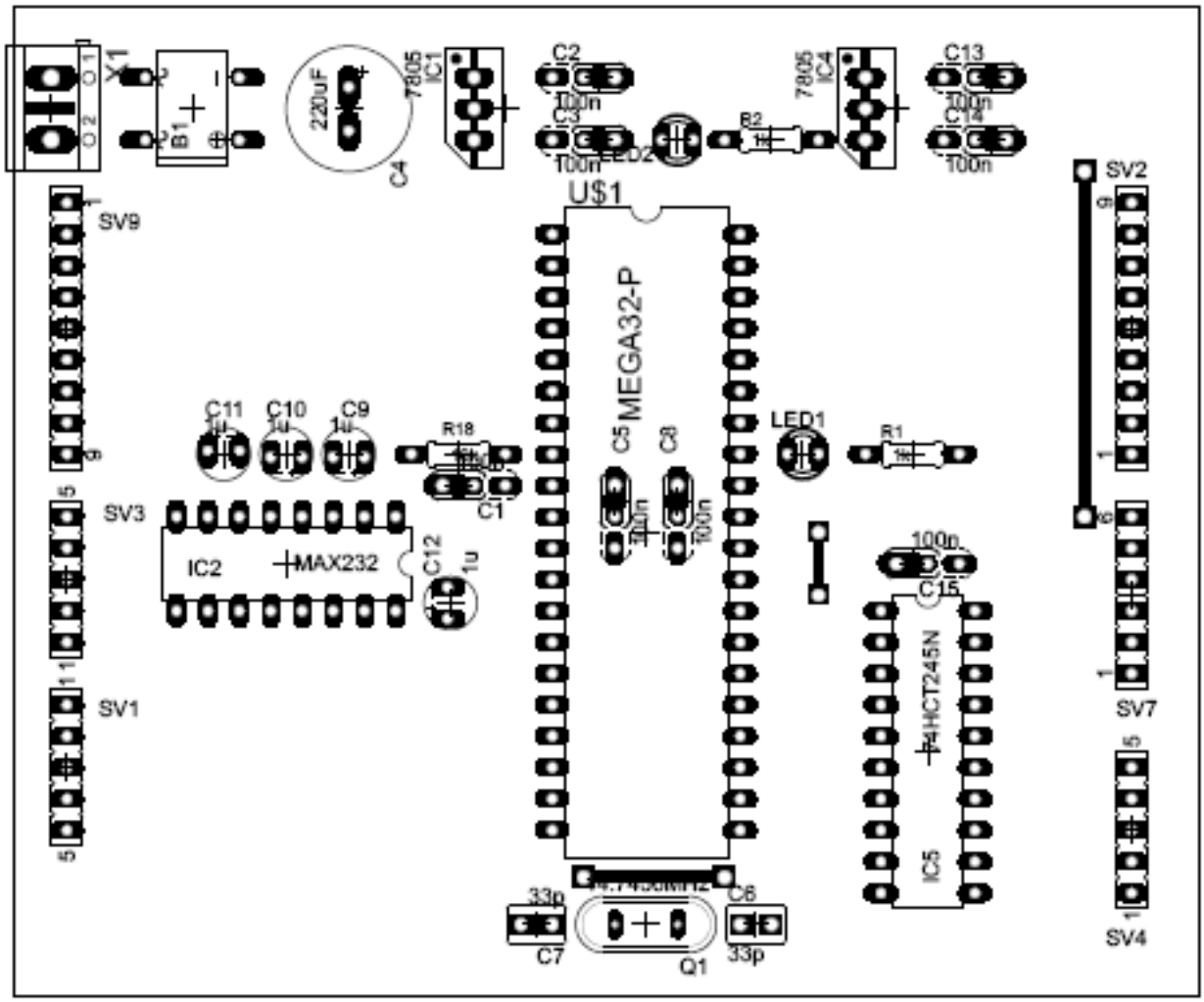
Atmel Mega32 Digital RailRoad Control



Document Content

1.Introduction

Yes, another DIY digital model rail road control. Why?

- Others did not satisfy my needs, they
  - Only support MM format.
  - Only support DCC format.
  - Supported a lot of extras I don't use.
  - To complicated.

The DigiSys[1] module was what I wanted, just a simple PCB with a micro controller and some extra components. But it only supported MM and it used a PIC[2]. Based on the DigiSys idea I created a similar control based on an Atmel[3] Mega32 micro controller targeted for use with Koploper[4] to match my needs for controlling my model rail road. If this controller does not match your needs, there are plenty of other do it yourself controllers or commercial controllers for digital rail road control.

1.1 Features

It features:

- DCC[5] and MM-2[6] loc commands limited to 64 locomotives
  - DCC only 28 step decoders DCC, long addresses supported.
  - MM-2 14 speed steps.
- Function F1..F12 support for DCC locomotives.
- Function F1..F4 support for MM-2 locomotives.
- MM[7] / DCC[8] turnout control for controlling gauges, signals and so on. DCC turnout is limited to 512 addresses.
- Single S88 bus for up to 32 S88 units.
- 2*16 LC Display HD44780 compatible.
- Easy software update using a boot loader.
- Serial communication support for use with Koploper / RocRail.
- Programming and reading DCC decoder CV's.
- Support for (wireless) manual control and keyboard.

So, this document describes how the MegaDigitalRailRoadControl (MDRRC) can be build and used.

[1] http://www.moba-digital.net/
[2] http://www.microchip.com/
[3] http://www.atmel.com/
[4] http://www.pahasoft.nl/
[5] http://www.nmra.org/
[6] http://www.maerklin.nl/
[7] http://www.maerklin.nl/
[8] http://www.nmra.org/

1.2 Disclaimers

- I do **not** accept any responsibility for damage resulting from using the items presented in this document or referenced ZIP files. In no event the author will be liable to you for damages.
- In short **USE AT OWN RISK !!!**
- The software is as is and can be updated any time without notice to users.
- Commercial use of the items presented in this document and items available in the ZIP-file(s) is prohibited.
- I am not responsible for the content of web pages mentioned in this document.
- If a product(name) or picture is used in this document a link is created to the product(name) or source of picture.
- It's tried to implement functions according specifications, but it's NOT assured neither fully tested that the MDRRC fulfils all these specifications and works with all (non-) commercial model rail road control programs or decoders.
- It's not my intention to harm any patents or commercial opportunities. MDRRC is a digital control build by a hobbyist for hobbyist..

2. Hardware

The PCB of the MDRRC is shown in Figure 1. The schematic can be found in [REF01]. The hardware is rather simple and could also be build on an experimental board. The PCB layout can be found in [REF01].

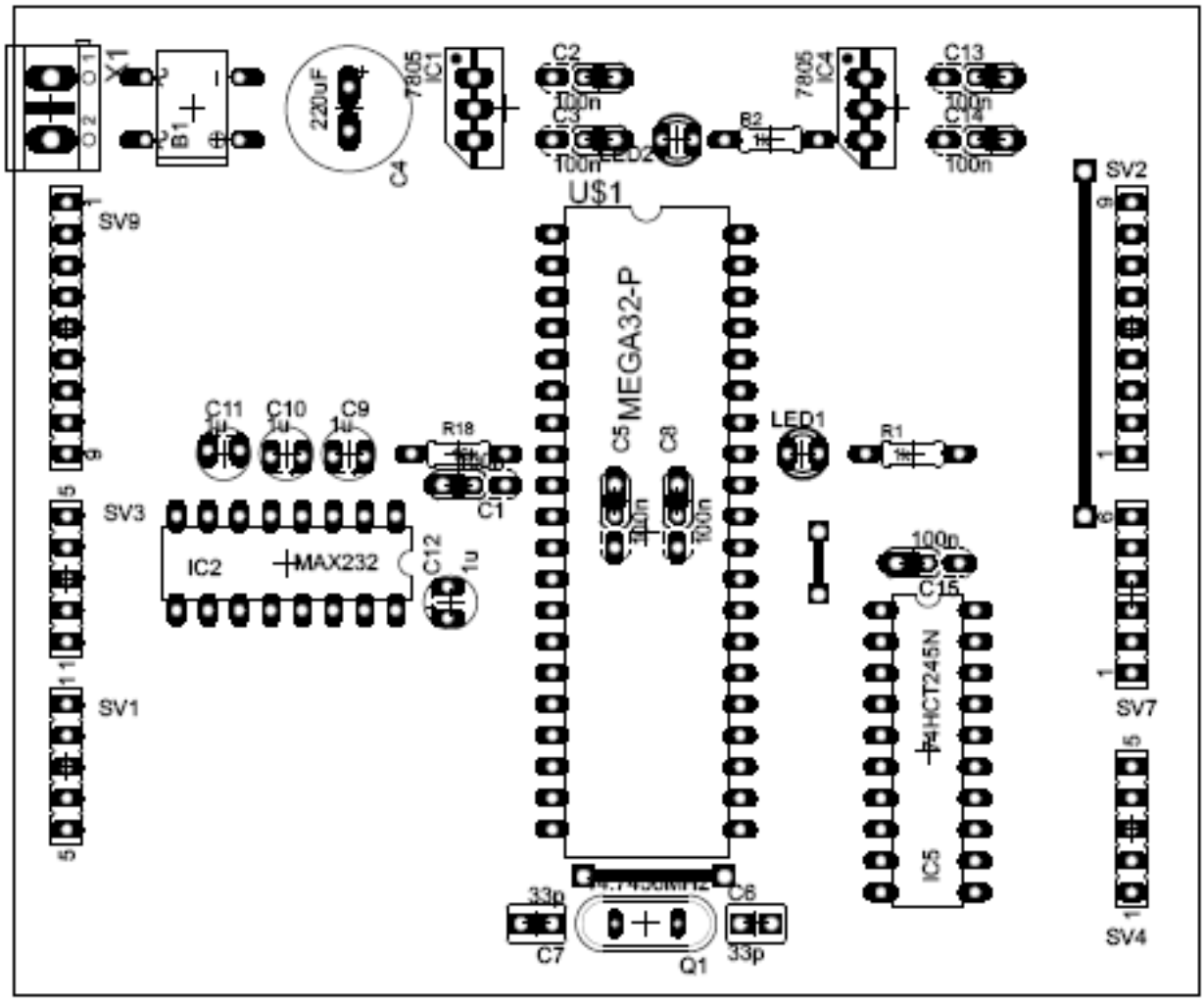


Figure 1 Components

Mount C5 en C8 at the solder side of the PCB if the used capacitor blocks mounting the ATMega32.

Attention : The PCB is NOT consistent any more with the schematic!! The schematic is up to date, the PCB ***not***! For several options corrections are required as described further on in this document (See 4.10). See also [REF03], [REF04] and [REF05] for modifications if the I2C and / or RFM12 manual control are used.

2.1 Component list

The component list (see Table 1) is based on Conrad[9]. Please verify before ordering the numbers, a typo could be in it...

Component	Description	Order number
U$1	Atmel Mega32	154081
IC2	MAX232	SEE REMARK
IC1,IC4	LM7805	179205
IC5	74HC(T)245N	164542
B1	Rectifier	501174
C1,C2,C3,C5, C8,C13,C14,C15,C17,C18	Capacitor 100n	453358
C4	Elco 220uF / 25V	445477
LED1, LED2	Led 3mm	184560
X1	Connector	
R18	Resistor 10k	404160
R1,R2	Resistor 1K	404047
C9,C10,C11,C12	Elco 1uF Elco 0,1uF	445563 445670
SV1 .. SV9	SIL connector	
Q1	Xtal 14,7458 Mhz	
C6,C7	Capacitor 33pF	457175

Table 1: Component list

Remark:
There are a lot of pin compatible variants of the MAX232. Please check your type in the corresponding data sheet and select based on the data sheet the correct value for capacitors C9,C10,C11!

[9]www.conrad.nl

2.2 Connectors.

Using simple SIL connectors, connections to the outside are established. Each connector and pinning of the connectors is described in the next paragraphs. Do not short circuit pins to ground or voltage supply unless described (for example switch inputs).

2.2.1 SV1 Rotary Switch.

A rotary switch can be connected to SV1 for user control in combination with the LCD display, see Table 2.

Pin	Description
1.	Rotary switch A
2.	Rotary switch B.
3.	Rotary Switch push button
4.	Rotary Switch ground
5.	Rotary Switch push button ground

Table 2: SV1 Rotary switch

If the rotary switch does not react well, please mount on pinA and pin B 100nF capacitors, both connected to ground and enable the option RotarySwitch (see 5).

2.2.2 SV2 Switches / RFM12 interface.

SV2, pinning see Table 3. The Emergency Stop/Go button must be normal open type of switch. When closed, it must connect to ground.

Pin	Description
1.	+5 Volt
2.	Rfm12 Select
3.	Rfm12 clock
4.	Not used.
5.	Not used.
6.	Rfm12 sdi
7.	Rfm12 sdo
8.	Emergency Stop / Go (switch contact to ground).
9.	Ground

Table 3: Connector SV2

2.2.3 SV3 Serial connection to PC.

SV3 (see Table 4) is used for connecting to a RS232 serial interface of a PC.

Pin	Description
1.	Tx (Transmit)
2.	Not connected.
3.	Rx (Receive).
4.	Not connected
5.	Ground

Table 4: Serial connection to PC

The digital control and PC running Koploper must be connected using a serial port (USB serial converter also works). How to connect PC and Digital control is shown in Figure 2.

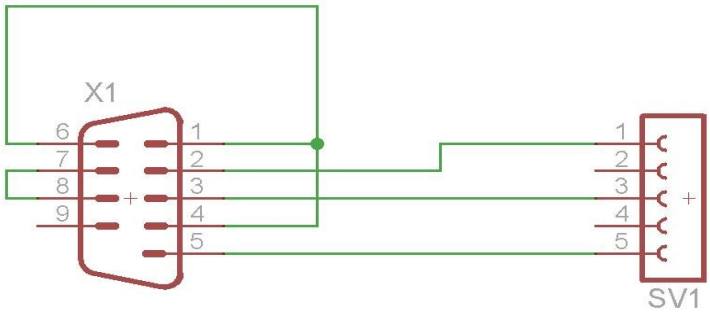


Figure 2: PC connection

X1 is a 9 pin male connector. SV1 must be connected to SV3 on the Digital control.

2.2.4 SV4 Booster interface

Pinning for connection to a booster see Table 5.

Pin	Description
1.	Booster signal (track signal).
2.	Booster enable.
3.	+5 Volt
4.	Gnd
5.	Short circuit

Table 5: Booster interface

If a DIY booster is used (for example [REF01] SIMPLE_BOOSTER_xxx), you will have to create a simple interface using a MAX232. This chip converts the digital signals into RS232 signals. An interface example is shown in Figure 3 usable for the simple booster.

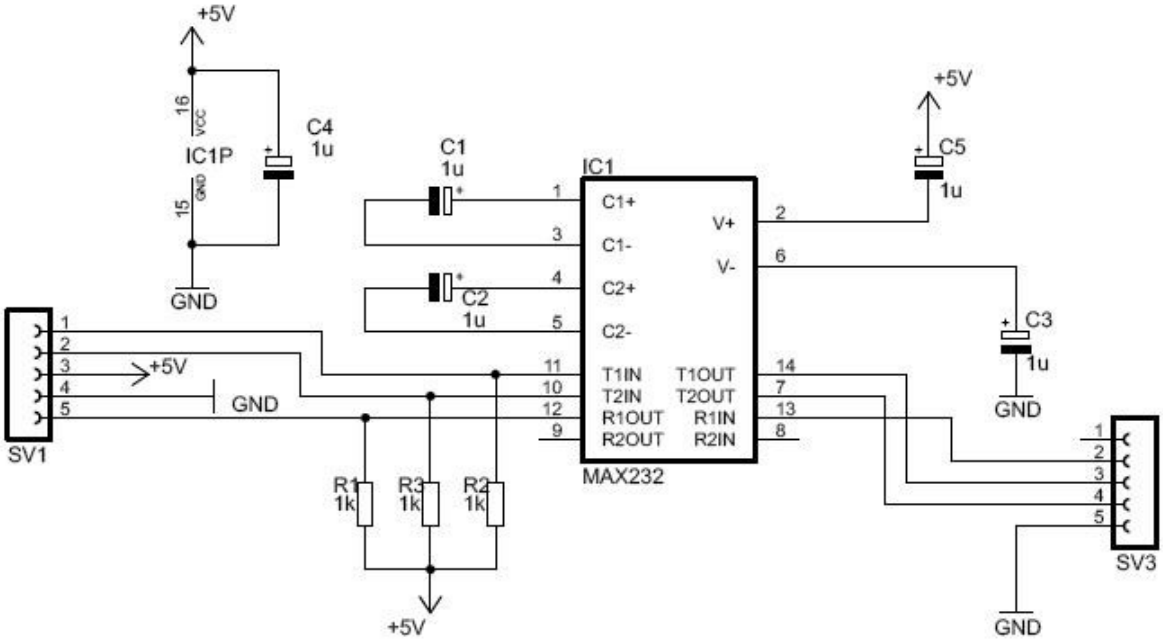


Figure 3 Booster Interface

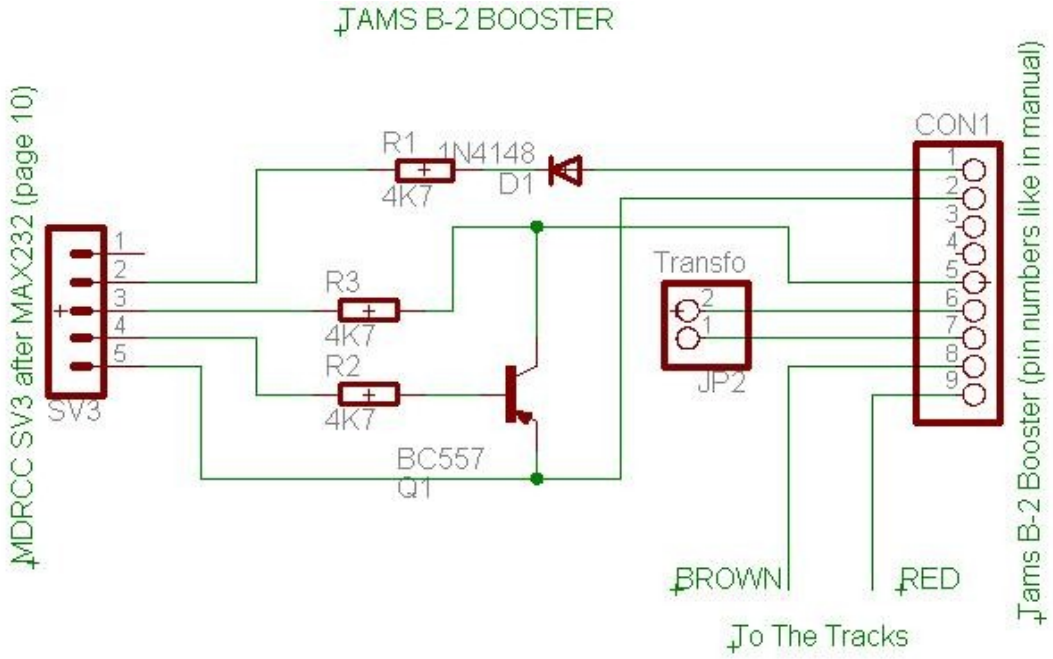
The pinning of the connector for the connection to the booster is described in the table below.

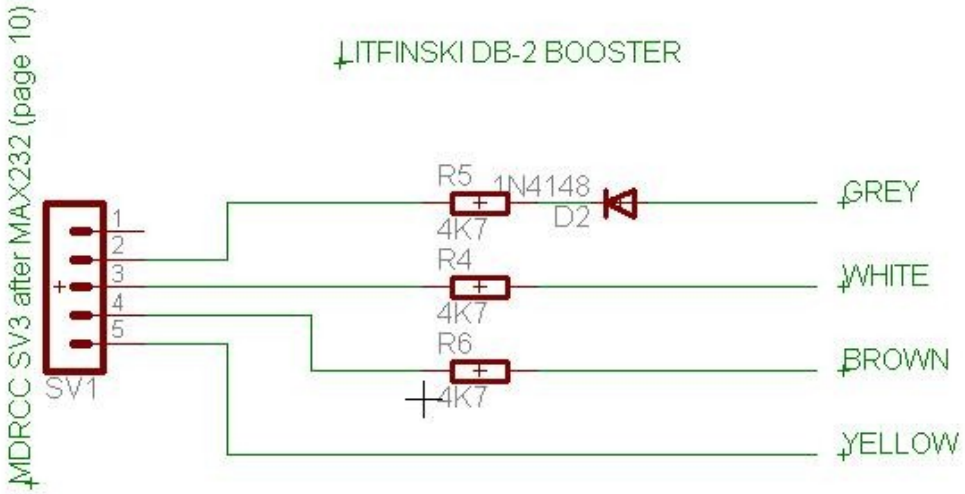
Pin	Description
1.	Not connected
2.	Short circuit from booster
3.	Track signal to booster
4.	En- disable of booster.
5.	Ground

Table 6: Booster interface

Connector SV1 of the interface needs to be connected to connector SV4 of the MDRRC PCB. SV3 needs to be connected to the booster. For elco's C1..C4, see remark at Component list regarding type of MAX232 and capacitor values.

Kris [10] needed to add some extra components when using the interface of Figure 3 Booster Interface combined with a Tams B-2[11] or LitFinski DB-2[12]. The interfaces created by Kris is shown in the figure below.



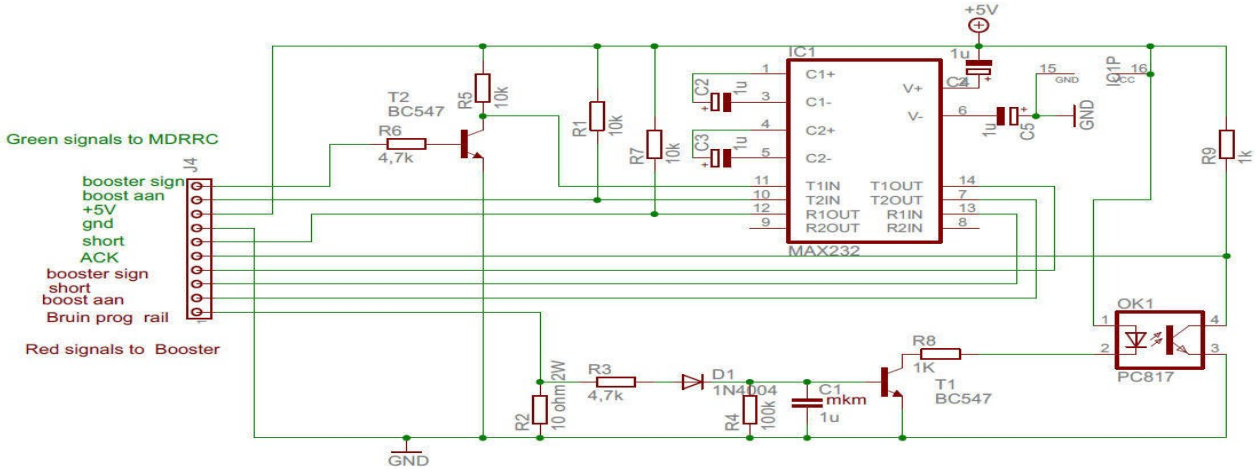


Gert informed me the Lussi [13]booster (a Marklin 6017 compatilble booster) has somewhat different handling for the booster on/off and short circuit. These signals must be inverted using a transistor inverter or a logic IC.

[10] http://www.digitalplayground.be

[11] http://www.tams-online.de/htmls/produkte/b2/produkte_b2.html
[12] http://www.ldt-infocenter.com/
[13] http://luessi.ch/pdf/Booster%20BMD%20V5%20e.pdf

Frans[14] created an interface between MDRRC and the Elektor booster.



For more detials take a look ak the site of Jaap.

2.2.5 SV5 I2C manual control connector.

Pin	Description
1.	SDA
2.	SCL
3.	+5 Volt
4.	Gnd

Table 7: I2C manual control connector.

2.2.6 SV6 Acknowledge connector for DCC.

An acknowledge detector can be connected, see 4.8.5

Pin	Description
1.	Acknowledge input
2.	Gnd
3.	Gnd

Table 8: Acknowledge connector.

2.2.7 SV7 S88 connector.

Pinning according S88, see Table 9.

Pin	Description
1.	Data
2.	Gnd
3.	Clock
4.	Shift / Load (PS)
5.	Reset
6.	+5 Volt

Table 9: S88 connector

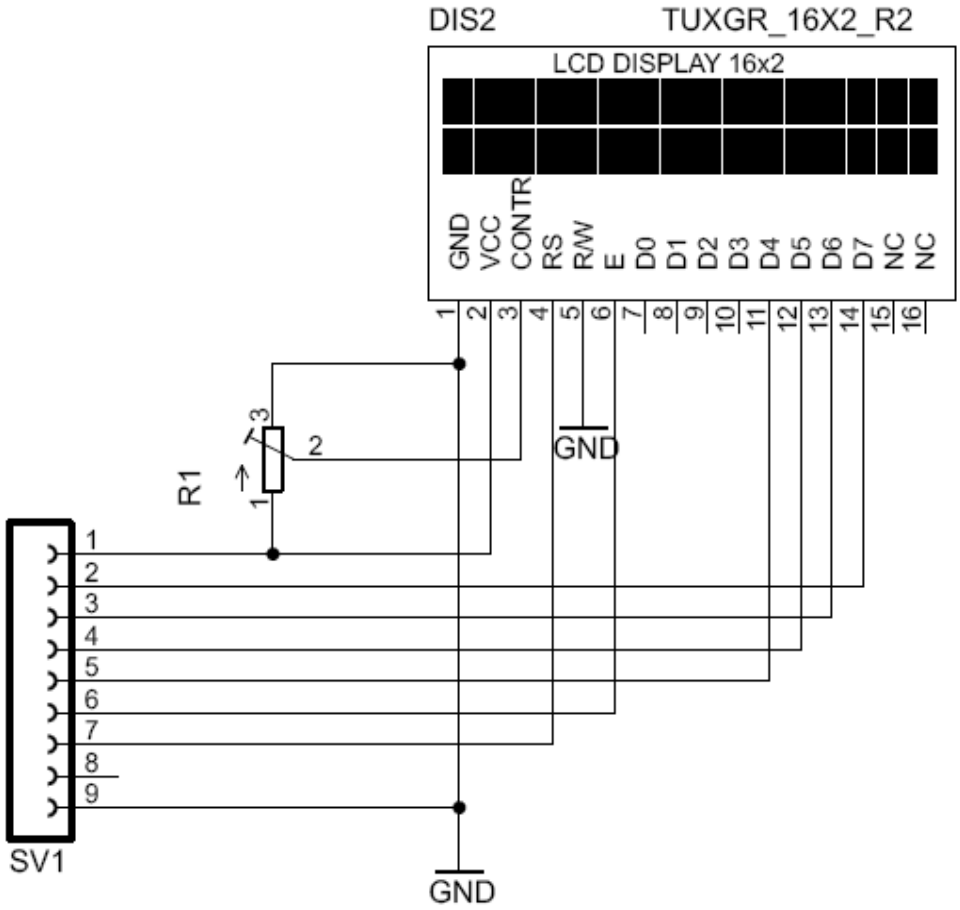
[14] http://members.home.nl/fjstevens/booster_interface.htm

2.2.8 SV9 LCD.

Table 10 (and figure) list pinning for connecting a 2*16 44780 compatible LCD to the MDRRC.

Pin	Description
1.	+5 Volt
2.	LCD D7
3.	LCD D6
4.	LCD D5
5.	LCD D4
6.	LCD E
7.	LCD Rs
8.	Programming track enable (see 4.8)
9.	Gnd

Table 10: LCD



3. Programming the software.

[REF01] holds the actual version of the MDRRC.

3.1 Boot loader software.

It's recommended to use the boot loader[15] for easy software upgrades. The boot loader (Bootload.hex) must be programmed ONCE using ISP. On the MDRRC control there is no integrated ISP option. You might solder wires directly to the pads or use a separate programmer.

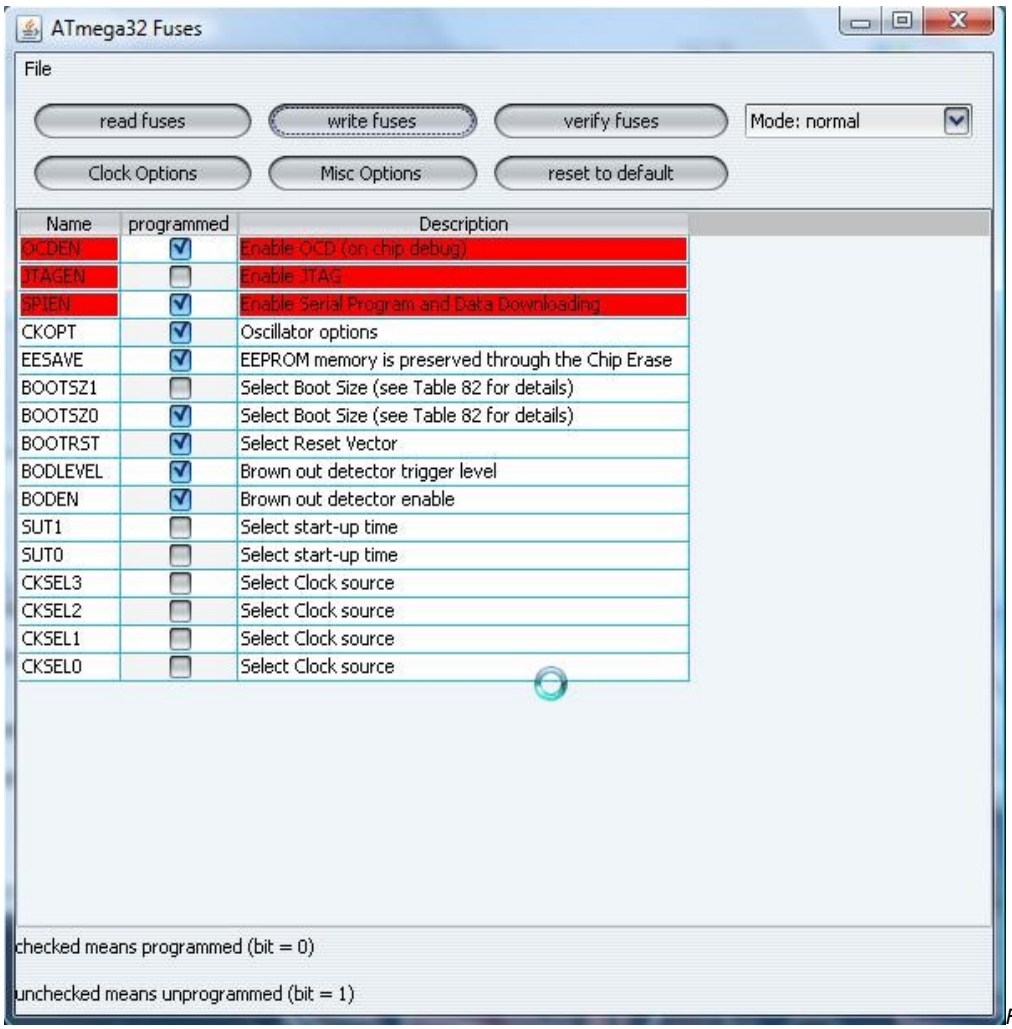


Figure 4: BurnOMat fuses

After the boot loader is programmed the fuses of the Mega32 must be set as shown in Figure 4[16]. Make sure also the JTAG option is NOT ACTIVE, else the rotatry switch will not work correctly and S88 reading may be fussy.

[15] http://www.mikrocontroller.net/topic/73196#new
[16] http://avr8-burn-o-mat.aaabbb.de/avr8_burn_o_mat_avrdude_gui_en.html

3.2 MDRRC programming the software.

After the boot loader is programmed AND the Mega32 fuses are set for boot loader support, the main software can be programmed. The sequence for programming the main software is described below.

- Rename mdrrc_x_yy.hex to mdrrc~1.hex. The tool can't handle long file names, so *mdrrc~1* needs to be entered...
- Start the tool by entering in the dos box f*boot /Cx /Pmdrrc~1.hex*
  - The x is the com port to be used.
  - Selection of baud rate use parameter /B38400 (38400 baud in this example). This might be useful is communication fails.
- The tool starts and will try to find the Atmel micro controller, see Figure 6.

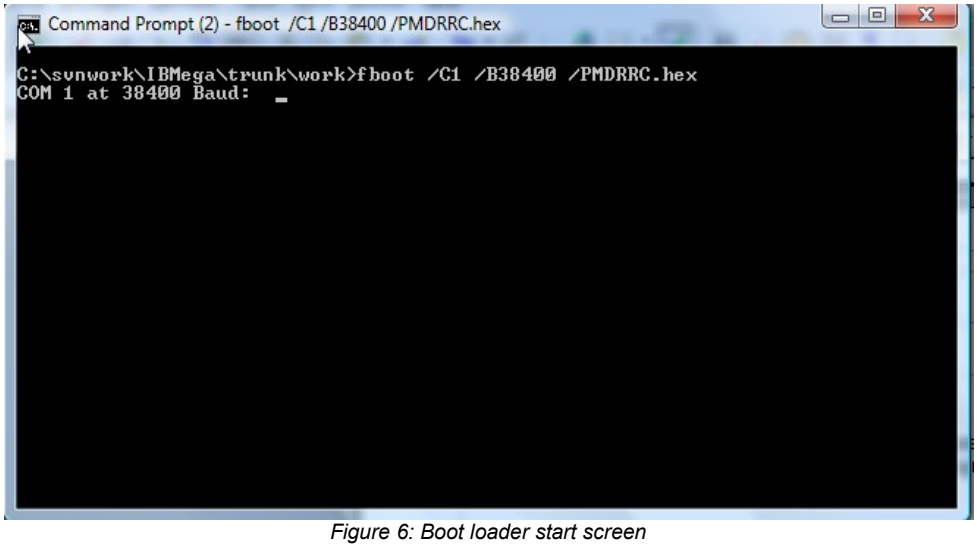


Figure 6: Boot loader start screen

- Switch off/on or reset MDRRC. After the tool recognized the Atmel micro controller it will start to program it as shown in Figure 7.

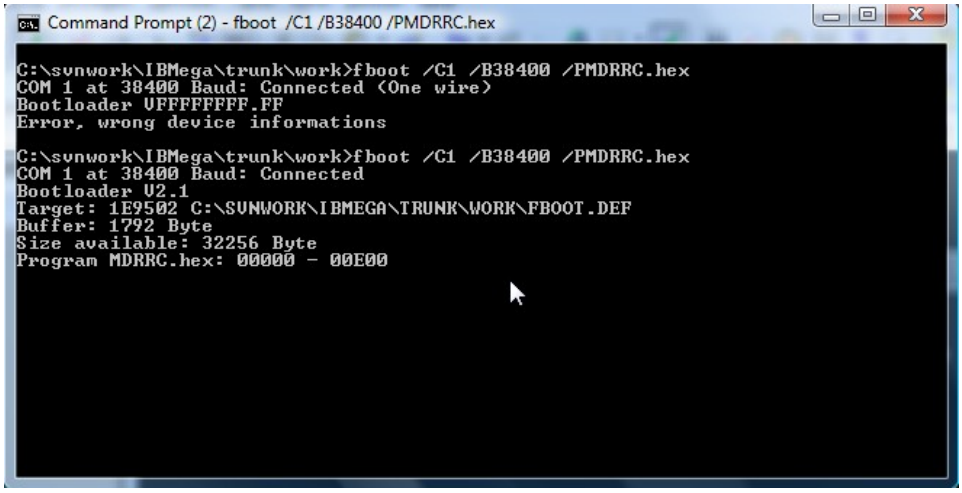


Figure 7: Programming

- After the update is finished (example screen as shown in Figure 8) Led1 should start to blink at a rate of ~1Hz, the start up text will appear on the LCD and the MDRRC is ready to be used.

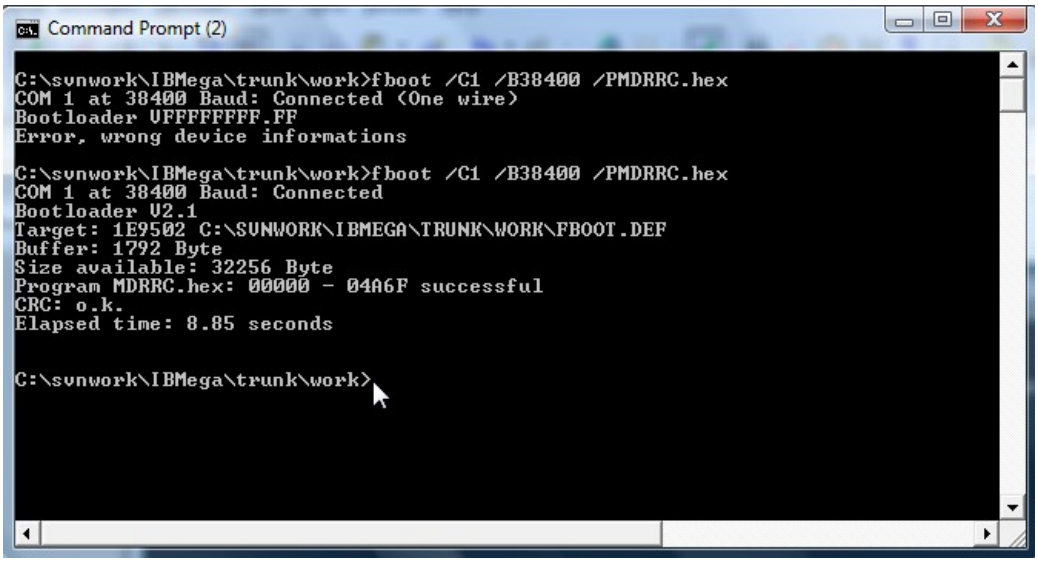
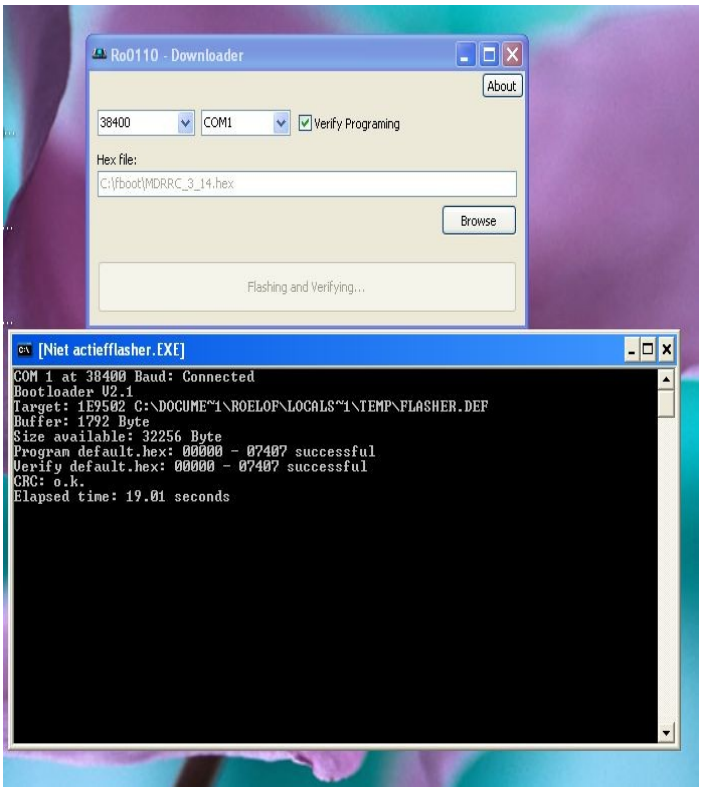


Figure 8: Update finished.

- It's also possible to use a GUI to program MDRRC, see figure below. It's not required to rename the hex file. The GUI can be found here http://www.societyofrobots.com/axon2/axon2_setup3.shtml



4.Using the MDRRC.

4.1 Koploper settings.

4.1.1 Intellibox / Twin Center

The settings applicable for using the MDRRC with Koploper are shown in Figure 9. The Digital System must be set to IntelliBox/TwinCenter, the baud rate must be set to 19200, and of course select the applicable serial port.

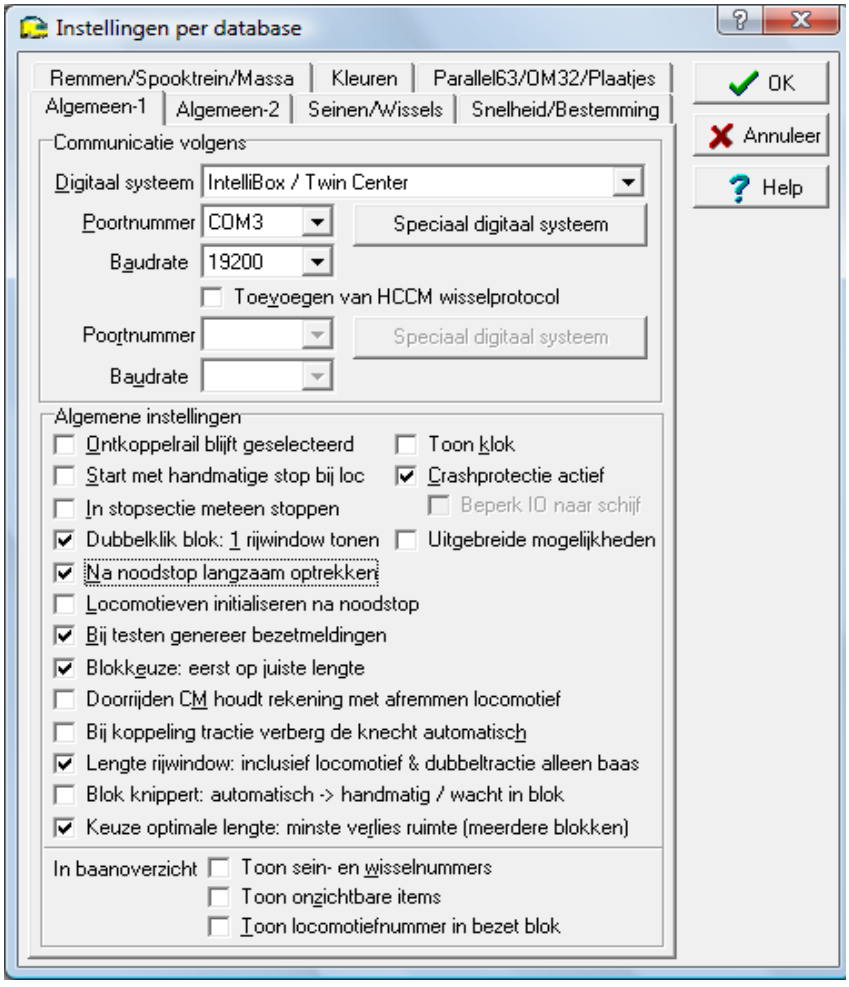


Figure 9: Instelling per database SettingsIntelliBox / Twin Center

Following settings are applicable in the sub screen 'Speciaal Digitaal Systeem', see Figure 10. Make sure to select 'Alleen eigen protocol IB/TwinCenter'. Other settings are for own choice.

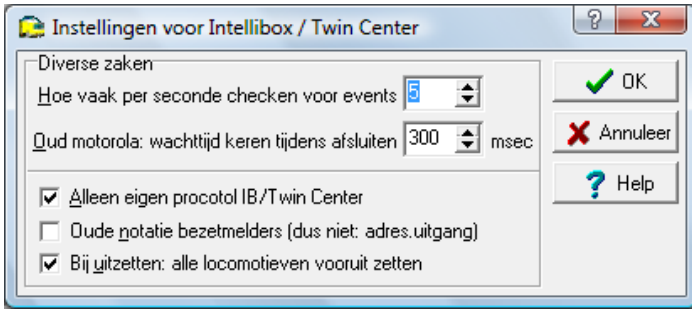


Figure 10: Speciaal Digital Systeem settings

After mentioned settings are set, press F5 / Groen SpiegelEi, communication starts (LED1 blinking on rithm of received data). Depending on settings, turnouts are set and locomotives are stored in internal memory and subsequently controlled. That's all!!!

4.1.2 MrDirect option Koploper

If functions F9..F12 needs to be supported, select MrDirect[17] as option. Be aware, if F9..F12 is changed on a manual control it IS NOT forwarded to Koplopr. Koploper does not handle the extra data.

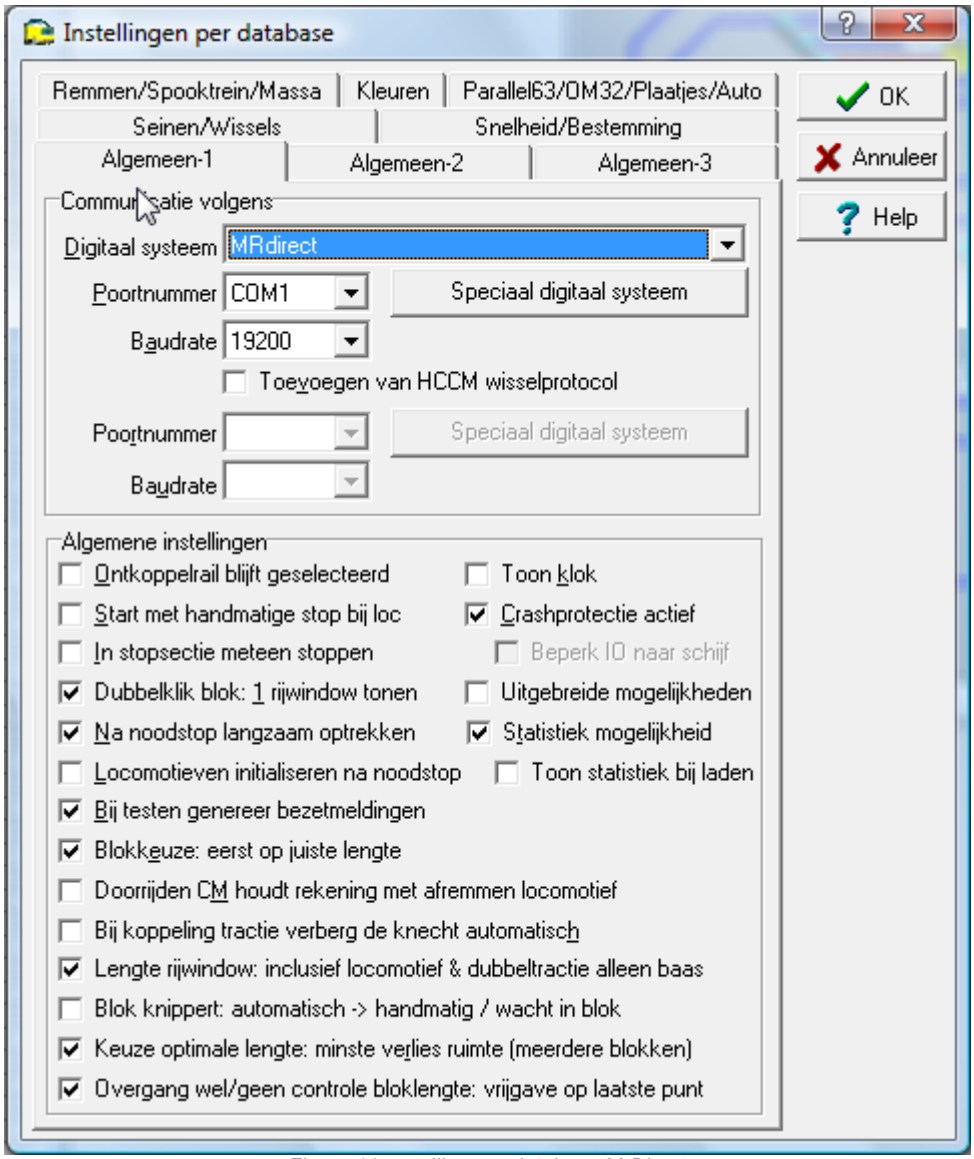


Figure 11: nstelling per database MrDirect

[17] http://www.mrdirect.nl/

4.2RocRail Settings.

When using RocRail[18] settings as shown below ***must*** be set at RocRail Properties.
Do ***NOT SELECT*** Opvragen / Poll!!! This will mess up the communication! If using S88 just enter a number in Melders...

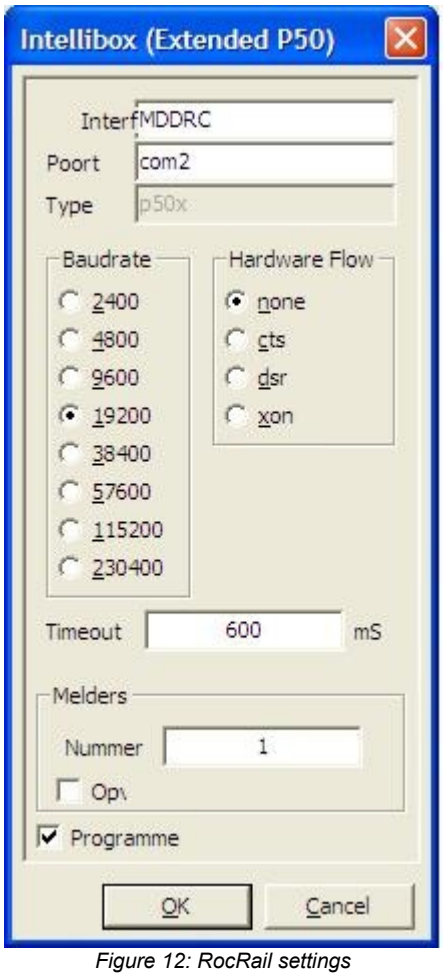


Figure 12: RocRail settings

Also select P50x only mode using the set up tool for MDDRC, see Chapter 5.

MDDRC does work with RocRail version 1.4 build number 1129 (tested) and higher (not tested).

Regarding function F9..F12, same remark as with MrDirect (see 4.1.2).

Compared to Koploper RocRauil does not transmit the off command for turnouts. Turnouts are now switched off automatically by MDRRC from version 4.42 if the P50xOnly mode is enabled. This IS IMPORTANT for RocRail[19] users!

[18]http://wiki.rocrail.net/doku.php
[19]http://forum.rocrail.net/viewtopic.php?t=5051

4.3 Settings.

Some settings can be configured. If the settings are not changed, an default S88 bus frequency of 10Khz will be applied and the number of S88 units will be set default to 32.

Settings can be changed using the rotary switch. If NO communication is running with the PC, press the push button of the rotary switch. On the LCD the main menu appears as shown in figure below.

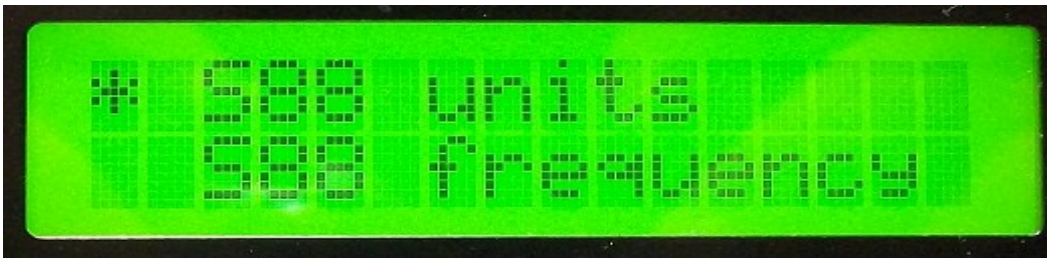


Figure 13: Main settings menu

Turn the rotary switch so a star appears before the item to be changed. Press the push button of the rotary switch to enter the applicable menu.

4.3.1 S88 units

With the menu option S88 Units it is possible to change the number of connected s88 units, see figure below. Turn the rotary switch until the required number is shown on the display. Press the rotary switch button to store the selected value.

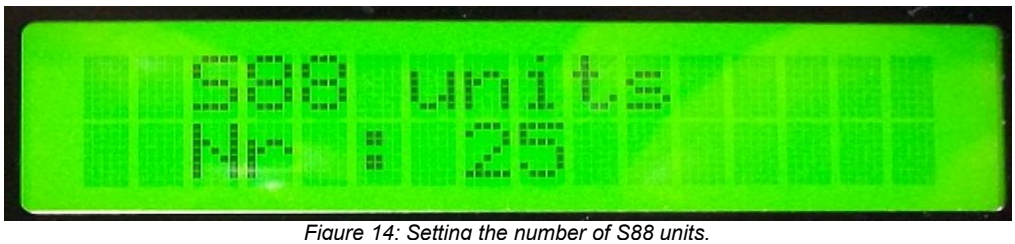


Figure 14: Setting the number of S88 units.

Valid S88 number of units is between 0 and 32. If 0 is entered, NO S88 events will be generated. This might be useful if an external S88 reader is used like a Littfinkski[20] HSI interface.

[20] http://www.ldt-infocenter.com/netherland/home_frame_nl.htm

4.3.2 S88 frequency.

With the menu option S88 Frequency it is possible to change the S88 bus frequency, see figures below. Turn the rotary switch until the required frequency is shown on the display. Press the rotary switch button to store the selected frequency.
Selectable S88 bus frequency's are:

- ~ 3.5 kHz
- ~ 6.5 kHz
- ~ 10 kHz
- ~ 12.5 kHz

Figure 15: S88 frequency 6,5kHZ

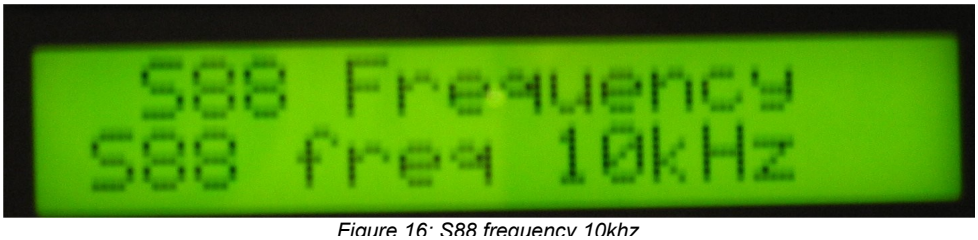


Figure 16: S88 frequency 10khz

4.4 LCD during use.

During use, information is shown on the LCD about the status of the system. At start-up, the name actual software version and active manual controls (see 4.9) are shown, see figure below.

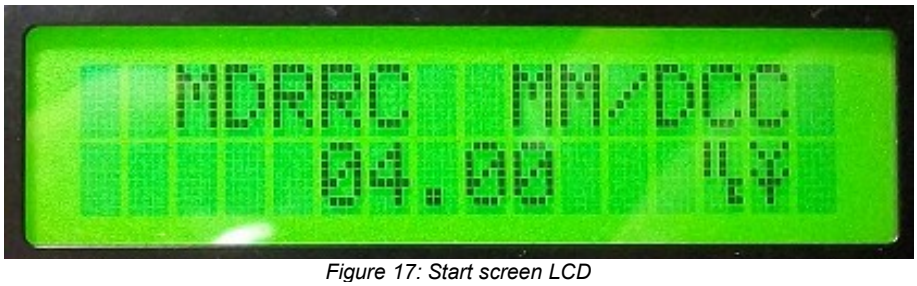


Figure 17: Start screen LCD

The middle symbol represents the active I2C manual control.
The right symbol represents an antenna indicating the RFM12 manual control is active.

During active operation (locomotives / turnout control), the last received locomotive command (upper row) and last received turnout command (second row) are displayed, figure below.
For locomotives:

- D (DCC) or M (MM-2) is shown indicating the protocol used for the locomotive.
- The decimal decoder number is shown.
- The decoder set speed is shown.
- The direction (arrow) is shown.
- The light status (artistic) is shown.
- The function status F1..F4 is shown.

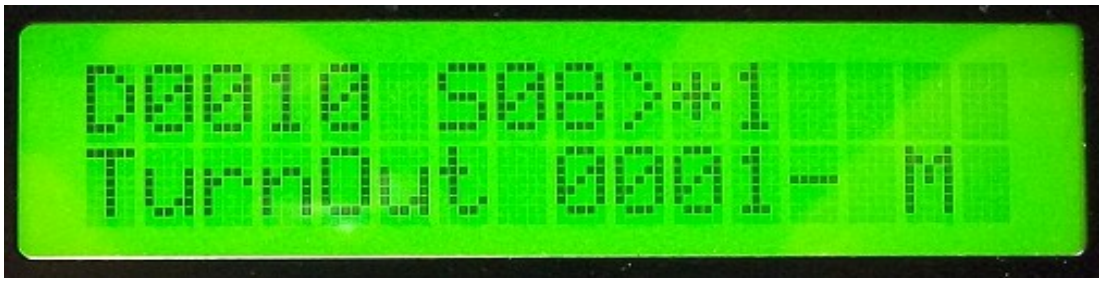


Figure 18: Normal mode

If function F1 .. F4 is active of a locomotive, it's also shown. In the example above function 1 is enabled. Function higher F4 are not shown on the display.

If a turnout command is received :

- The decimal turnout number is shown.
- The direction is shown.
- The type of turnout, M for Maerklin Motorola or D for DCC.

If the power is switched off NO locomotives are active controlled, POWER OFF is shown, the number of stored locomotives and the number of S88 units, figure below.

Figure 19: Power Off

If locs are active controlled (driving) and the Emergency Switch is presses on the Digital Rail Road control, I2C manual control or RFM12 manual control, a short circuit is detected by the booster or (Emergency) Stop is pressed , the display shows Emergency Stop, the number of stored locomotives and the number of S88 units is shown.

4.5 S88 logging

If track voltage is applied (Power On), the actual status of S88 contacts can be viewed. Press the push button of the rotary switch, a screen as shown in figures below will appear (s88 unit number may be different).

Figure 20: S88 contact logging example

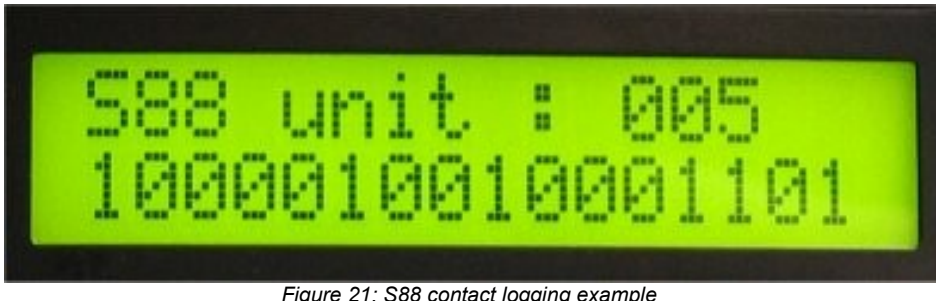


Figure 21: S88 contact logging example

The most left digit in the lower row is S88 contact 1, the most right digit in the lower row is S88 contact 16.

By turning the rotary switch, selecting another unit is possible until the maximum programmed number of units is reached. The menu can be left by pressing the rotary switch push button. Depending on the activity of the digital control, an empty screen is shown or active controlled turnouts and/or locomotives are shown.

4.6 DCC turnout decoders.

If the option DCC only turnout option is not set (see 5) and a mixed MM / DCC turnout needs to be used then DCC addresses used for controlling turnouts need to be programmed.

- Activate Koploper, wait until the initialization cycle of Koploper is finished or enable MDRRC with the OnOff button.
- Press the push button of the rotary switch, the menu will appear.
- Select DCC turnout using the rotary switch, see figure below.

Figure 22: DCC turnout learning mode selection.

- Press the push button switch of the rotary switch.

- Screen as shown in figure below will appear.

Figure 23: DCC learning mode entry.

- Click in Koploper on a turnout (gauge, signal, switch) which must be controlled by DCC or enter the turnout number on the keyboard.

It's possible to program up to 128 addresses for DCC.

- The display will show the added address and the total number of stored DCC addresses. In the example of figure below address 4 is added and the total number of stored DCC turnout address is 5.

Figure 24: DCC learning mode adding DCC address.

- If a DCC turnout address needs to be deleted, press on the corresponding turnout in Koploper.
- The number of DCC turnout decoders in the display will decrease by one.
- Leaving the DCC turnout learn mode is simple, just press the rotary switch push button.

4.7 Erase settings.

With the Erase settings option, it is possible **to set all settings to default.** Number of S88 units (default 32) , S88 frequency (default 6,5kHz), locomotive name list will be cleared and the DCC list are cleared ans all options are set to default (off).

- Make sure Koploper is switched off using 'Rood SpiegelEi'.
- Press the push button of the rotary switch.
- Select Erase settings, see figure below.

Figure 26: Erase select

- Select Yes using the rotary switch and press rotary push button if settings must be cleared. Erasing will appear on the screen (see figure below) and after the erase is performed a reset will be performed.

Figure 27: Erasing

- Select No using the rotary switch and press rotary push button if the settings must not be cleared. The menu is shown again.

4.8 CV programming.

It's possible to program CV's of DCC decoders manually with the rotary switch or by using a PC application like PfuSch[21] (or directly from RocRail for example). Only DIRECT MODE programming is supported. If the decoder can't be programmed using DIRECT MODE Prolok[22] may be a good alternative.

4.8.1 Programming CV's manually using MDRRC and rotary switch.

It's a quit simple implementation. Reading of CV values is NOT possible when using this option. Furthermore maximum CV adress to be programmed is 255. Only the byte write option is implemented according Direct Mode RP9.2.3 July 2003.

- First of all, make sure Koploper/RocRail is not controlling the model rail road.
- Select using the rotary switch the menu option CV programming, see figure below.

Figure 28: DCC programming menu option.

- After selecting the DCC programming mode an initial screen will appear as shown in figure below.

Figure 29: CV programming initial screen

[21] http://www.stp-software.at/PfuSch/PfuSch.htm
[22] http://tt.borrmanns.de/index.php?nav=0;0&cont=software2

- Set each digit of the CV number to be changed and the CV value. Turning at a digit position in- or decreases the value. The digit to be changed is indicated by the cursor on the LCD, see figure below.

Figure 30: CV values

- Pushing the rotary switch selects the next digit until all digits are set.
- If the last digit is set (CV value), the new value is programmed into the locomotive.
- During programming, “Programming” will appear on the LCD. After the DCC values are written, the previous DCC screen will appear on the screen.
- Leaving the DCC programming mode is possible by setting both the CV and value to value 0 or by activating Koploper / pushing the OnOff button of MDRRC.
- It´s NOT possible to read CV´s in the manual programming mode. Also acknowledge is NOT handled.

WARNING : During programming, connect the MDDRC to a separate programming track, else ALL locomotives will be programmed!!!!

4.8.2 Programming DCC long addresses.

It's possible to program long addresses with MDRRC. CV17 and CV18 must be programmed and don't forget the long address option in CV29. CV17 and CV18 need specific values, see [23] for a description and online tool to convert a decimal long address into values for CV17 and CV18.

[23] http://www.ruppweb.org/Xray/comp/decoder.htm

4.8.3 P.f.u.Sch / RocRail.

When using P.f.u.Sch[24] for programming, select Intellibox as system with baud rate set fixed to 19200, see also screen shots below of fpuSch .

Figure 31: PfuSch options

Remark regarding P.f.u.Sch : The option “Kommunikation testen” does NOT work!

[24] http://atw.huebsch.at/PfuSch/PfuSch.htm or http://www.stp-software.at/Downloads.htm

When the Ack Detector (see 4.8.5) is present and enabled (see 5), the decoder can be read.

Below a screen shot of reading CV's with RocRail. Seems the Programming Track option needs to be enabled in RocRail for correct behaviour.

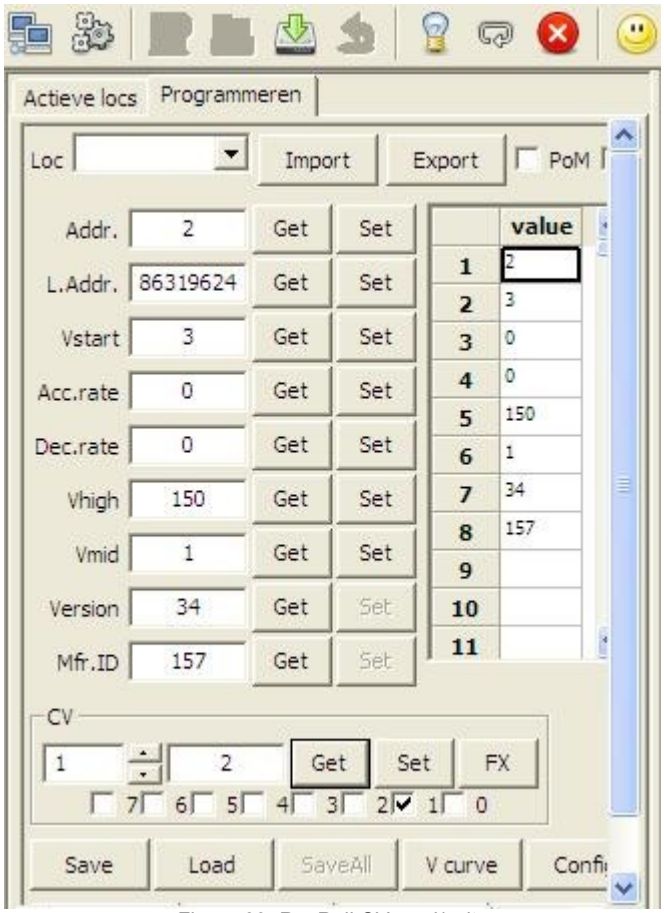


Figure 32: RocRail CV read/write

4.8.4 Programming track.

Circuit below shows a possible solution for selecting the programming track using the MDDRC. Connect LSP7 to pin 8 of SV9. This pin is activated if DCC programming is selected. It's deactivated as soon as Koploper gets active or the DCC programming mode is left. When using a PC tool to program CV's, the programming track relay control is en- or disabled by means of the Pc tool.

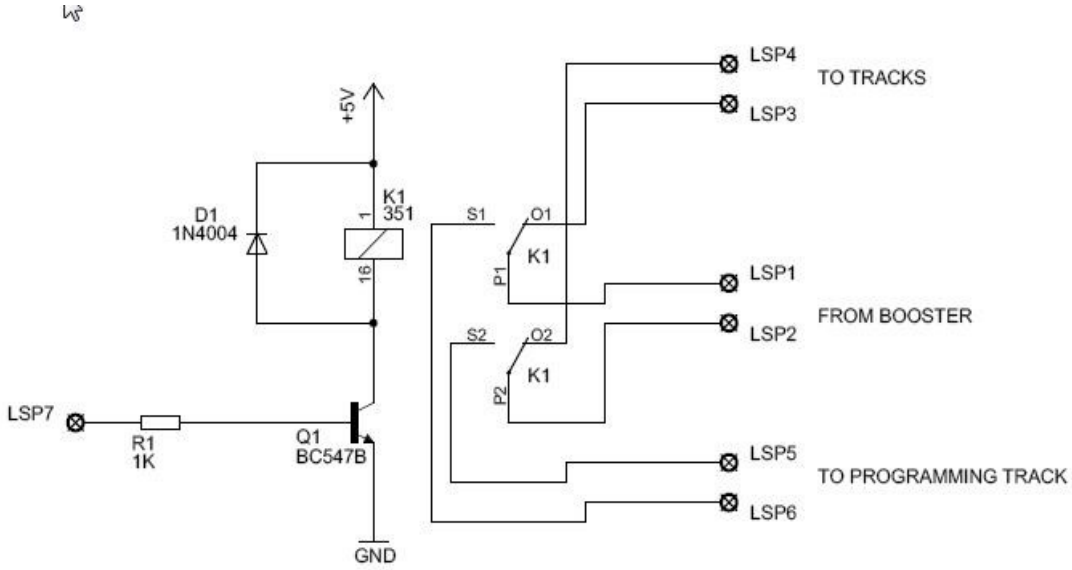


Figure 33: Programming track selection

4.8.5 DCC Acknowledge detector.

With a little circuit it's possble to read CV values and also acknowledge of programmers is handled. The circuit is shown below including how to connect to MDRRC. The circuit is based on this AckDetector [25] and adapted for use by Roelof. May be required to 'play' with the values of R1 and R2!!! Volker adapter another ack detector[26] [27], see the directory AckDetector

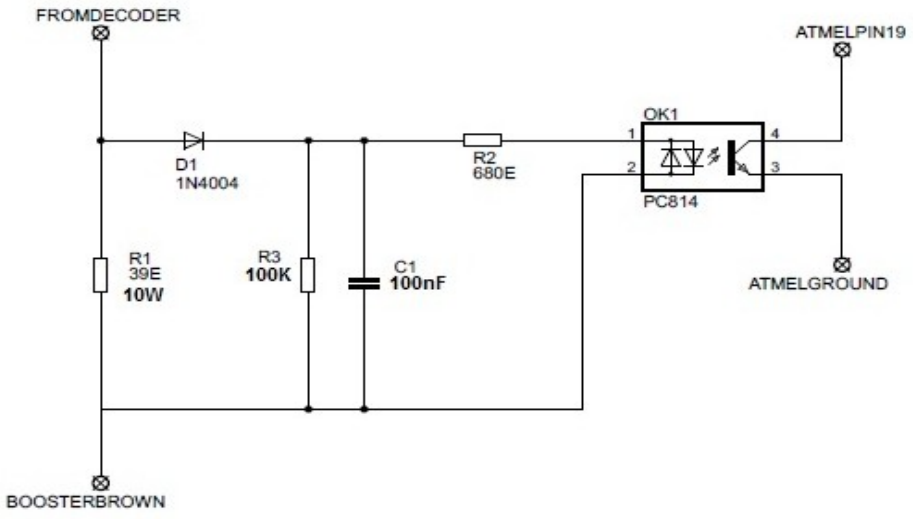


Figure 34: DCC Acknowledge detector

[25] http://tt.borrmanns.de/index.php?nav=0;0&cont=software2
[26] http://www.tinet.cat/~fmco/dccgen_en.html
[27] http://www.tinet.cat/~fmco/download/dccgen_sch.pdf

4.9 Manual Control.

With the manual controls, it's possible to control a locomotive. All manual control options are switched off by default, see PcTool description how to enable the manual control options. If a manual control type is not used, keep it not selected or set it to not selected.

4.9.1 I2C manual control / Keyboard.

For details on the I2C[28] manual control see [REF03], keyboard see [REF05].

4.9.2 RFM12 wireless manual control.

The RFM12 manual control (see [REF04]) enables a wireless control of the locomotive. MDDRC needs to be extended with an interface containing some electronic components, see next pictures, rfm12_interface.pdf and rfm12_interface_pcb.pdf. The components are mounted at the solder side!!! SV2 on the interface can be used to connect the emergency stop / go button and the resistor manual controls. See schematic for pinning.

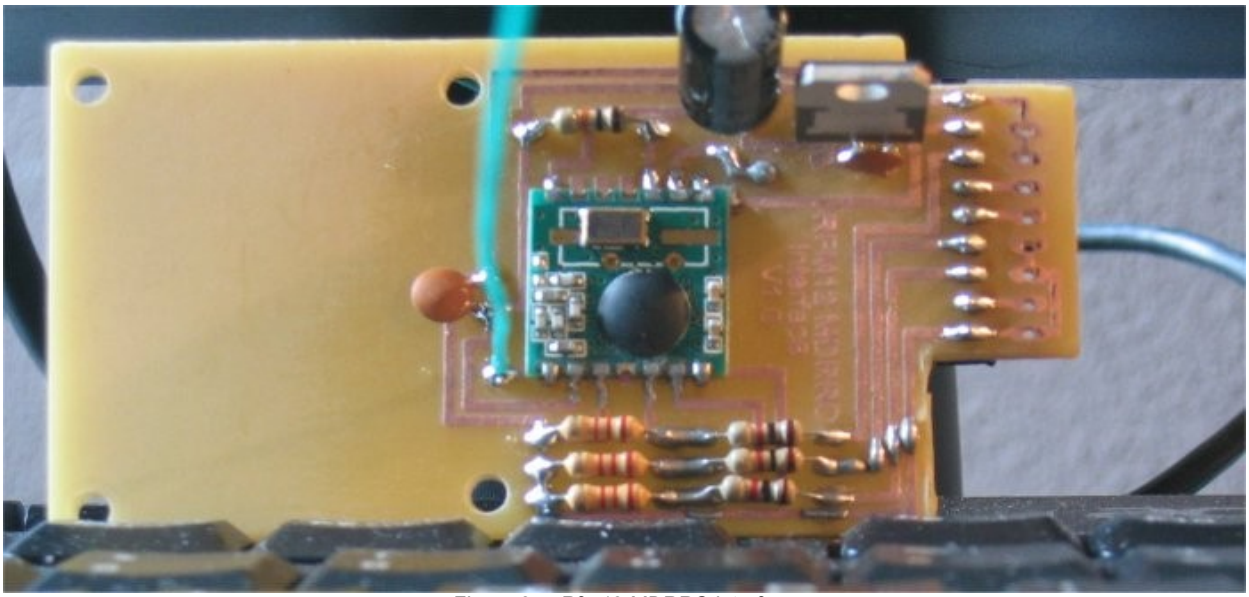


Figure 35: Rfm12 MDRRC interface

Some changes at the PCB are required, also if the Rfm12 unit is not used! See next page. The schematic of MDRRC is UP TO DATE !

[28] http://www.nxp.com/acrobat_download/literature/9398/39340011.pdf

Because the PCB layout is not yet redesigned, some changes are required as described and shown below.

- Pin 1 of the rotary switch needs to be disconnected from pin 16 of the Mega32 and connected with pin 29 of the Mega32.
- Pin 16 of the Mega32 needs to be directly connected to pin 2 of the RFM12 module (IRQ in schematic of the RFM12 interface.

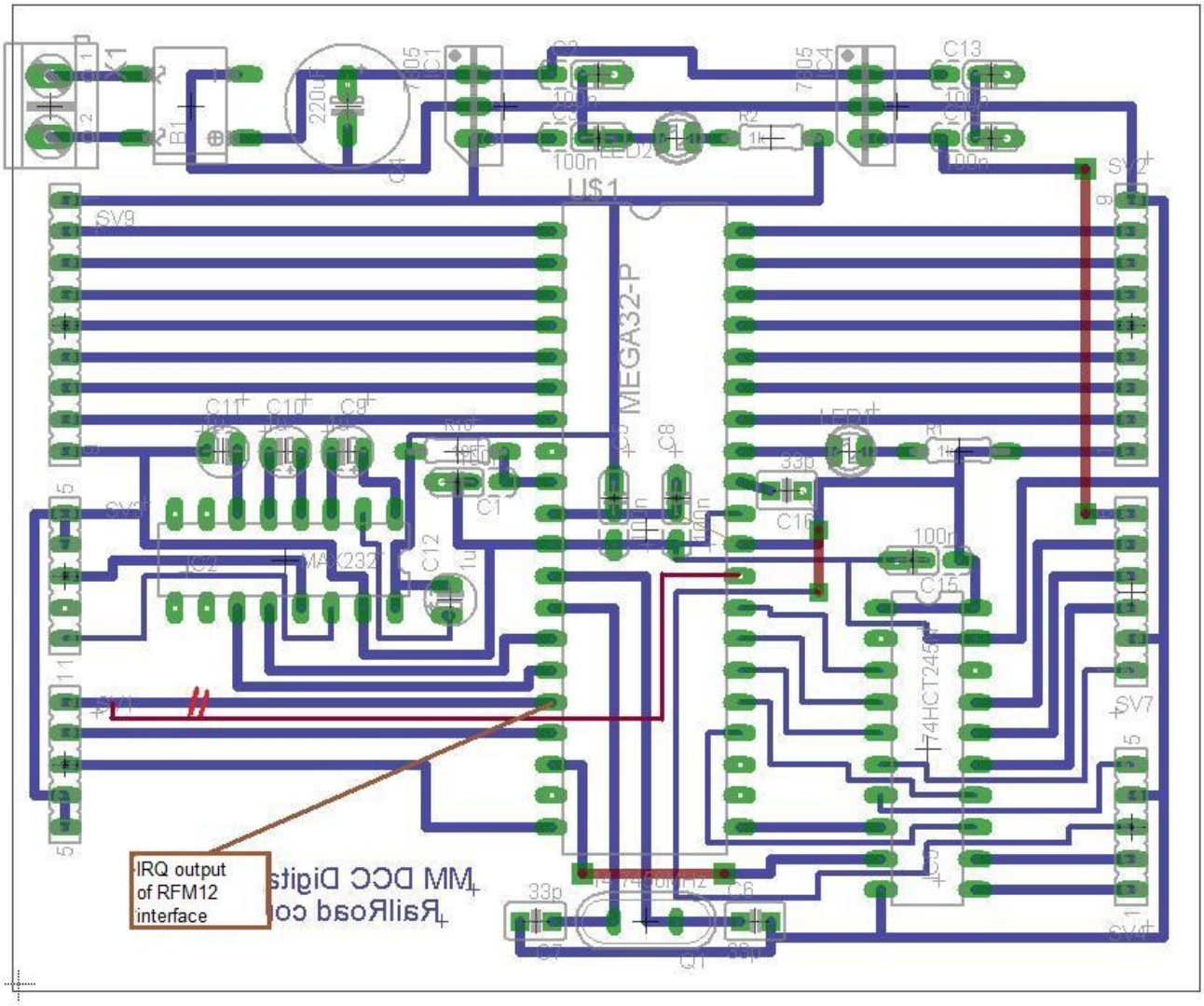


Figure 36: MDRRC PCB changes

On pin 8 of the Mega32 a led and series resistor (1K) can be mounted. The led will blink if a message is received from the RFM12 manual control. By this, a visual clue is given if the wireless communication is running.

4.10 Modification MDRRC PCB

Another modification is required for the non redesigned PCB version, even if the manual control is NOT used. See figure below.

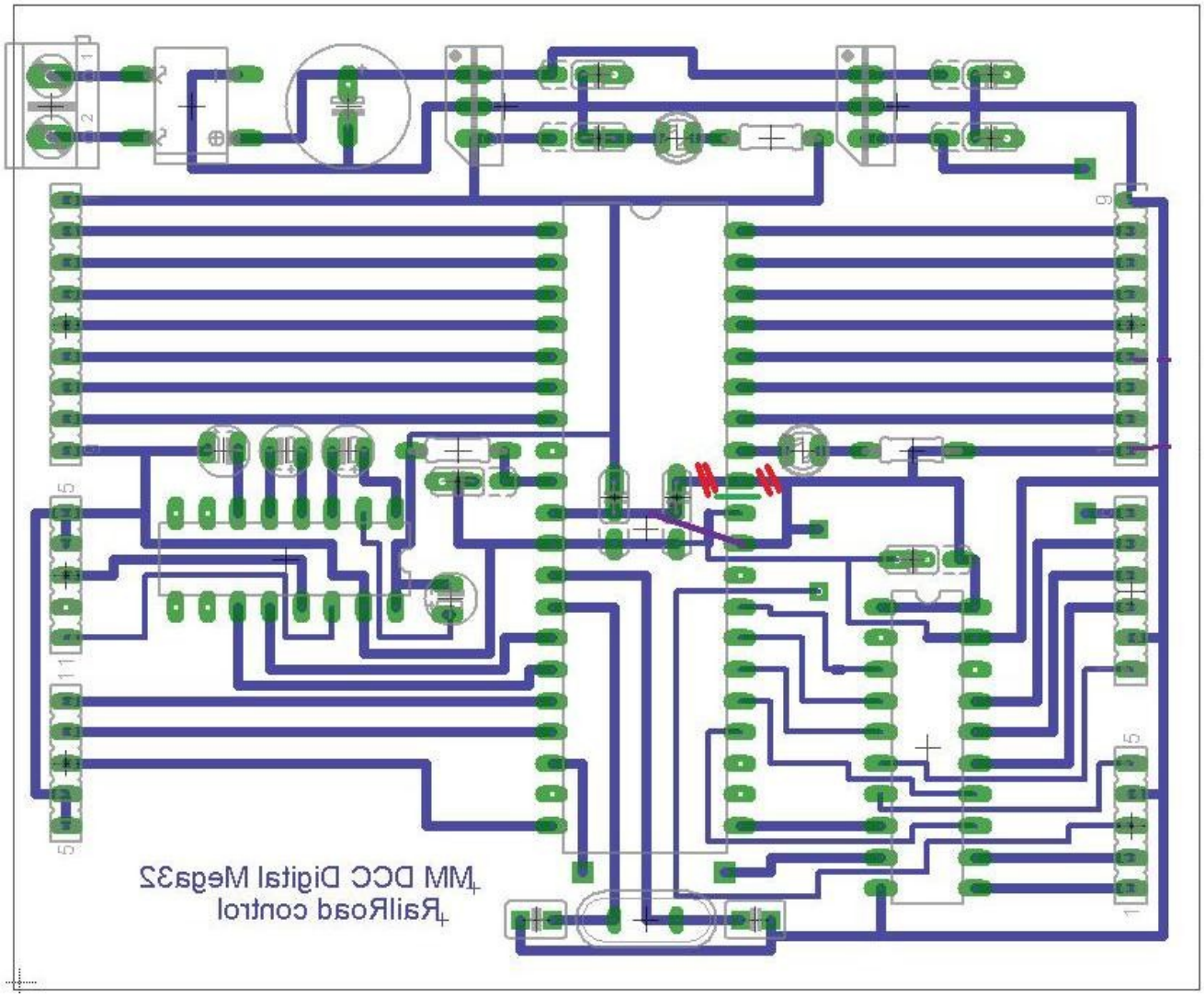


Figure 37: PCB modification for manual control.

- The track at pin 32 of the Mega32 needs to be disconnected from the +5V power supply, red stripes.
- Add between pin32 and pin31 of the Mega32 a 47nF capacitor (green line).
- Connect pin 30 of the Mega32 to the +5 Volt supply voltage, purple line.

4.11 Short circuit handling

MRDDC is able to handle short circuit feedback from a booster. As soon as the signal is low at the pin of the Mega32, MDRRC initiates a stop to Koploper. At the MDRRC display EMERGENCY STOP will occur. You need to

- Apply 'Opheffen' in Koploper
- Or push the emergency button on MDRRC or I2C / RFM12 manual control.

to restart the rail road. There is no automatic retry mechanism within the MDRRC after a short circuit.

See also 2.2.4 SV4 Booster interface for the various options regarding the signal level of the S/C feedback.

4.12 Stand alone use.

MRDDC can be used stand alone. The Emergency Stop / Go button can be used to en- or disable MDRRC. If manual controls are connected locomotives can be controlled. With the keybaord it's also possible to control turnouts.

5. PC Tool

By means of a ***simple*** Pc tool the locomotive names and decoder type can be set and options can be en- or disabled. To install the application as any other Windows program by clicking Setup.exe in the PcCom package of [REF01]. If a newer version is installed, please uninstall the older version.

- Select in MDRRC the option PCCom.
- Start up the program, screen as shown in must appear (The number of found com ports depending on the number of com ports present on your PC).
- Click on the applicable serial port.

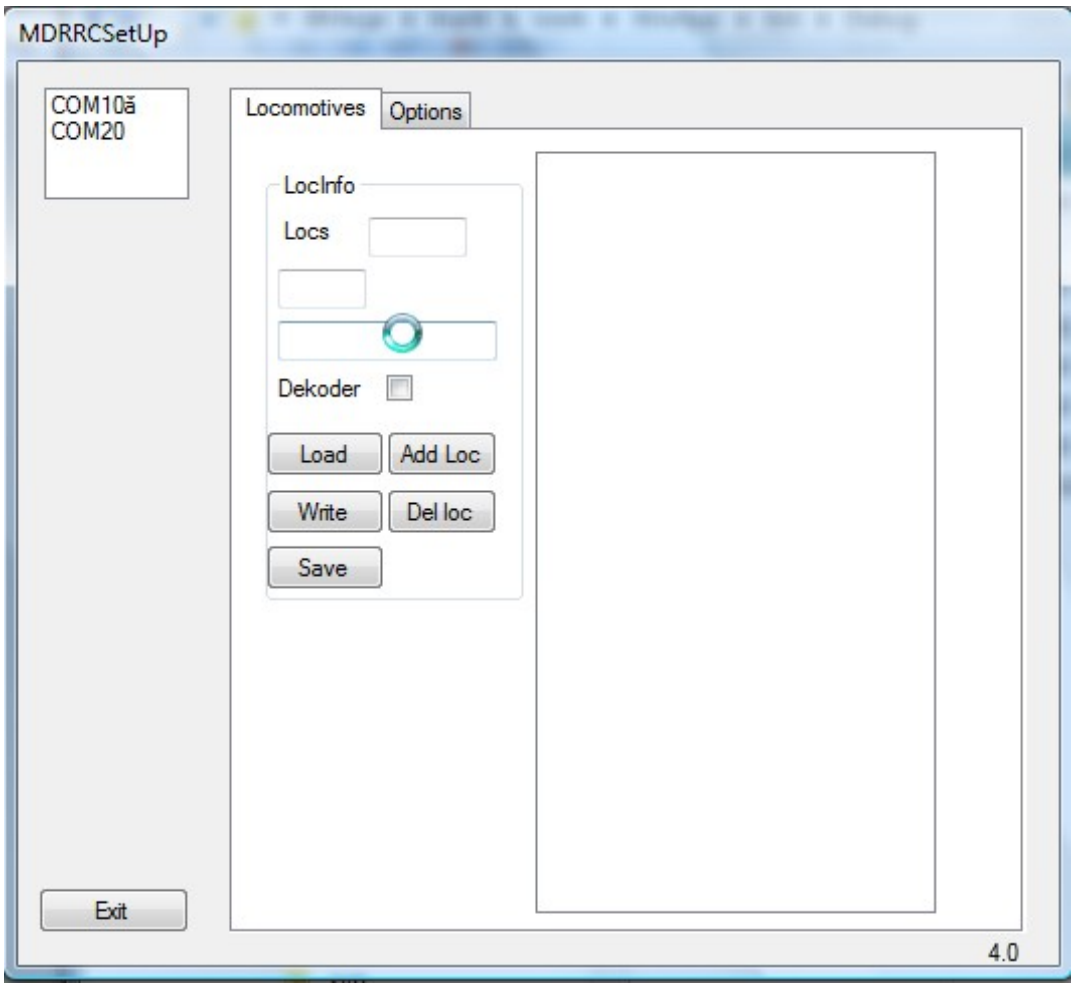


Figure 38: PC Tool start up screen.

- The program starts to read locomotives names, number of s88, (manual control) options , and number of locs from the MDRRC. If no name is stored, ------ will appear.
- Click on a locomotive to be changed. The decoder number and locomotive name appear left. Change the name, press **Enter** and the changed data is written into the MDRRC and the locomotive list is updated.
- If Dekoder is checked, the locomotive is controlled using the MM-2 locomotive format. If Dekoder is unchecked, the locomotive is controlled using the DCC 28 steps format.

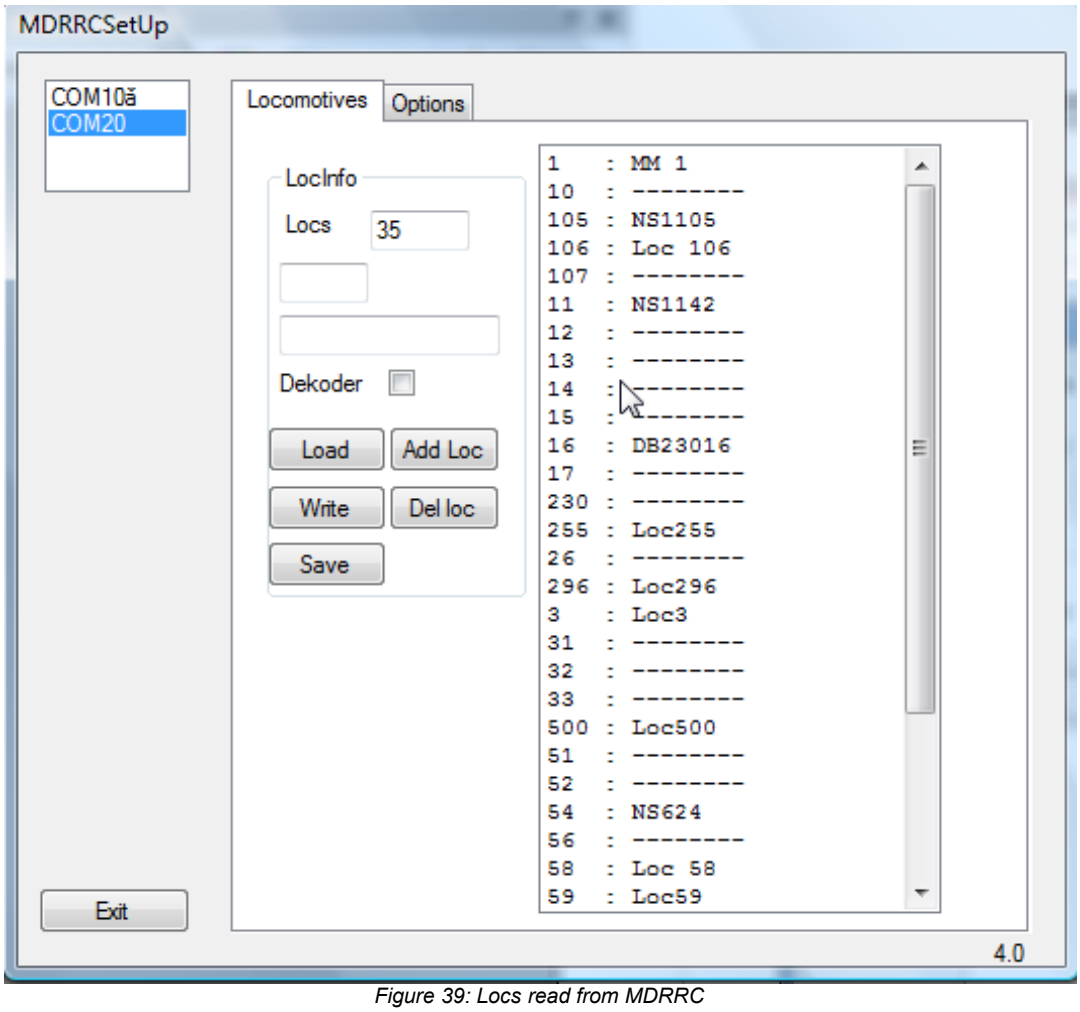


Figure 39: Locs read from MDRRC

- Using the Save, it's possible to store ALL locomotive names and decoder numbers into a file. This file can be edited with for example Notepad to add locomotive names more easily.
- With Load, the previous stored file can be loaded, and with the button Write the complete list is written into the MDRRC. This might be useful after a erase all settings is done.
- With the button AddLoc a loc can be added to MDRRC without using Koploper or Rocrail. Just press the button, the decoder number and locname field will be filled, update the data and press enter.
- With the button Del Loc a locomotive can be delected from MDRRC. Select the loc to be deleted in the list and selec press Del Loc. A confirmation is required before deleting as shown in figure 40.

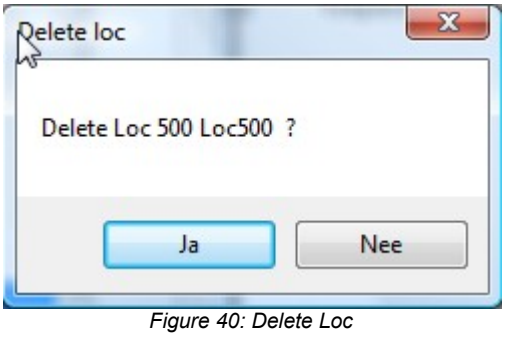


Figure 40: Delete Loc

- If yes is pressed it takes a few seconds and then the list will be rebuild on the screen.

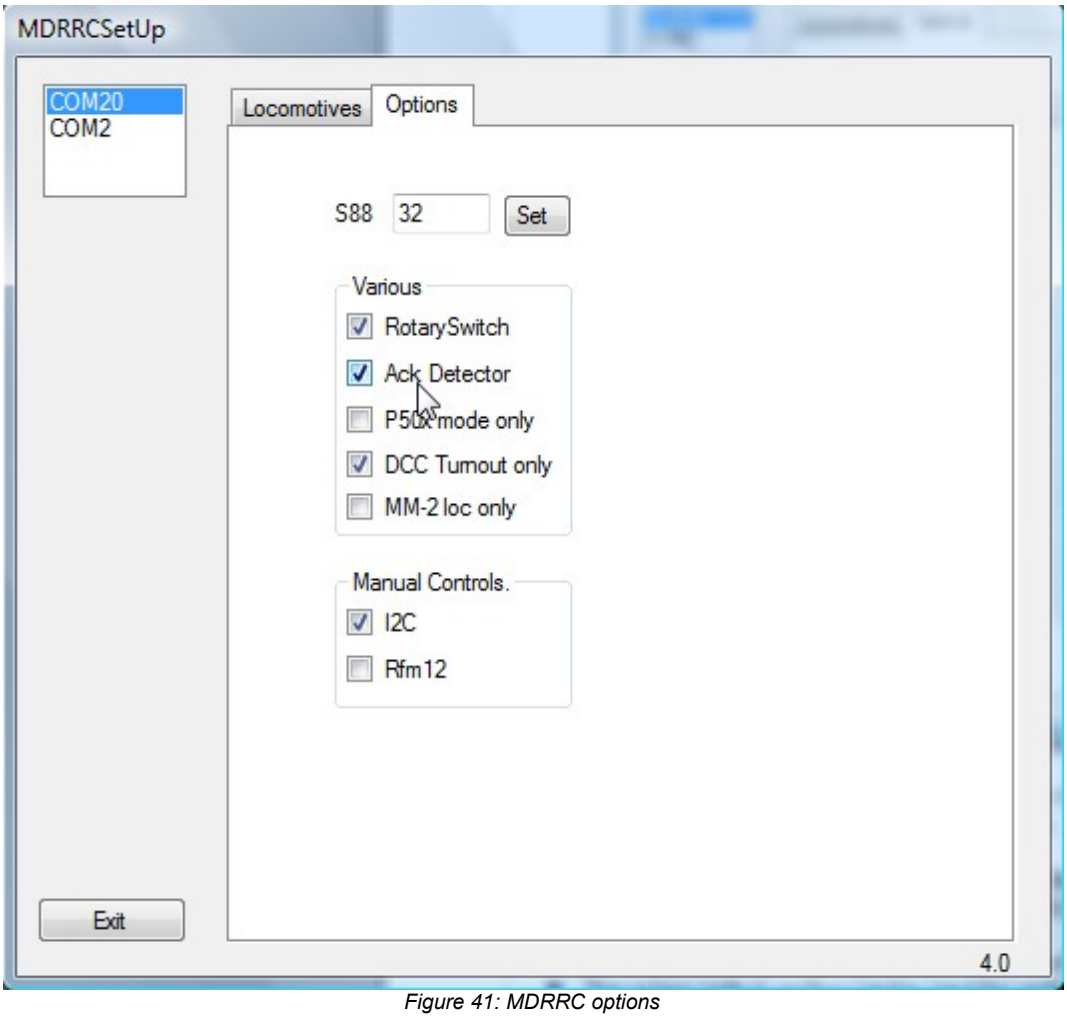


Figure 41: MDRRC options

Besides setting locomotives names, it´s possible to set a number of options.

- S88 can be used to set the number of S88 units. Enter the number in the text box after S88,and press Set.
- The manual control options are disabled by default. To enable a manual control, click on the radio box of the applicable manual control. It's advised to leave options disabled if NOT used.
- If a keyboard is used (see [REF05] enable the I2C option.
- The rotary switch option can be used for setting the rotary switch less sensitive.
- The option Acknowledge must be set if a Acknowledge detector is used during DCC programming. Clear the option if no acknowledge detector is used.
- P50x only mode must be enabled if pure P50x communication is used, for example when using RocRail.
- DCC turnout only option, set it if **only** DCC turnout decoders are used. If MM and DCC turnout decoders are used, MDRRC needs to learn the DCC decoders, see 4.6.
- MM-2 loc only can be used if NO DCC decoders are used but only MM-2 compatible locomotive decoders. The option Dekoder has in this case NO effect.
- If Exit is pressed, MDRRC will perform a reset so new settings are used and MDRRC is ready for connecting to a digital rail road control program.

6.Changes.

Version	Date	Changes
01	23-03-2008	- Initial version.
02		– Settings changeable by using rotary switch and LCD instead of serial port. – Added remark with 0 S88 units. – Added examples of S88 LCD display. – Added PC connection (SV3 Serial connection to PC.) – Added remark at disclaimers.
03	15-07-2008	– Corrected PC connection (SV3 Serial connection to PC.) – Corrected some typos.
04	16-08-2008	– Updated 2.2 Connectors. – Added rotary switch connection on SV1 (Rotary Switych). – Figure index corrected. – Schematic corrected, version 1B.
05	27-08-2008	– Added text in 1. Introduction. – Corrected pin of SV2. (+5 Volt instead of GND). – Added remark for mounting C5 and C8 in 2 Hardware. – Corrected interface schematic of SV4 Booster interface. – Spelling check with OpenOffice Writer. – Changed order in chapter 4. – Added remark regarding MAX232 in 2,1 Component list and Booster Interface. – Added C12 at MAX232. – Software version 1.2 – Added SFD description. – Added Erase settings description. – Fixed menu item for selecting S88 / Erase settings. Special thanks to Adriaan and Jan of http://www.mrgv.nl/ for finding the errors....
06	13-01-2009	– Added R1..R3 in booster interface for connection to an Edits booster. – Added manual control. – Changed boot loader and updated description boot loader. – Added description PC tool. – Added Cv programming description. – Added DCC turnout description.
07	16-04-2009	– Short circuit handling added. – Removed paragraph about Edits booster. – Added description function selection of the manual control. – Updated figures.
8	01-09-09	– Added example (chapter 6) of build in electronics based on Conrad housing. – Updated chapter 5 PcTool. – Added Rfm12 manual control

Version	Date	Changes
9	28-09-09	– Updated start up screen of MDDRC. – Added description at Exit button of PcTool. – Updated rotary switch handling, see applicable paragraph for required changes!
10	14-11-09	– Booster interface description updated (2.2.4)., – 4.1 communication led replaced by LED1. – 4.4 Sources of emergency stop updated. – 4.9 Added remark of non active manual controls. – Removed text of resistors. – 4.11 reworked. – Updated figure references. – Corrected some typo's. – Added CV programming using DecoderProgrammer – REF04 added.
11	29-12-09	– 2.2.5 Added I2C manual control connector. – 2.2.6 Added Ack detector connector. – 2.2.8 Updated picture LCD connection. – 4.1.2 Added RocRail settings – 4.8 Added Acknowledge detection. – Fout: Bron van verwijzing niet gevonden Added description for PT.EXE /PfuSch. – 3 Added remark about file name. – PcTool (5) pictures updated. – Textual changes left and right.
12	01-01-10	– Only DCC turnout option added (Fout: Bron van verwijzing niet gevonden, 4.6, 5) – Manual CV programming added remark max CV address (4.8.1). – Some textual changes.
13	11-03-10	– Programming using DecoderProgrammer removed. – Some textual corrections (as usual). – Ack detector circuit updated (4.8.5) and added variant of Volker. – Removed resistor manual control. – Added stand alone mode (4.12). – Updated description MdrrcSetupTool (5). – Added 8 Appendix A. Thanks to Volker and Roelof for testing the software.
14	19-03-10	– Changed ack detector of Volker (4.8.5)
15		– 2.2.4 added info for connection TAMS/B2 of Litfinski DB-2 booster.

Version	Date	Changes
16	24-10-10	– MDRRC updated to version 3.65 and MdrrcSetUpTool updated to version 3.0 – Added remark about connecting a Lussi (Marklin 6017 compatible booster) (2.2.4) – Added remark of JTAG fuse (3.1) – Added MrDirect option for Koploper (4.1) – 4.3.10 removed. – 4.9.1 Renamed. – Remark about keyboard and I2C (5) – Add loc manual added using PC tool (5) – Removed chapter 6. – REF05 added. – Added / Updated text at pictures. – Picture references in text removed.
17		– Features updated, long DCC addresses for locs and turnout max address increased to 512. (1.1) – Feature functions corrected to F1..F12. (1.1) – Several typo's as usual. – Several screen shots updated. – Added description how to set DCC long addresses with MDRRC (4.8.2). – Updated SetUpTool screen shots (5). – Added description Del Loc (5).
18	03-05-11	– PT removed (4.8). – P.f.u.Sch link added (4.8). – RocRail install link removed (4.2) – Programming SFD/DCC added I2C keyboard.
19	03-07-11	– RFM12 interface updated namings in schematic. – MDRRC schematic some lose pins connected to ground and updated power inputs on pins 20,21,22 of Mega32.
20	07-06-12	– Update disclaimers (1.2 Disclaimers). – SFD option ***REMOVED***. – REF02 removed.
21	05-01-13	– Text 2.2.2 SV2 Switches / RFM12 interface. updated. – Added new booster interface (2.2.4 SV4 Booster interface). – Added remark about turnouts in 4.2 RocRail Settings.

7.References:

REF01 MDRRC.ZIP

REF03 I2C manual control.
http://members.home.nl/robert.evers/ZIP/mdrrc_manualcontrol.zip

REF04 RFM12 manual control.
http://members.home.nl/robert.evers/ZIP/mdrrc_manualcontrol_rfm12.zip

REF05 I2C keyboard
http://members.home.nl/robert.evers/mdrrc_keyboard.htm

8. Appendix A

Below description in GERMAN by Volker how to use the PcTool as described in chapter 5 with Ubuntu. Might be usefull for RocRail users...

Da meine Eisenbahn mit Rocrail unter Ubuntu(Linux)läuft, habe ich probiert, wie man dein mddrcsetuptool.exe unter Ubuntu zum Laufen bringt.
Dafür ist es nowendig eine bestimmte Wine-Version* zu installieren. Die mit Ubuntu gelieferte Version funktioniert nicht fehlerfrei.
Ich habe gute Erfahrungen mit der Wine-Version 1.1.30 gemacht.

...und so funktioniert es (alles am Beispiel com1 bzw. /dev/ttyS0)

- Version 1.1.30 downloaden und installieren von http://wine.budgetdedicated.com/archive/index.html
- Winetricks installieren

  im Terminalfenster "wget http://www.kegel.com/wine/winetricks"
- .NET2.0 installieren:

  im Terminalfenster "sh winetricks dotnet20"
- im Verzeichnis ~/.wine/dosdevices kontrollieren, ob ein Link von /dev/ttyS0 zur com1 Schnittstelle vorhanden ist,

  ansonsten anlegen mit im Terminalfenster "ln -s /dev/ttyS0 ~/.wine/dosdevices/com1"
- in Verzeichnis ~/.wine/System.reg kontrollieren, ob dieser Eintrag vorhanden ist:
  [HARDWARE\\DEVICEMAP\\SERIALCOMM]
  "COM1"="COM1"

anschliessend kann ich mddrcsetuptool.exe unter Ubuntu ausführen.

Gruss
Volker