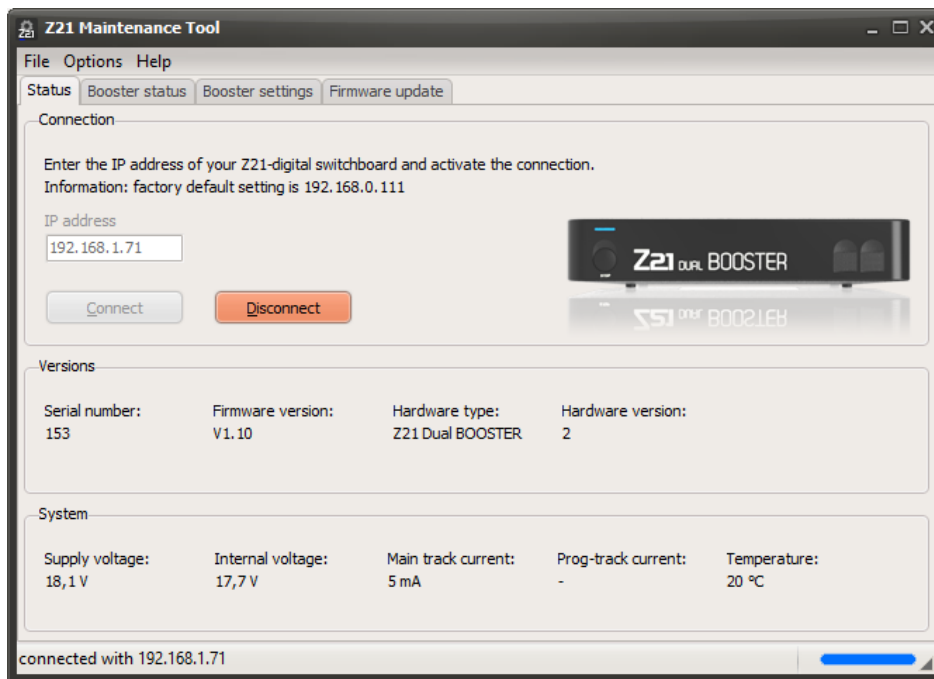
The Z21 Maintenance Tool is now trying to detect the device connected to the 10838 Z21 pro LINK. All this works without any DCC central station. **Thus, no Z21 is necessary here, because the PC communicates directly via Wi-Fi and Z21 pro LINK with the end device.**

While working with the Z21 Maintenance Tool, it is recommended that no other Wi-Fi client (Z21 app, ...) is connected to the Z21 pro LINK.

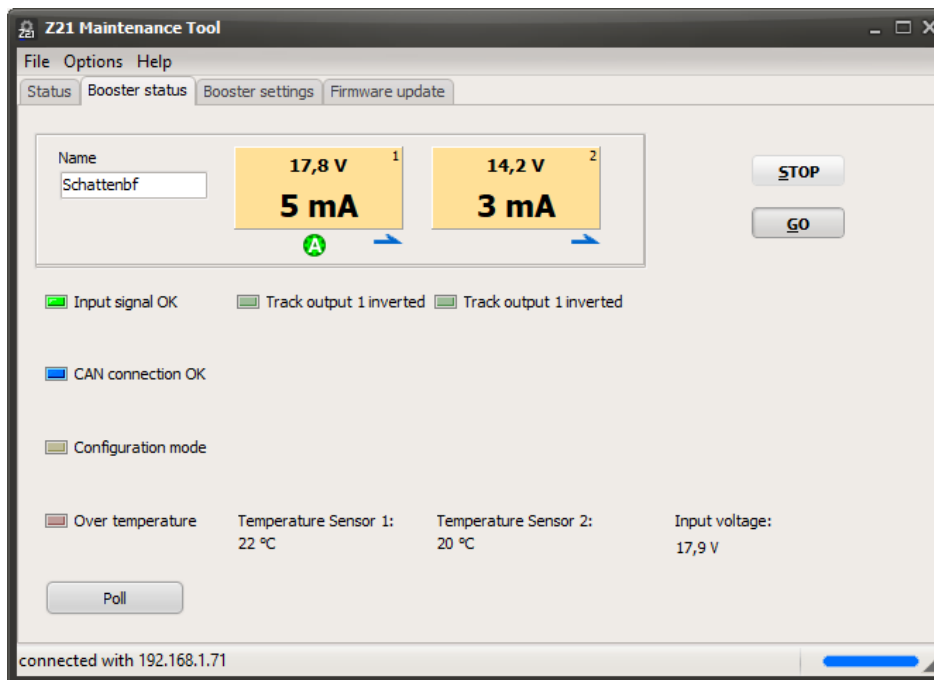
4.1 Z21 BOOSTER

4.1.1 Status







If the Z21 pro LINK is plugged into a 10806 Z21 single BOOSTER, 10807 Z21 dual BOOSTER or 10869 XL BOOSTER, the detected device and the **status** including the firmware version is shown.



More details can be seen in the **Booster Status** tab.



Depending on the type, single or dual booster, one or two panels with the current voltage and power consumption appear for each track output. The icons under the panels indicate the status of the respective track output:

-  Track output is switched off.
-  Short-circuit detected.
-  Auto Settings Ok: the settings for track voltage and RailCom have been transferred from the control center to the booster automatically.
-  Brake generator mode active.
-  RailCom cutout active: the RailCom cutout is generated in the DCC track signal by the booster.
-  RailCom cutout active + RailCom data from a locomotive decoder is received in the booster.

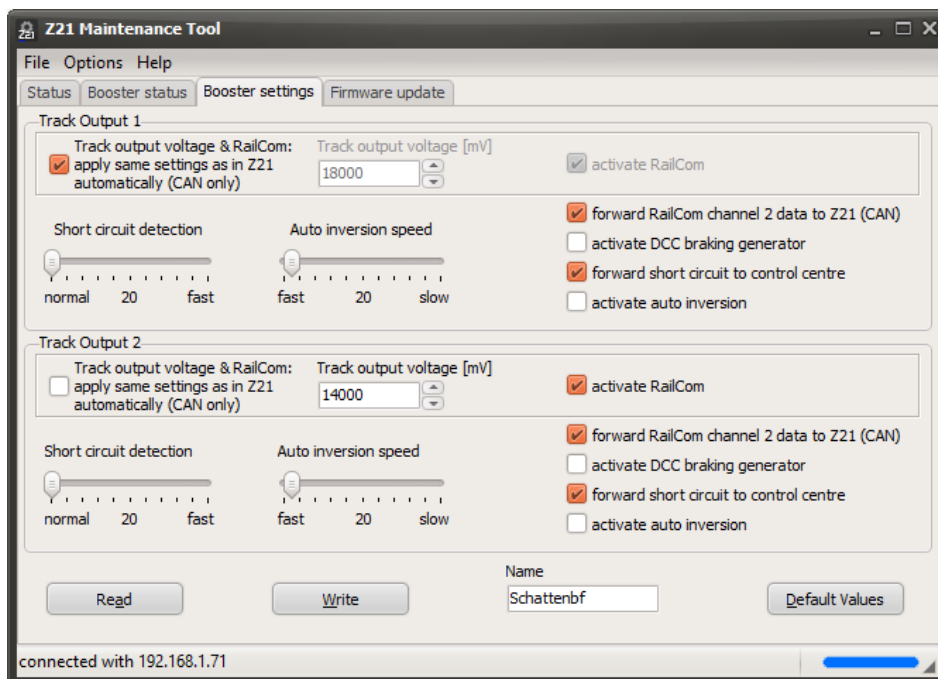
Moreover, status information about the DCC input signal, CAN bus, mode as well as the operating temperatures can be seen.

When connected with a 10806 Z21 single BOOSTER or Z21 XL BOOSTER, of course, the display panels for the second track output are omitted.

from **Booster Firmware V1.11**, the corresponding track outputs can be switched on and off *individually* by clicking on the panels (**booster management**). With the **STOP** and **GO** buttons you can switch all track outputs of the booster off and on *together*. Of course, switching on can only be done successfully if there exists a valid DCC input signal coming from the control center.

4.1.2 Settings

In the **Booster Settings** tab, you will find all the options that you can configure on your booster.



The individual settings have already been explained in section 3.5.2.1 *Roco 10806 and 10807 booster setup* and 3.5.2.2 *Roco 10869 XL Booster setup*, see there. Use button “Default Values” to fill the tab with the factory defaults and write them into the booster by pressing the button “Write”.

You can enter a name (free text with up to 16 characters) in the input field "Name" and write into your booster. It can be used as a reminder making it easier to identify the device in the future.

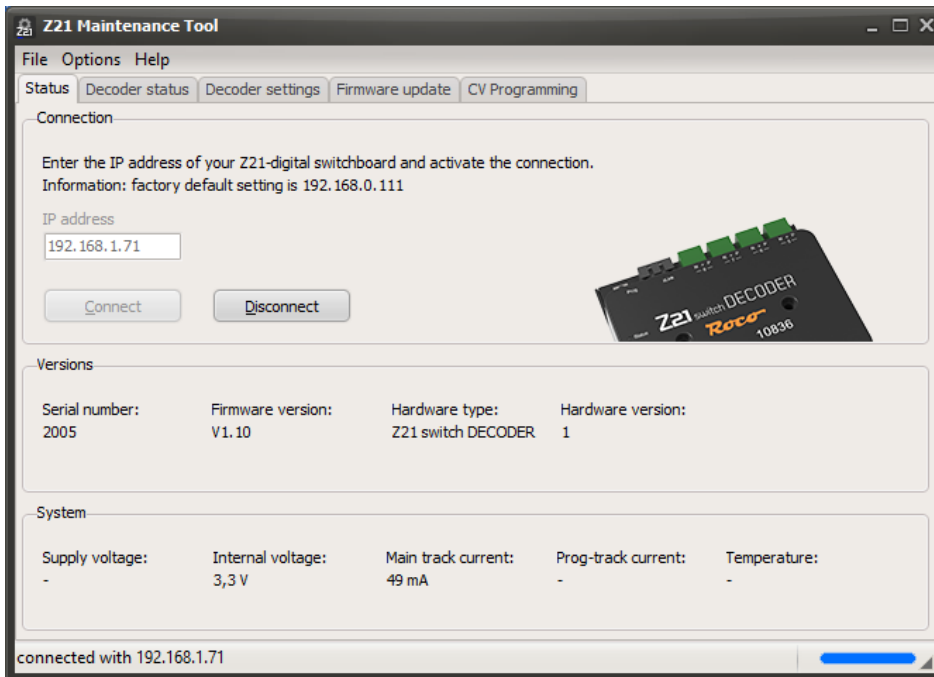
4.1.3 Firmware Update

In the **Firmware Update** tab, you can update the firmware of your booster.

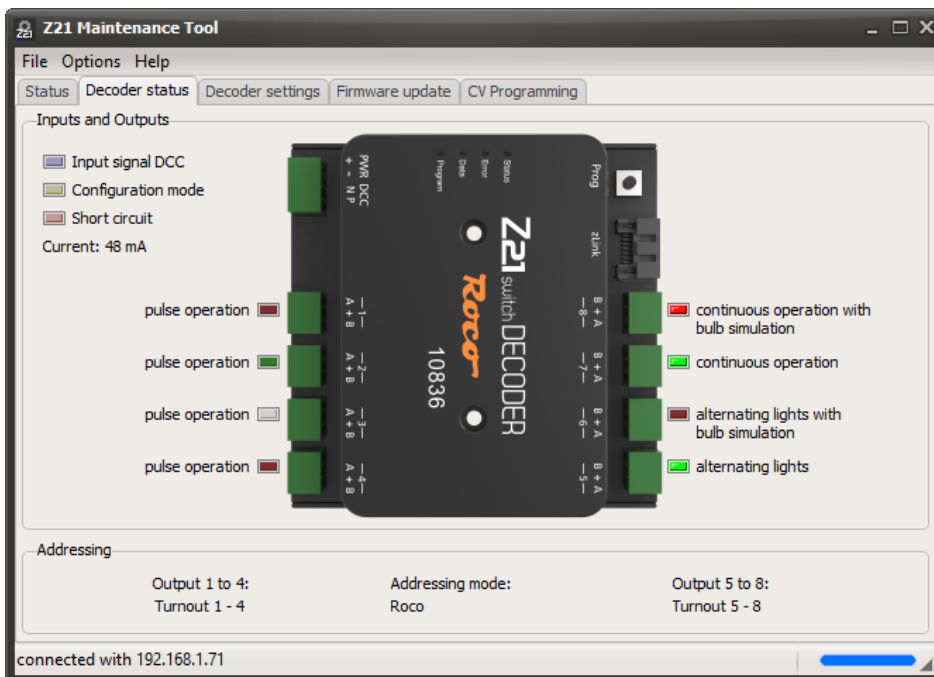
4.2 Z21 switch DECODER

4.2.1 Status

If the Z21 pro LINK is plugged into a 10836 Z21 switch DECODER, the detected device and its **status** including the firmware version is shown.



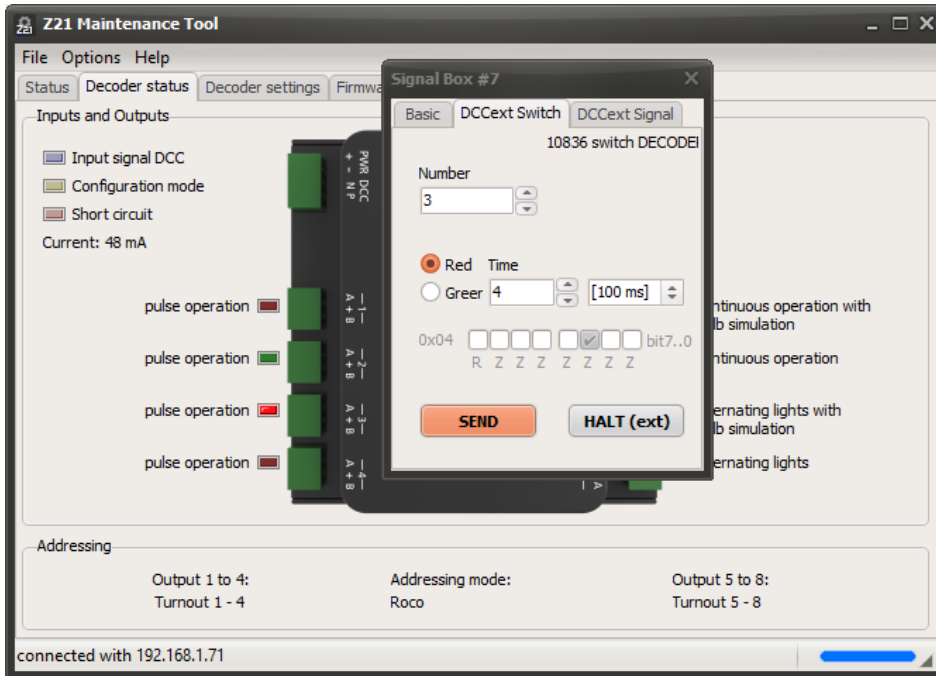
More details can be seen in the **Decoder Status** tab.



Status lights for the input signal, configuration mode, short circuit and current can be seen on the left side. The operating mode and status of each of the 8 output pairs are also displayed. Red color stands for “output A” and green color stands for “output B”. A bright color means “on”, a dark color means “off”. Outputs that have never been switched since the decoder was switched on, are shown in grey color.

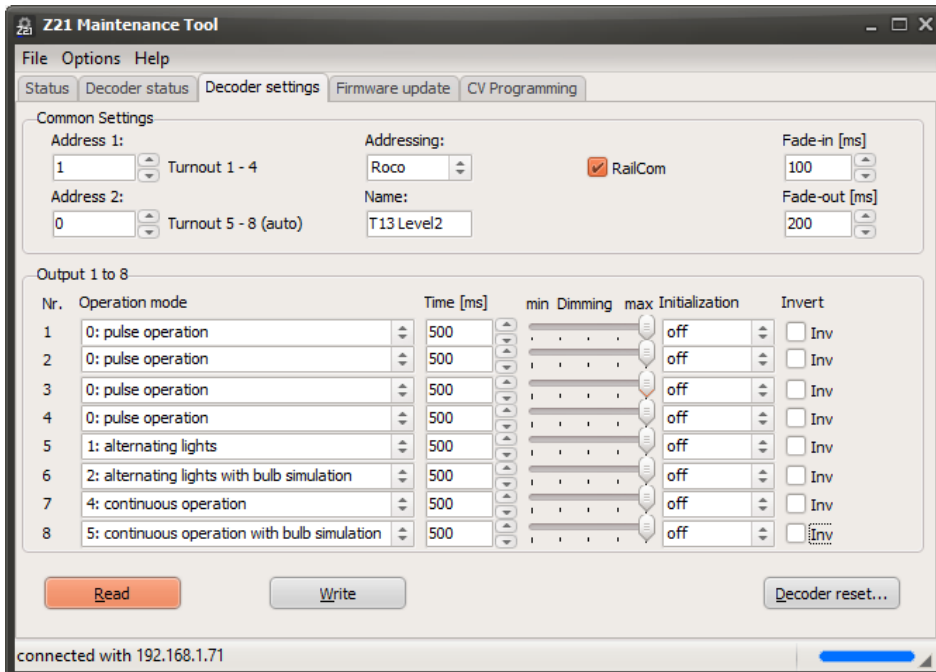
4.2.2 Controlling

You can switch the outputs for testing purposes even without any DCC central station. To do so, use the **"Signal Box"** feature described in section 3.11.5 Signal Box. It can be opened via the menu Options → Signal Box or by using the key combination Ctrl+S.



4.2.3 Settings

The decoder can be configured in the **Decoder Settings** tab.



Here, the first and second decoder address, as well as the addressing mode, RailCom and the duration of smooth fading in and fading out can be configured without any complicated CV tables.

Next to the two decoder addresses, the corresponding turnout numbers are displayed, with which the individual output pairs can be switched, e.g., with the multiMAUS.

For each output pair, the operating mode, the power-on time (if applicable), a dimming value (for illuminations) and a power-on initialization value (for simple signals) can be configured individually. For the detailed descriptions of the available values, see the **user manual for the 10836 Z21 switch DECODER**. Use dimming for illumination purpose only, and never for magnetic drives.

You can enter a name (free text with up to 16 characters) in the input field "Name" and write into your decoder. It can be used as a reminder making it easier to identify the device and its turnouts in the future.

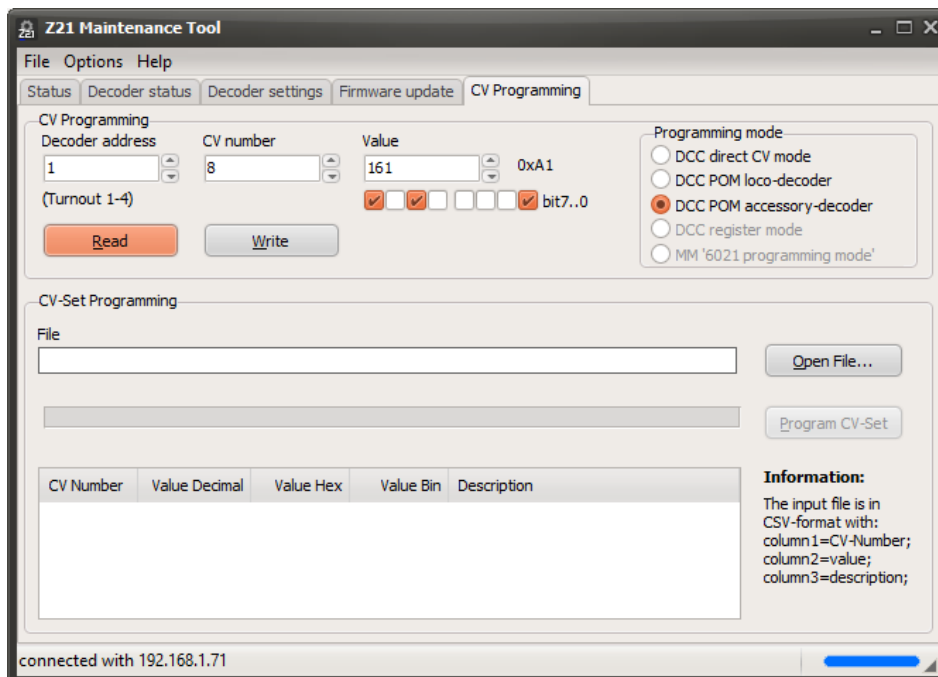
You can reset the decoder to its factory settings with the button "Decoder Reset".

4.2.4 Firmware Update

In the **Firmware Update** tab, you can update the firmware of your decoder.

4.2.5 CV Programming

If you prefer to configure the decoder via CV, you can do this in the **CV Programming** tab.

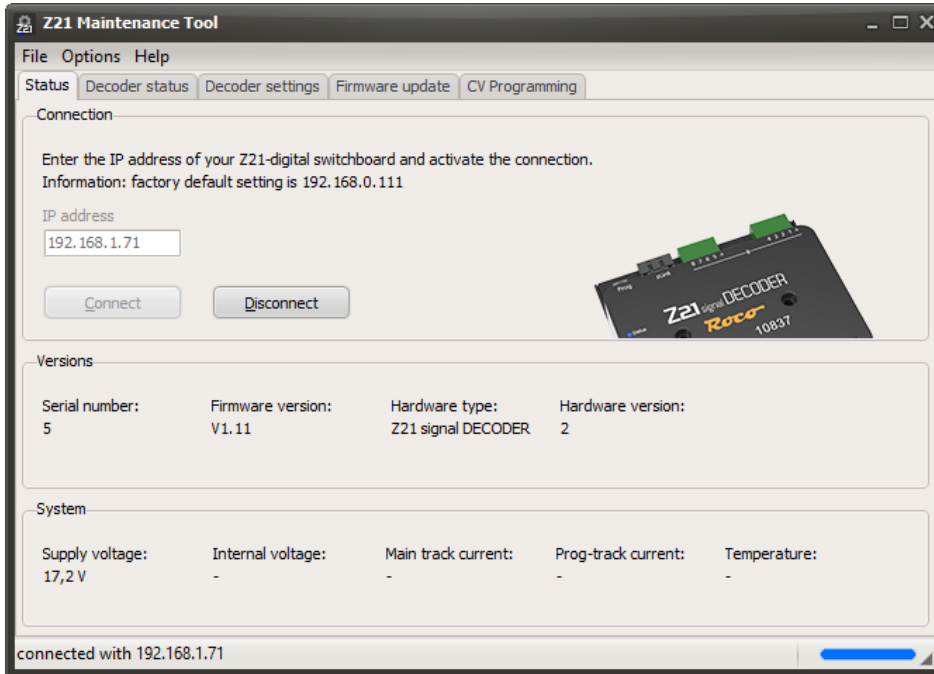


All the CV programming commands are also forwarded directly to the decoder by the Z21 pro LINK via the zLink interface. This means that here no DCC central station is necessary. The corresponding CV table can be found in the user manual for the 10836 Z21 switch DECODER.

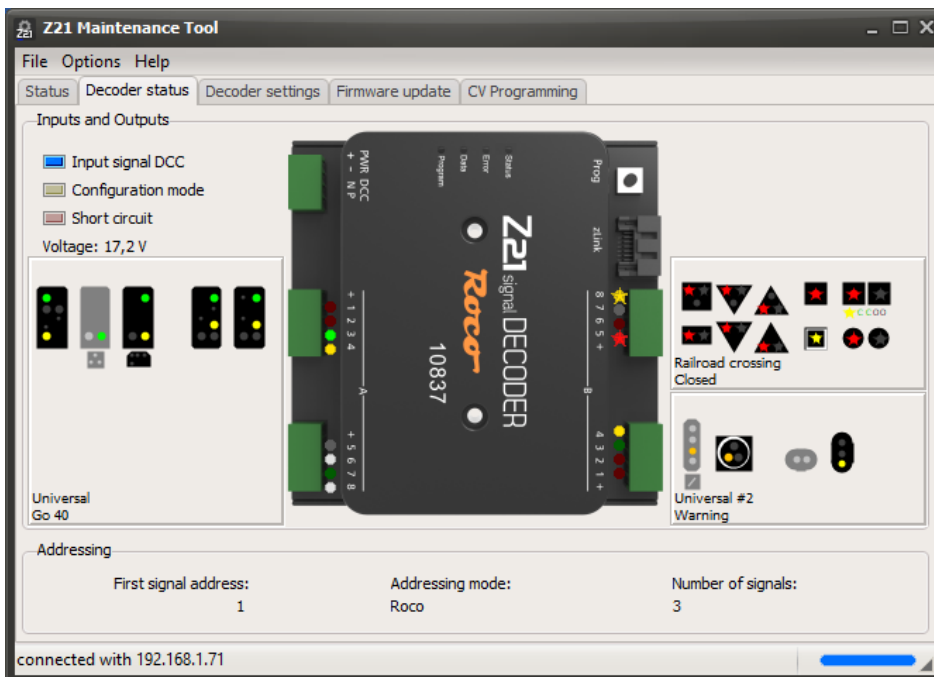
4.3 Z21 signal DECODER

4.3.1 Status

If the Z21 pro LINK is plugged into a 10837 Z21 signal DECODER, the detected device and its **status** including the firmware version is shown.

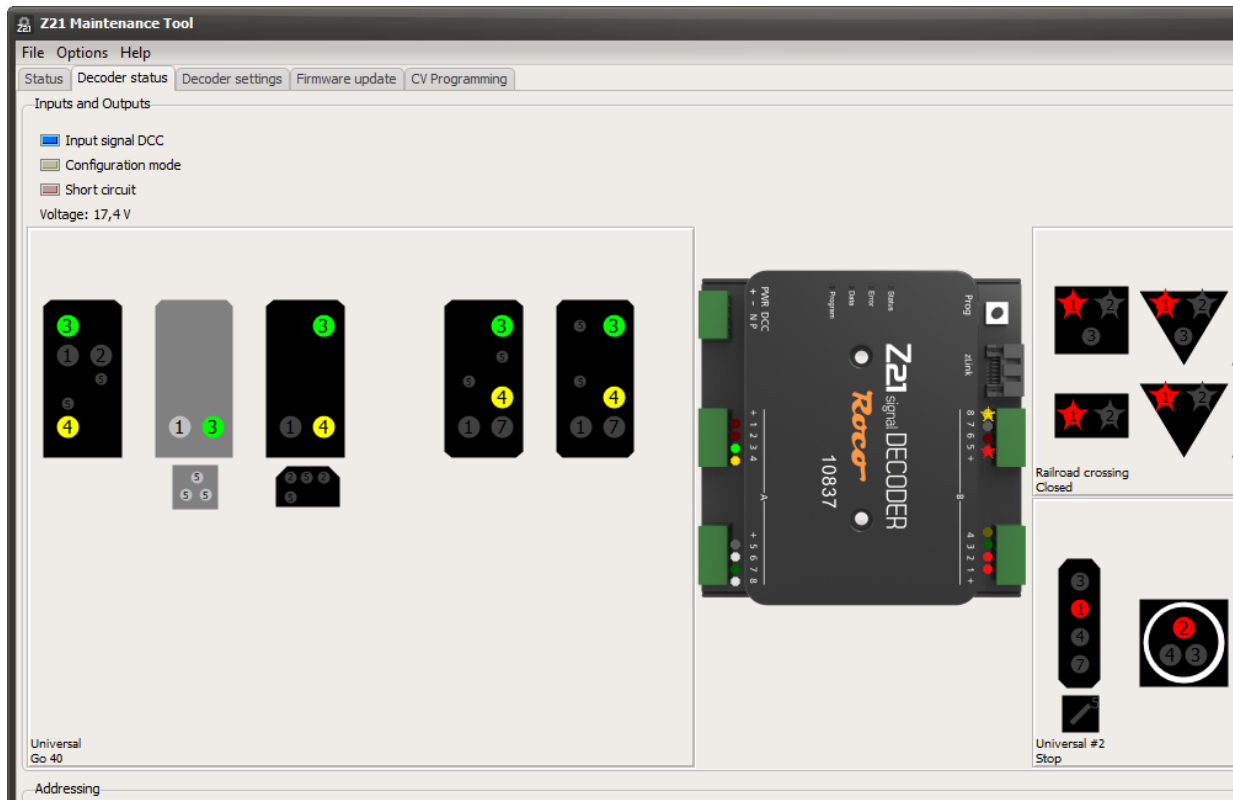


More details can be seen in the **Decoder Status** tab.



Status lights for the input signal, configuration mode, short circuit and voltage can be seen on the left side. Also the configured signal types as well as the current signal aspects are shown in a graphical way. Each active output is also highlighted inside the graphic of the signal decoder. An "astersik" indicates flashing outputs.

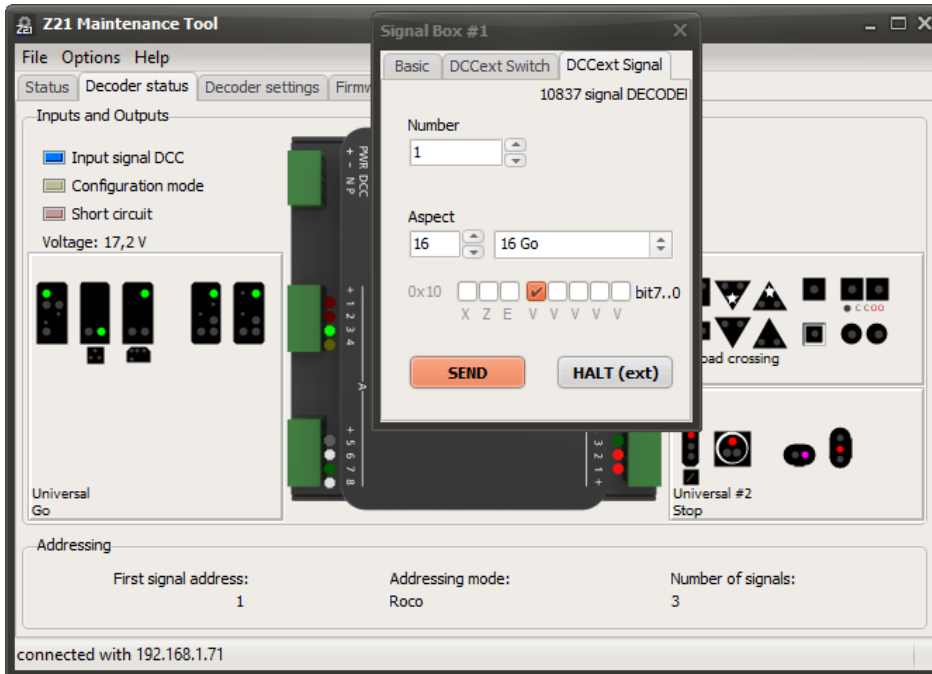
Enlarge the application window to see even more details on the signal panels.



A small number at each "lamp" in the signal panel indicates the ascending sequence to which clamp of the signal decoder the LED should be connected.

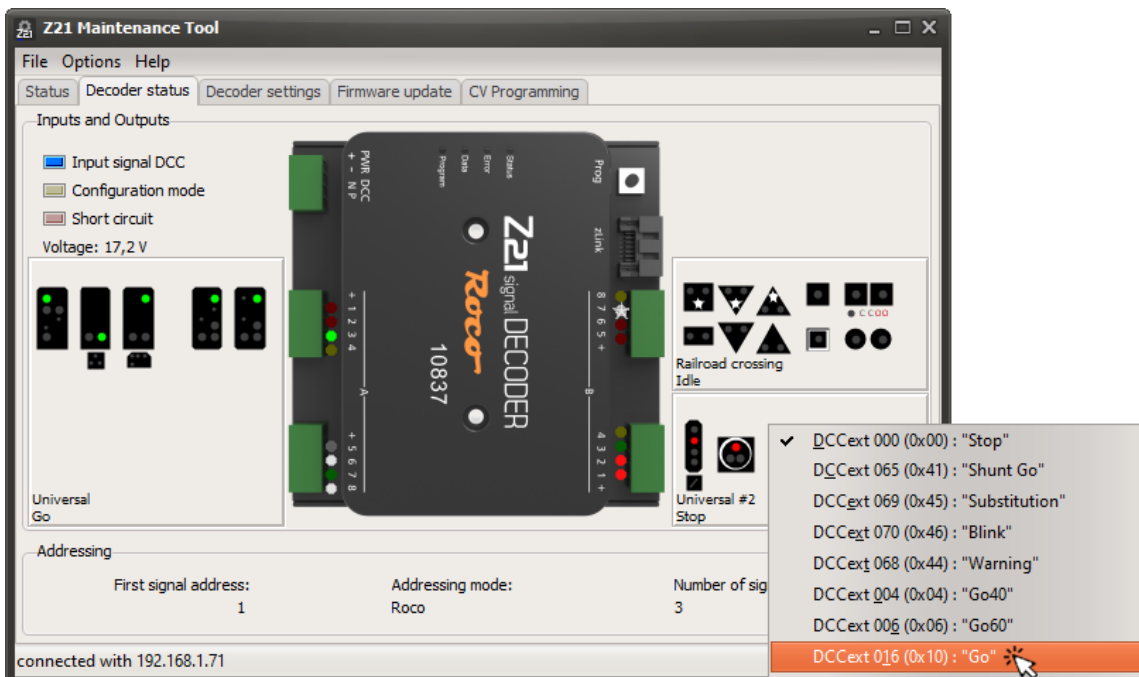
4.3.2 Controlling

You can switch the signal aspects for testing purposes even without any DCC central station. To do so, use the **"Signal Box"** feature described in section 3.11.5 Signal Box. It can be opened via the menu Options → Signal Box or by using the key combination Ctrl+S.



The actual DCCext value for the desired signal aspect of your signal can be found in <https://www.z21.eu/en/products/z21-signal-decoder/signaltypen>.

You can switch a signal even more comfortably by clicking with the right mouse button on the signal graphic.

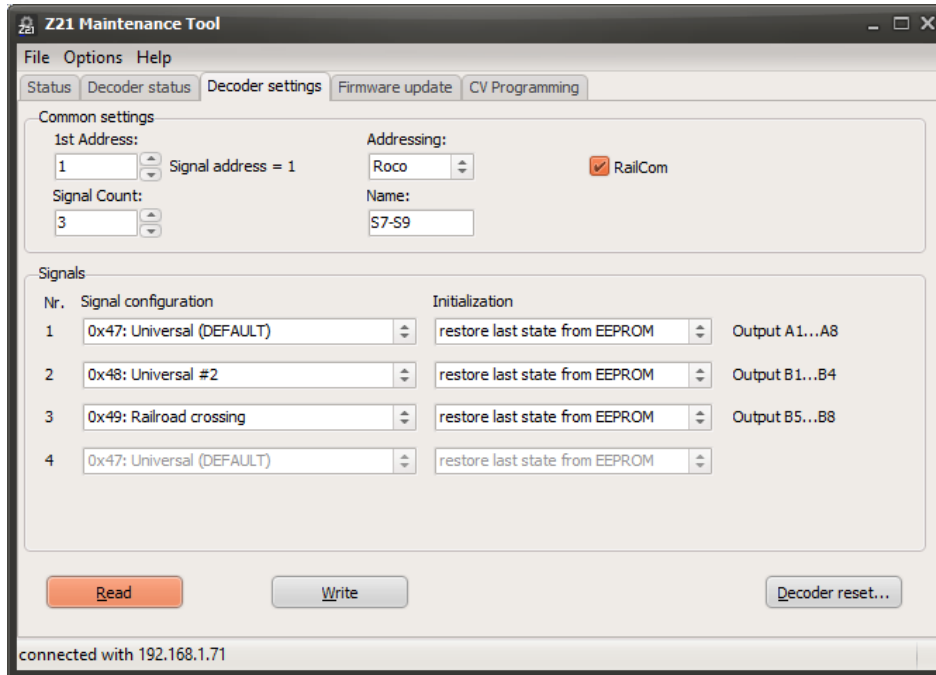


Do a click with the right mouse button in the panel with the signal graphics. A pop-up menu will appear, where you can select and switch a new signal aspect. In addition to the name of each signal term, there

can also be seen on the left side the value with which this signal aspect could be switched by means of "extended accessory packet format". DCCext stands for "extended DCC". More information about "DCCext" can be found in the **user manual for the 10837 Z21 signal DECODER**. This value is shown in the decimal format and also in hexadecimal format for the advanced user. With this pop-up menu, you can become acquainted with the different signals in a very simple way, even without a "reference book", or you test a new signal for correct function.

4.3.3 Settings

The decoder can be configured in the **Decoder Settings** tab.



Here you can configure the first decoder address, the number of signals, the addressing mode and RailCom without any CV tables. Next to the decoder address, the corresponding first signal address is displayed, with which the signals can be switched, for example, with a multiMAUS or with the Z21 app.

One of numerous predefined signal configurations as well as a power-on initialization can be individually adjusted for each signal. By default, it is configured to restore the signal aspect that was shown before the decoder has been turned off. However, here you can also select a specific signal aspect to be when the decoder is switched on.

There is an indication on the right side, showing to which terminal block of the decoder the respective signal can be connected. This value depends on the actual number of signals.

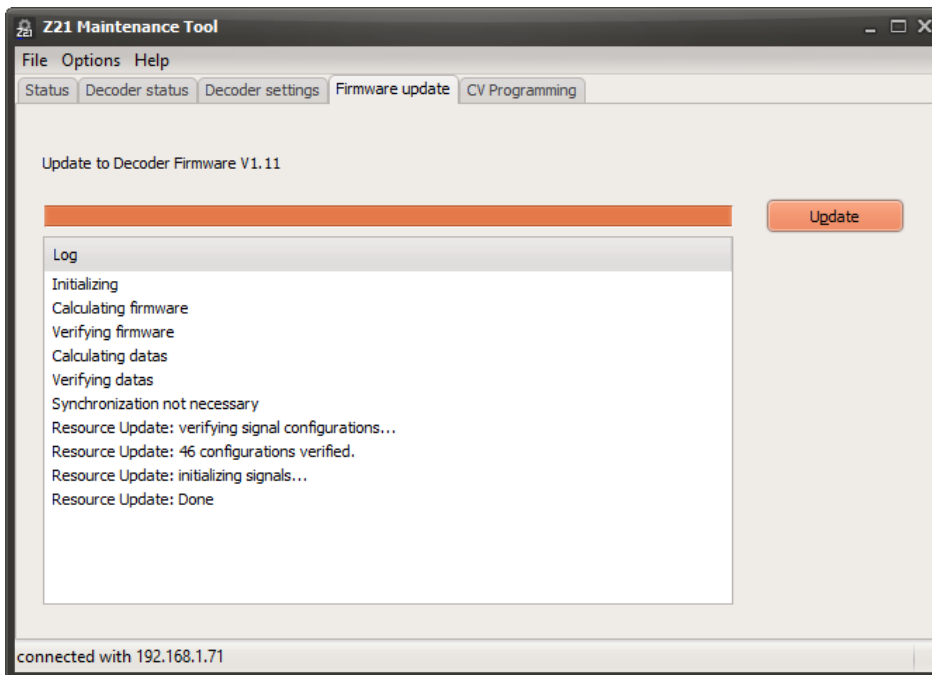
More information about decoder address versus signal address, signal configuration and "DCCext" can be found in the **user manual for the 10837 Z21 signal DECODER**. More details about the predefined signal configurations can be found online at <https://www.z21.eu/en/products/z21-signal-decoder/signaltypen>.

You can enter a name (free text with up to 16 characters) in the input field "Name" and write into your decoder. It can be used as a reminder making it easier to identify the device and its signals in the future.

You can reset the decoder to its factory settings with the button "Decoder Reset".

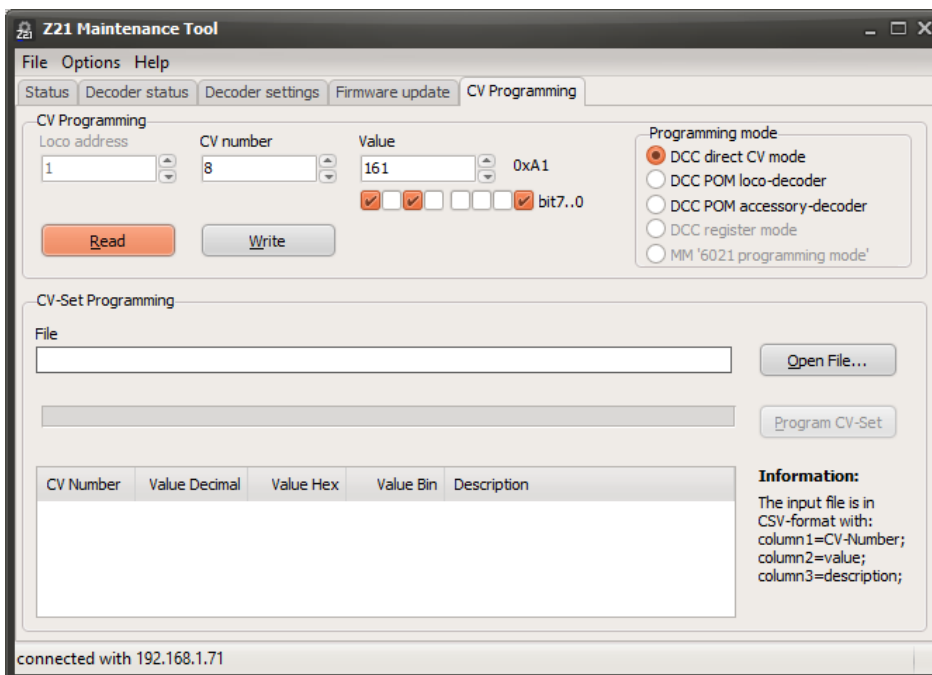
4.3.4 Firmware Update

In the **Firmware Update** tab, you can update the firmware and resources of your decoder. The resources are the predefined signal configurations that you can choose from.



4.3.5 CV Programming

If you prefer to configure the decoder via CV, you can do this in the **CV Programming** tab.



All the CV programming commands are also forwarded directly to the decoder by the Z21 pro LINK via the zLink interface. This means that here no DCC central station is necessary. The corresponding CV table can be found in the user manual for the 10837 Z21 signal DECODER.