The MiniDCC® Station is designed to control
• 4 Locos simultaneously,
• 99 turnouts and
• 26 routes
in several DCC compliant operation and programming modes

User Manual / abstract

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
• 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 on enclosure and personal preferences.

Start Sequence

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

<table>
<thead>
<tr>
<th>Loc 4</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loc 3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>B</td>
</tr>
<tr>
<td>Loc 2</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>C</td>
</tr>
<tr>
<td>Loc 1</td>
<td>*</td>
<td>0</td>
<td>#</td>
<td>D</td>
</tr>
</tbody>
</table>

#### Locos in Bot or B/A Mode

<table>
<thead>
<tr>
<th>Speed increase</th>
<th>Speed decrease</th>
<th>Direction change (toggle)</th>
<th>Front-Light on/off (toggle)</th>
<th>Function selection</th>
<th>Emergency Stop</th>
</tr>
</thead>
</table>

- 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

- 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
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

Programming Modes

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
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

© Robert Côté and John Zajdler, Canada
### F1 - F4 Function Control

<table>
<thead>
<tr>
<th>Loc 1</th>
<th>Loc 2</th>
<th>Loc 3</th>
<th>Loc 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>C</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>0</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>⋆</td>
<td>8</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

F1 - F4 Function Control

- **Loc 1**: 003x 004x 005x 006x (not changeable)
- **Fun**: xx----------xx-- (=off / x=on (toggle))
- **Spd**: 0000000000000000 (not changeable)

for all 4 Locos
Station Address Programming

<table>
<thead>
<tr>
<th>Loc 4</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loc 3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>B</td>
</tr>
<tr>
<td>Loc 2</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>C</td>
</tr>
<tr>
<td>Loc 1</td>
<td>*</td>
<td>0</td>
<td>#</td>
<td>D</td>
</tr>
</tbody>
</table>

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 (toggle)
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

(A) / 7: CV / Value increase
0        / 8: CV / Value decrease ----- CV checking / reading

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

CV:001   Va:000 001-00

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

It is much quicker but not supported by older decoder.

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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>B</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>C</td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>#</td>
<td>D</td>
</tr>
</tbody>
</table>

**Turnout **/  
A→Z  
Z→A  

**Save**

1→99  99→1

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.

Erasing 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

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>#</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

- **Disp Kbd TnDelay**
  - 20x4
  - B/A
  - 50x40ms

- **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 (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 still 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 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**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>#</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

**Data**  **PwSafe**  **Link**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Save</td>
<td>Off</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Off / On (toggle)</td>
<td>Off / On (toggle)</td>
<td>Send / Wait for EEPROM data</td>
<td></td>
</tr>
</tbody>
</table>

**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.
MiniDCC© Station for model railroad control

Rotary knob preset

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>#</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

**aDx** analog Direction

To use this function the MiniDCC© Station has to be switched into analogue 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)

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.

---

via ICSP-Interface

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

---

Updater application

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

More details you’ll find in the section MiniDCC® Application resp. concerning 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.
To download and update the application, resp. Upgrade the Firmware of MiniDCC® Station, a internet connection is required.

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

(MiniDCC Firmware Updater)

(Icon on desktop)

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

MiniDCC © Application - Version Update

Select “Version Update”, either

the last update is downloaded (status of download in the bottom line) or

the version is already the most recent → no update necessary

press OK to continue resp. to restart the 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.
MiniDCC© Application for model railroad control

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

Select “Firmware Upgrade”
look for the available HEX files
select the appropriate HEX file
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 pushch button SW3

MiniDCC© Station should be in “normal” Operation Mode

Press the button Connect

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)

The bottom screen will show a message from the MiniDCC© Station, indicating it is ready for Uploads

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.

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

BootLoader Mode
P:0B9A

40 - 60 Seconds

Automatic Restart

BootLoader Mode
Upgrade Done!

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 “xxxxxxxxx.Tout” of the dedicated PC.

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

PwSafe must be On !!
Data Load / Turnout Safe

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

Select “Turnout Load/Save”

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

switch Data to “Load” (toggle)

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

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

Data PwSafe Link

Load On Off

PwSafe must be On !!

Content of Data file

MiniDCC© Station

MiniDCC© Application

Application for model railroad control
MiniDCC© Application for model railroad control

**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 xxxx.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 the View/Print button in MiniDCC® Application (in lower right part of Window), a protocol of the Turnout Decoder results is available.
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.
Actual turnout routes and positions

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

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.
MiniDCC© Application for model railroad control

CV Programming

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

CV Reading - Preparation

MiniDCC® Station

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

MiniDCC® Application

Select CV Programming Mode section

Select the CV you want to read (Custom = individually, Default = CV# 1..5, All)

on the 3 Pages (CV# 1.. 64, 65..172, 173..255) and then return to Page 1
CV Programming

CV Reading

1. Pressing the **Start Upload** button 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 the display of MiniDCC® Station.
4. The CV result is shown besides each CV chosen.

Pressing the **View/Print** button (in lower right part of Window), a protocol of the CV results is available.
MiniDCC© Application for model railroad control

**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**

Start the Link by pressing the appropriate control button

The remote control display is represented.

The array “MiniDCC Station USB Link” has a blue background and all loco information are empty.

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 - USB Drivers

The drivers for the UART/USB converter, basing on MicroChip PIC 16F1455 placed e.g. on interface board (daughter 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 above 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**
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

- E.g. LCD-Display
  - 4 x 20 characters
- MiniDCC© Station
- Main Board
- Output
- Track
- Input
- Power
- USB
- Flat Telephone
- E.g. keypad of telephone type
- e.g. Extension Board for potentiometers with moment push button for direction control
- necessary cables
MiniDCC® Station for model railroad control

Shopping Store and Downloads

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

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

New version 2.0 - 16F1938
Firmware Updater/Programming/Turnout Save and Load
Schematic and Parts list
PCB Layout
Latest 16F1938 HEX file
SHOPPING STORE NEW!!!

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 microcontroller 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

© Robert Côté and John Zajdler, Canada
Page 38 of 48
MiniDCC© Station for model railroad control

Dimensions of PCB: 80 x 39 mm
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

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

# Switches have to be open in normal position and closed if pushed.
Extension boards - daughter 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

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

SW4 .. SW7: optional push-on switch on R1 .. R4 (Direction Control)
**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**: 0 .. 9, *, #, A .. D
- **hexadezimal**: 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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>B</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
<td>C</td>
</tr>
<tr>
<td>*</td>
<td>0</td>
<td>#</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Telephone</th>
<th>hexadezimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>[F]</td>
</tr>
<tr>
<td>B</td>
<td>[E]</td>
</tr>
<tr>
<td>C</td>
<td>[D]</td>
</tr>
<tr>
<td>D</td>
<td>[C]</td>
</tr>
<tr>
<td>#</td>
<td>[B]</td>
</tr>
<tr>
<td>*</td>
<td>[A]</td>
</tr>
</tbody>
</table>

**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”.

© Robert Côté and John Zajdler, Canada
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 °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.

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**

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 (Programming on Main track)
- JMRI (Java Model Railroad Interface)

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