



The MiniDCC® Station is designed to control

- 4 Locomotives simultaneously,
- 99 turnouts and
- 26 routes

in several DCC compliant operation and programming modes

## User Manual / abstract

for MiniDCC® Station Firmware 301a  
and MiniDCC® Application Rel. 4.0.0.5

### MiniDCC® Station - stand alone features

- Control elements / start sequence
- Operation Mode
- Service Mode
- Setup

### MiniDCC® Application - features with a dedicated PC

- Setup and Version Update
- MiniDCC® Station Firmware upgrade
- Turnout Save/Load, Decoder, Encoder
- CV Programming
- Link to control basic function of 4 locos
- Admin

### MiniDCC® Station - Hardware

- Schematic
- Parts List
- PCB
- Hardware aspects

MiniDCC® Station and MiniDCC® Application  
developed by Robert Côté and John Zajdler, Canada - [www.miniDCC.com](http://www.miniDCC.com)

## MiniDCC® Station - stand alone features

### Control elements



Switch to switch off the main track while CV# programming (optional)

2 push-buttons for Emergency Stop and Mode Selection

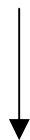
4 x 4 Keypad  
(note on page 39)

4 Pots for speed setting  
(in B/A or T/A mode)

The placement of control elements can vary, depending of enclosure and personal preferences.

### Start Sequence

0,5 sec



MiniDCC Station  
Derosoft (c)  
www.minidcc.com  
Version 301a

actual  
Firmware-  
Release

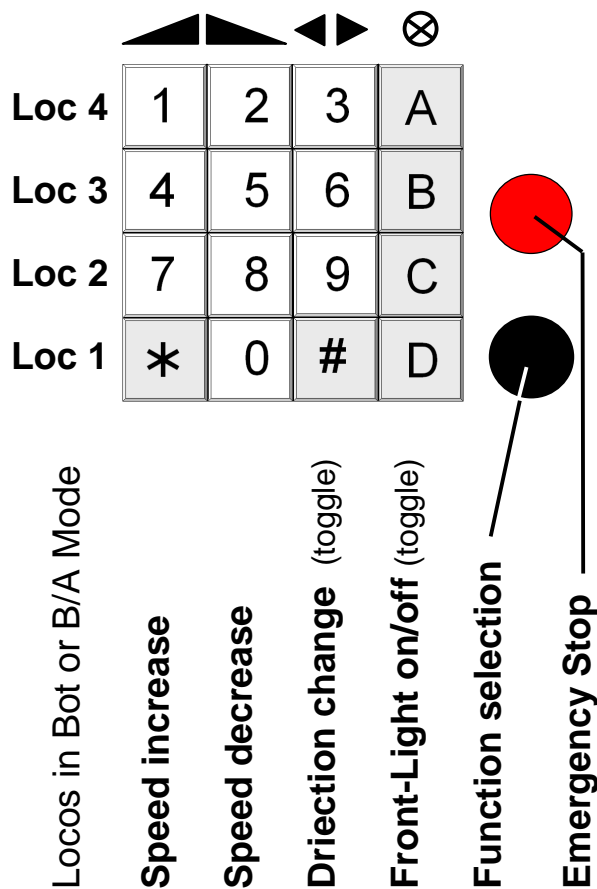
MiniDCC Station  
Loc 003x004x005x006x  
Fun -----  
Spd 000->000->000->000->

Start in Operation Mode  
(e.g. in 4x20 display mode )



All following pictures / instructions  
are figured out in 4 x 20 display mode

## Operation Mode



```
MiniDCC Station
Loc 003x004x005x006x
Fun -----
Spd 000→000→000→000→
```

```
Loc 003x004x005x006x
|   |   |   |
|   F0 Front-Light x/-
|   Loc-DCC-Address

Fun -----
|   |   |   |   |
| F1 F4 ... F1 F4

Spd 000→000→000→000→
|   |   |   |
|   Direction </>
|   Speed
```



After Setup in Bottom/A (B/A) or Top/A (T/A) mode (x/A = analog by pots):  
Speed setting of locos

- via pots only - corresponding columns of keypad are deactivated
- after Startup or Emergency Stop from speed "0" only



Direction change is accepted after the loco is on speed "0" only



F0 front light can be switched on/off (toggle) at any time in operation mode



The red pushbutton activates the emergency stop function.  
The word Emergency Stop appears on the screen (Details on next page).



The black pushbutton activates various operation and programming modes

**Fun**

The control of functions F1 .. F4 is possible after change into function mode

**Key X [x]** depending on actual keyboard layout - details on page 40

## Function Control Modes - Overview



### Emergency Stop

```
MiniDCC Station
Loc 003x004x005x006x
Fun -----
Emergency Stop !
```

On Emergency Stop, all speeds are reduced to zero and all locos are brought to an immediate stop.

The direction of travel and the status of the headlamps remains as they were before the stop.

The system reverts to operating mode after about 2 seconds. There is no need to press the Stop button again.

If PwSafe is On – power is removed from track as well – Pressing Mode or Emergency again resets power back.

To restart travelling, all speed settings must start at "0".



### Function Control

**1x** Turnout Sequence Playback

**2x** F1 - F4 Function Control

**3x** Return to Operation Mode

```
MiniDCC Station
Turnout Control Mode
Play Route A 01 00|
```

```
Function Control Mode
Loc 003x004x005x006x
Fun -----
```



### Programming Modes

**1x** + **1x, 2x, 3x, 4x, 5x, 6x, 7x**

**1x** Station Address, speed steps

**2x** CV Programming

**3x** Turnout Programming

**4x** Setup

**5x** PC interfacing

**6x** Rotary knob preset

**7x** Return to Operation Mode

```
MiniDCC Station
Statn #1 #2 #3 #4
Addr 000 000 000 000
```

```
MiniDCC Station
Service Mode Pag/Reg
CV:001 Va:000 001-00
```

```
MiniDCC Station
Turnout Control Mode
Rec. Route A 01 00|
247 Steps left
```

```
Disp Kbd TnDelay
20x4 B/A 50x40ms
```

```
Data PwSafe Link
Save Off Off
```

```
aD1 aD2 aD3 aD4
On On Off Off
```

## Turnout Control Mode

 1x

1	2	3	A	Sequence
4	5	6	B	Turnout !/
7	8	9	C	A→Z
*	0	#	D	Z→A
				Turnout

1→99    99→1

MiniDCC Station  
Turnout Control Mode  
Play Route A 01 00|

Play Route A 01 00|  
 |                    |   |   |   |  
 |                    |   |   |   |   Status "|" or "/"  
 |                    |   |   |   |   DCC Turnout Number 0..99  
 |                    |   |   |   |   Step of Play-List 0..99  
 |                    |   |   |   |   Play-List A ..Z (26)  
 Turnout Sequencing playback

**Turnout Sequencing playback mode**

To &lt;Play Back&gt; a recorded sequence,

- 1) select the desired route (A .. Z) with Keys B [E] "A→ Z" and C [D] "Z→ A" and
- 2) press key A [F] to start the play back sequence.
- 3) The signal will be sent along without disturbing the continuous speed and direction data.

**Review** a turnout sequence,

- 1) first select the desired route with Keys B [E] "A→ Z" and C [D] "Z→ A" and
- 2) then use Keys \* [A] and # [B] to increment or decrement the sequence within that particular route.

(Of course, this feature will only work once a sequence as been recorded).  
 Non-recorded routes will display a value of 00 and remain at sequence 01.

**Individual Turnout Control**

To test an individual turnout,

- 1) enter a value between 00 and 99 using the appropriate key and
  - 2) press key D [C] to send the DCC signal for that turnout.
- The vertical bar will change to a forward slash to show a thrown turnout.  
 Pressing key A [F] will toggle and repeatedly move the switch.  
 The value entered will not disturb the sequence shown  
 as these can only be changed in the Record mode.

**Key X [x]** depending on actual keyboard layout - details on page 40

## F1 - F4 Function Control

 **2x**

Loc 4	1	2	3	A
Loc 3	4	5	6	B
Loc 2	7	8	9	C
Loc 1	*	0	#	D

F1 on / off

F2 on / off

F3 on / off

F4 on / off

for all 4 Locos

MiniDCC Station

```



Loc  003x004x005x006x
Fun  xx-----xx--
Spd  000→000→000→000→
  
```





```

Loc  003x004-005x006-   (not changeable)
Fun  xx-----XX--    -=off / x=on (toggle)
Spd  0000000000000000 (not changeable)
  
```

## Station Address Programming

 **1x** +  **1x**

				
Loc 4	1	2	3	A
Loc 3	4	5	6	B
Loc 2	7	8	9	C
Loc 1	*	0	#	D
	DCC-Address increase	DCC-Address decrease	---	Speed Steps 14, 28, 128

for all 4 Locos

```

MiniDCC  Station
Statn   #1  #2  #3  #4
Addr    003 004 005 006

```



```

Statn   #1  #2  #3  #4
        |
        Loco-Number

Addr >000>000 000<000
    | |
    | DCC-Address 00 .. 127
    Speed Steps 14,28,128
    <=14,  =28,  >=128 (toogle)

```

## CV Programming

 **1x** +  **2x**

	1	2	3	A
	4	5	6	B
Value	7	8	9	C
CV	*	0	#	D

▲ / 7: CV / Value increase  
 ▼ / 8: CV / Value decrease  
 ■ / 9, 6, 3: CV programming  
 ■ [A], ■ [B], ■ [C], ■ [D]

for a single Loco only  
e.g. on programming track !

MiniDCC Station  
Service Mode Pag/Reg  
CV:001 Va:000 001-00



CV:001 Va:000 001-00

| | |  
 | | | Data-Reg. #  
 | | | Paging-Reg. #  
 | | Value 000..255  
 CV 000..999  
 (001 = DCC-Address)

**CV Programming** ( after selection of CV number and of CV value “Va” )

using 3, 6 and 9 do require that you confirm by pressing the # [B] key

- 3** uses the newer Extended protocol but again is limited to newer decoders only
- 6** uses the other protocol allowing all CVs to be programmed but may not be recognized by all decoders
- 9** uses the more common Page/Register NMRA protocol which most old or new decoders understand
- # [B]** confirmation of CV programming to prevent sending an unwanted signal to a CV inadvertently when playing around with the keypad  
(# isn't the synonym for “number”, but for the real # key resp. [B] !!)

The « **Match / Fail** » message will show correctly only if the decoder returns the feedback by energizing the motor a few milliseconds – if the decoder does not respond, you will get a “false” even if it has programmed correctly.

**Key X [x]** depending on actual keyboard layout - details on page 40



## CV checking / reading

 **1x** +  **2x**

	1	2	3	A
	4	5	6	B
Value	7	8	9	C
CV	*	0	#	D

for a single Loco only  
e.g. on programming track !

\* [A] / 7: CV / Value increase  
 0 / 8: CV / Value decrease  
 ---  
 CV checking / reading

MiniDCC Station  
Service Mode Pag/Reg  
CV:001 Va:000 001-00

CV:001 Va:000 001-00  
 | | | |  
 | | | Data-Reg.#  
 | | | Paging-Reg.#  
 | | Value 000..255  
 CV 000..999  
 (001 - DCC address)

**CV checking / reading** ( after selection of CV number and of CV value “Va” )  
using A, B, C, and D [F, E, D and C]

- A** [F] The A [F] key uses the advance protocol to scan and identify the CV values. It is much quicker but not supported by older decoder.
- B** [E] The B [E] key does the same thing but using the advanced protocol to do so. If the decoder does not support the advanced mode, then you will get a “false” even if the CV is programmed correctly.
- C** [D] The C [D] key start the scan from 0 to 255 for a given CV number using the slower Page/Register protocol.
- D** [C] The D [C] key validates the display combination of CV no. And CV value using the more common Page/Register protocol – it does not reprogram but validates what is on the display.

**Key X** [x] depending on actual keyboard layout - details on page 40

## Turnout / route programming

 **1x** +  **3x**

1	2	3	A	Turnout  /
4	5	6	B	A→Z
7	8	9	C	Z→A
*	0	#	D	Save

**1→99    99→1**

MiniDCC Station  
Turnout Control Mode  
Rec. Route A 01 00|  
247 Steps left

Rec. Route A 01 00|  
| | | | Status "|" or "/"  
| | | | DCC Tournout Number 0..99  
| | | | Step of Play-List 0..99  
| | | | Play-List A ..Z (26)  
Recording of a Play-List  
247 Remaining Memory for Route Definitions

**Recording**

- 1) Once a route (A .. Z) is selected (Keys B [E] "A→ Z" and C [D] "Z→ A"),
- 2) enter the turnout ID using the keyboard (Keys 0 .. 9)
- 3) then press key A [F] if you want the switch thrown (toggle)  
(watch the | and / sign on the display indicating straight or thrown)  
The DCC signal is also sent to the track so you can observe the turnout behaviour.
- 4) To record the data, press Key D [C]; the sequence number will increment to 02,
- 5) ready for the next turnout ID, like 2), or
- 6) Pressing Key \* [A] and # [B] allows to review the route sequence.
- 7) When satisfied, just revert to the operating mode  
(the data are stored) and play back the route(s) as required.

**Re-programming a sequence**

To change the status of a turnout or the turnout ID in a sequence,

- 1) just select the route (Keys B [E] "A→ Z" and C [D] "Z→ A"), and the
- 2) sequence number (Keys 0 .. 9) and
- 3) enter the new route and status (Key A [F] for "|" or "/") using the keyboard and
- 4) pressing Key D [C]; this will overwrite the existing ID and status.

**Eraseing a sequence**

To remove a turnout ID from the sequence,

- 1) select the proper route (Keys B [E] "A→ Z" and C [D] "Z→ A"),
- 2) along with the ID (Keys \* [A] and # [B] ) to be removed and
- 3) enter a value of <00>,
- 4) then press Key D [C] to record the data.

This will remove the ID from the slot and re-sequence  
all the other Ids as well as recover the memory for future data.

## Setup

 **1x** +  **4x**

1	2	3	A
4	5	6	B
7	8	9	C
*	0	#	D

\* [A] Display (toggle)

0 Keyboard (toggle)

# [B]: Value increase

D [F]: Value decrease

Disp    Kbd    TnDelay  
20x4    B/A    50x40ms

Disp    Kbd    TnDelay  
|        |        |  
|        |        TurnoutDelay / TurnoutPulse \*\*  
|        |        Keyboard: Bot,B/A,Top,T/A (toggle) \*  
Display: 16x2 / 20x4 (toggle)

**Kbd** Keyboard readout:

Bot: **bottom** to top  
Top: **top** to bottom

B/A: **bottom** to top, locos **analog**  
T/A: **top** to bottom, locos **analog**

**Speed control**

} digitally with keys  
of columns 1 and 2

} analog per pots

After Setup in B/A or T/A mode:

Speed increasing and decreasing of locos

\* via pots only - the corresponding 2 columns of keypad are deactivated

\* after Startup or Emergency Stop starting from speed "0" only

**TnDelay** Turnout timing setup

TnDelay: delay time between 2 commands in milliseconds

TnPulse: pulse time of commands

**Key X [x]** depending on actual keyboard layout - details on page 40

## Data Save / Load

 1x +  5x

1	2	3	A
4	5	6	B
7	8	9	C
*	0	#	D

\* [A] Data save / load

0 PwSafe Off / On

# [B] Link Off / On

D [C] Load / Save Data

Data	PwSafe	Link
Save	Off	Off



Data	PwSafe	Link
Save*	Off	Off
		Off / On (toggle)
	Off / On (toggle)	
	Send / Wait for EEPROM data	
	Save / Load (toggle)	

**DATA** (UART to USB Converter required) using MiniDCC.exe application

Once in this menu, the “\*” should toggle from Save to Load on the bottom line. Both Save and Load are activated with the “D [C]” button.

- In Save mode, you will see an “\*” briefly showing after the Save word “Save \*”. this is indicating that the entire EEPROM data is being sent to the UART pins;
- If you do the same when the LOAD option is ON and you press the “D [C]” button, the MiniStation will append an \* after the Load “Load \*” and the MiniStation is waiting for the **UART device** at the other hand to send the DATA that will replace the EEPROM data. Since you don’t have anything connected, the watchdog will time out after about 8 seconds and the MiniStation will reset.

When you are ready to connect the **UART pins to a USB converter**, you can use the MiniDCC.exe application to Read and Write to the EEPROM data - for example, once the proper COM port is selected in the Settings menu, you can connect and then move on to the Turnout Load / Save tab.

If you then go into the MiniDCC menu and select SAVE and then press “D [C]”, the EEPROM data should appear immediately in the top window – If you don’t have any turnout programmed, you will till see the first line of data has your station address plus other options selected (i.e. 16x2 display...).

Once the info is displayed there, you can the change the menu to “Load” and press the “D [C]” and immediately click the “Start Upload” button – If everything is well, the “Load \*” will change to “Load “ to show that the upload is complete. You can save and retrieve the date in the top window as a file on your PC to recover turnout information without having to re-enter all the info by hand...

**PwSave and Link**
 **1x** +  **5x**

1	2	3	A
4	5	6	B
7	8	9	C
*	0	#	D

Data	PwSafe	Link
Save	Off	Off



[A]	Data save / load
*	
0	PwSafe Off / On
#	Link Off / On
D	Load / Save

Data	PwSafe	Link
Save*	Off	Off
		Off / On (toggle)
	Off / On (toggle)	
	Send / Wait for EEPROM data	
Save / Load (toggle)		

**PwSave****PwSafe** (local service - no UART to USB Converter required)

To avoid accidents while configuring / programming we implemented a special feature:  
If PwSafe is On – as well, pressing

● Mode

● Emergency Stop

power is removed from track

Pressing “Mode” or “Emergency Stop” again resets power back.

**Link****Link** (UART to USB Converter required) using MiniDCC® Application

Speed, direction, FrontLight (F0 / FL, Functions F1 .. F4 and Emergency Stop  
can be adjusted from MiniDCC® Application, as well from MiniDCC® Station.

The settings are displayed simultaneously  
in the MiniDCC® Application, as well as on the display of MiniDCC® Station.

## Rotary knob preset

 **1x** +  **6x**

1	2	3	A
4	5	6	B
7	8	9	C
*	0	#	D

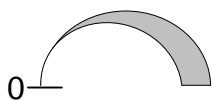
**Pot 1**    **Pot 2**    **Pot 3**    **pot 4**  
**\* [A]**    **0**    **# [B]**    **D [C]**

aD1    aD2    aD3    aD4  
On    On    Off    Off  
|  
Off / On (toggle)

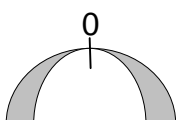
**aDx** analog Direction

To use this function the MiniDCC® Station has to be switched into analog mode B/A or T/A (see page 11)

## Specifics

**aDx = Off**

- zero speed at left limit stop
- max. speed at right limit stop
- change of direction by keypad / pots push button at speed zero only !
- When returning from an emergency stop, the user must goto left limit stop (speed zero) to become active again.

**aDx = On**

- zero speed at middle position (center)
- max. speed at left or right limit stop
- change of direction left resp. right of center
- When returning from an emergency stop, user must cross the middle point for the pot to become active again.

Both methods can be used mixed, e.g.

aDx = Off for an express train

aDx = On for a shunting loco

## Firmware Upgrade

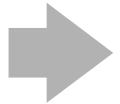
MiniDCC® Station Firmware Upgrade can be processed

- in **Bootloader Mode** (USB to UART Converter required)
  - or via the **ICSP Interface** (PIC programmer required)
- } information under “Hardware aspects”



In both cases don't forget to set up the parameters after the upgrade again, like loco addresses, speed steps (e.g. 127) and keyboard readout (e.g. B/A).

It is expendable using the updater application MiniDCC.exe saving the EEPROM of MiniDCC® Station (Turnout Save) before upgrading and writing them back (Turnout Load) to MiniDCC® Station after Firmware Upgrade.



In both cases disconnect the “normal” power source and power the MiniDCC® Station via the USB to UART converter resp. by the PIC programmer

### via ICSP-Interface

( PIC programmer required )

See ICSP ( In Circuit Serial Programming ) connections on page 41 for more details on how to proceed.

**BootLoader Mode**

### Updater application

( UART to USB Converter required )

Jump to the bootloader mode



by holding the Emergency stop switch and

- resetting (SW3) or
- remove and apply power.

**BootLoader Mode**

(Holding the Menu switch while resetting will toggle the display between between 2x16 and 4x20.)

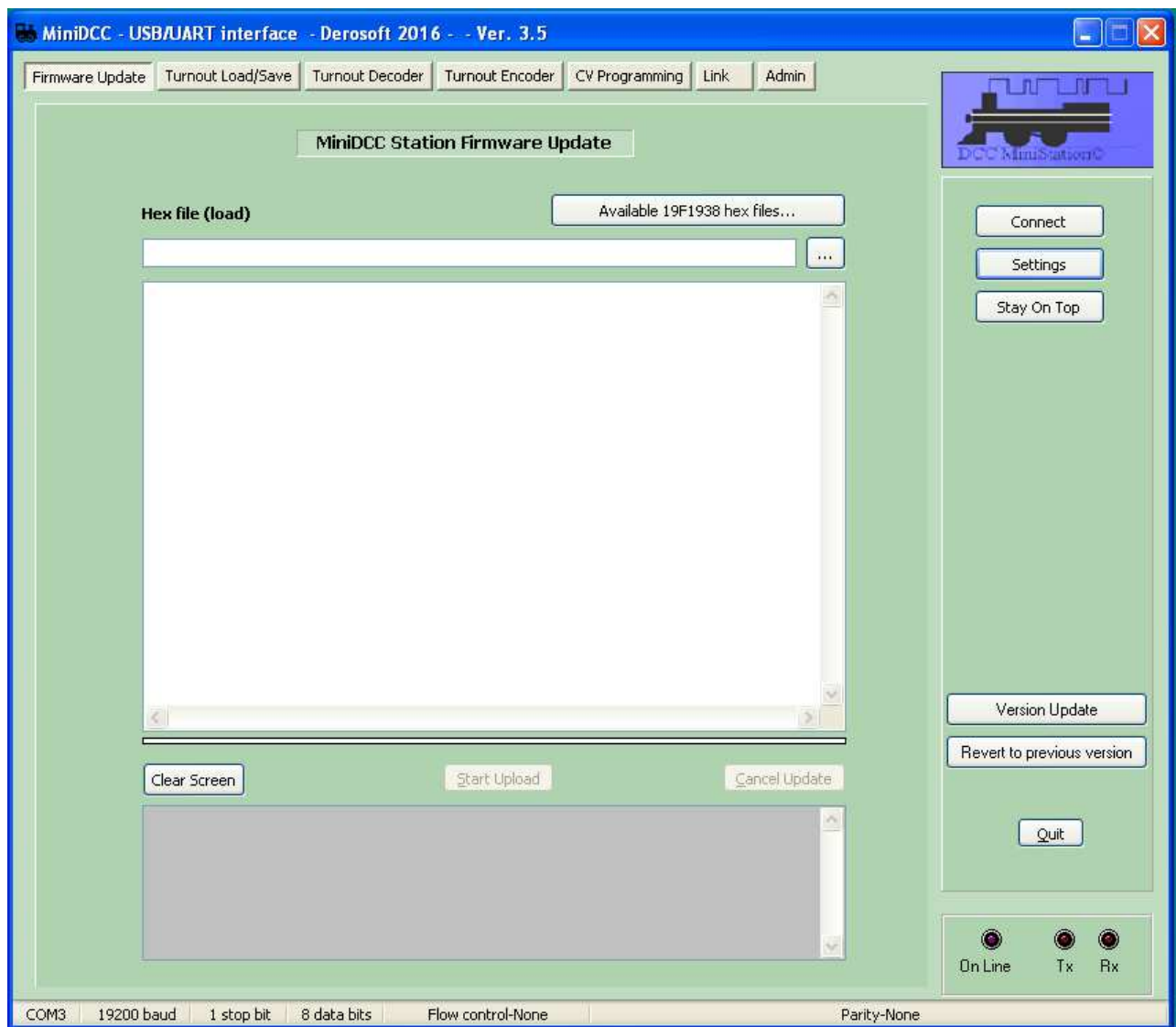
This is the easier method to upgrade the MiniDCC® Station Firmware, without using an dedicated PIC programmer.

More details you'll find in the section MiniDCC® Application resp. concernig the USB to UART converter in the section “Hardware aspects”

## MiniDCC© Application - features with a dedicated PC

MiniDCC.exe is a powerful application to transfer various data between a dedicated PC and the MiniDCC© Station

- MiniDCC© Station Firmware Upgrade
- Turnout Load / Save
- Turnout Decoder
- Turnout Encoder
- CV Programming
- Link Mode to control basic functions of the MiniDCC© Station (speed, direction, F0, F1 .. F4) of 4 locos via GUI of MiniDCC.





## MiniDCC® Application

To download and update the application, resp. Upgrade the Firmware of MiniDCC® Station a internet connection is required.

<http://www.minidcc.com/>

### MiniDCC® - A Digital Command Control Do-It-Yourself Project!

(Download the software updaters to obtain the latest HEX file)

(New pictures and more information coming soon!)



#### DCC MiniStation® Version 2.0

The MiniStation® has been improved considerably over the years. We have moved to a 28 pin template to allow for added features such as 4 discrete potentiometers for speed control, an RS232/USB link for firmware update as well as Turnouts (Switches) route saving and loading using a PC. The companion MiniBooster® (optional) now provides for CV reading facility as well as complete power shutdown upon Emergency Stops. The memory assigned to Turnout routes has been increased to double the size available under the old 16F628. An extended Menu offers choice of display (16x2 or 20x4), Keypad or Potentiometer control, saving and retrieving Turnout routes, etc.

#### DCC MiniBooster®

While the MiniDCC® station can operate with any compatible NMRA booster, the optional MiniBooster® integrates the function of READING as well as WRITING to CVs using the usual NMRA protocol. The LMD1800T is an efficient MosFet bridge, providing up to 3 amps of DCC power with full short circuit and high temperature protection built-in. A double-sided PCB designed by John Zajdler is also available in limited quantity (please write for info). Now you can control up to 4 trains simultaneously, up to 99 different turnouts/switches on 26 different routes (over 240 events) and program all your decoders (Read and Write) using any one of the 3 NMRA standards at a fraction of the cost of a commercial unit!

Write for more info...!

#### New version - 16F1938

Firmware Updater/Turnout SAVE and LOAD  
v2.0 Schematic  
PCB Layout  
Parts list

#### Schematics

16F628 circuit  
16F84A circuit  
MiniBooster® circuit

#### PCB Layout / Pictures / Supply

PCB Layouts  
Pictures/Alternate site  
Source Code/User Manual  
Part order temporary closed

#### Links

DCC Related  
Technical  
NMRA member #115144

#### New version - 16F1938


Firmware Updater/Turnout SAVE and LOAD  
v2.0 Schematic  
PCB Layout  
Parts list

### Download

Download the **MiniDCCsetup.zip** from the Internet [www.minidcc.com](http://www.minidcc.com) into a directory of your choice.

## MiniDCC® Application - Installation

Then extract it to

 MiniDCCsetup.exe

1.321 KB

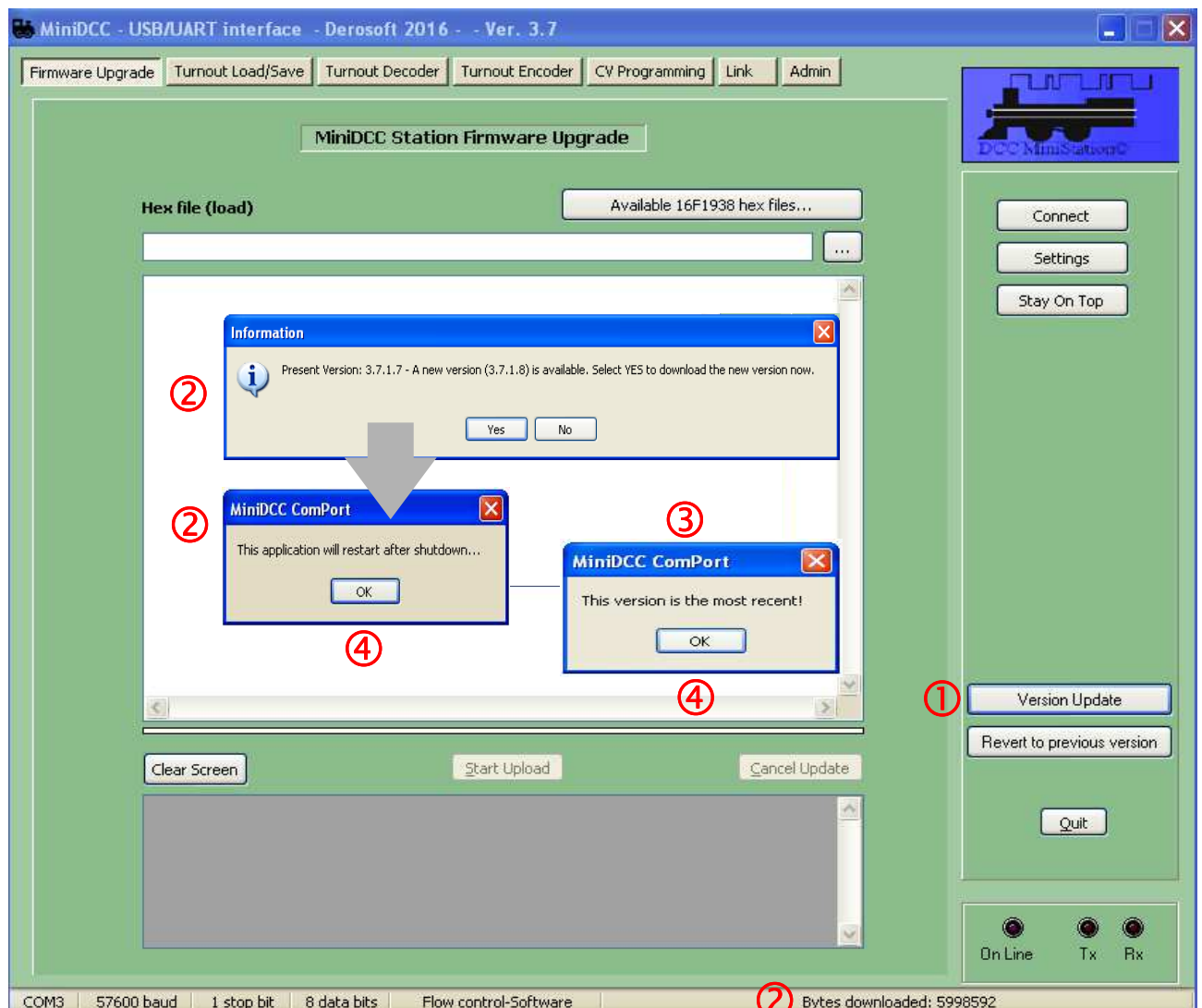
and install it



(Icon on desktop)

MiniDCCsetup.exe is installing the recent version of MiniDCC.exe.

## MiniDCC © Application - Version Update



- ① Select "Version Update", either
- ② the last update is downloaded (status of download in the bottom line) or
- ③ the version is already the most recent → no update necessary
- ④ press  to continue resp. to restart the MiniDCC® Application

## Communication Setup

Windows PC



MiniDCC® Application

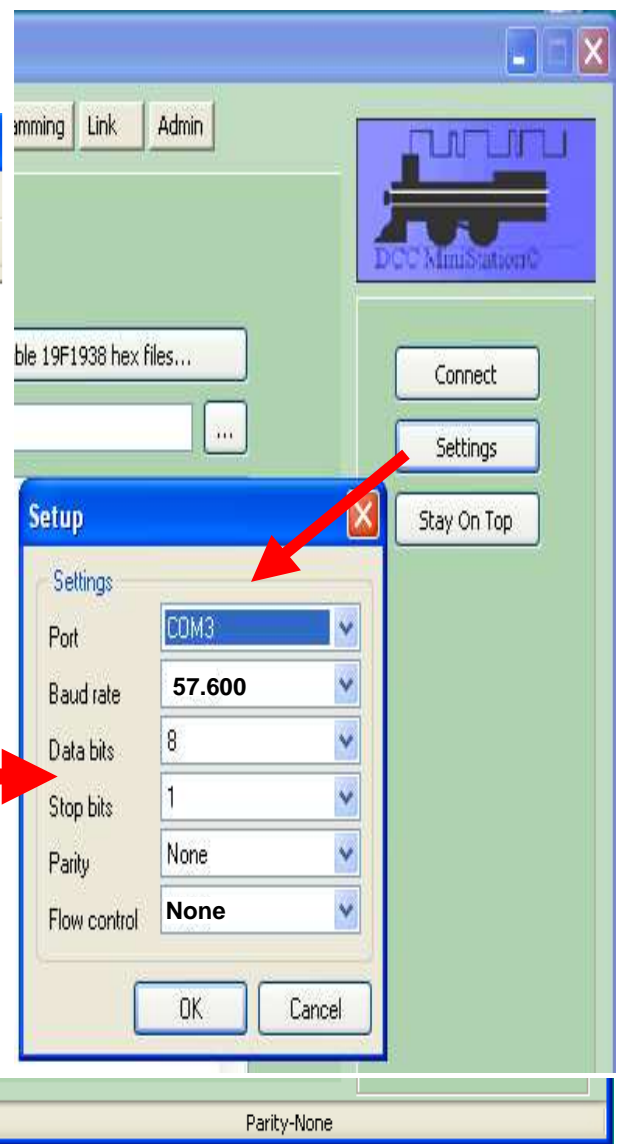
After installing the USB to UART converter the virtual COM interface appears in the device manager of your PC

(screendumps of WinXP).

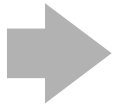


You can control the actual settings in the last row of the MiniDCC.exe window.

(screendump of MiniDCC.exe)



## Firmware Upgrade in BootLoader Mode

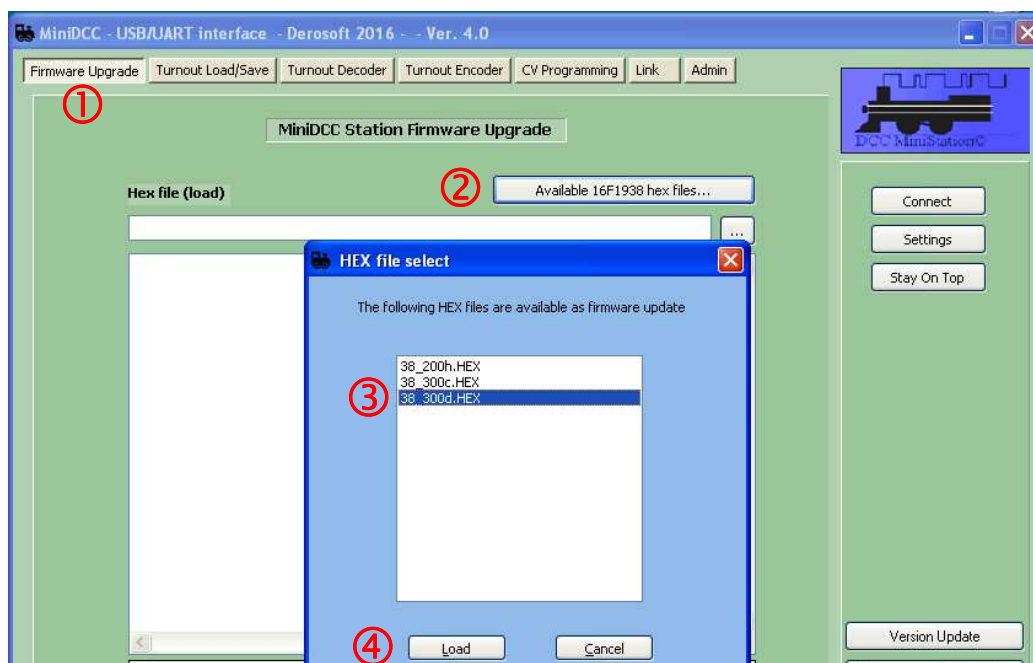


Don't forget to set up the parameters after the Firmware upgrade again, like loco addresses, speed steps (e.g. 127) and keyboard readout (e.g. B/A).

It is expendable using the updater application MiniDCC.exe saving the EEPROM of MiniDCC® Station (Turnout Save) before upgrading and writing them back (Turnout Load) to MiniDCC® Station after Firmware Upgrade.

## Selection of Hex- File

### MiniDCC® Application



- ① Select "Firmware Upgrade"
- ② look for the available HEX files
- ③ select the appropriate HEX file
- ④ transfer the hex-file by pressing the  into the "load" field



The various versions of the HEX files are coming directly from the Web server, they are not included in the application.

## Upload Preparation

**MiniDCC® Station** must be switched in "Bootloader Mode"



- by holding the Emergency stop switch and
  - resetting (SW3) or,
  - remove and apply power.



Respect the different succession of both solutions, outlined on the next 2 pages, please.

**BootLoader Mode**

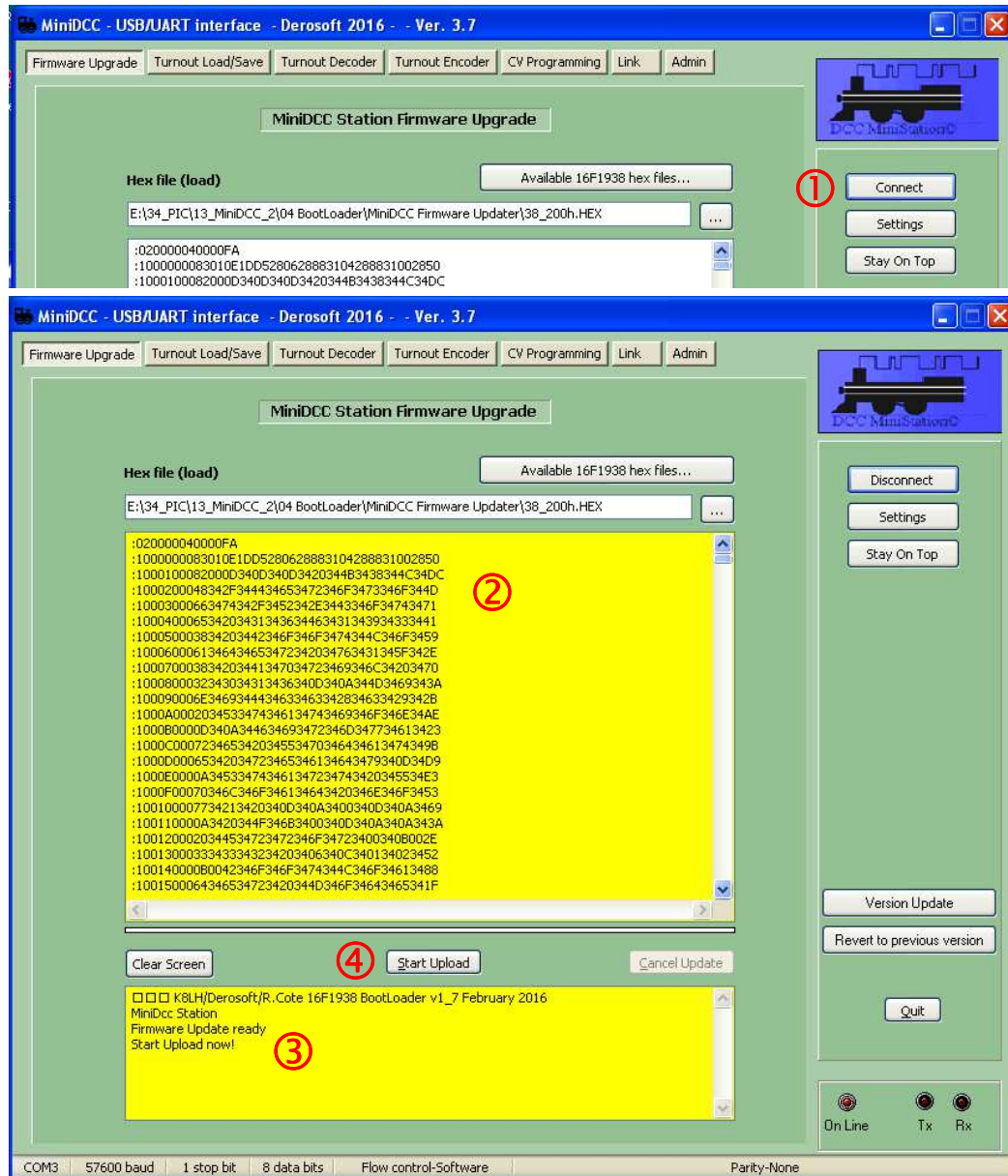
## Firmware Upgrade in BootLoader Mode

### Upload Preparation / Start



MiniDCC® Station **resetting by**  
**push button SW3**

MiniDCC® Station should be in “normal” Operation Mode



- ① Press the button **Connect**
- ② Window will turn yellow indicating a correct connect

Set the MiniDCC® Station into BootLoader mode (see page 19)  
by holding the Emergency stop switch and resetting by Reset (SW3)

- ③ The bottom screen will show a message from the MiniDCC® Station,  
indicating it is ready for Uploads
- ④ start upload by pressing **Start Upload**



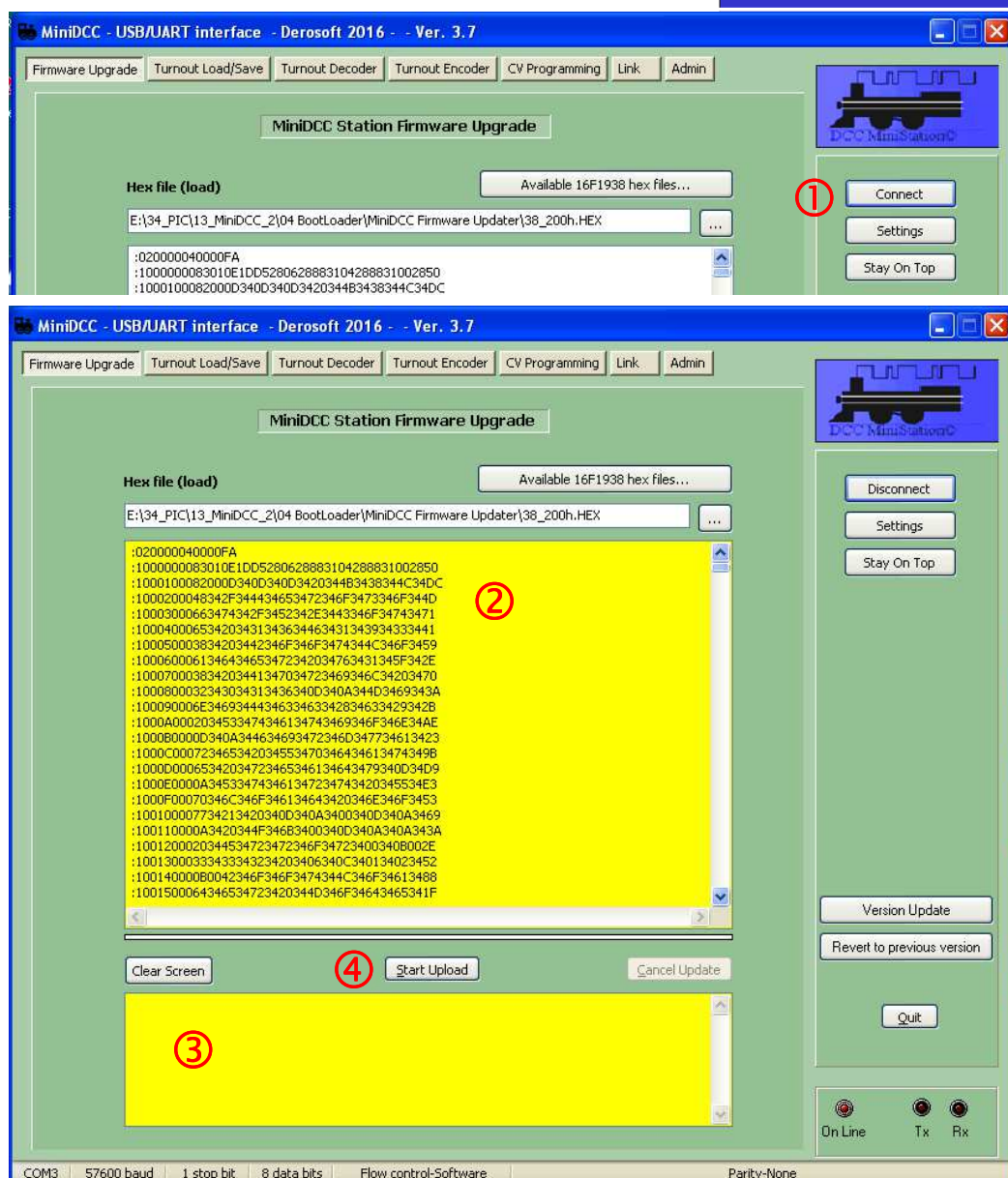
## Firmware Upgrade in BootLoader Mode

### Upload Preparation / Start

MiniDCC® Station **resetting by remove and apply power**

Set the **MiniDCC® Station** into BootLoader mode by holding the Emergency stop switch and resetting by remove and apply power.

BootLoader Mode



- ① Press the button **Connect**
- ② Window will turn yellow indicating a correct connect
- ③ The bottom screen stays blank
- ④ Start upload by pressing **Start Upload**

## MiniDCC® Station

BootLoader Mode  
P:0B9A

40 - 60  
Seconds

BootLoader Mode  
Upgrade Done !

## Automatic Restart

MiniDCC Station  
Derosoft (c)  
www.minidcc.com  
Version 301a

```

MiniDCC Station
Loc  003x004x005x006x
Fun  -----
Spd  000→000→000→000→

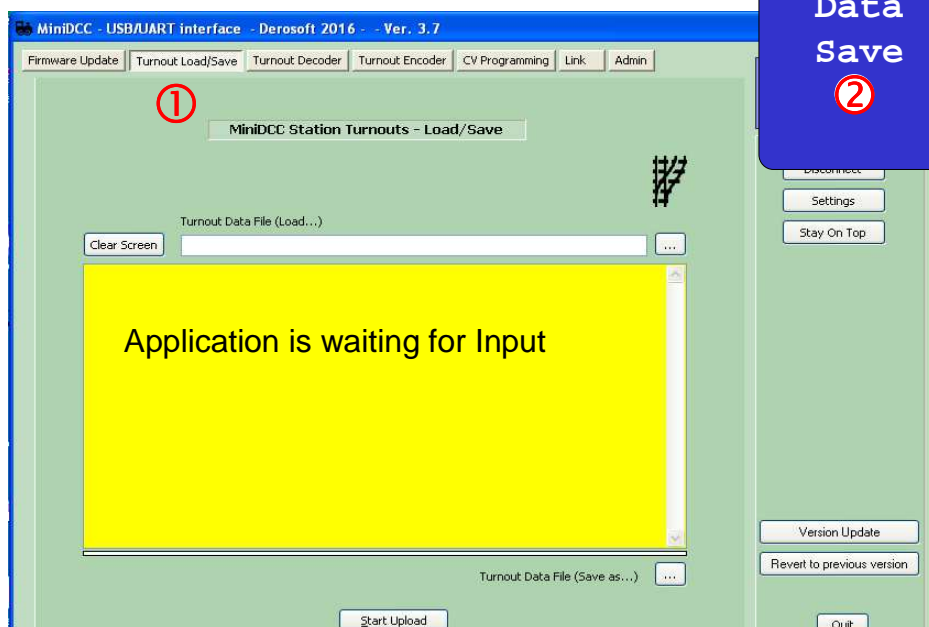
```

## Data Save / Turnout Save

All EEPROM data of the MiniDCC® Station, incl. loco addresses, speed settings, keyboard readout, turnout stati and routes are transferred to file “xxxxxxx.Tout” of the dedicated PC.

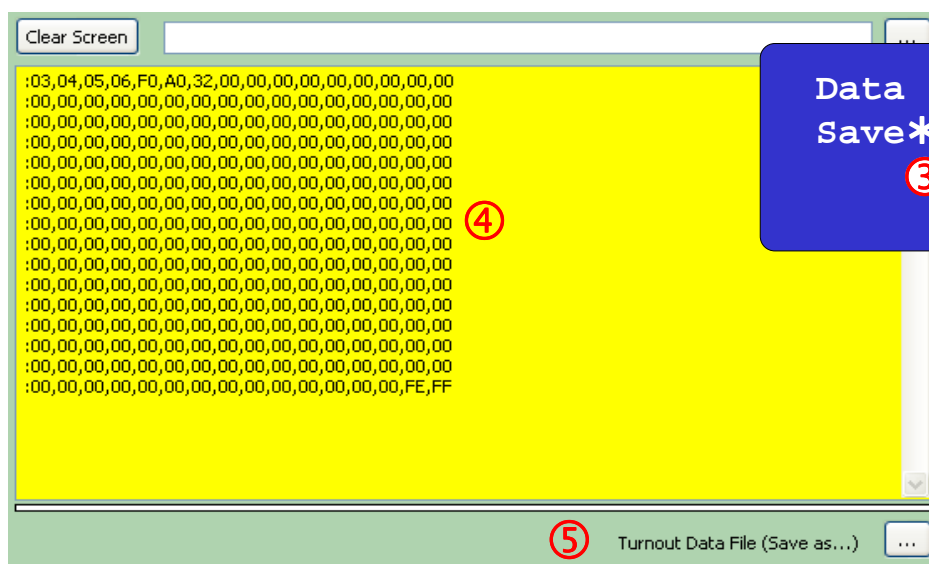
## MiniDCC® Application

## MiniDCC® Station



PwSafe must be On !!

push D [C] on keypad



- ① Select “Turnout Load/Save”
- ② switch Data to “Save” (toggle)
- ③ push D [C] on keypad to activate the upload to PC (\*)
- ④ the EEPROM content is displayed
- ⑤ the data can be stored in a Turnout Data File “xxxxxxx.Tout”

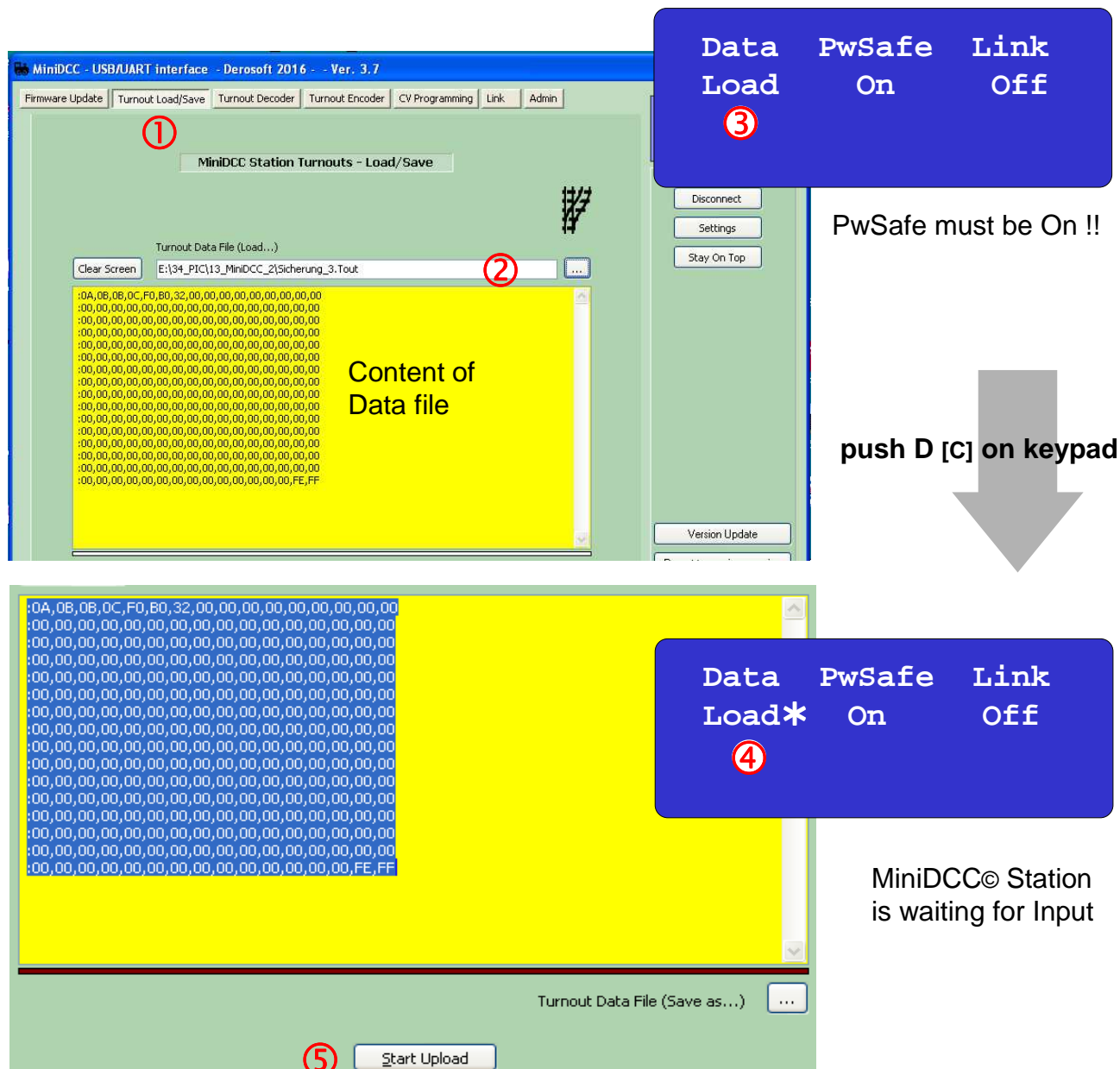


## Data Load / Turnout Safe

All data of File “xxxxxxx.Tout” on dedicated PC, incl. loco addresses, speed settings, keyboard readout, turnout stati and routes are transfered into the EEPROM of the MiniDCC® Station and are active after a Restart.

## MiniDCC® Application

## MiniDCC® Station



**Step 1:** Select “Turnout Load/Save”

**Step 2:** select and load the Turnout Data file “xxxxxxx.Tout”

**Step 3:** switch Data to “Load” (toggle)

**Step 4:** push D [C] on keypad to set MiniDCC® Station “wait for Input” mode (\*)

**Step 5:** **Start Upload** to transfer the Data into the EEPROM of MiniDCC® Station

**MiniDCC® Station Status:**

- Data Load: ③
- PwSafe: On
- Link: Off

PwSafe must be On !!

push D [C] on keypad

**MiniDCC® Station Status (after push D [C]):**

- Data Load\*: ④
- PwSafe: On
- Link: Off

MiniDCC® Station is waiting for Input

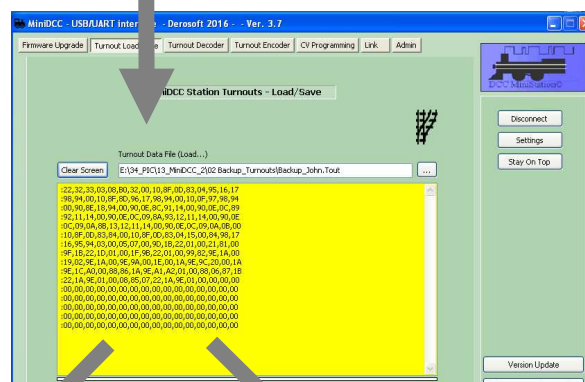
## Turnout Decoder / Turnout Encoder - Preamble

The Turnout Decoder and Turnout Encoder work with the content of yellow window in the “Turnout Save/Load” tab.

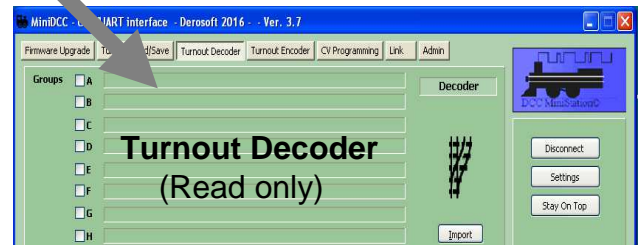
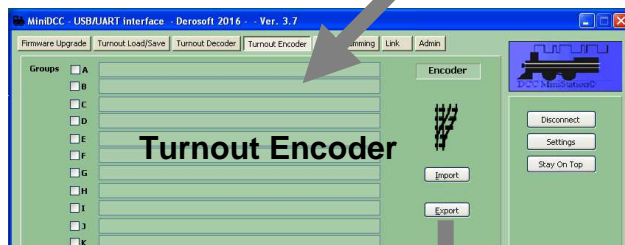
### Turnout Save / Load

If you have a full window (with the entire EEPROM data in the window – either by Loading the xxxx.Tout file or Reading you actual EEPROM) then you can “Import” this info into the other two tabs “Turnout Decoder” and “Turnout Encoder”.

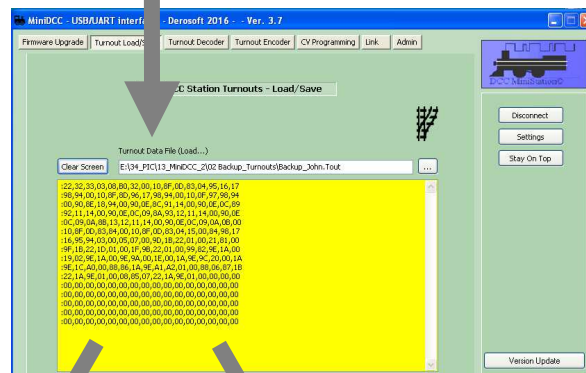
**Turnout Save** (from MiniDCC® Station) or  
**File xxxxx.Tout** (Load from xxxx.Tout Directory)



**Import from memory**



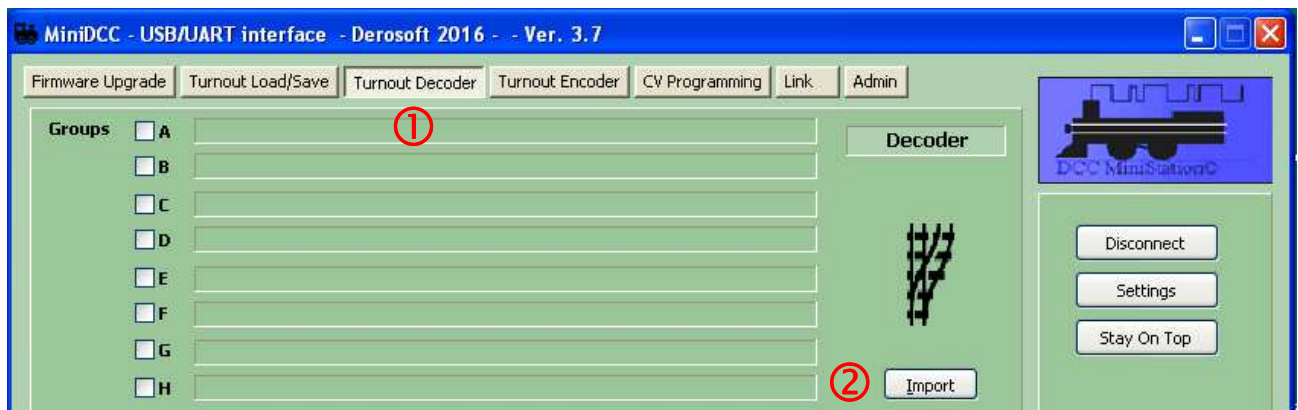
**Export into memory**



**Turnout Load** (to MiniDCC® Station)      **Turnout Data File** (Save as xxxx.Tout)

## Turnout Decoder

The Turnout decoder is a “Read Only” function

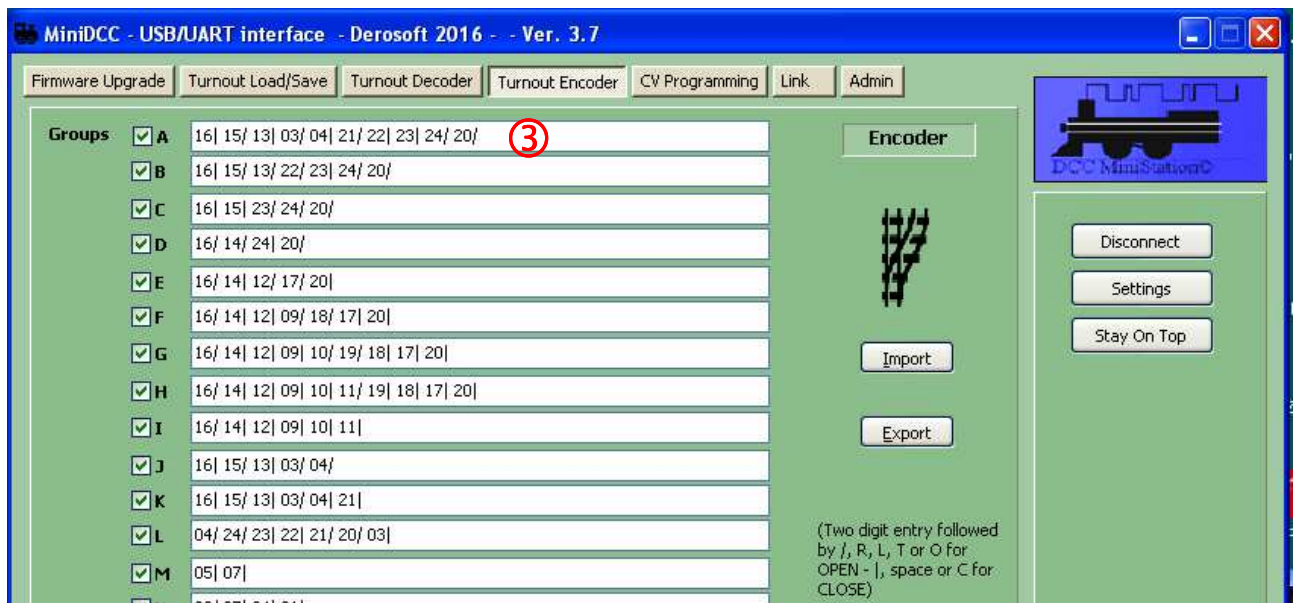
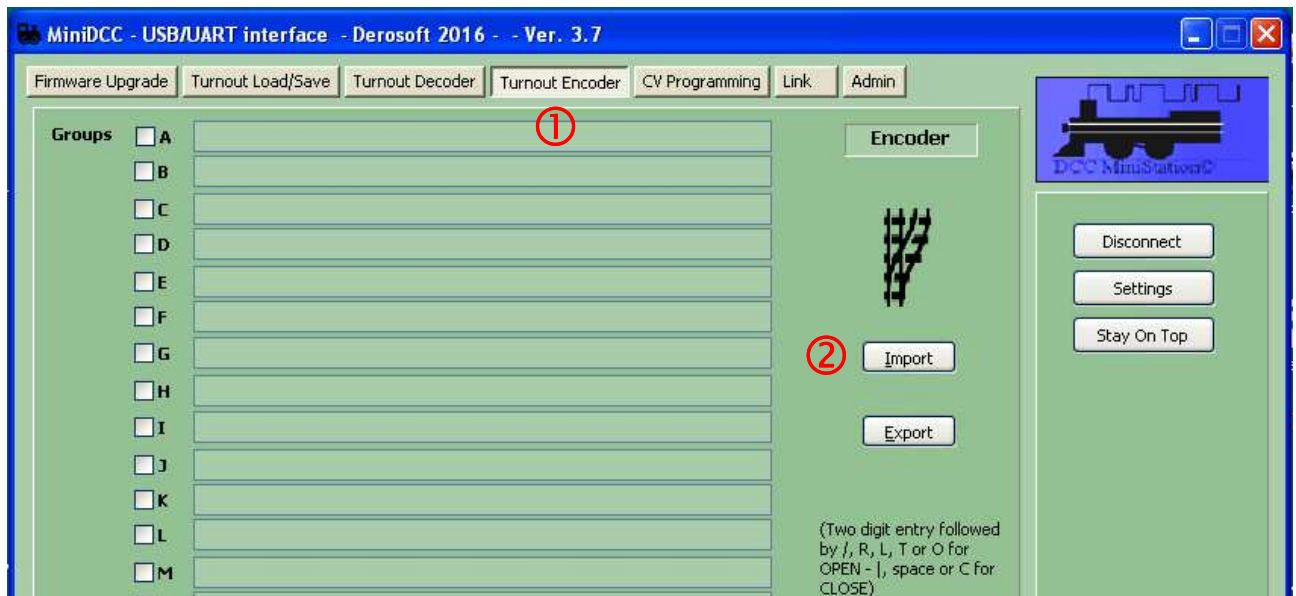


- ① Open the “Turnout Decoder” tab
- ② “Import” the info from “Turnout Load/Save” tab into the “Turnout Decoder”
- ③ The “Turnout Decoder” tab show you the actual turnout routes and positions.

➔ pressing  in MiniDCC© Application ( in lower right part of Window ), a protocol of the Turnout Decoder results is available.

MiniDCC - USB/UART interface - Derosoft 2016 - - Ver. 3.7	
Turnout printout	
Groups	Route Number and Direction
A	16  15  13  03  04  21  22  23  24  20
B	16  15  13  22  23  24  20
C	16  15  23  24  20
D	16  14  24  20
E	16  14  12  17  20
F	16  14  12  09  18  17  20
G	16  14  12  09  10  19  18  17  20
H	16  14  12  09  10  11  19  18  17  20
I	16  14  12  09  10  11
J	16  15  13  03  04
K	16  15  13  03  04  21
L	04  24  23  22  21  20  03
M	05  07
N	29  27  34  01

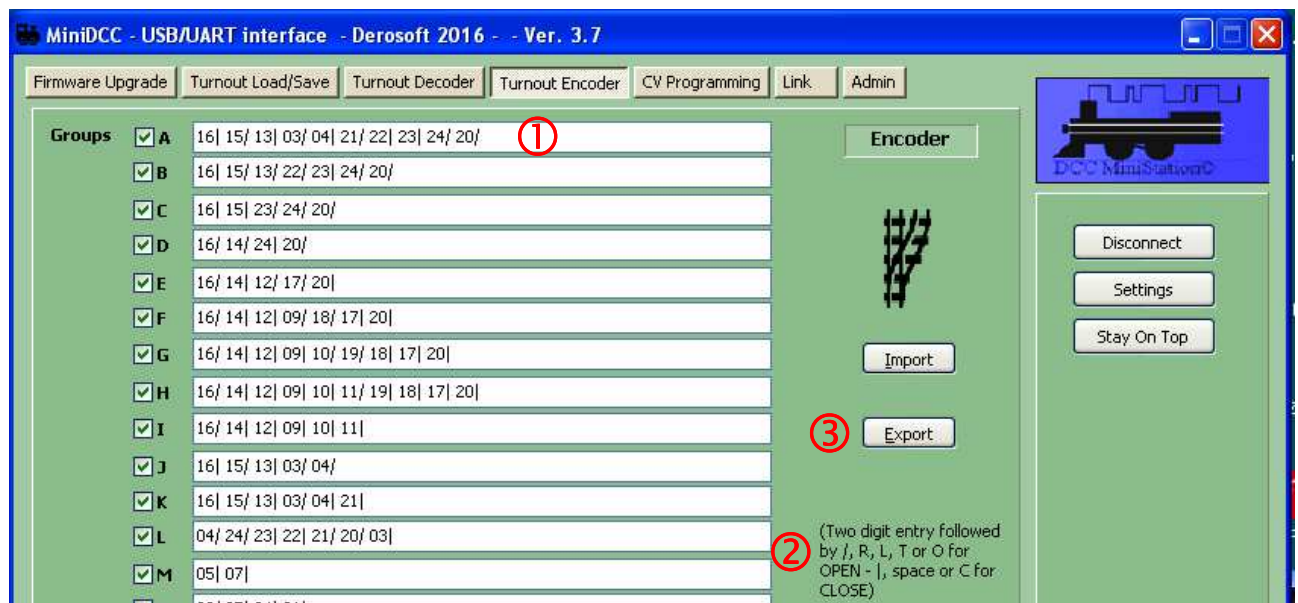
## Turnout Encoder - getting the turnout routes and positions



- ① Open the "Turnout Decoder" tab
- ② "Import" the info from "Turnout Load/Save" tab into the "Turnout Encoder"
- ③ The "Turnout Encoder" tab show you the actual turnout routes and positions.

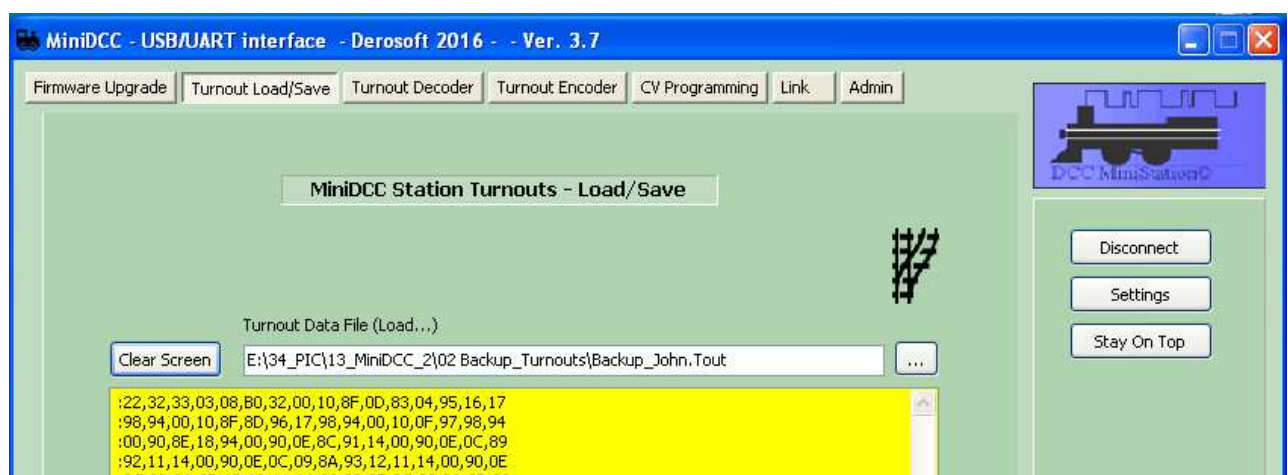


## Turnout Encoder - edit of turnout routes and positions



- ① Actual turnout routes and positions
- ② Turnout routes and positions can be edited directly by two digit entry (00 .. FF), followed by  
 “ / “ by character: / or R or O  
 “ | ” by character: L or |  
 Close by character C or Space
 

(Two digit entry followed by /, R, L, T or O for OPEN - |, space or C for CLOSE)
- ③ When you press the “Export” button in the Turnout Encoder tab, then the window will change with the new information e.g. from “15/ 16R 17L 18T 19O 20| “ to “15/ 16/ 17| 18/ 19/ 20| “ and the information is transferred to the common memory window.



It can either be saved to file, or uploaded again through the “Load” feature (item 5 on page 23)

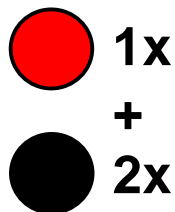
**Turnout Data File** (save as xxxx.Tout)      **Turnout Load** (to MiniDCC® Station)

## CV Programming

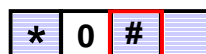
This application only **reads CVs** and does not re-program them !!

## CV Reading - Preparation

### MiniDCC® Station



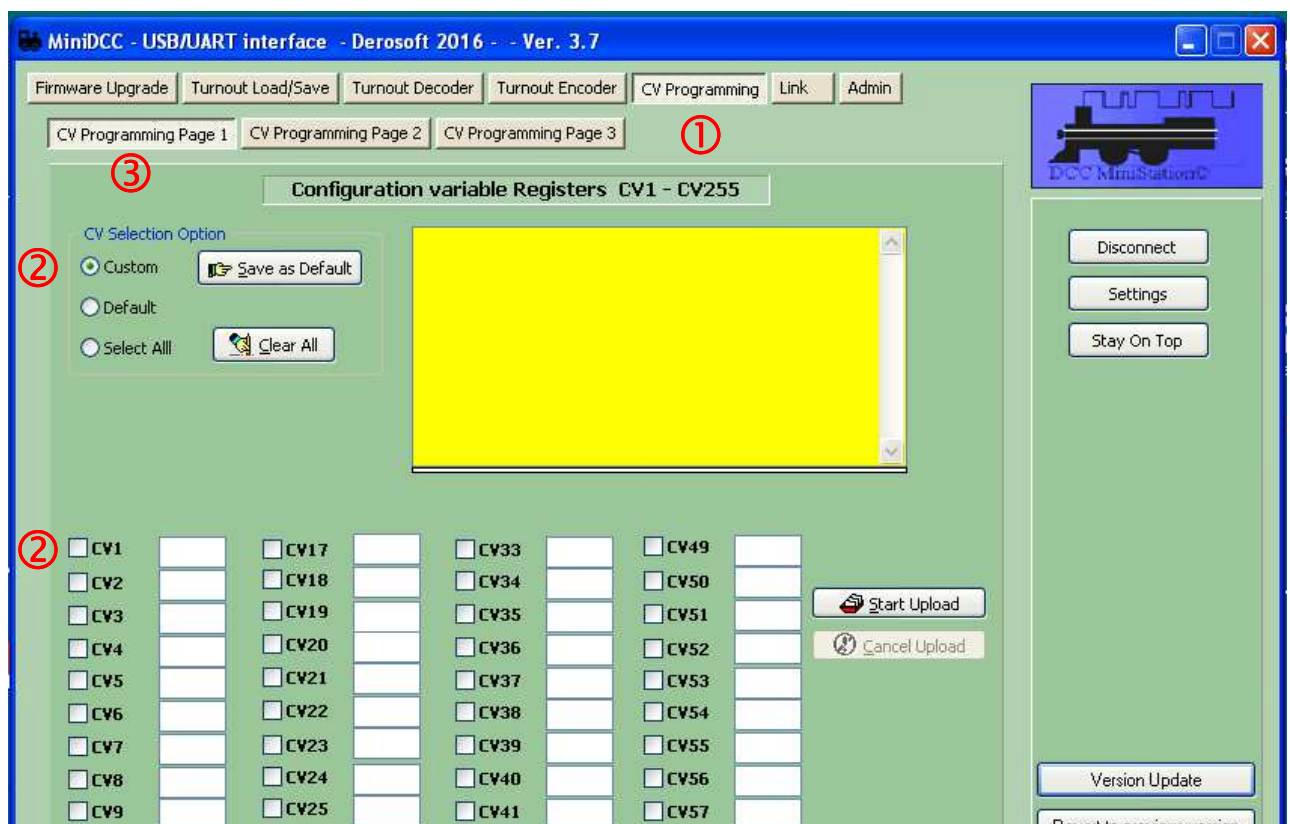
Pressing key “#” [B] on Keypad  
of MiniDCC® Station  
initialates the request



```
MiniDCC Station
Service Mode Pag/Reg
CV:001 Va:000 001-00
```

```
MiniDCC Station
Service Mode Pag/Reg
CV:001 Va:000 001-00
Start CV Upload...
```

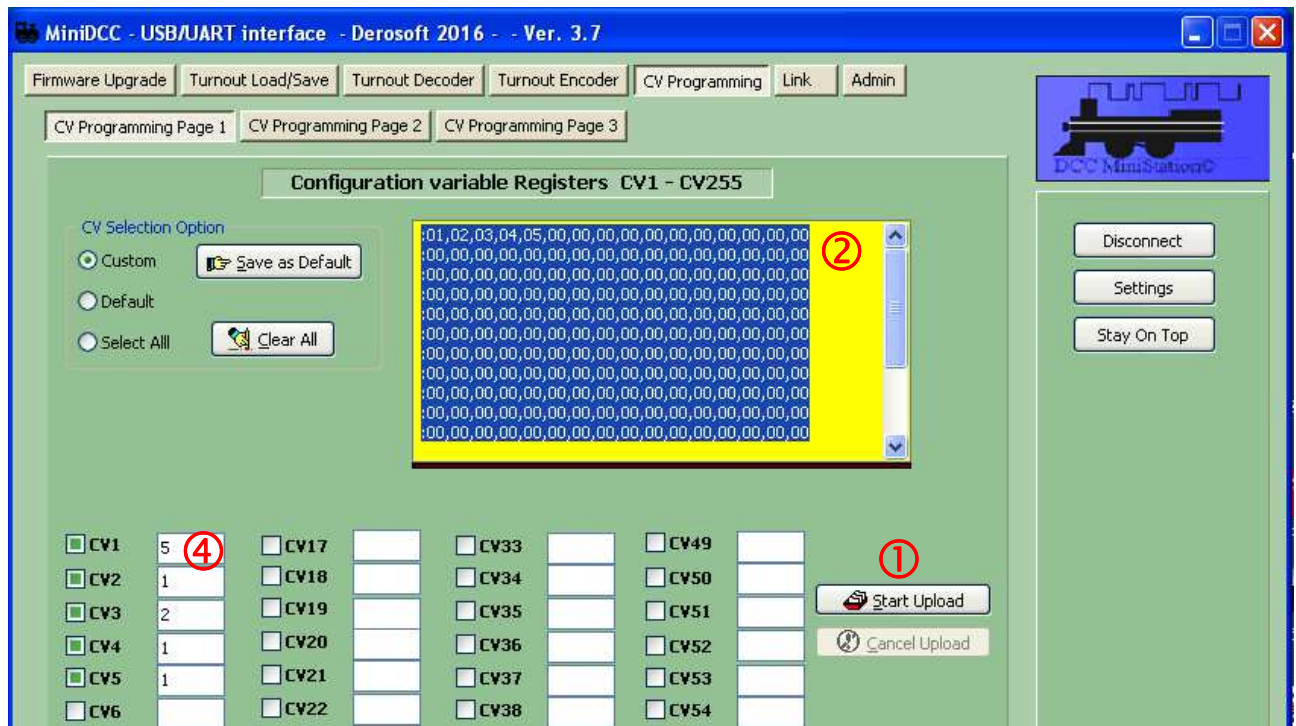
## MiniDCC® Application

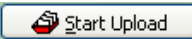


- ① Select CV Programming Mode section
- ② Select the CV you want to read (Custom = individually, Default = CV# 1..5, All)
- ③ on the 3 Pages (CV# 1.. 64, 65..172, 173..255) and then return to Page 1

## CV Programming

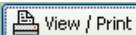
## CV Reading

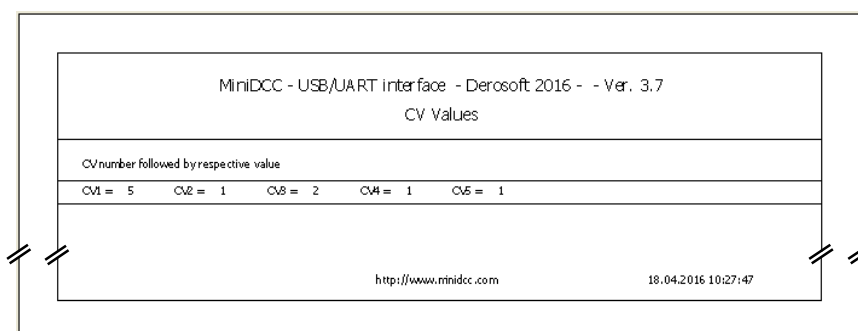


- ① pressing  in MiniDCC® Application starts the process and all selected CVs are read
- ② the job can be controlled in the task window of MiniDCC® Application
- ③ progress can be controlled on display of MiniDCC® Station
- ④ The CV result is shown besides each CV chosen.

MiniDCC Station  
Service Mode Pag/Reg  
CV:00x Va:yyy

③

➔ pressing  in MiniDCC® Application ( in lower right part of Window ), a protocol of the CV results is available.

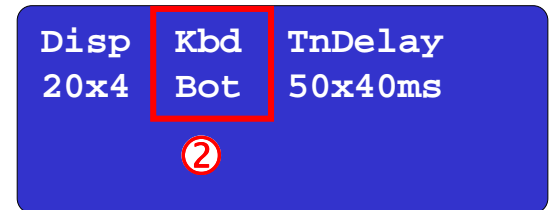
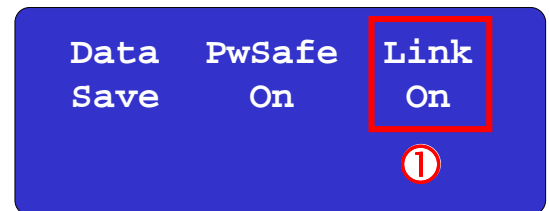


## Link for remote control of 4 locos

### MiniDCC® Station

MiniDCC® Station must be prepared for remote control

- ① Link must be switched “On” (toggle)
- ② If you would be in Analog mode (B/A or T/A), you couldn’t use the speed control on the PC side, since they are equivalent to using the Keypad.



On the Link issue, actually the “Save” and “Load” function are disabled when Link is “On” and enabled when Link is “Off”.

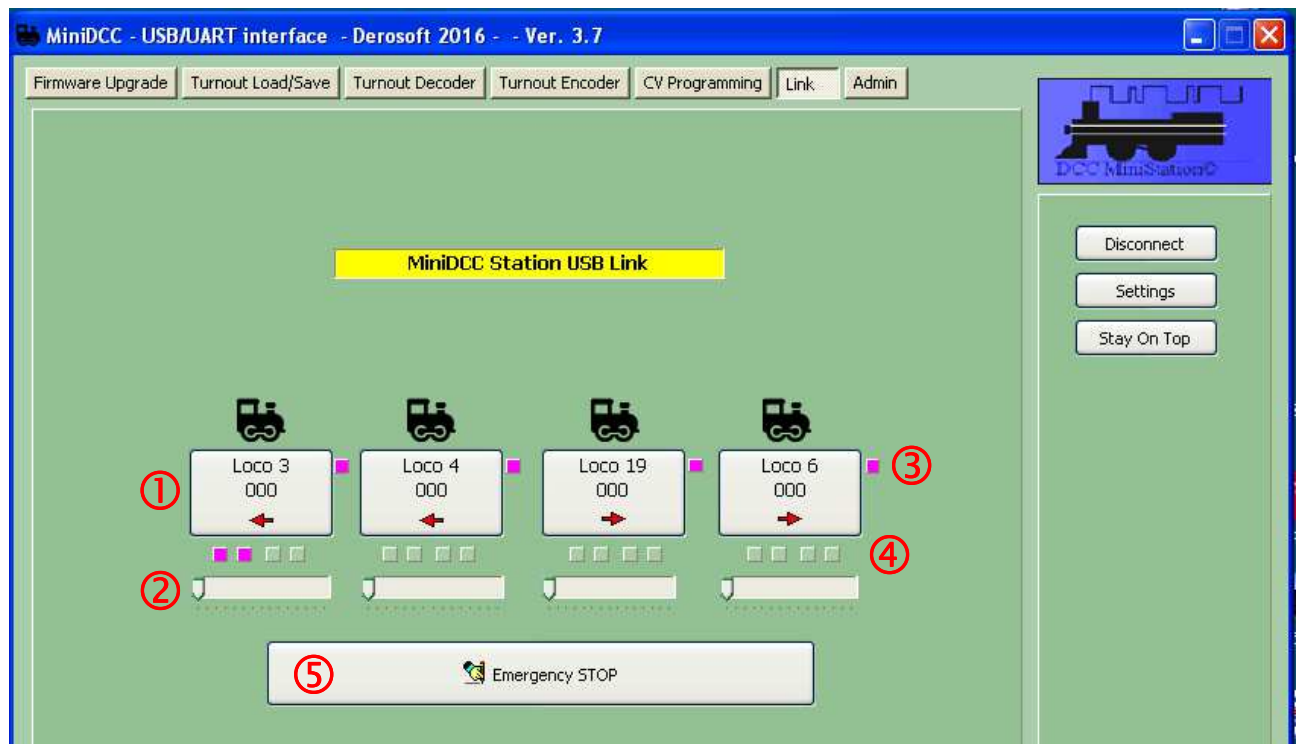
### MiniDCC® Application



- ③ Start the Link by pressing the appropriate control button
- ④ The remote control display is represented.  
The array “MiniDCC Station USB Link” has a blue background and all loco information are empty.
- ⑤ The remote control starts after pressing to one of the 4 loco information tabs.  
The array “MiniDCC Station USB Link” changes to yellow background and the loco information are picked up from MiniDCC® Station and displayed (see on next page)



## Link for remote control of 4 locos

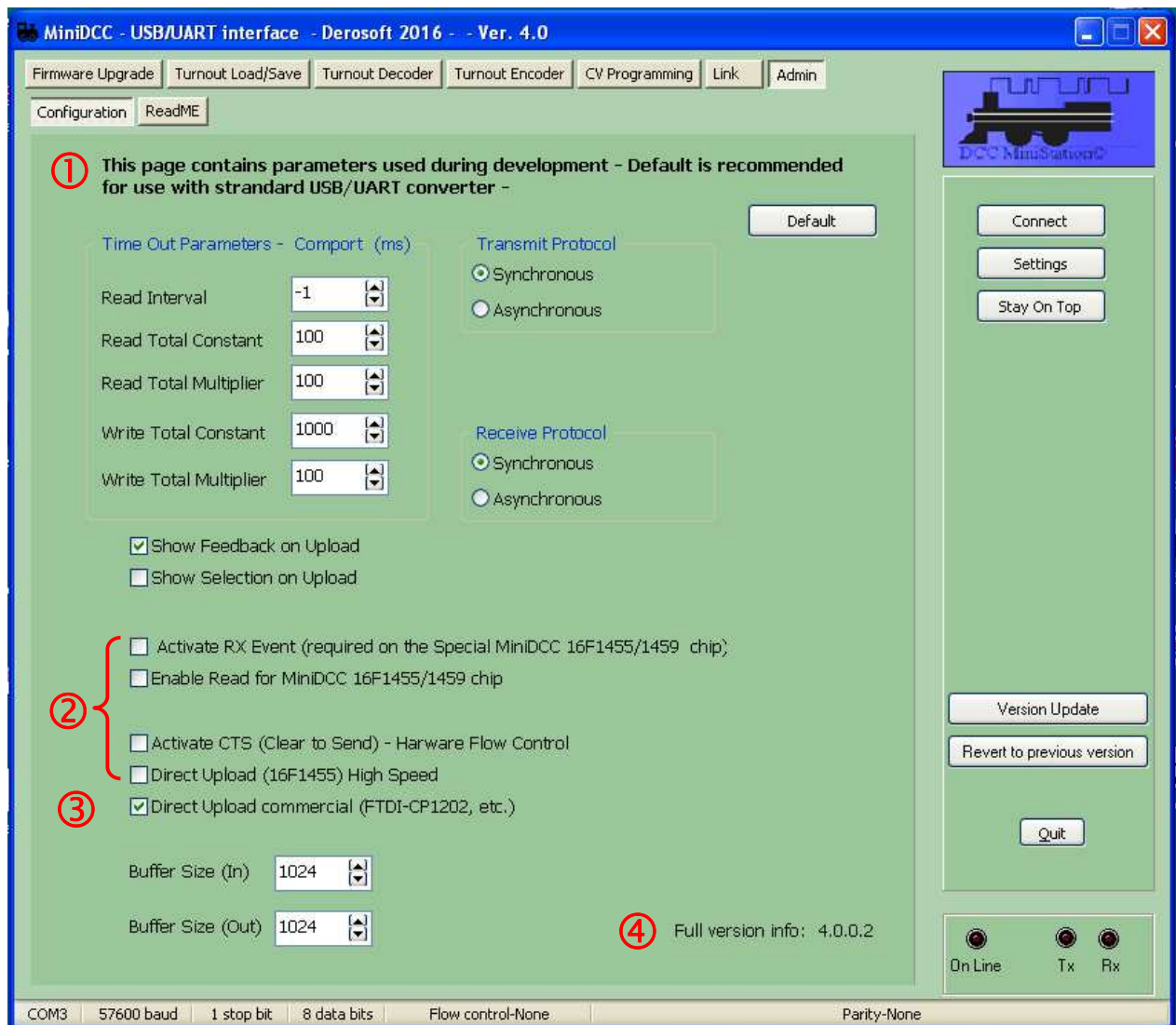


- ① Loco information field contains
  - loco number ( setting from the MiniDCC® Station only )
  - speed ( display only )
  - direction ( toggle by pressing the loco appropriate field ☐ )
- ② Speed regulator ( slide control knob  )
  - ⇒ If slide control knob returns automatically to start position a analog mode B/A or T/A is activated. Change to digital mode Bot or Top, please.
- ③ Front Light F0 ( toggle by pressing the loco appropriate field ☐ )
- ④ Function Keys F1 .. F4 ( toggle by pressing the loco appropriate field ☐ )
- ⑤ Emergency Stop ( function dependant of PwSave Setting of MiniDCC® Station)

Speed, direction, FrontLight (F0 / FL, Functions F1 .. F4 and Emergency Stop can be adjusted from MiniDCC® Application, as well from MiniDCC® Station (Speed with the keypad column 1 and 2 only - not analog by pots).

The settings are displayed simultaneously in the MiniDCC® Application, as well as on the display of MiniDCC® Station.

## Admin



- ① For communication between MiniDCC® Station and MiniDCC® Application The Parameters shown are by default correct one for most USB / UART converter.
- ② Using the 16F1455 or 16F1459 as UART to USB converter (external device, but planned to be integrated on PCB) some parameters are selectable.
- ③ Using a FTDI-CP2102 USB-to-UART-Bridge select it please and deselect all 16F1455 / 16F1459 relevant items.
- ④ Full version info is displayed.

Further details will follow.

## ReadMe



- ① Selecting ReadMe
- ② MiniDCC® Station Firmware Updater Instructions are displayed
- ③ Selecting "Instruction Manual" the most actual User Manual is displayed.
- ④ For further information you can visit the MiniDCC® web site [www.minidcc.com](http://www.minidcc.com)





## System Setup

For setup of MiniDCC® Station you need the PCB (note on next page) and either

- a pre-programmed 16F1938 micro-controller, or
- a 16F1938 micro-controller, a suitable hex-file (e.g. 38-300d.hex) and a PIC programmer.



Firmware upgrades (after first setup) can be processed either

- via ICSP interface by an external PIC programmer, or
- very comfortable by means of MiniDCC® Application.

## Hardware - Parts list

**PIC micro-controller 16F1938** (28 pins)

**28 pin IC socket** (recommended)

**PCB** (note on next page)

C1 – 47ufd to 100 ufd – 25 volts min – Electrolytic

C2, C3 – 10nf (.01 ufd) ceramic disk

C4 – 1ufd 10 volts Tantalum capacitor

C5 - .001ufd ceramic capacitor

RN1 – 510 ohm to 1k resistor network (parallel) or 8 discrete 510 ohms – 1k resistors

R2 – 51 ohm or straight jumper (depending on LCD backlight requirements)

R3, R4 – 2.2k to 4.7k resistors

R5 – 470 ohm to 1 k resistor

R6 – 33k resistor – (critical – do not substitute – used in sensing CV values)

R7 – 1k resistor

Pots 1 to Pots4 – 5k to 10 k with optional direction switch

Led1 – Regular LED (yellow or white)

Led2 – Bipolar Red/White led (or back to back discrete leds) #

SW1, SW2, SW3 – spst miniature switches (Menu – Emergency Stop – Reset) ##

POT – 5k – LCD brightness

U1 - LM18200T – Dual half bridge

U2 – 7805 – 5 volt regulator (or any electronic substitute)

U3 – Pre-programmed 16F1938 pic

ZD – Zener Diode 5.1 volts (IN5231B)

J1,J2,J3... various Molex pin connectors as required

LCD – 16x2 or 20x4 standard LCD display (Hitachi HD44780 compatible)

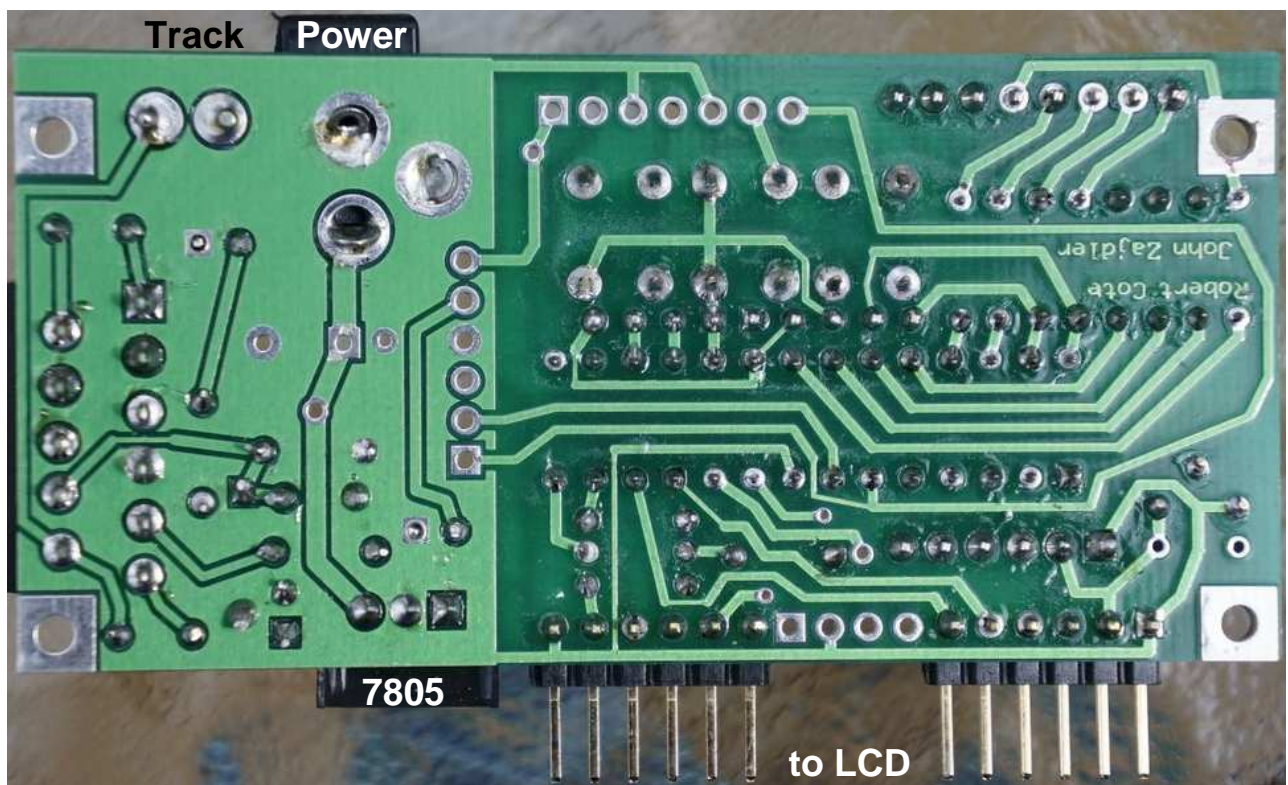
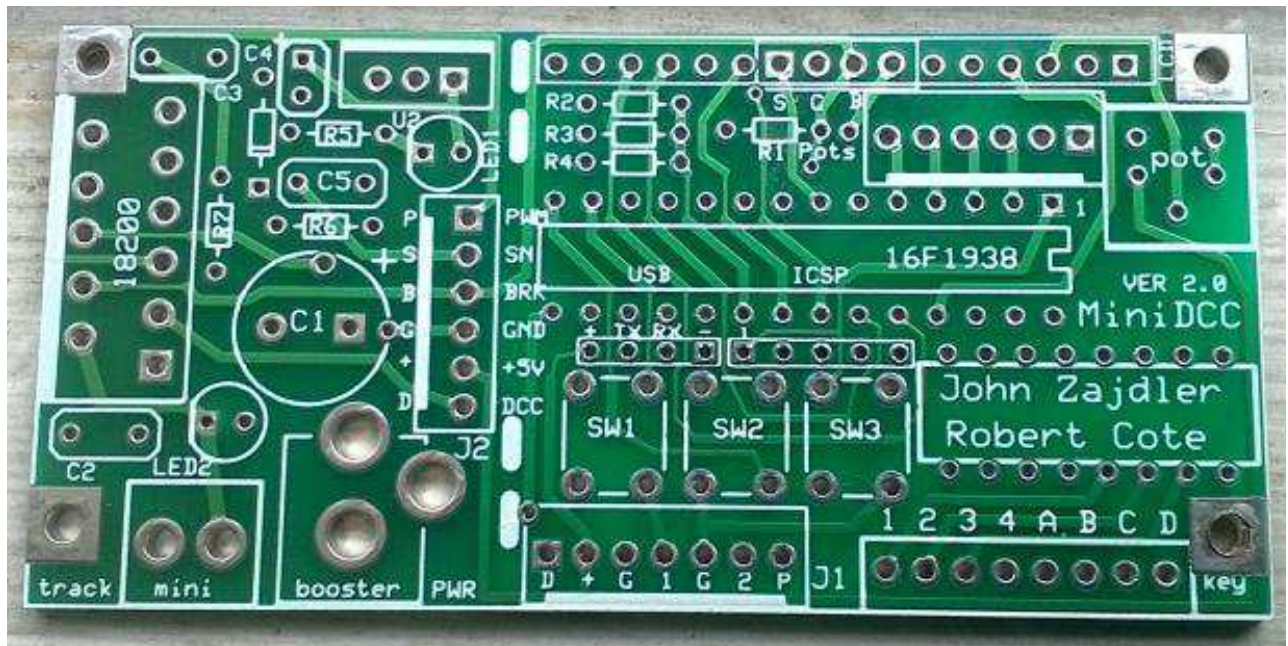
Keypad – 4x4 matrix keypad

### Enclosure

# anti-parallel ⇒ page 41

## Switches have to be open in normal position and closed if pushed

## Hardware - PCB

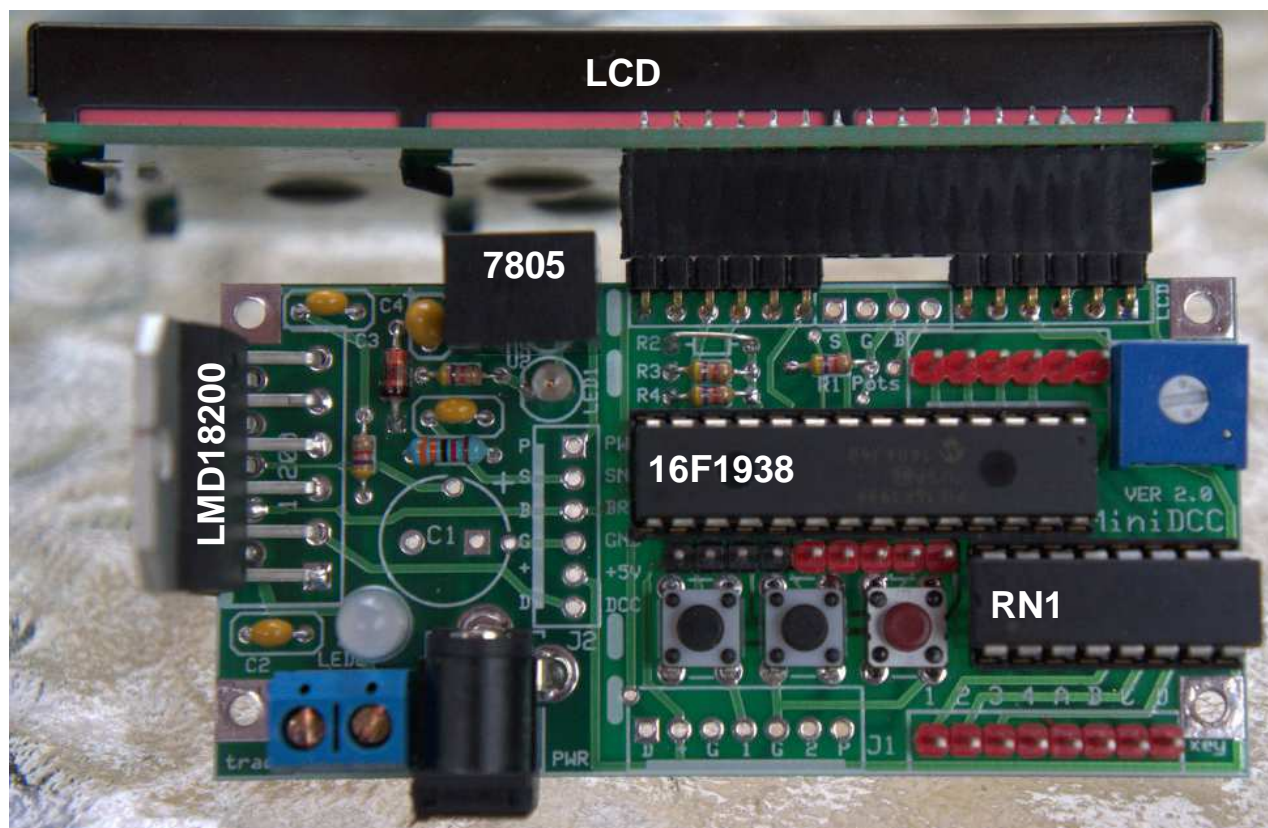


Dimensions of PCB: 80 x 39 mm

Note: This PCB version has been produced in limited quantities.  
Full support is not yet available - for experienced users only.  
A limited number of PCBs are available as well as  
pre-programmed PIC 16F1938 micro-controllers.  
Ref: <http://www.minidcc.com> - [Derosoft@videotron.ca](mailto:Derosoft@videotron.ca)



## Hardware - PCB



Track Power

Further details are available on the web site “MiniDCC.com”

Write for more info...!

<p><a href="#">New version - 16F1938</a></p> <p><a href="#">Firmware Updater/Turnout SAVE and LOAD</a></p> <p><a href="#">v2.0 Schematic</a></p> <p><a href="#">PCB Layout</a></p> <p><a href="#">Parts list</a></p>	<p><a href="#">Schematics</a></p> <p><a href="#">16F628 circuit</a></p> <p><a href="#">16F84A circuit</a></p> <p><a href="#">MiniBooster® circuit</a></p>	<p><a href="#">PCB Layout / Pictures / Supply</a></p> <p><a href="#">PCB Layouts</a></p> <p><a href="#">Pictures/Alternate site</a></p> <p><a href="#">Source Code/User Manual</a></p> <p><a href="#">Part order temporary closed</a></p>	<p><a href="#">Links</a></p> <p><a href="#">DCC Related</a></p> <p><a href="#">Technical</a></p> <p><a href="#">NMRA member #115144</a></p>
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## Hardware aspects

### Enclosure

Our manual is illustrated with the Enclosure “Hommond Electronics 1599HSTSGY” (220 x 110 x 40 mm), but any other enclosure can be used.



### Keypad



For various applications the market offers different layouts of keypads, e.g.

telephone  
0 .. 9, \*, #, A .. D  
e.g. Accord “KB1604-PNB”

hexadezimal  
0 .. 9, A .. F  
e.g. EOZ “ECO 15250.06”

The manual

- refers to the “telephone layout” x, #, A .. D and indicates the equivalent “hexadezimal” keys A .. F small and in [ ] brackets
- figures out the functions with a stylized keypad, 0 .. 9 only

1	2	3	A
4	5	6	B
7	8	9	C
*	0	#	D

Telephone	hexadezimal
A	= [F]
B	= [E]
C	= [D]
D	= [C]
#	= [B]
*	= [A]

### Pots

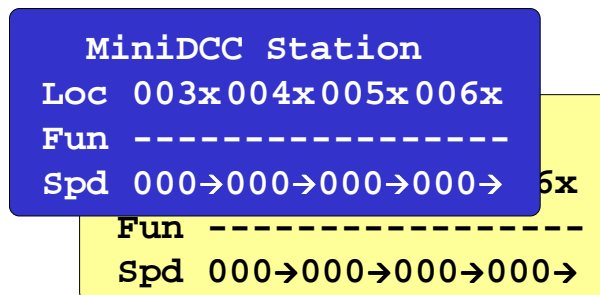
Alternatively to “normal” Pots and change direction via the keys of 3rd column of keypad, you can use potentiometers with momentary push switch like Alps “RK0971114Z07”.





## Hardware aspects

### Display



Both types of displays, e.g.  
 ● blue: EA W204B-NLW  
 ● yellow (out of production)  
 can be used with same  
 functionality

(The white / blue display  
 needs less current)

### Push buttons



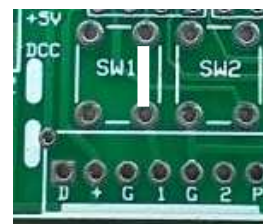
Emergency



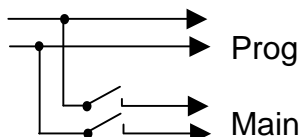
Mode Select

Both push buttons can vary  
 in color and placement  
 depending on personal  
 preferences

Connecting external  
 push buttons only, you  
 must bridge the two  
 soldering pads of switch 1.



### Switch optional



This double pole switch switches OFF  
 the main track while CV programming  
 on your separate programming track,  
 to avoid programming of several locos  
 (not figured out in the schematic)

### LEDs optional

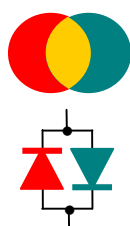
They aren't  
 mandatory  
 for operation,  
 they are for  
 control only !

#### Overtemp alarm



LED1 is a regular LED (e.g. blue, white or yellow)  
 It provides the thermal warning of Booster.  
 It becomes active at 145 °C (junction temperature  
 of LMD 18200T); however the chip will not shut  
 itself down until 170 °C is reached at the junction.

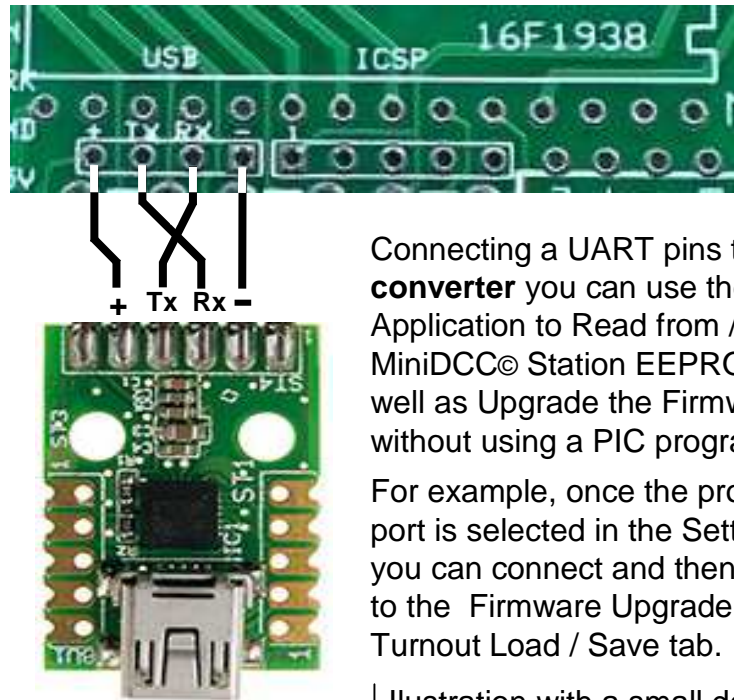
#### DCC Output Control



LED2 is a bipolar LED (e.g. red and green)  
 If something goes wrong with the booster, then  
 you only see either a **RED** or a **GREEN** light.  
 When things are right, you see an "Orange" sort  
 of glow indicating the proper DCC signal with the  
 polarity reversal operating normally.

## Hardware aspects

### USB



Connecting a UART pins to a **USB converter** you can use the MiniDCC® Application to Read from / Write to MiniDCC® Station EEPROM data as well as Upgrade the Firmware directly without using a PIC programmer.

For example, once the proper COM port is selected in the Settings menu, you can connect and then move on to the Firmware Upgrade tab or the Turnout Load / Save tab.

Illustration with a small device  
with controller SILABS CP2102

In **Link Mode** basic functions of the MiniDCC® Station (speed, direction, F0, F1 .. F4) of 4 locos can be controlled via a GUI.

**Firmware Upgrade** of MiniDCC® Station with 57.600 Bit/s needs about **40 to 60 seconds**.



Disconnect the “normal” power source and power the MiniDCC® Station via the USB to UART converter !

### ICSP



- ① VPP/MCLR
- ② +5V (Vdd)
- ③ GND(Vss)
- ④ Data (PGD)
- ⑤ Clock (PGC)

Connecting the **ICSP** pins (in circuit serial programming) to a PIC programmer, the PIC can be programmed directly.

**Firmware Upgrade** of MiniDCC® Station needs about **10 seconds**.



Disconnect the “normal” power source and power the MiniDCC® Station via the PIC programmer !

## Summary

### MiniDCC® Station Version 2.0

The MiniDCC® Station has been improved considerably over the years. We have moved to a 28 pin template to allow for added features such as 4 discrete potentiometers for speed control, an RS232/USB link for firmware upgrades as well as Turnouts (Switches) route saving and loading using a PC.

Now you can control

- up to 4 trains simultaneously,
- up to 99 different turnouts / switches on 26 different routes (over 240 events) and
- program all your decoders (Write and Read) using any one of the 3 NMRA standards

with some few some limitations

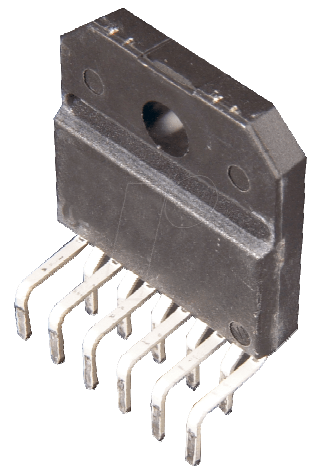
- Loco addresses up to 127 (no extended addresses)
- functions F0, F1 .. F4
- standard function decoder addresses
- PC USB interface needs an additional TTL-USB converter.

The memory assigned to Turnout routes as been increased to double the size available under the old 16F628. An extended Menu offers choice of display (16x2 or 20x4), Keypad or Potentiometer control, saving and retrieving Turnout routes, etc.

### MiniDCC® Booster

While the MiniDCC® Station can operate with any compatible NMRA booster, the optional MiniDCC® Booster (on same PCB) integrates the function of READING as well as WRITING to CVs using the usual NMRA protocol and complete power shutdown upon Emergency Stops.

The used H-Bridge LMD1800T is an efficient MosFet bridge, providing up to 3 amps of DCC power with full short circuit and high temperature protection built-in.



### Restrictions

Please note that this release based on a Microchip PIC16F1938, while compatible with the NMRA standard, **does not** support the following features such as:

- MM (Motorola / Maerklin Protocol)
- LocoNet (Digitrax)
- RailCom (bi-directional communication)
- PoM (**P**rogramming **o**n **M**ain track)
- JMRI (**J**ava **M**odel **R**ailroad **I**nterface)

but the development of MiniDCC® Station / Application isn't finished yet .....



**MiniDCC® Station, developed by Robert Côté and John Zajdler, Canada offers already very powerful features for model railroad control**  
- standalone, without a dedicated PC.

**The unit is easy to build and quite inexpensive compared to commercially available systems.**

**MiniDCC® Application can Read and Write certain EEPROM data, as well as Upgrade the FIRMWARE directly and allows remote control of 4 locos.**

**Have a lot of fun with our MiniDCC® Station and MiniDCC® Application !!**



On our Homepage: [www.minidcc.com](http://www.minidcc.com) you'll find e.g.

- our Mail-Address
- Shop for PCBs and Parts for MiniDCC® Station with Prices
- Download of MiniDCC® Application (for free)
- Schematic, Parts List, Manuals (english and german), further Information and Links