
The MiniDCC© Station is designed to control
- 4 Locos simultanously,
- 99 turnouts and
- 26 routes

in several DCC compliant operation and programming modes

# User Manual / abstract

for MiniDCC© Station Firmware 301e
and MiniDCC© Application Rel. 4.2.0.2

Newer version: 2.0.0.4
Rev-2023

**MiniDCC© Station - stand alone features**
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- Setup

**MiniDCC© Application - features with a dedicated PC**
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- MiniDCC© Station Firmware upgrade
- Turnout Save / Load, Decoder, Encoder
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- Admin

**MiniDCC© Station - Hardware**
- Schematics
- Parts Lists
- PCBs
- Hardware aspects

MiniDCC© Station and MiniDCC© Application
developed by Robert Côté and John Zajdler, Canada - 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.

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## Start Sequence

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

actual Firmware-Release

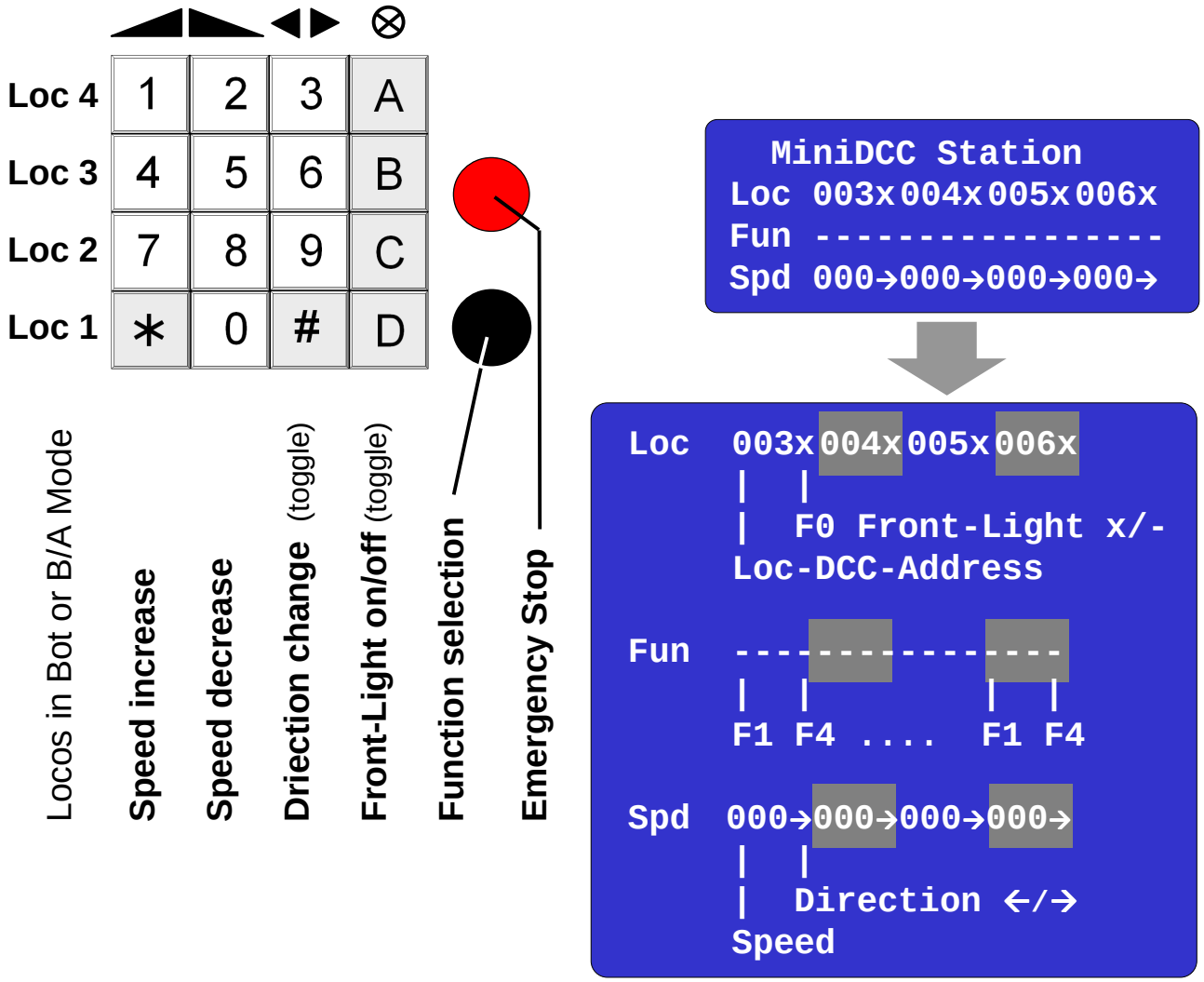
0,5 sec

```
 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




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 Turnout !/** |
| 4 | 5 | 6 | B | **A→Z** |
| 7 | 8 | 9 | C | **Z→A** |
| ∗ | 0 | # | D | **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 <Play Back> 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

for all 4 Locos

| | | | | |
|---|---|---|---|---|
| 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 |

```
  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

for all 4 Locos

| | | | | |
|---|---|---|---|---|
| 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 |

```
  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 |

**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)
```

***** [A] **/ 7: CV / Value increase**

**0 / 8: CV / Value decrease**

**# [B],9,6,3: CV programming**

**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:** | **Speed control** |
|---|---|---|
| | Bot: **bot**tom to top<br>Top: **top** to bottom | digitally with keys of columns 1 and 2 |
| | B/A: **b**ottom to top, locos **a**nalog<br>T/A: **t**op to bottom, locos **a**nalog | **a**nalog 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 |

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

```
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)
```

### 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

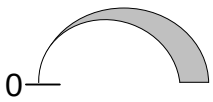
| | | | |
|---|---|---|---|
| 1 | 2 | 3 | A |
| 4 | 5 | 6 | B |
| 7 | 8 | 9 | C |
| * | 0 | # | D |
| * [A] **Pot 1** | **0 Pot 2** | # [B] **Pot 3** | **D** [C] **pot 4** |

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

**aDx** **a**nalog **D**irection

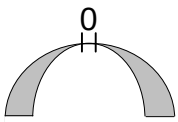
To use this function the MiniDCC© Station has to be switched into analoge mode B/A or T/A (see page 11)

### 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

Further information by "ReadMe" on Page 35.

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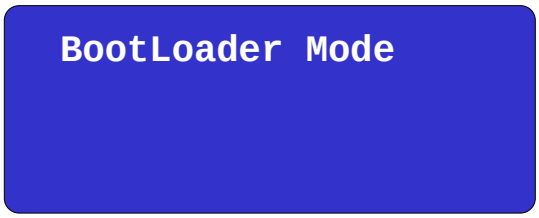
## via ICSP-Interface

( PIC programmer requierd )

See ICSP ( In Circuit Serial Programming) connections on page 46 for more details on how to proceed.

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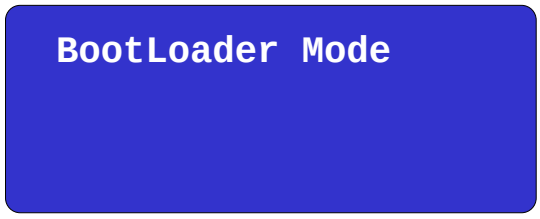
## Updater application

( UART to USB Converter required )

Jump to the bootloader mode

by holding the Emergency stop switch and

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




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

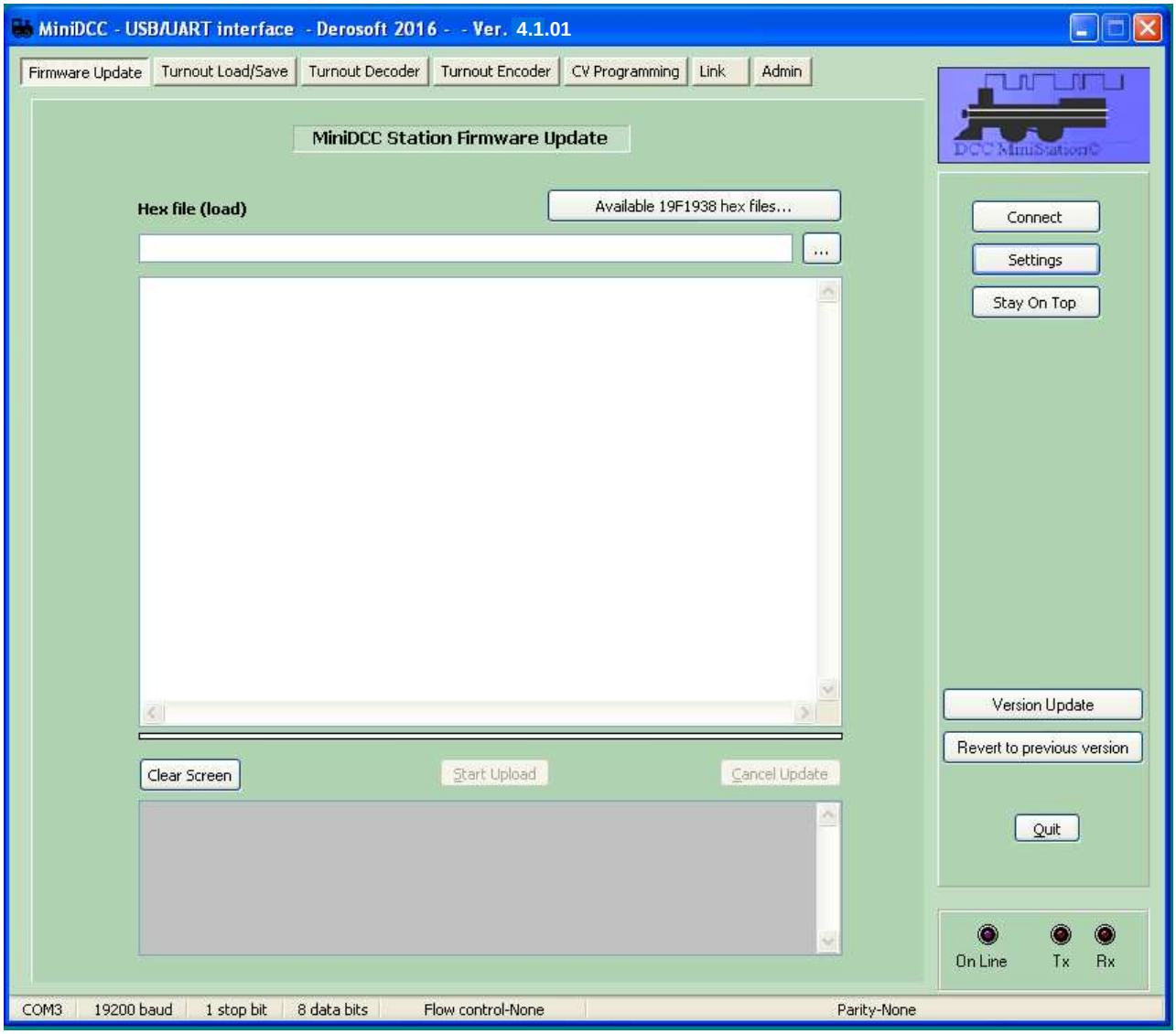
This is the easyer method to upgrade the MiniDCC© Station Firmware, without using an dedicated PIC programmer.

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 powerfull application to transfer various data between a dedicated PC and the MiniDCC© Station

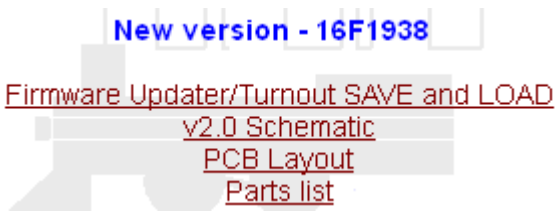
- MiniDCC© Station Firmware Upgrade
- Turnout Load / Save
- Turnout Decoder
- Turnout Encoder
- CV Programming
- Link Mode to control basic functions of the MiniDCC© Station (speed, direction, F0, F1 .. F4) of 4 locos via GUI of MiniDCC.



## MiniDCC© Application

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

http://www.minidcc.com/


## Download

Download the **MiniDCCsetup.zip** from the Internet 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 desctop)

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

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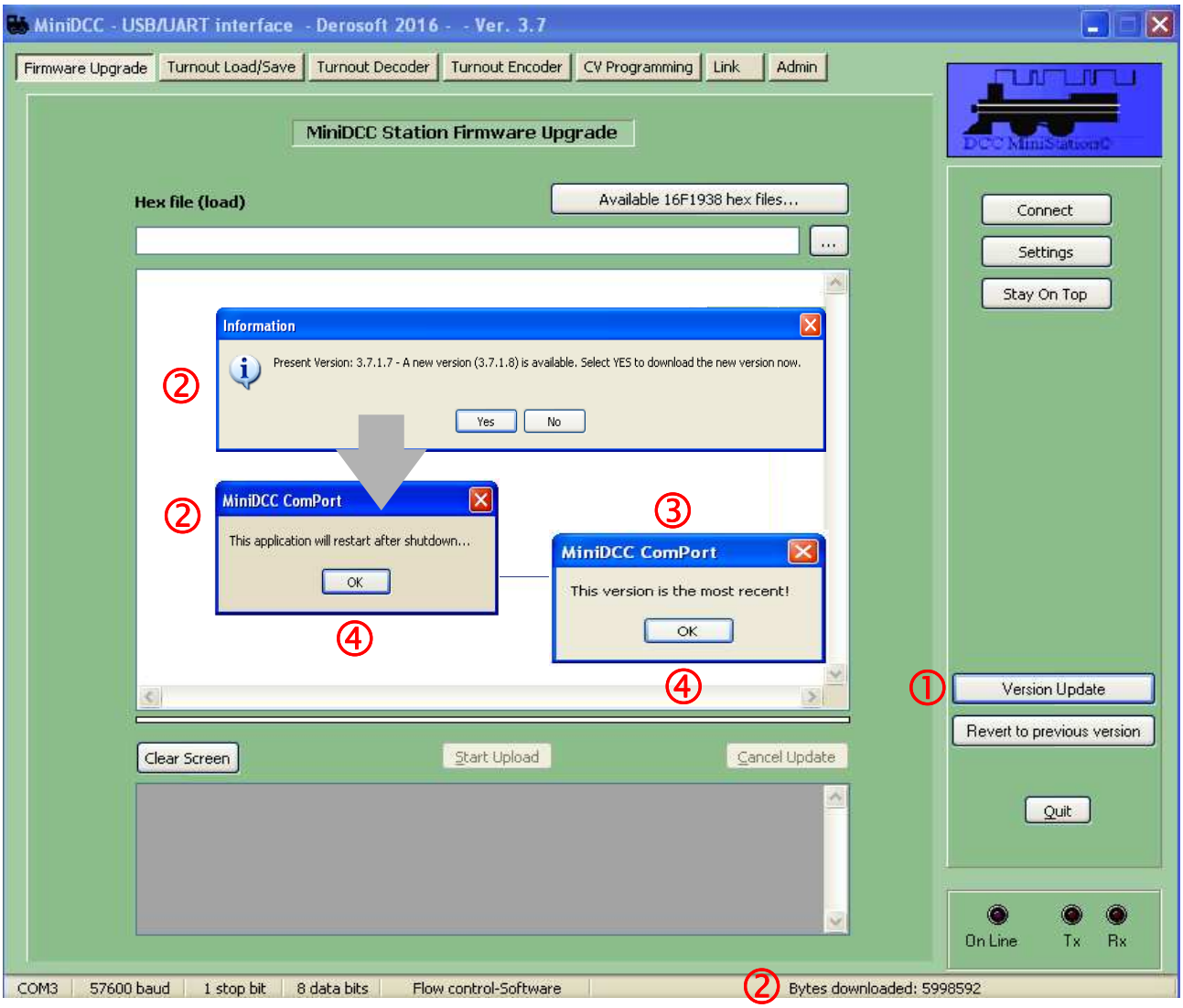
## MiniDCC © Application - Version Update




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 OK to continue resp. to restart the MiniDCC© Application

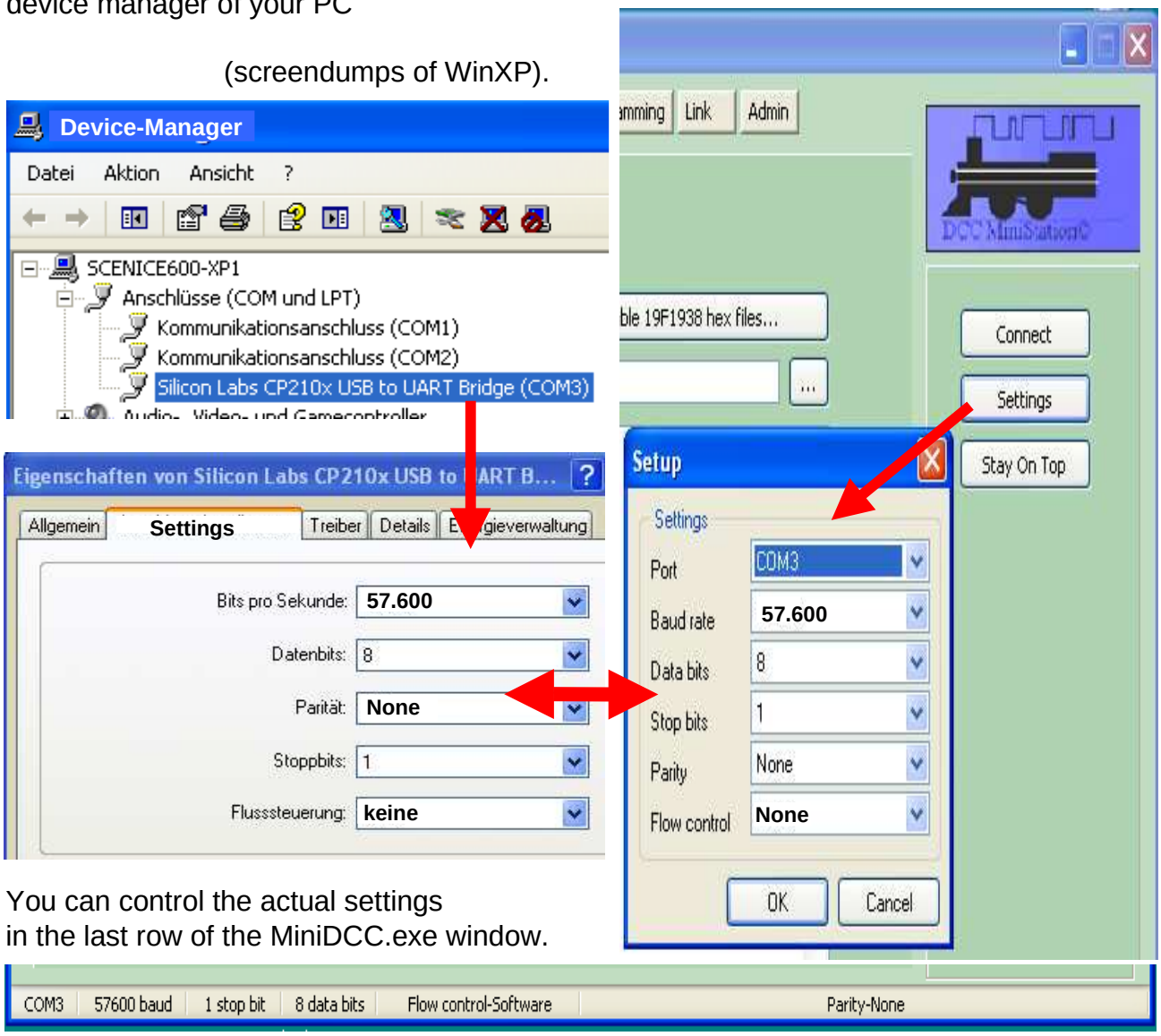
## Communication Setup

**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).

(screendump of MiniDCC.exe)




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

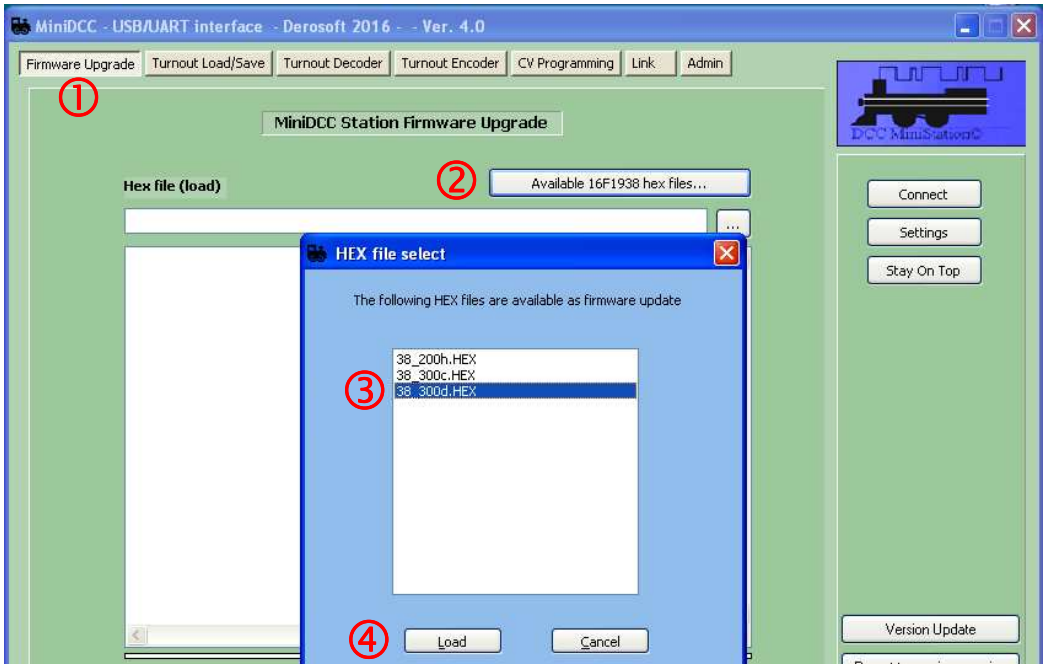
## Firmware Upgrade in BootLoader Mode

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.

## Selectionof 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 Load into the "load" field

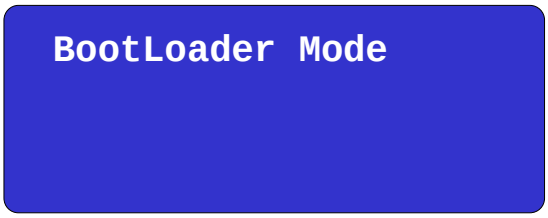
The various versions of the HEX files are coming directly from the Web server, they are not included in the application.

## Upload Preparation

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

by holding the Emergency stop switch and

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



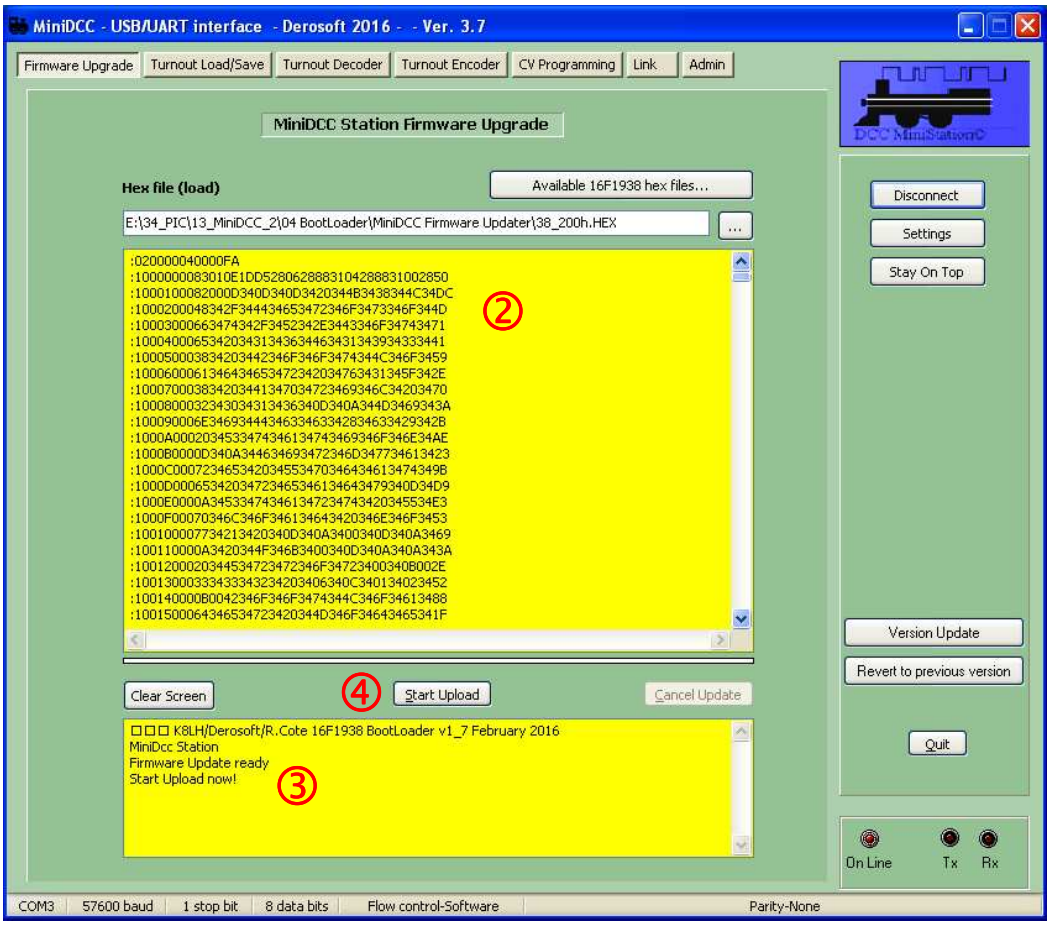

Respect the different succession of both solutions, outlined on the next 2 pages, please.

## Firmware Upgrade in BootLoader Mode

### Upload Preparation / Start

MiniDCC© Station **resetting by pusch 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

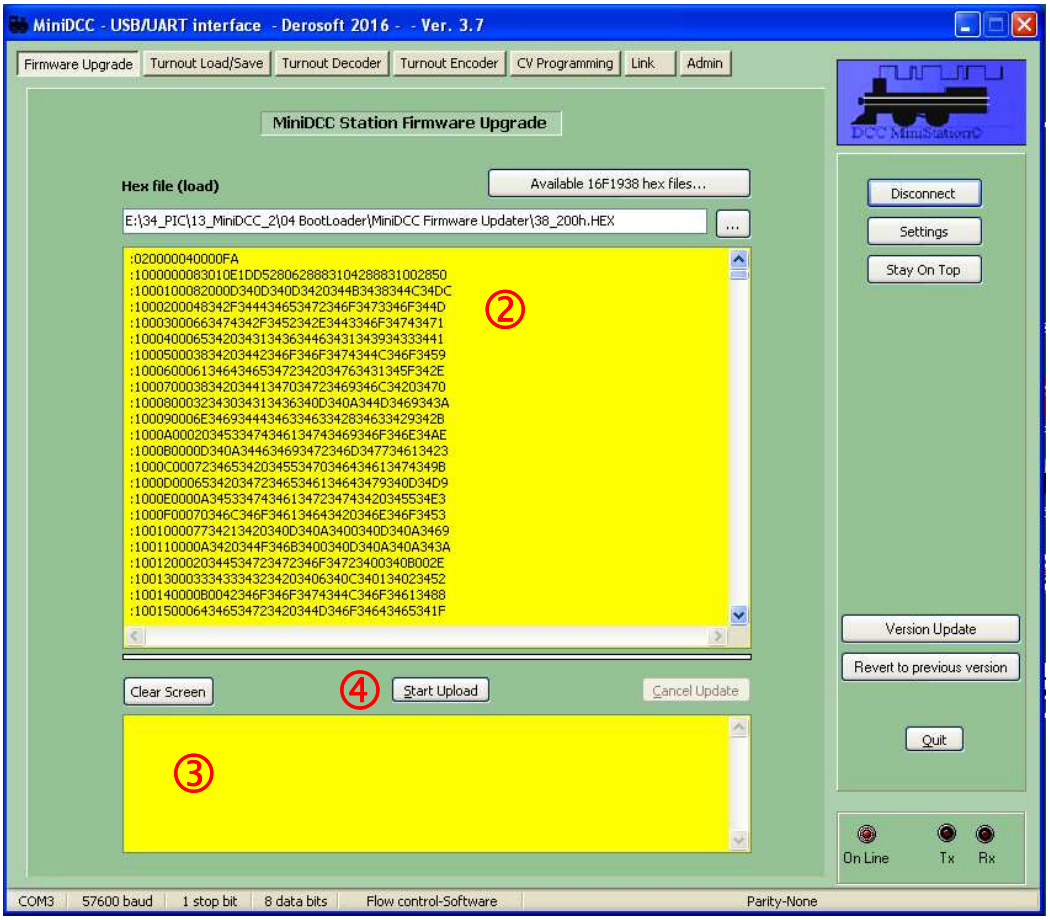
## Firmware Upgrade in BootLoader Mode

### 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

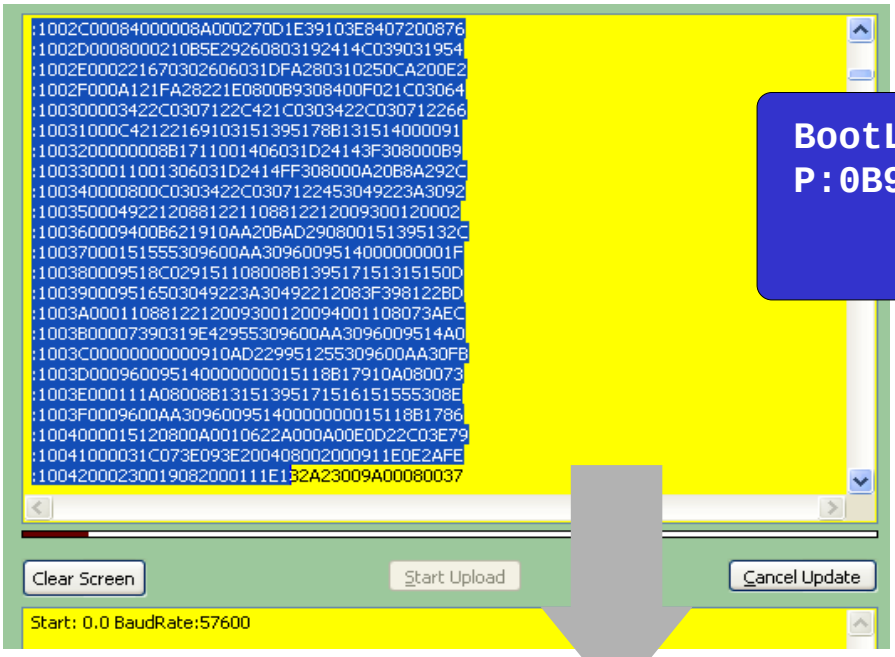
④ Start upload by pressing Start Upload

## Firmware Upgrade in BootLoader Mode

### Upload

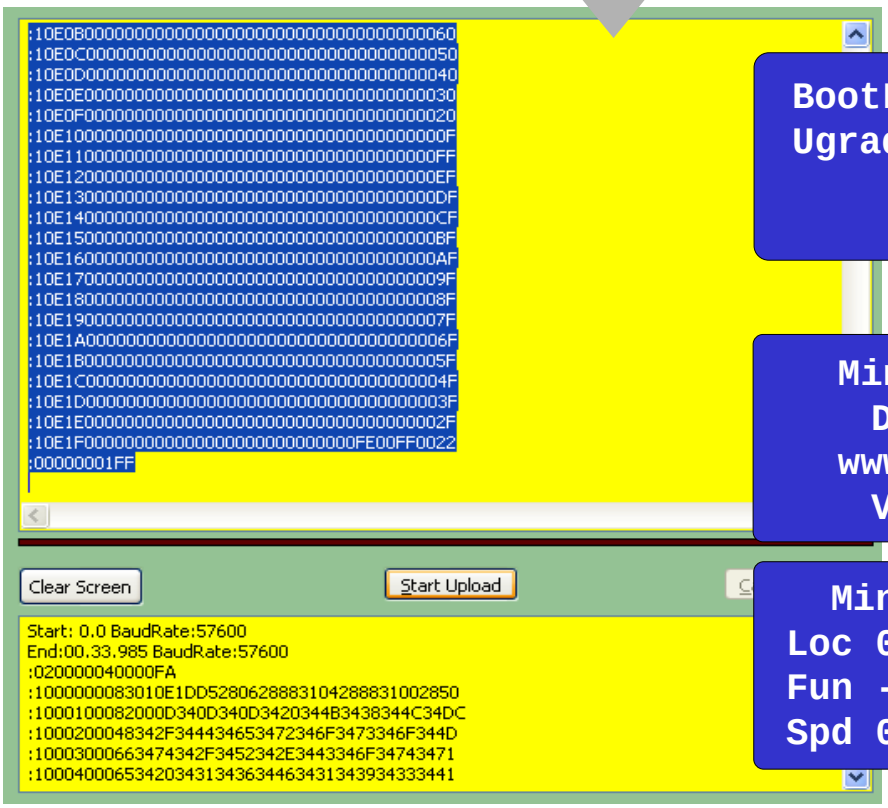
**MiniDCC© Application**

**MiniDCC© Station**




```
BootLoader Mode
P:0B9A
```

40 - 60
Seconds




```
BootLoader Mode
Ugrade Done !
```

Automatic Restart

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

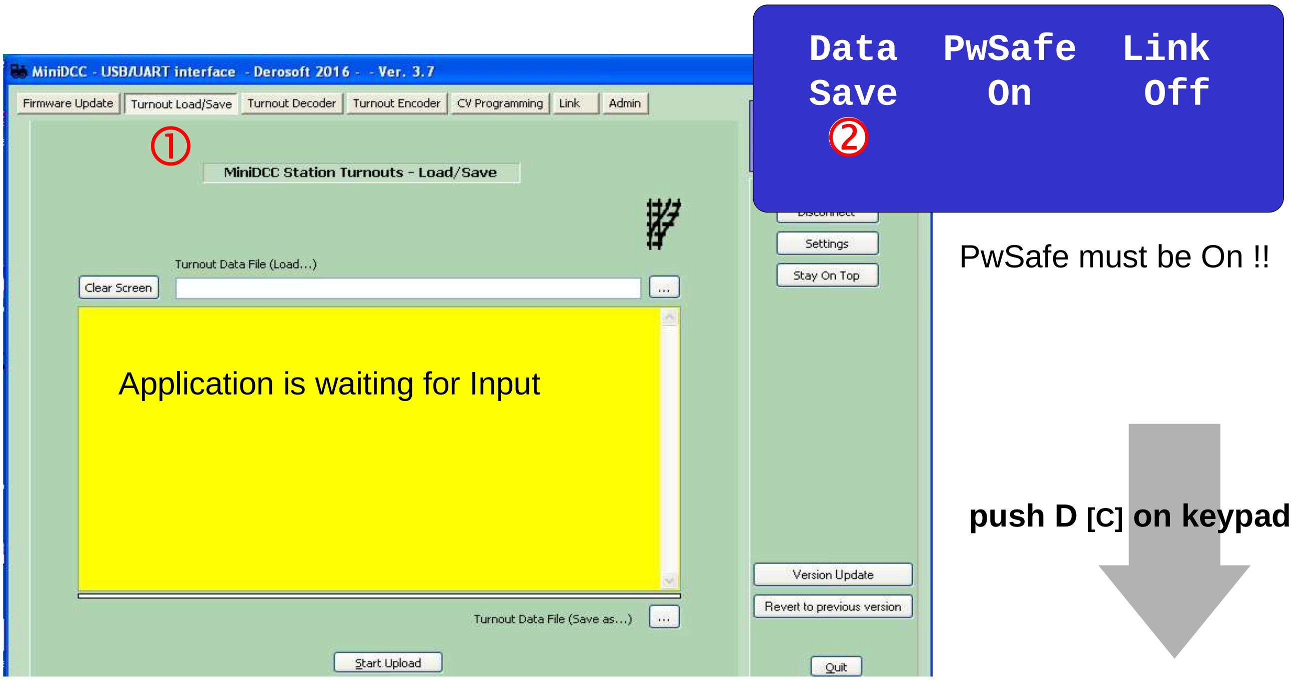
```
MiniDCC Station
Loc 003x004x005x006x
Fun ----------------
Spd 000→000→000→000→
```

## Data Save / Turnout Save

All EEPROM data of the MiniDCC© Station, incl. loco addresses, speed settings, keybord readout, turnout stati and routes are transfered to file “xxxxxxxx.Tout” of the dedicated PC.

### MiniDCC© Application

### MiniDCC© Station

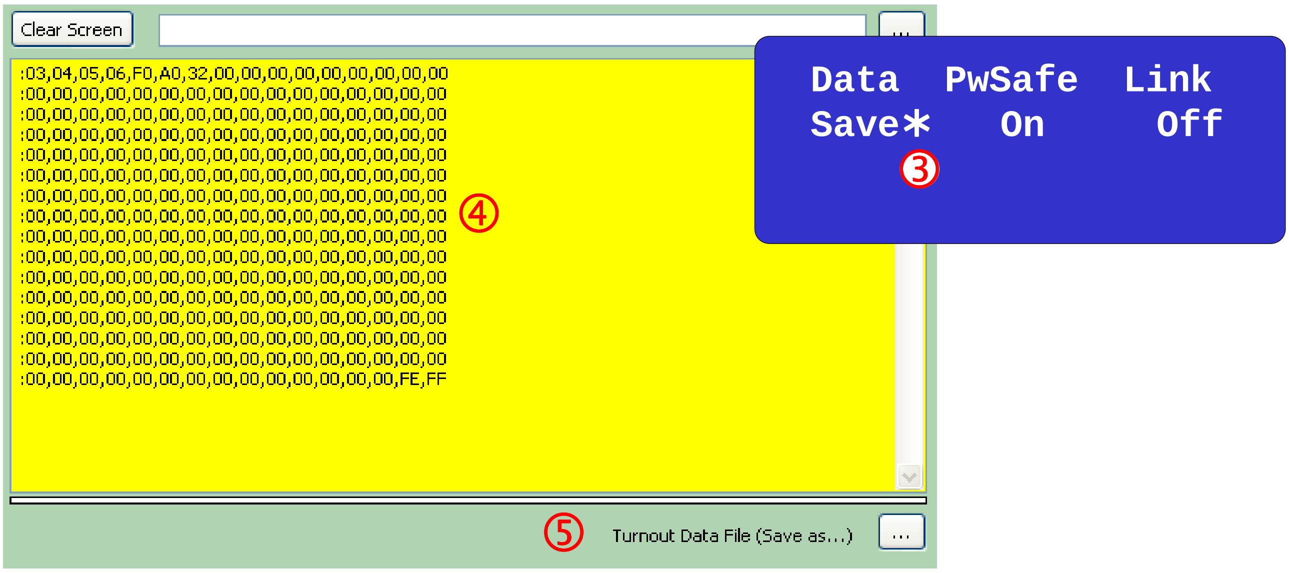


Application is waiting for Input

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

PwSafe must be On !!

**push D [C] on keypad**



```
:03,04,05,06,F0,A0,32,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
:00,00,00,00,00,00,00,00,00,00,00,00,00,00,FE,FF
```

```
Data    PwSafe   Link
Save∗     On      Off
```

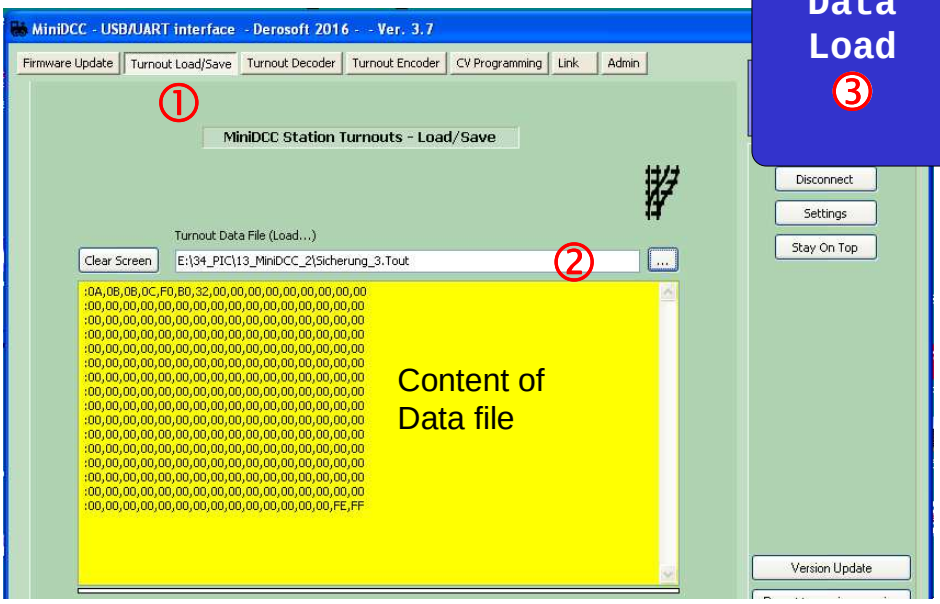
① Select “Turnout Load/Save”
② switch Data to “Save” (toggle)
③ push D [C] on keypad to activate the upload to PC (∗)
④ the EEPROM content is displayed
⑤ the data can be stored in a Turnout Data File “xxxxxxxx.Tout”

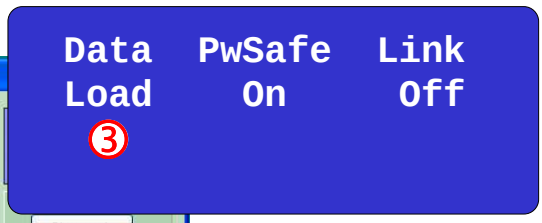
## Data Load / Turnout Safe

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

### MiniDCC© Application

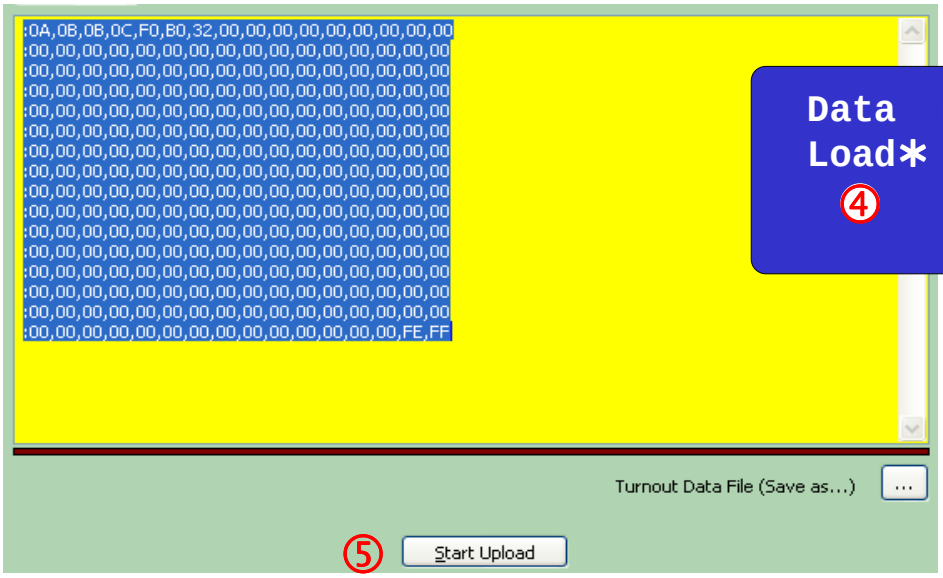
### MiniDCC© Station

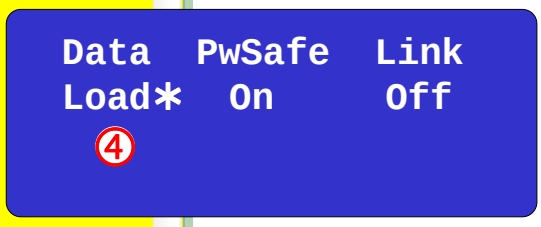



PwSafe must be On !!

**push D [C] on keypad**




MiniDCC© Station is waiting for Input

① Select “Turnout Load/Save”

② select and load the Turnout Data file “xxxxxxxx.Tout”

③ switch Data to “Load” (toggle)

④ push D [C] on keypad to set MiniDCC© Station “wait for Input” mode (✱)

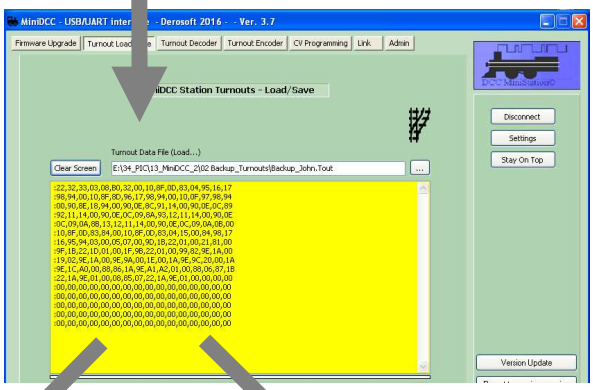
⑤ Start Upload to transfer the Data into the EEPROM of MiniDCC© Station

## Turnout Decoder / Turnout Encoder - Preamble

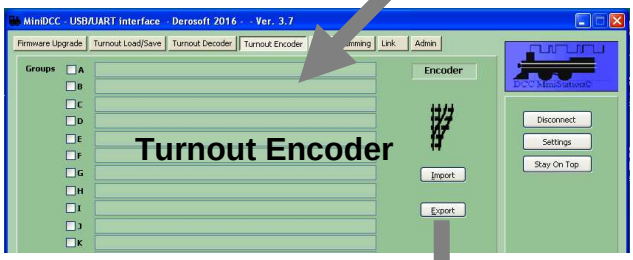
The Turnout Decoder and Turnout Encoder work with
the content of yellow window in the "Turnout Save/Load" tab.

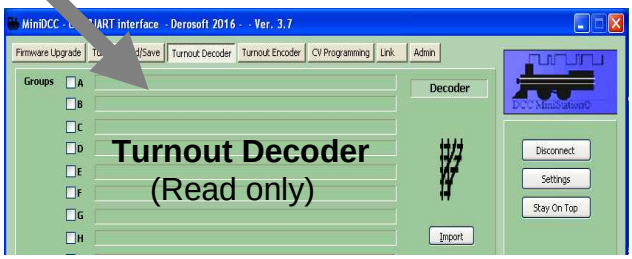
**Turnout Save / Load**
If you have a full window (with the entire EEPROM data in the window – either by Loading the xxxx.Tout file or Reading you actual EEPROM) then you can "Import" this info into the other two tabs "Turnout Decoder" and "Turnout Encoder".

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

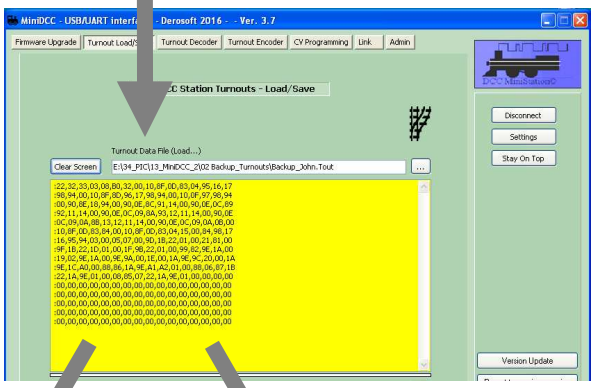



**Import** from memory




**Export** into memory

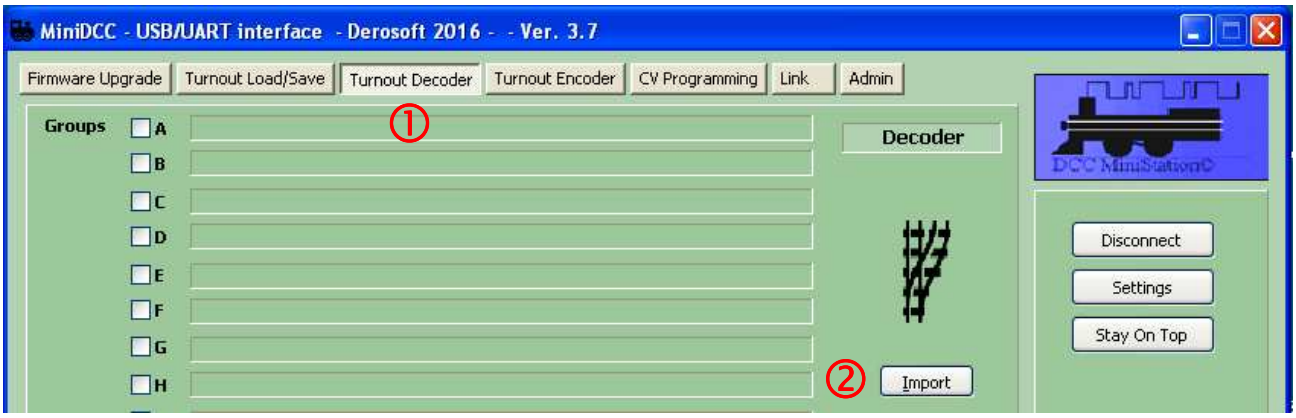


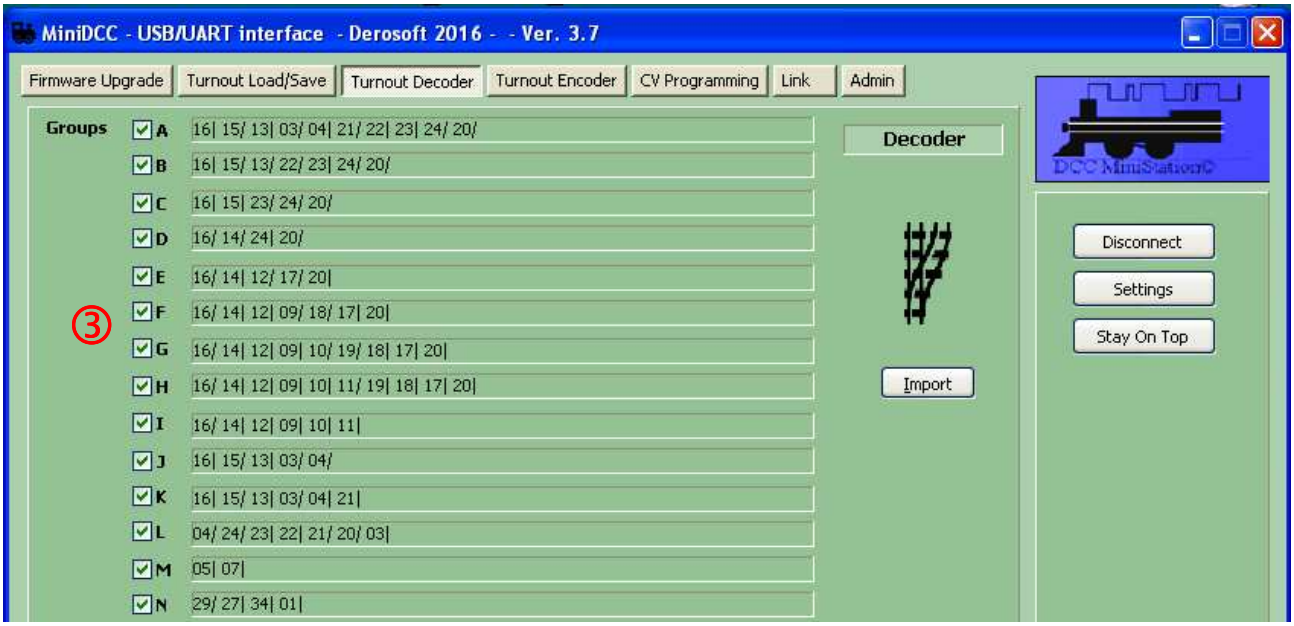

**Turnout Load**
(to MiniDCC© Station)

**Turnout Data File**
(Save as xxxx.Tout)

## Turnout Decoder

The Turnout decoder is a “Read Only” function



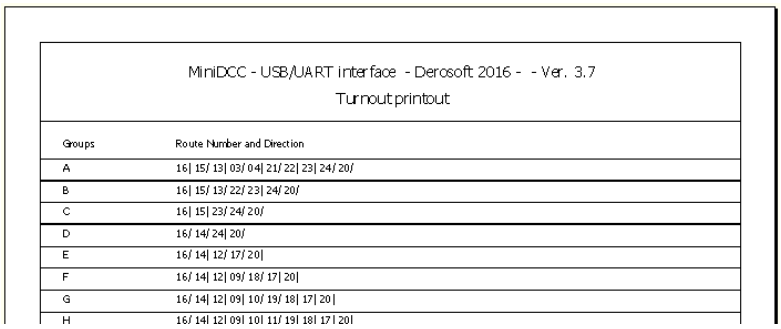




① Open the”Turnout Decoder” tab

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.

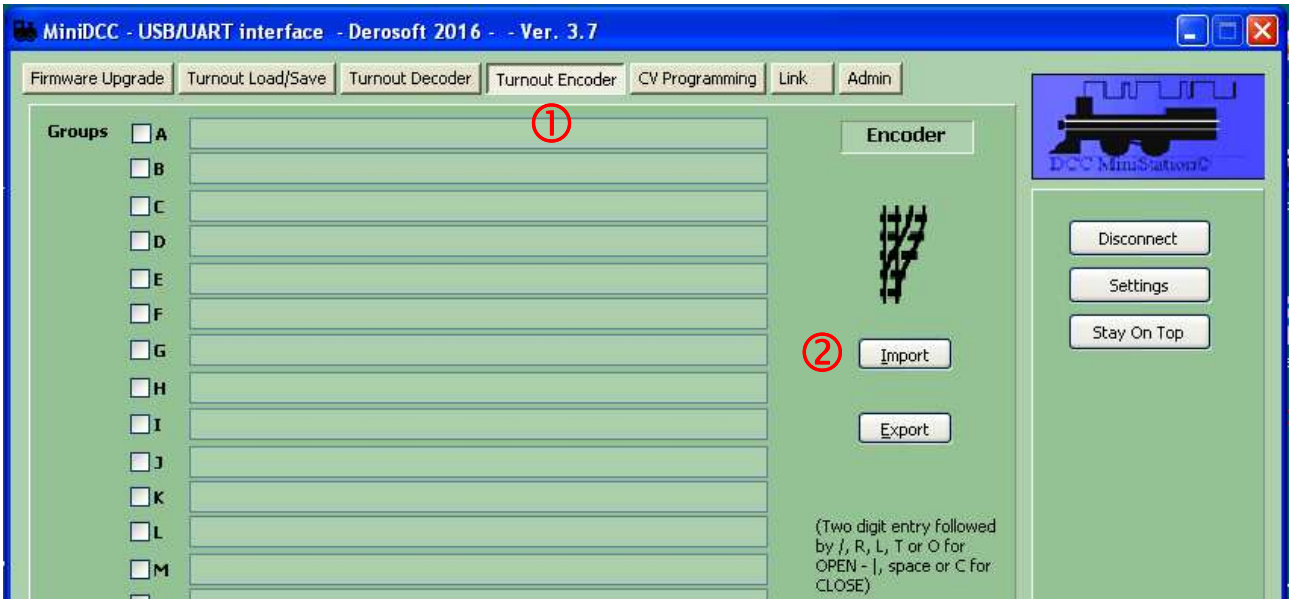
pressing View / Print in MiniDCC© Application
( in lower right part of Window ),
a protocol of the Turnout Decoder results is available.

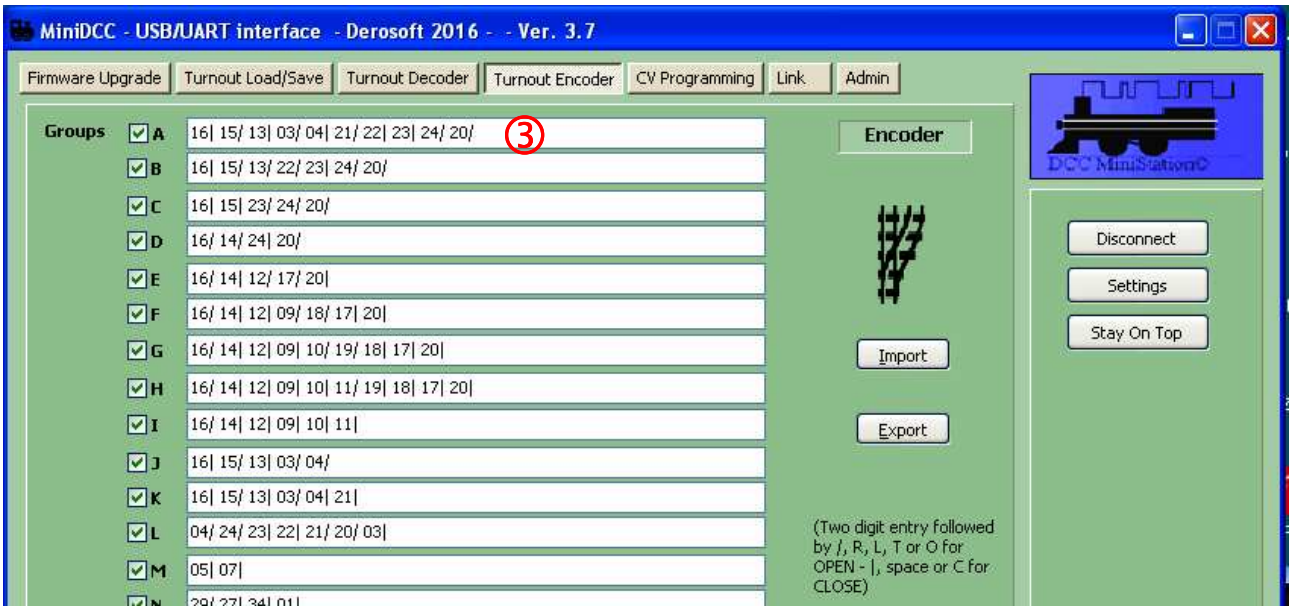


MiniDCC - USB/UART interface - Derosoft 2016 - - Ver. 3.7
Turnout printout

| 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| |

## Turnout Encoder - getting the turnout routes and positions



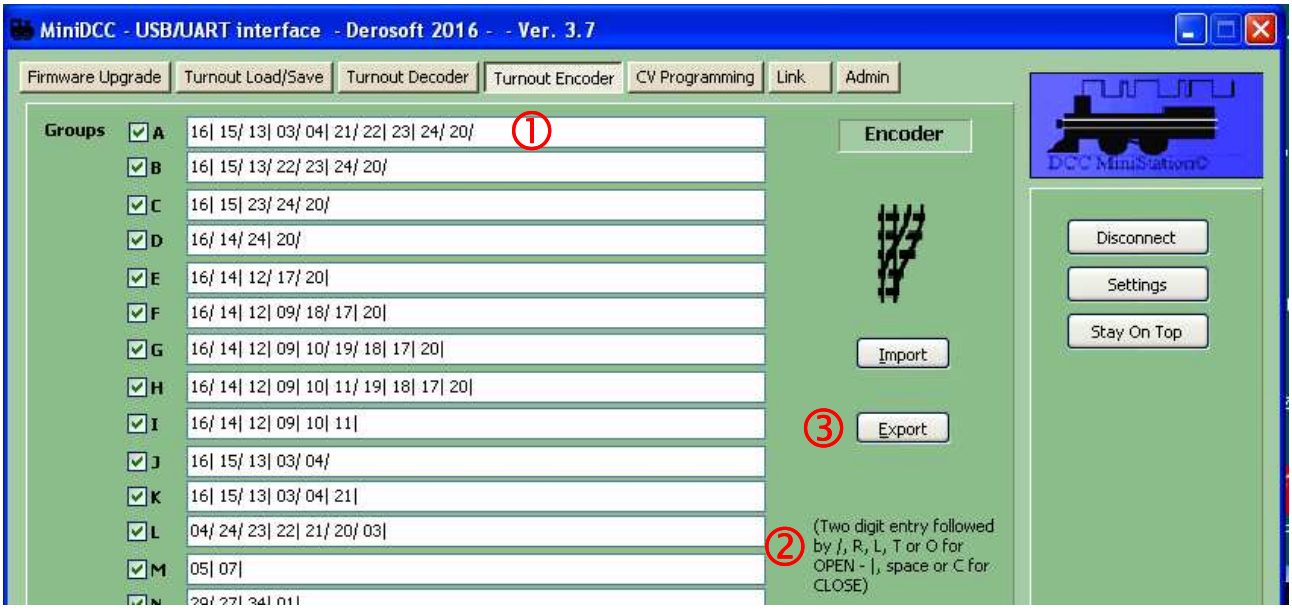




① Open the"Turnout Decoder" tab

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



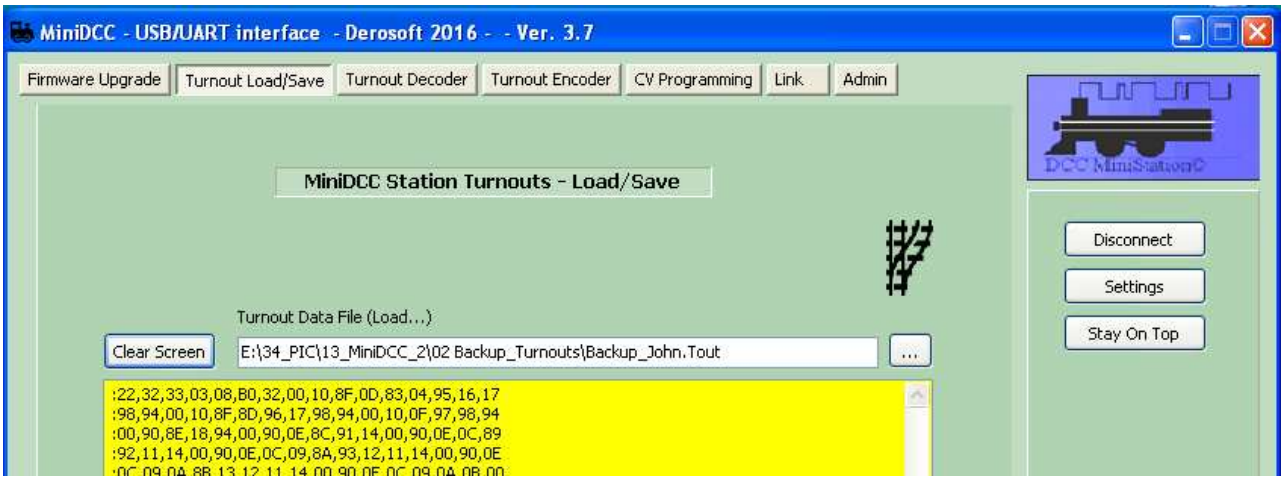

① Actual turnout routes and positions

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 transfered 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)

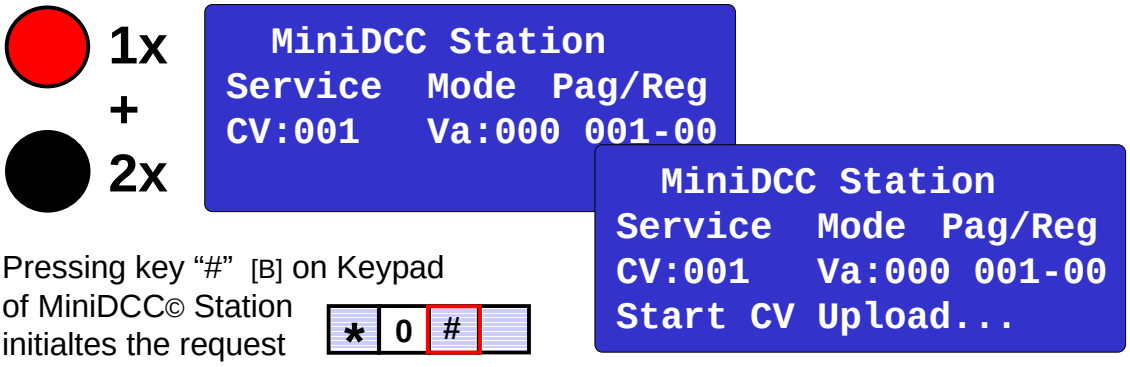
**Turnout Load**
(to MiniDCC© Station)

## CV Programming

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

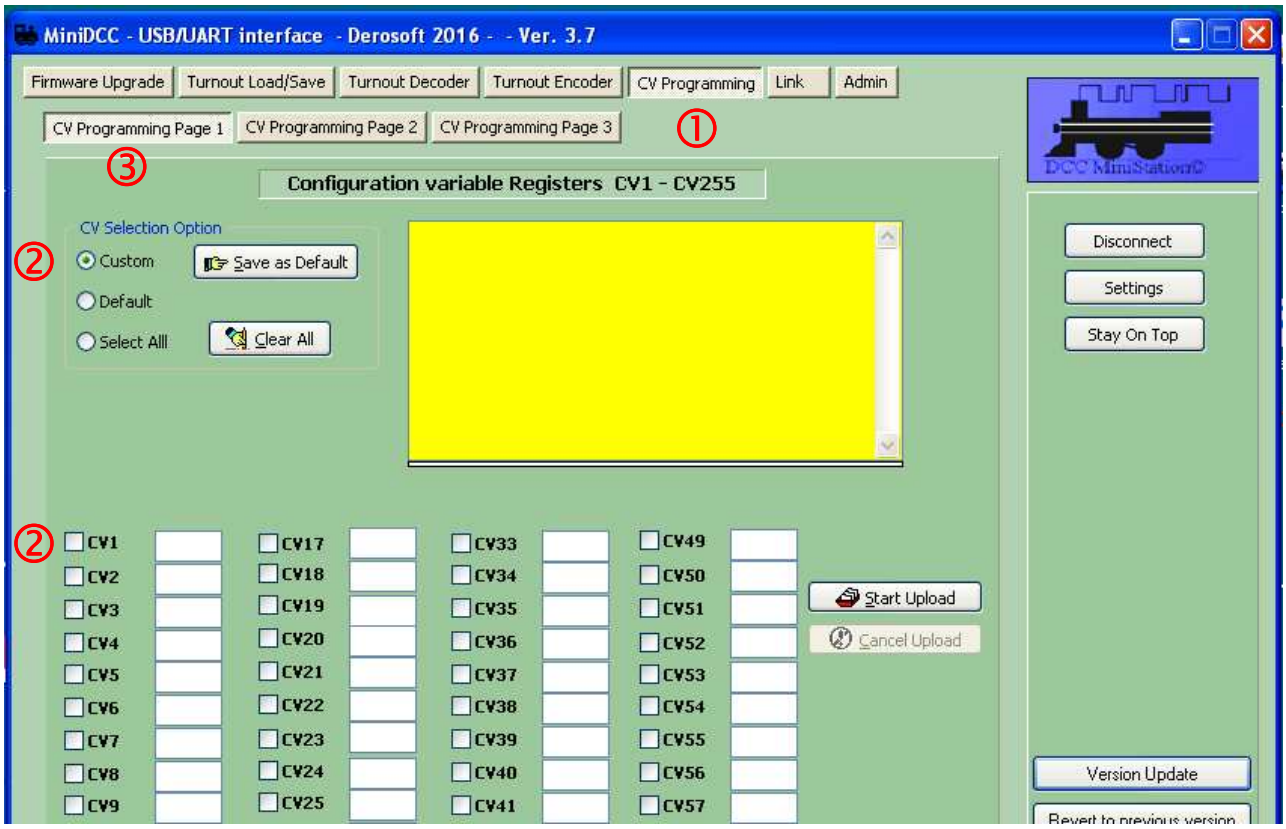
## CV Reading - Preparation

### MiniDCC© Station




Pressing key "#" [B] on Keypad of MiniDCC© Station initialtes the request

### MiniDCC© Application



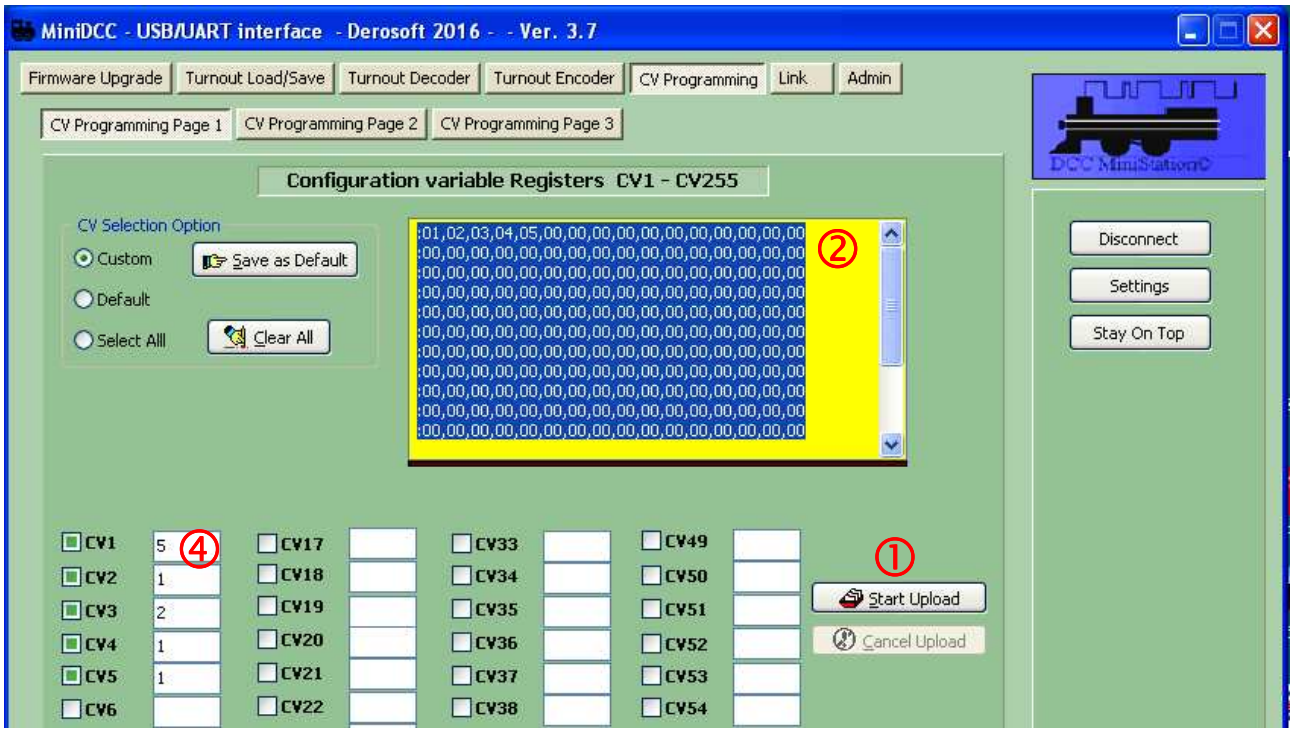

① Select CV Programming Mode section

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

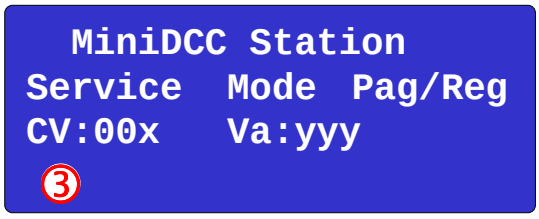



① pressing Start Upload in MiniDCC© Application starts the process and all selected CVs are read

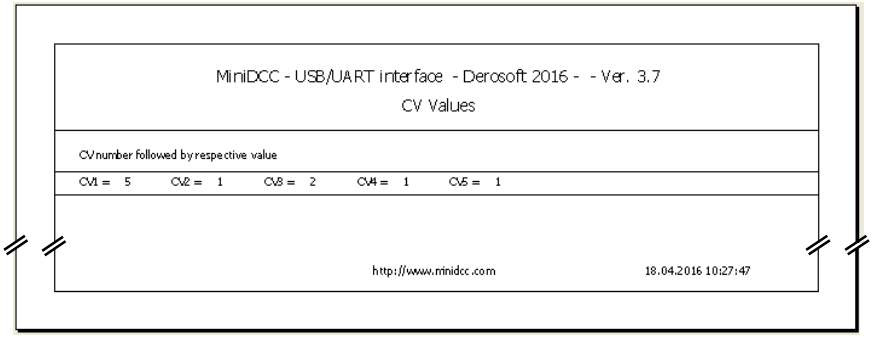
② the job can be controlled in the task window of MiniDCC© Application

③ progress can be controlled on display of MiniDCC© Station

④ The CV result is shown besides each CV chosen.

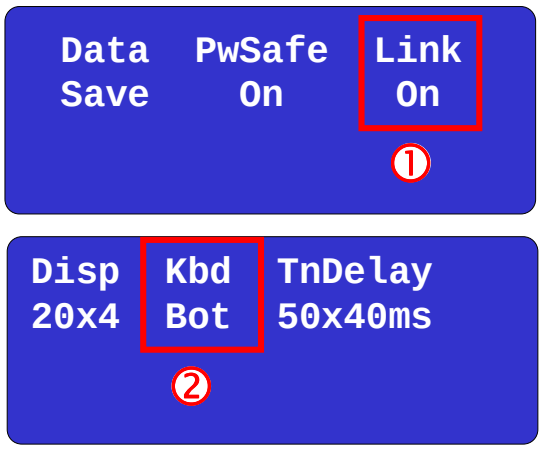



pressing View / Print in MiniDCC© Application ( in lower right part of Window ), a protocol of the CV results is available.



## **Link** for remote control of 4 locos

### MiniDCC© Station




MiniDCC© Station must be prepared for remote control

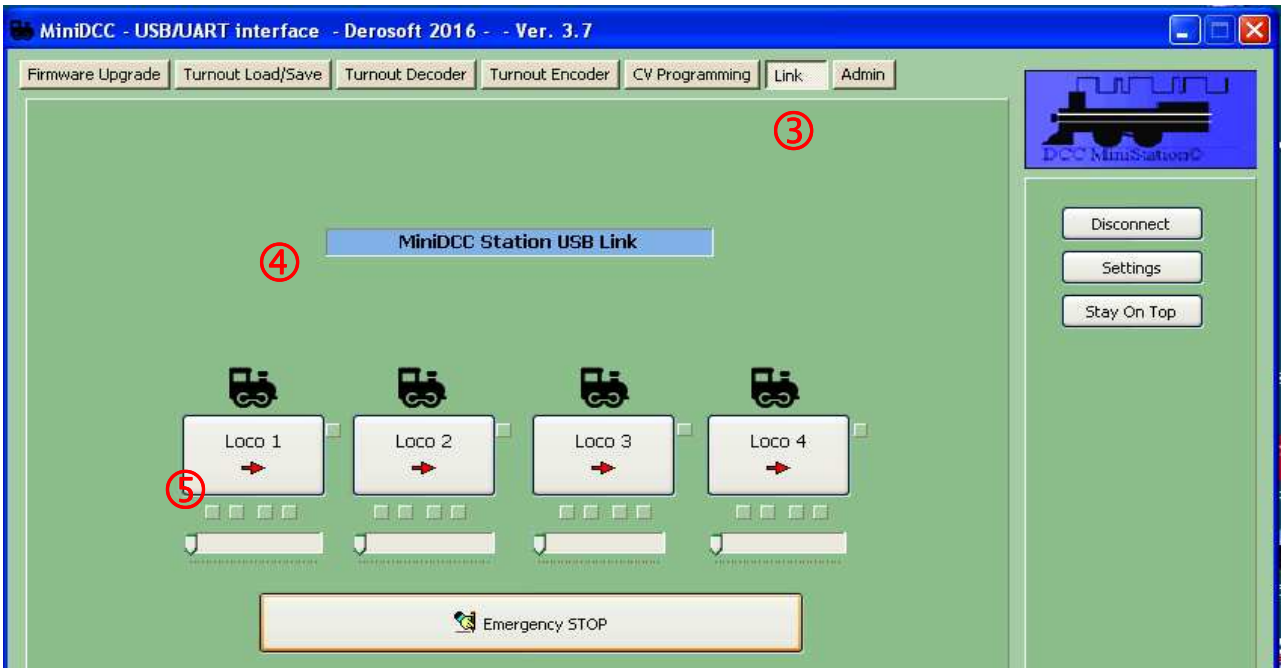
① Link must be switched "On" (toggle)

② If you would be in **A**nalog 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

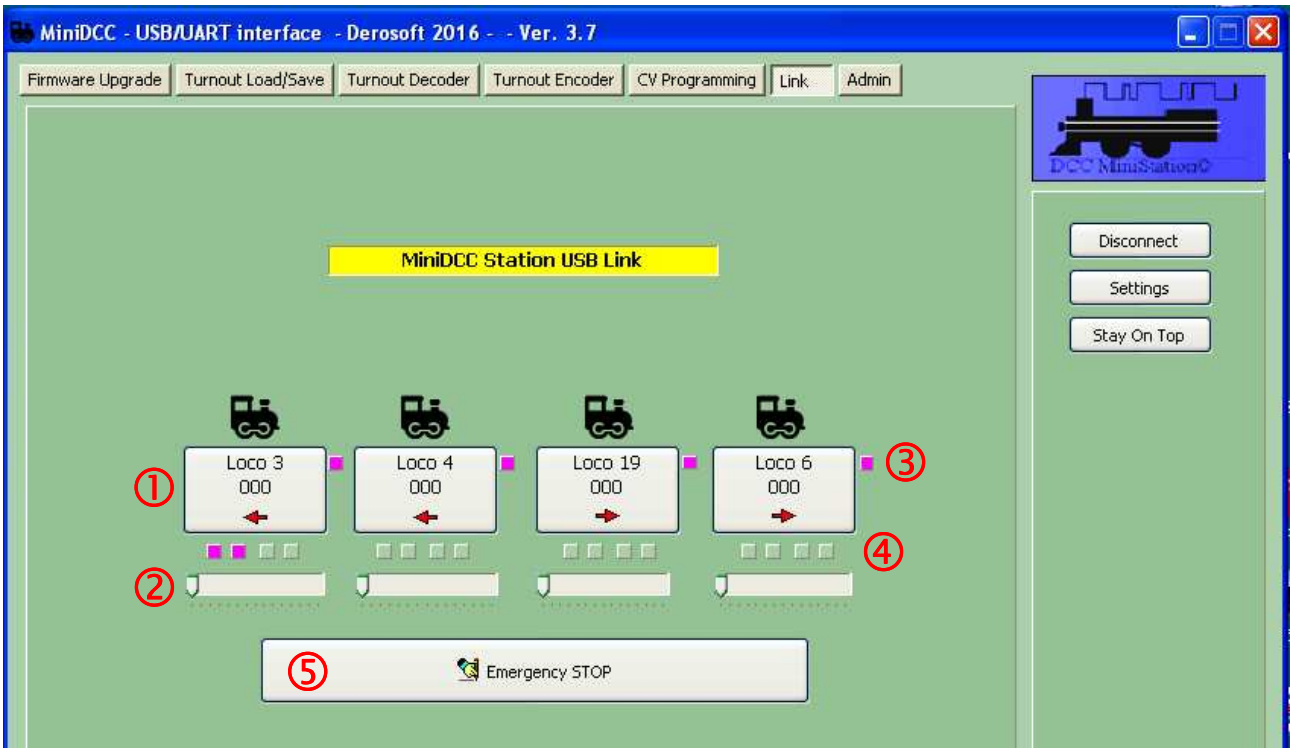



③ Start the Link by pressing the appropiete control button

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 appropriete field ☐ )

② Speed regulator ( slide control knob ⛉ )
⇨ If slide control knob returns automatoically 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 apropriete field ☐ )

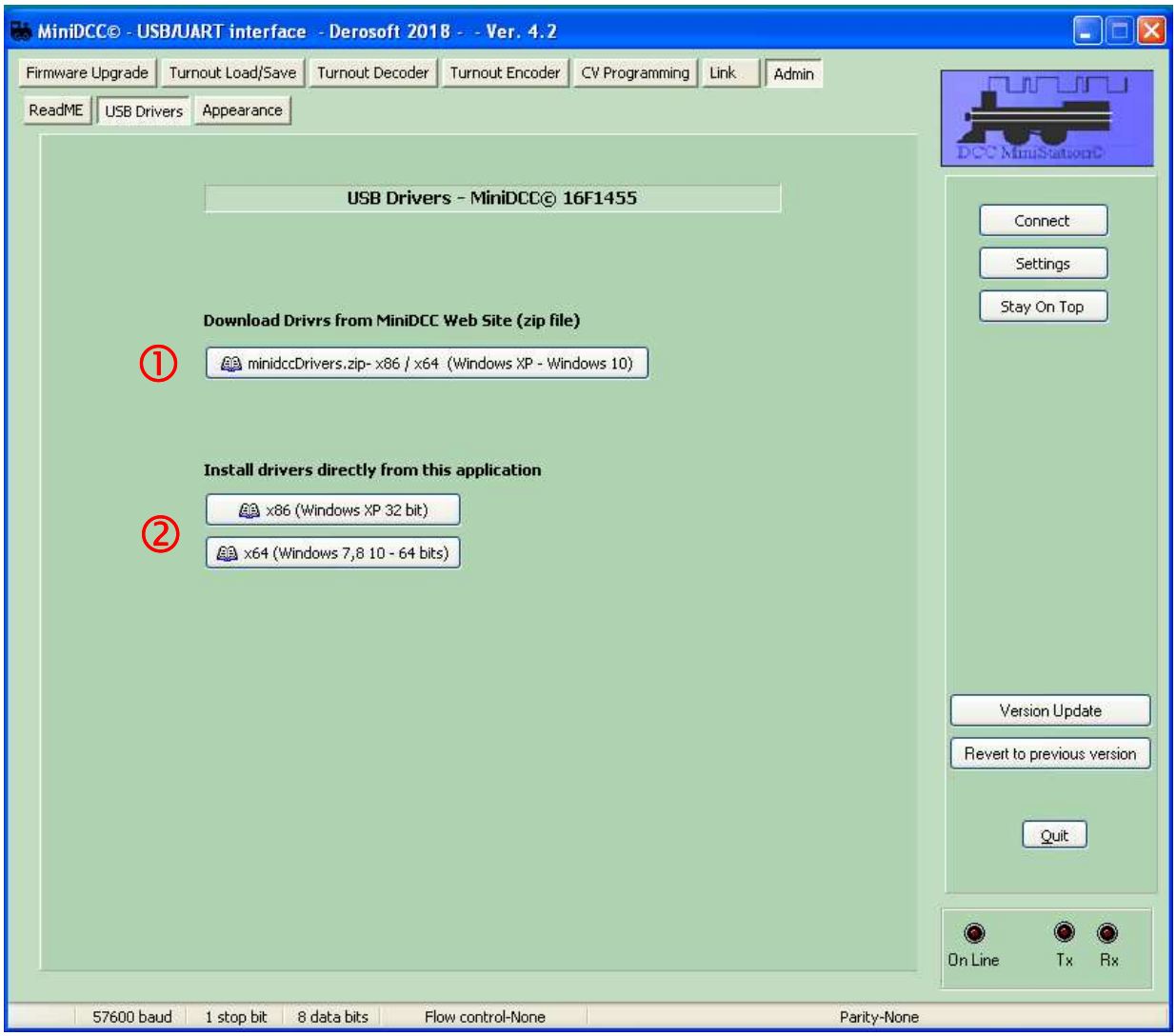
④ Function Keys F1 .. F4 ( toggle by pressing the loco apropriete field ☐ )

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 - USB Drivers




The drivers for the UART/USB converter, basing on MicroChip PIC 16F1455 placed e.g. on interface board (doughter board) for WinXP resp. Win7, 8, 10 can be

① downloaded, or

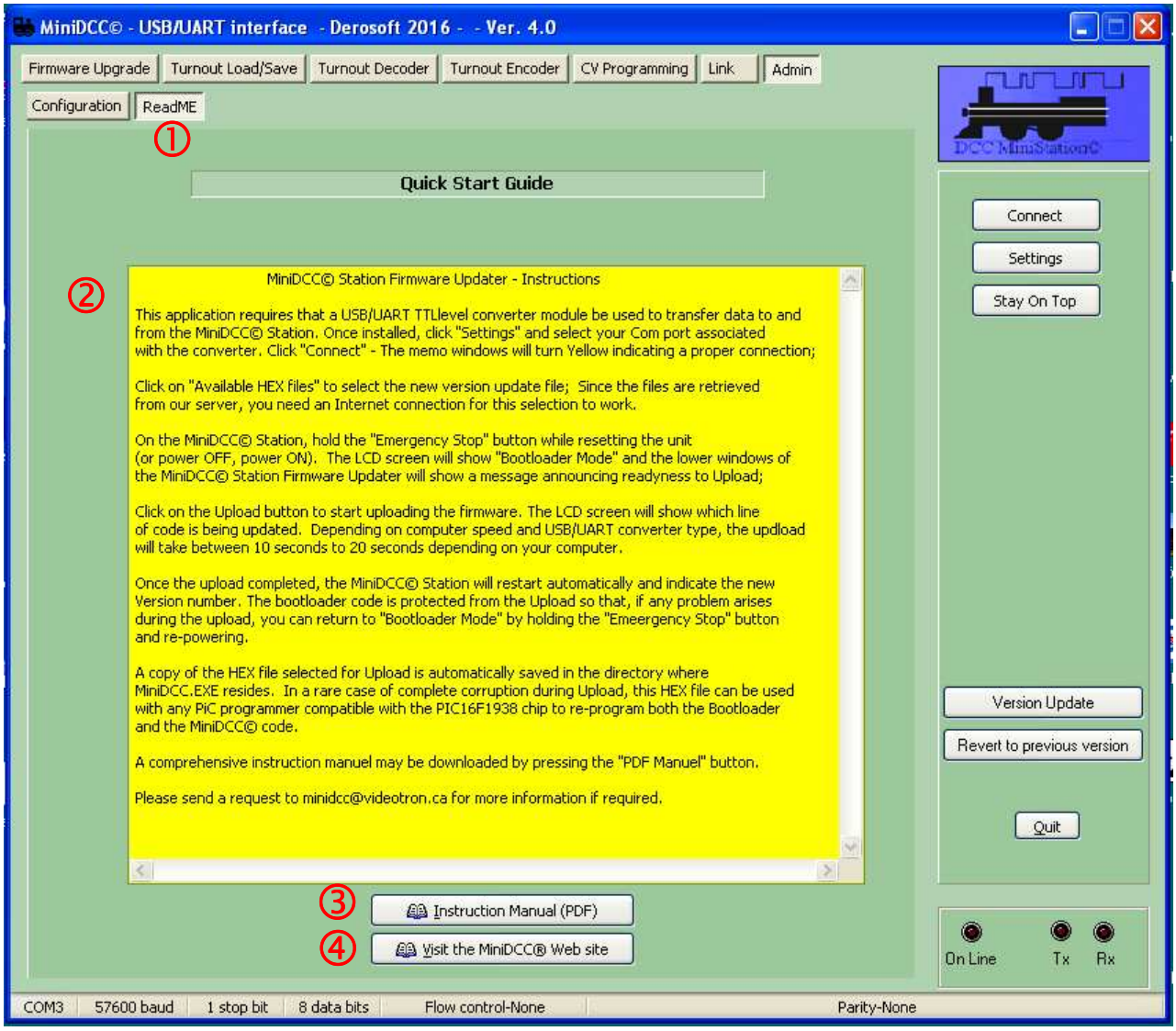
② installed directly;

for Linux systems the installation of drivers isn't necessary.

Using an external "FTDI-CP2102 UART-to-USB-Bridge"
the obove mentioned drivers will work in most cases without problems.

Otherwise, or using other converters the supplied drivers should be installed.

## ReadMe



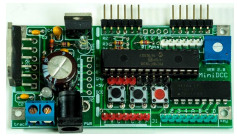

① Selecting ReadMe

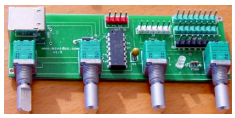
② MiniDCC© Station Firmware Updater Instructions are displayed

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

## Hardware-Overview




To setup a complete MiniDCC© Station is necessary:

- MiniDCC© Station Board
- Extension Board
- LCD display
- Keypad
- Potentiometer 4x

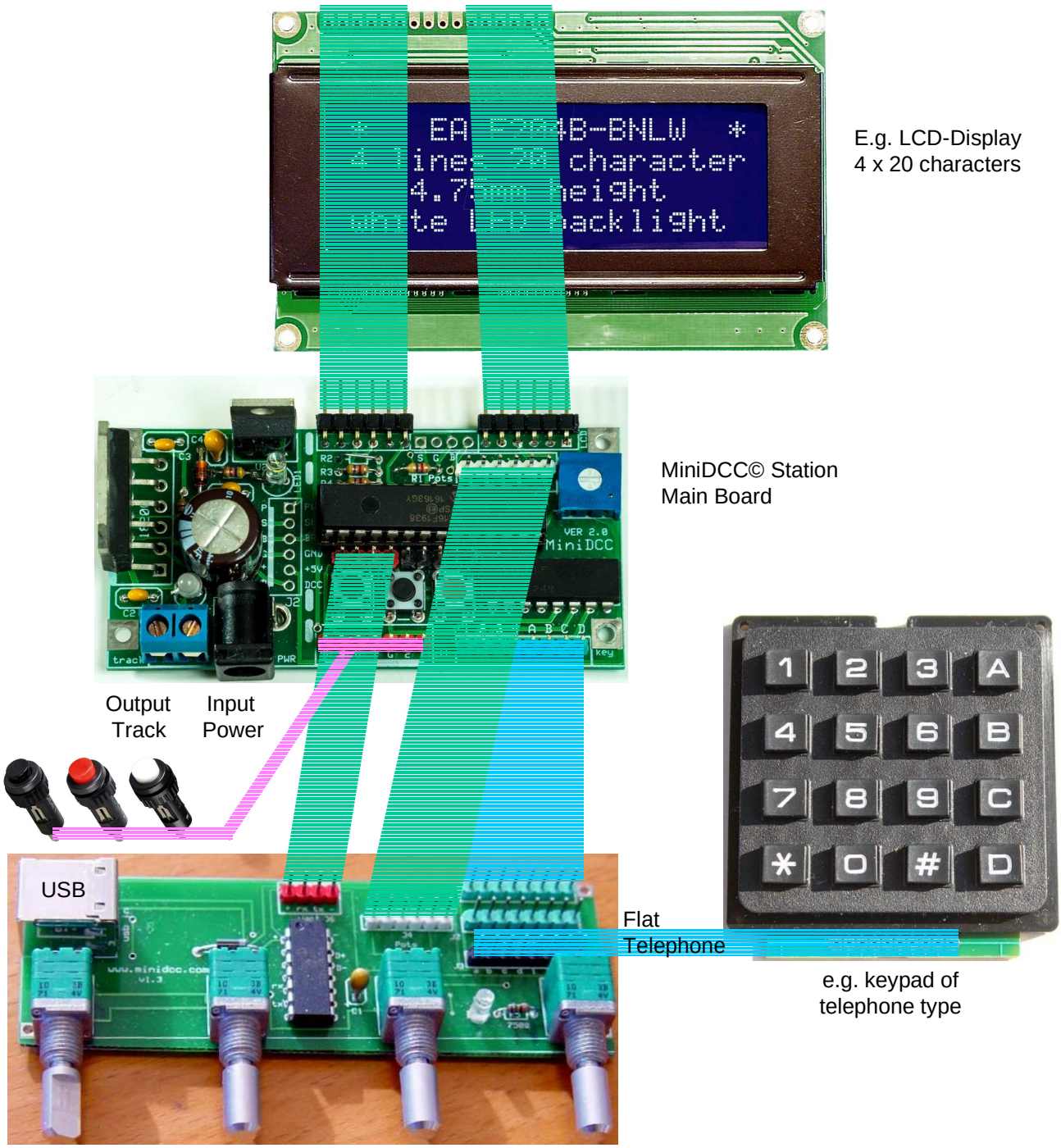
These parts can be ordered via “shopping store” on www.MiniDCC.com Details and options see page 38.

- 2 or 3 push buttons (Emergency, Mode Select, Reset)
- enclosure and 4 potentiometer knobs
- internal connecting cables by DIY

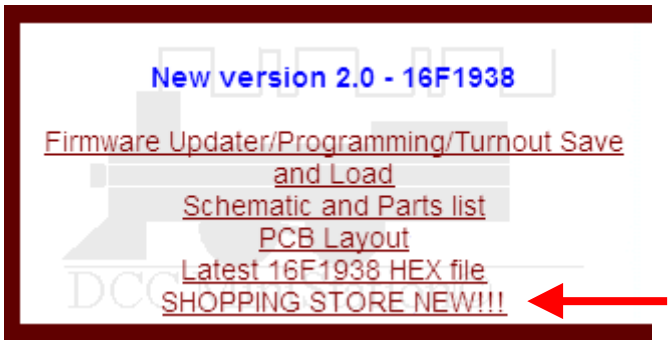
Depending of chosen option of both boards, missing parts of parts list has to be obtained and you should have certain experience in soldering these parts, and in any case in manufactoring the internal cables.

For customizing of enclosure and mounting of the operation and display elements you should have basic mechanical skills.

## Hardware - wiring



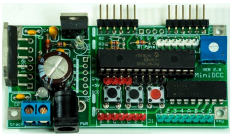
## Shopping Store and Downloads




On left lower corner of our main page the shopping store can be found to ordert various items.

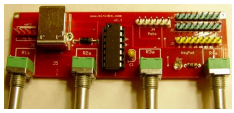
A one time worldwide shipping and handling fee of $10.00 CAD is added to final order

**MiniDCC© Station**



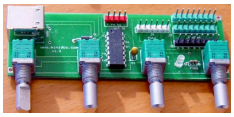
- Microcontroller PIC 16F1938, pre-programmed incl. bootloader (without PCB, parts, etc.)
- bare PCB* (MiniStation and MiniBooster on one board)
- assembled and tested PCB* (MiniStation and MiniBooster on one board)
  * not including the keypad, pots and LCD, order these items separately, please.
- Latest .hex-file for miccrocontroller PIC 16F1938 for download

**Extension Bords** type A (doughter boards)
for 4 pots for speed control (direction control via keypad)



- bare PCB
- PCB with all parts incl. UART/USB converter, but without pots
- assembled and tested PCB with UART/USB converter and 4 pots

**Extension Boards** type B (doughter boards)
for 4 pots for speed and direction control (pot with push-button)



- bare PCB
- PCB with all parts incl. UART/USB converter, but without pots
- assembled and tested PCB with UART/USB converter and 4 pots

**UART/USB converter** for Extension Borads type A and B, as well as for own designs
- UART/USB converter with pre-programmed PIC 16F1455

**Keypad 4x4 Matrix** optional

- flat type (0 ..... F)
- telephone type (0 .. D , ∗,#)

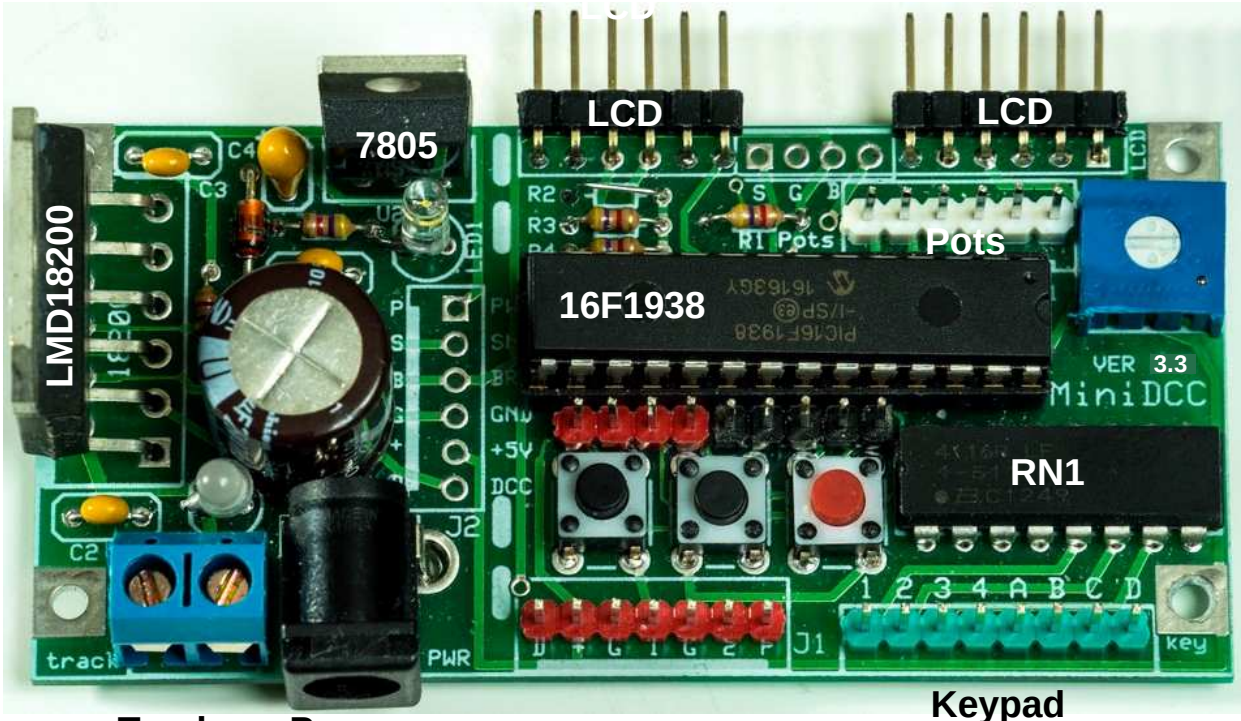
**Pots** optional for

- speed control (pot only) for extension board type A
- speed and direction control (pot + push button) for extension board type B

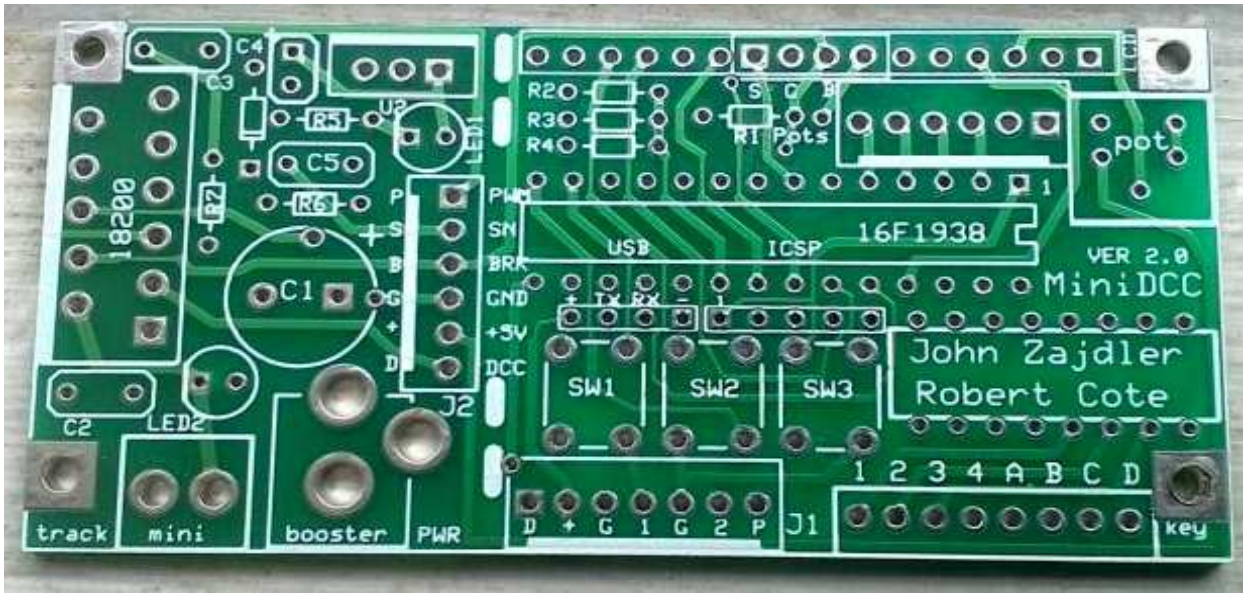
**LCD** (white on blue background) optional


- 16 characters x 2 rows
- 20 characters x 4 rows

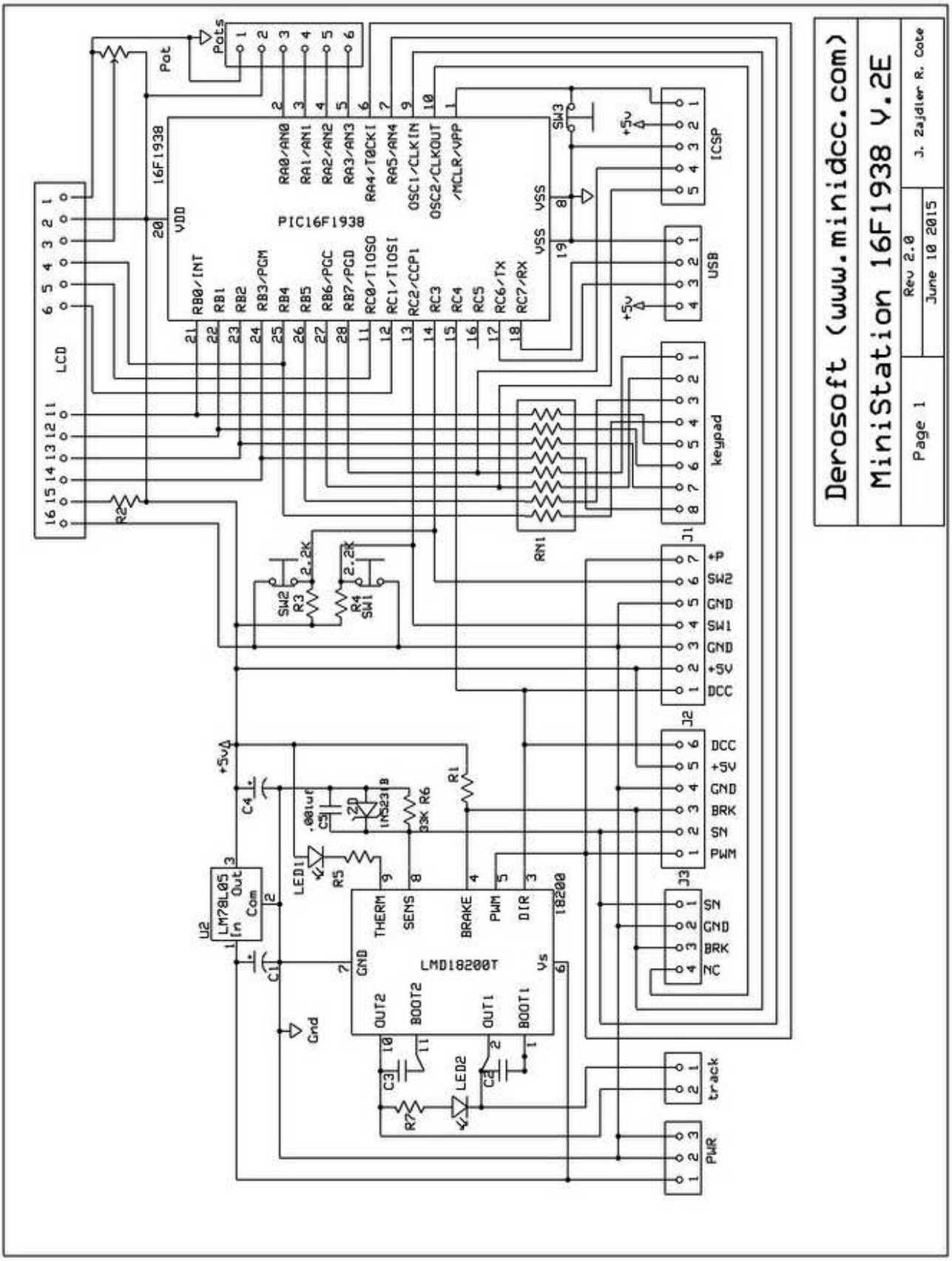
## MiniDCC© Station




Dimensions of PCB: 80 x 39 mm



## MiniDCC© Station - Schematic



## MiniDCC© Station - System Setup

For setup of MiniDCC© Station you need either

- a pre-programmed 16F1938 micro-controller, or
- a 16F1938 micro-controller, a suitable hex-file (e.g. 38-300e.hex - by download) 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.

---

## MiniDCC© Station - Parts list

| | |
|---|---|
| Platine | MiniDCC© Station PCB (pictures on pages 40 and 41) |
| C1 | capacitor 47µF to 100µF / 25V min - Electrolytic |
| C2, C3 | 10 nF ceramic disk |
| C4 | 1µF / 10V Tanatalum capacitor |
| C5 | 1 nF ceramic capacitor |
| RN1 | resistor network (parallel) or 8 discrete 510 Ω to 1 kΩ |
| R2 | 51 Ω or straight jumper (depending of LED backlight requirements) |
| R3, R4 | resistor 2,2 kΩ to 4,7 kΩ |
| R5 | resistor 270 Ω to 1 kΩ |
| R6 | resistor 33 kΩ (critical - do not substitute - used in sensing CVs) |
| R7 | resistor 1 kΩ |
| Pots 1 .. 4 | potentiometer 5 kΩ to 10 kΩ, with optional direction switch# (on interface PCB) |
| LED1 | regular LED (yellow or white) |
| LED2 | bipolar Red/White LED or back to back discrete LEDs (antiparallel ⇨ see page 45) |
| POT | potentiometer 5 kΩ (contrast control of LCD) |
| SW1 .. SW3 | spst miniatur switches# (Menu, Emergencs Stop, Reset) |
| | possibly addional or alternativ external switches |
| U1 | dual half bridge LM18200T |
| U2 | 5V voltage regulator (or any electronic substitute) |
| U3 | micro controller PIC 16F1938 (28 pins) with 28 pin IC socket (recommended) |
| ZD | Zener Diode 5,1 V (e.g. IN2318) |
| J1 .. J3 | various Molex pin connectors as required - 2,54 mm pitch |
| LCD | 16x2 or 20x4 standard LCD display (Hitachi HD44780 compatible) |
| keypad | 4x4 Matrix (flat or telephone type) |
| enclosure | depending of your own idea |

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

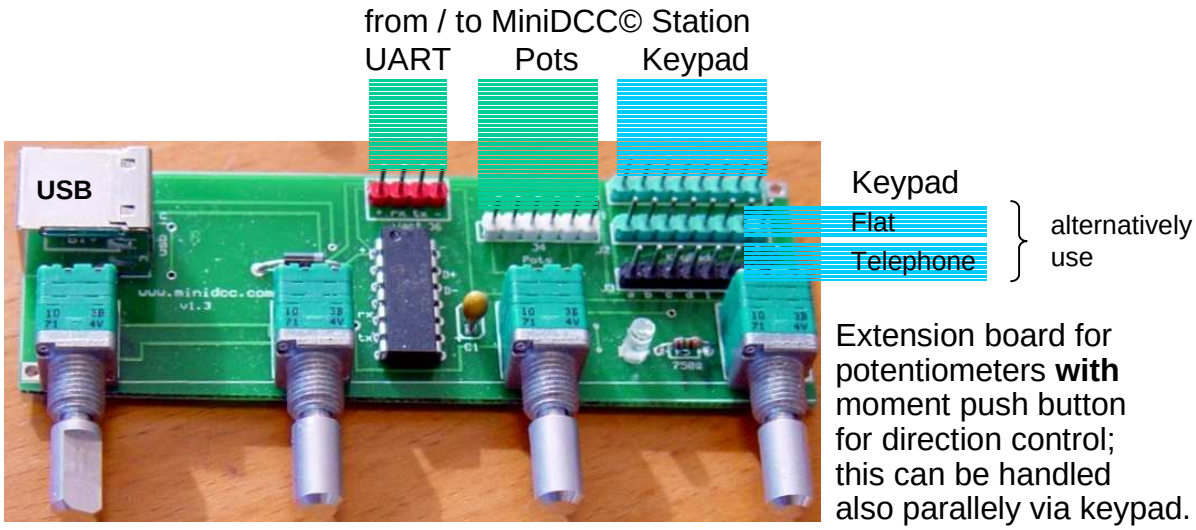
## Extension boards - doughter boards

The extension boards offers with simple and well arranged 1:1 wiring to MiniDCC© Station following functions:

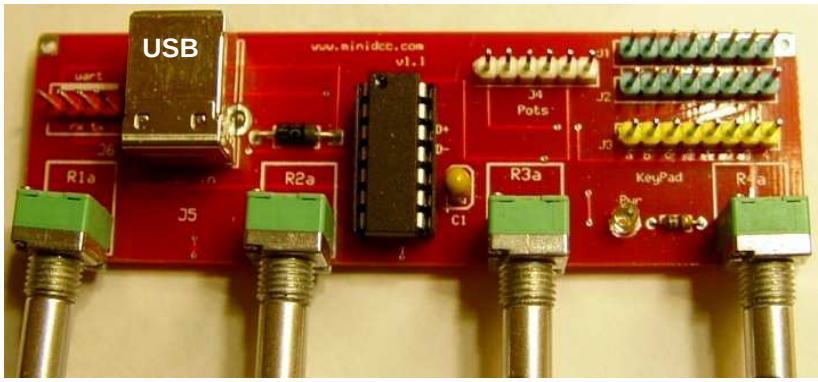
- USB A interface via UART/USB converter
- connectors for 4 pots (with / without moment push button for direction control)
- two alternative connectors to either flat (0…F) or telephone (0...D, ∗,#) type keypads.

Both boards offers a USB/UART converter, using Microchip PIC 16F1455, to provide a simple but efficient USB access to firmware updates and allows saving and loading of turnouts route if desired, as well as controlling/programming basic functions of 4 locos via the MiniDCC© Application.

The WinXP or Win7,8,10 drivers for the UART/USB converter can be downloaded or directly installed via the tab “Admin” > “USB Drivers” of DCC© Application (⇨ Page 34); for Linux systems the installation of drivers isn’t necessary.




Extension board for potentiometers **with** moment push button for direction control; this can be handled also parallely via keypad.

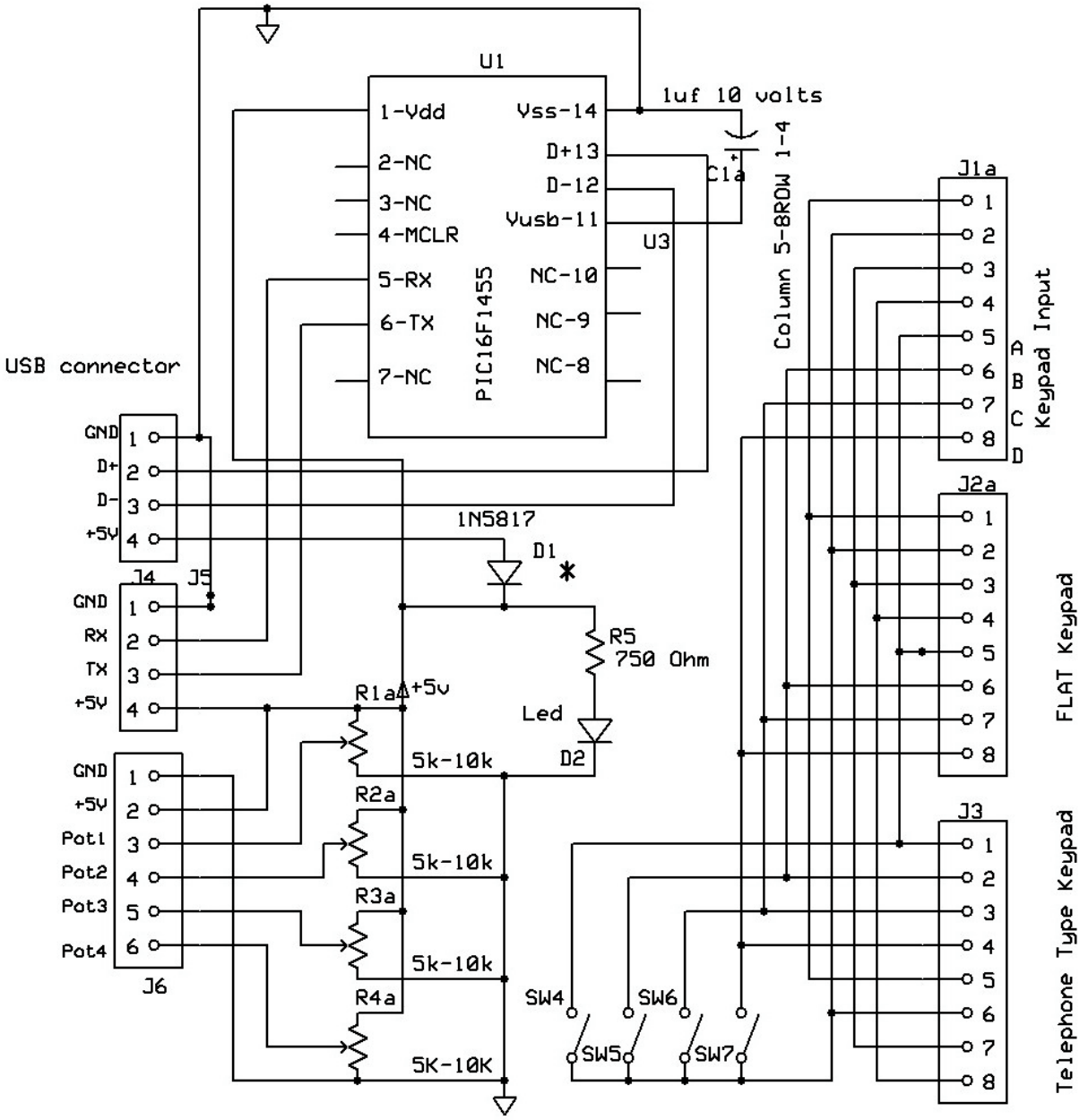



Extension board for Potentiometers **without** moment push button.

Direction control is handled via keypad.

## Interface board - Schematic

interface PCB for potentiometers with moment push button for direction control




SW4 .. SW7: optional push-on switch on R1 .. R4 (Direction Control)

## Parts list:

| | |
|---|---|
| U1 | Processor Microchip 16F1455 (pre-programmed) |
| D1 | Schottky diode 1N5817 (low dropout preferred - 1N4001 acceptable) |
| D2 | standard LED |
| R1 .. R4 | Potentiometer 5 to 10 kΩ (push button optional) |
| R5 | Resistor 750 Ω (depending of LED also 820 Ω or 1 kΩ |
| J7 | USB A connector |
| J1 .. J6 | Molex connectors 2,54 mm |
| C1 | 1µF / 10V Tantalum Capacitor |

## Hardware aspects

### Enclosure

Our manual is illustrated with the Enclosure "Hommond Electronics 1599HSTSGY" (220 x 110 x 40 mm).
With the interface PCBs this enclosure could be to flat !!

### Keypad



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

| telephone | hexadezimal |
|---|---|
| **0 .. 9, *, #, A .. D** | **0 .. 9, A .. F** |
| e.g. *Accord* "KB1604-PNB" | 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 |

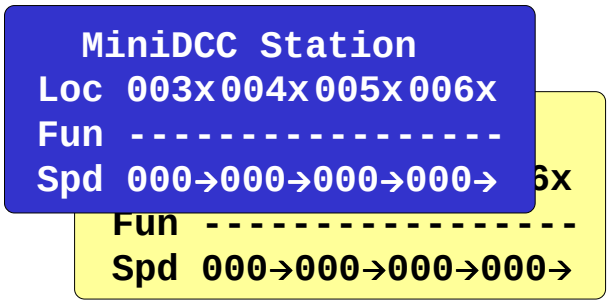
| Telephone | | hexadezimal |
|---|---|---|
| A | = | [F] |
| B | = | [E] |
| C | = | [D] |
| D | = | [C] |
| # | = | [B] |
| * | = | [A] |

### 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

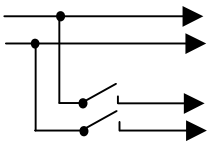
Emergency

Mode Select

Reset

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

### 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 ℃ (junction temperat ure of LMD 18200T); however the chip will not shut itself down until 170 ℃ is reached at the junction .

**DCC Output Control**

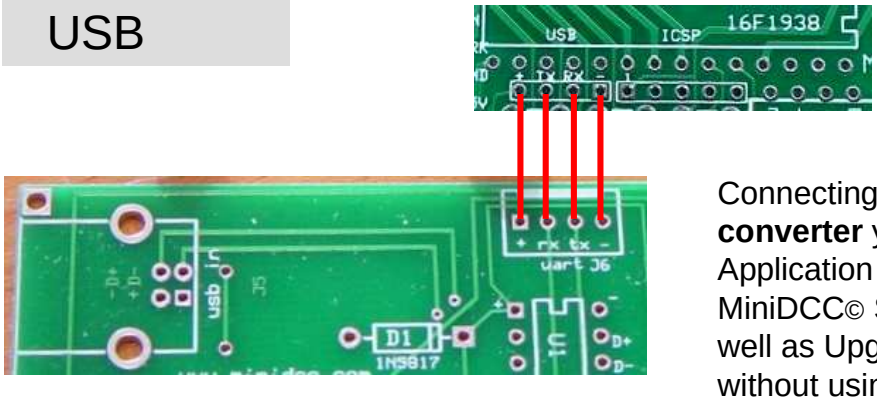
LED2 is a bipolar LED (e.g. red and green)

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.

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

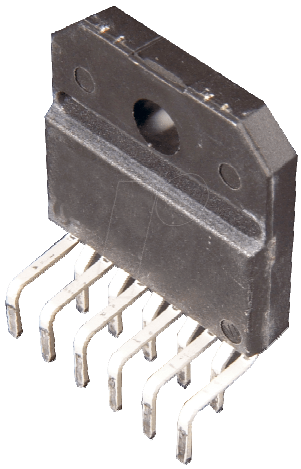
The MiniDCC© Station has been improved considerably over the years.
We have moved to a 28 pin template to allow for added features such as 4 discrete potentiometers for speed control, an RS232/USB link for firmware upgrades as well as Turnouts (Switches) route saving and loading using a PC.

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 LMD18200T 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 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