

DCC MiniStation (Version 5.x) – Operating Instructions

General

This version of the MiniStation uses the more recent 16F628 micro controller from Microchip. The software has been re-written to take advantage of the additional memory available. The following features have been added to the original 16F84 design:

1. Support for 128 speed steps (in addition to 14 and 28 steps);
2. Auto-repeat feature on all keys to facilitate data entry;
3. Emergency stop brings all loco to a stop without re-setting direction or headlights status;
4. Turnout control has been added with the possibility of recording and playing back up to 26 different routes to a total of over 120 steps. The recorded information remains in memory even with power off. Routes and Sequencing steps may be added, modified or deleted at any time;
5. Automatic sequence playback and individual turnout control (with keyboard entry) are supported while in operating mode;
6. Function F1 to F4 (ON and OFF) in addition to FL are now supported and are accessible while in operating mode.

Note: Since any 4x4 matrix keyboard can be used, the following instructions will refer to key numbers as follows:

1	2	3	C
4	5	6	D
7	8	9	E
A	0	B	F

Fig. 1

Connecting the MiniStation

Note: This paragraph applies to a limited number of assembled units – Power connections to other units will vary according to individual design preferences

Power must be applied to the two right hand connectors (when viewing the Station from the top) – These connectors are labelled <13> to indicate a nominal 13 volts (between 11 and 16 volts is acceptable). Polarity must be respected. A diode across the connectors will cause the supply to short out should the connection be reversed, offering some form of protection.

If the power is applied too slowly (using for example a DC train controller and moving the throttle slowly), the unit will fail to initialise and a blank green screen may appear. If that happens, remove the wire and reconnect – the unit should now initialise properly. This is a function of the LCD display and not the MiniStation itself.

Power to the track is from the other two connectors – there is no polarity as the DCC signal is bipolar by nature. Reversing those leads will have no effect on direction.

Version Identification

When the unit is powered, the version number appears for one half second and the unit then defaults to operating mode.

Initial Setup

Upon powering the unit, the LCD screen will show as follows:

Loc:03* 04* 05* 06*

->000->000->000->000

This means that the first locomotive being controlled is at DCC address 03, the second one at address 04, etc. The * following the address indicates that its headlight (Function FL) is ON. A – will indicate that the headlight is OFF.

The -> indicates forward movement and the <- indicates reverse. The 000 is the speed and will show from 000 to 031 for each locomotive.

At start-up, all headlights are ON and the speed is Zero with movement set to forward.

The actual address of the locomotives may vary from the above, depending of what addresses were programmed in the unit as will be shown further down.

Emergency Stop button

The Red pushbutton (S1) activates the emergency stop function. The word Emergency Stop appears on the screen and the system reverts to operating mode after about 2 seconds. There is no need to press the Stop button again. On Emergency Stop, the speed is reduced to zero and all locos are brought to an immediate stop. The direction of travel and the status of the headlamps remain as they were before the stop.

Operating Mode Menu button

S2 is used to toggle between the main Operating mode (Speed and Direction), the turnout sequence playback mode and the F1-F4 function control menu. The Speed/ Direction information data continues to be transmitted even when displaying sequence or function status.

Turnout sequencing playback mode

The LCD screen will initially show as follows:

Ply Rte A 01 00|

[123]

meaning, we are in Play mode, showing Route A with turnout 00 Normal (not thrown).

100 separate turnouts can be addressed in a sequence with a forward slash indicating a throw and a vertical bar | indicating Normal.

The bottom number indicates how much memory is left for sequencing data. This reduces towards zero as information is recorded (see Turnout Recording Mode Menu).

To <Play Back> a recorded sequence, select the desired route (From A to Z) with keys D and E and press key F to start the play back sequence. The signal will be sent along without disturbing the continuous speed and direction data.

To <Review> a turnout sequence, first select the desired route with Keys D and E and 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, enter a value between 00 and 99 using the appropriate key and press key 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 C 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.

Function Mode Display (F1-F4)

Pressing S2 once more will bring the Function Mode display. The top line of the display shows the Loco number and the status of the Headlamp function (ON or OFF). The second line shows the same status for F1 to F4 in sequence. For example, the following display:

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L01*L02*L03-L04*  
*-----*-----
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would indicate that Loco#1 has its headlights ON and Function F1 On, F2 Off, F3 Off and F4 On; Loco#2 has Headlights On, F1 Off, F2 Off, F3 Off and F4 On; Loco#3 has Headlights Off, F1 Off, F2 On, F3 On and F4 Off; etc.

Functions may be turned On or Off without disturbing normal Speed and Direction information while in operating mode.

Programming Mode

To enter programming mode, the emergency stop pushbutton (S1) must be pressed first and, while the screen is showing Emergency Stop, the black pushbutton (S2) is then pressed. The display defaults to the programming menu, starting with the Station Address Mode and show as follows:

Statn#1 #2 #3 #4

Addr 03 04 05 06

Pressing again will move you to the CV programming mode:

Serv Mode Pag/Reg

CV:001-000 01-00

and finally to the Turnout Sequence programming mode:

Rec Rte A 01 00|

[123]

Pressing S2 once more will bring you back to the operating mode.

Station Address Programming

Statn#1 #2 #3 #4

Addr 03 04 05 06

To change the address of station #1, press Key A once. To decrease the address setting, press Key 0. To change Station#2 address press the button immediately above (Key 7). Pressing Key 8 will decrement the address of station #2. The same applies for the other 2 stations. The information appearing on the screen will be recorded in memory as soon as you move to another menu. Once back in Operating mode, you will see the change following the <Loc:> symbol as it will now reflect the new station address.

Important note: While it is possible to program an address with a value of 00, this should be avoided as address Zero is a broadcast to all decoders – doing so will confuse other decoders and result in erratic operation from all you locos on the track.

This version now supports 3 step modes (14, 28 and 128). The default mode is 28; to access the other modes press the right hand keyboard buttons (Keys C, D, E or F) for station 4, 3, 2 and 1 respectively. Doing so will show a “<” or “>” besides the station address, indication 14 or 128 step mode. This information will remain in memory even with power off. When in 14 step mode, the display will stop at 14 for speed adjustment and conversely, when in the 128 step mode, the display will move up to 128.

Most DCC decoders arrived programmed at address 03 (check with your Decoder manufacturer). If you know the particular address of your decoder, you can program this address at any one of the four location and this address will remain set in the MiniStation even after powering off the unit.

Service Mode (Register) programming

This mode must be used with only ONE locomotive on the track at the same time. Most people use a special programming track set-aside for this function. The reason is that all loco decoders will listen to those commands and will therefore all record the same information. For example, if you wanted to program a decoder to respond to address 06, all decoders on the track at the time of programming will now change their address to 06 and respond to that address from now on...

To change a decoder address, place the loco with the decoder you want to change on the track by itself and move to the CV programming menu.

The screen will now show as follows:

Serv Mode Pag/Reg
CV:001-000 01-00

The CV (Configuration Variable Register) is selected using Key A and Key 0 (increase/decrease) from 000 to 255. The data value that you want this register to take is selected by using Key 7 and Key 8 again, increasing and decreasing until the desired value is attained. The Page/Reg display shows the equivalent Page/Register value for those who are more familiar with this format and whose decoder's literature includes it.

Most people will work with 3 or 4 values but the station will allow any register to be programmed and includes four different mode of programming in order to remain compatible.

Coming back to our example, you would select CV001 (this is the address register for all decoders) and then select 006 for the value. Pressing Key B will send the signal to the decoder using the first programming mode called *Page Programming*. Normally, you will hear 3 faint ticks as the decoder energizes the engine shortly. Pressing Key 9 will send the information again to the decoder but this time using the *Physical Register* mode (this mode as all the other produces only 1 faint tick from the motor).

The Physical Register mode only supports the first 8 registers (1-8) so selecting any other value will be ignored. The third mode is again selected by pressing Key 6; this is know as the *Direct Programming* mode and finally, the last mode is selected by pressing Key 3; this is know as *Advanced Direct Programming*.

Since not all decoders respond to all modes, the MiniStation supports all four modes – there is no harm in sending a signal to a decoder that does not support the mode – it will simply ignore it. If your decoder does not respond to a mode, try another one until you get the desired results.

From experience, all high end Digitrax decoders supports all mode while the lower cost MRC will not respond to the *Advanced Direct Programming* mode...but will respond the either the *page* or *physical register* mode.

Other CVs you may want to experiment with are CV3 and CV4 setting up the inertia or acceleration value. For example, I find that programming a value of 5 at CV3 and CV4 provide for a very realistic acceleration and deceleration characteristic when pressing the reverse button with the locomotive.

Most CVs used in accessory decoders are in the 500 areas. In order to facilitate quick access to those registers, it is possible to decrement beyond 000 using Key 0; this will bring you immediately to CV 511 – from there, you can increment and decrement to the proper value using fewer strokes. The MiniStation can address from CV000 to CV999 with values from 000 to 255.

Turnout Sequence Programming Mode

With no sequence programmed, the initial screen will show as follows:

Rec Rte A 01 00|
[123]

The <Rec> symbol indicates that we are in **Recording** mode;

<A> is one of 26 possible routes – A recording can start on any route – all those with no sequence programmed remained blank.

<01> indicates the sequence number for that particular route; this value will increment automatically as data is entered (see the **How to enter data** section below);

<00> indicates the turnout ID. Each turnout is assigned a number by the accessory decoder; the MiniStation supports up to 99 turnouts (from 01 to 99). The value <00> is used to erase a sequence and free memory for further sequencing (see **How to erase and/or re-program a sequence** below).
<|> indicates the status of this particular turnout; the straight bar indicates a thru switch and a </> indicates a thrown switch;
<[123]> indicates the number of free memory slots; one turnout ID and status takes up one slot of memory. This value decrements towards zero as new data is entered and increment when data is erased

Pressing Key D and E will increment and decrement the route identifier (from A to Z).
Pressing Key A and B will increment the sequence number within that route.

Operating Principle

Turnout sequencing is achieved by identifying routes and assigning turnout Ids and status to this route. Up to 26 different routes can be created and up to 99 different sequence can be assigned to these routes. Individual turnout Ids can be replaced or removed all together as required. . Routes name and sequences remain in memory even with power off. Individual turnouts may be tested by entering their Id directly on the keyboard and pressing Key C to toggle the switch status; this can be done in both playback or recording mode.

A typical program may look like this :

Route A – 01 25 /, 02 32|, 03 12 /, 04 15 |

Route B – 01 25|, 02 27|,03 29 /,04 15|,05 18 /,06 22 |

At any type, the user can swith to the turnout menu, select the Route A, press Key F and the following sequence will occur:

Turnout 25 will be thrown, turnout 32 will be reset, turnout 12 will be thrown and turnout 15 will be reset. Simirarly, Route B can be selected and played back while the trains are in motion, resulting in the switches being thrown as per the recorded sequence.

How to enter data

Once a route is selected (Keys D and E), enter the turnout ID using the keyboard (0-9) then press key C if you want the switch thrown (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.

To record the data, press Key F; the sequence number will increment to 02, ready for the next ID.

Pressing Key A and B allows to review the route sequence.

When satisfied, just revert to the operating mode and play back the route(s) as required.

How to erase and/or re-program a sequence

To change the status of a turnout or the turnout ID in a sequence, just select the route and the sequence number and enter the new route and status using the keyboard and pressing Key F; this will overwrite the existing ID and status.

To remove a turnout ID from the sequence, select the proper route along with the ID to be removed and enter a value of <00>, then press Key F 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.

Operating Mode

Once your station address agrees with the decoder you are using, you are ready to operate the locos on the track. Up to four locomotives can be driven simultaneously.

Assuming Loco#1 has address 03, its headlight should be ON. Pressing the lower right button (bottom row) will toggle the headlight of that loco ON and OFF with the display alternately showing a * or a -. This is the ENT button on some keyboard.

Pressing the button just before it (on the same row) will toggle the arrow from right to left, indicating a reversing of direction. This button is marked DEP on certain keyboard. Locos with directional headlights will show the proper headlight coming ON.

Pressing the left most button will increase speed (from 0 to 31) and pressing the button next to it will decrease speed. All four locos will operate the same way from bottom to top with the four buttons indicating SpeedUp SpeedDown Direction and FL (ON or OFF).

We suggest you practice with the buttons to get the right feel as you move from one loco to another and remember the Emergency stop is very handy at times when the situation gets out of hands...

CV Programming Mode

This mode must be used with only ONE locomotive on the track at the same time. Most people use a special programming track set-aside for this function. The reason is that all loco decoders will listen to those commands and will therefore all record the same information. For example, if you wanted to program a decoder to respond to address 06, all decoders on the track at the time of programming will now change their address to 06 and respond to that address from now on...

To change a decoder address, place the loco with the decoder you want to change on the track by itself and move to the CV programming menu (pressing the programming button twice).

The screen will now show as follows:

Serv Mode Pag/Reg

CV:001-000 01-00

The CV (Configuration Variable Register) is selected using the first two buttons on the bottom row (increase/decrease) from 000 to 255. The data value that you want this register to take is selected by using the buttons on the row above the bottom one (buttons 7 and 8) – again, increasing and decreasing until the desired value is attained. The Page/Reg display shows the equivalent Page/Register value for those who are more familiar with this format and whose decoder's literature includes it.

Most people will work with 3 or 4 values but the station will allow any register to be programmed and includes four different mode of programming in order to remain compatible.

Coming back to our example, you would select CV001 (this is the address register for all decoders) and then select 006 for the value. Pressing the bottom third button (marked DEP) on certain keyboard will send the signal to the decoder using the first programming mode called *Page Programming*. Normally, you will hear 3 faint ticks as the decoder energizes the engine shortly. Pressing the third button of the second row from the bottom (button 9) will send the information again to the decoder but this time using the *Physical Register* mode (this mode as all the other produces only 1 faint tick from the motor). The Physical Register mode only supports the first 8 registers (1-8) so selecting any other value will be ignored. The third mode is again selected by pressing the third row button from the bottom (button 6); this is know as the *Direct Programming* mode and finally, the last mode is selected by pressing the top third button (3); this is know as *Advanced Direct Programming*.

Since not all decoders respond to all modes, the MiniStation supports all four modes – there is no harm in sending a signal to a decoder that does not support the mode – it will simply ignore it. If your decoder does not respond to a mode, try another one until you get the desired results.

From experience, all high end Digitrax decoders supports all mode while the lower cost MRC will not respond to the *Advanced Direct Programming* mode...but will respond the either the *page* or *physical register* mode.

Other CVs you may want to experiment with are CV3 and CV4 setting up the inertia or acceleration value. For example, I find that programming a value of 5 at CV3 and CV4 provide for a very realistic acceleration and deceleration characteristic when pressing the reverse button with the locomotive already going at a fair speed; the loco will decelerate very slowly, stop reverse direction and starts accelerating towards high speed again. A value of 0 in both those registers will cause the engine to an abruptly stop and reverse with no inertial at all – (convenient for testing).

Refer to your decoder manufacturer for a list of all CVs and their suggested values.

For example, CV29 is a very important one when you need to alternate between DCC and pure DC, or reverse the headlight feature when operating a locomotive with Cab forward or backward. Again, either refer to your decoder literature or check the NMRA standards for more details.

28 or 14 Speed Steps programming

If your decoder does not support 28-step programming (or is programmed for 14 steps) you may wish to change the station setup to 14 steps. To do this, proceed to the station programming menu and, press one of the four buttons of the last column until a small backslash \ appears next to the address you want to control using 14 steps. This stepping feature will only affect the address you have selected and will remain in memory once power is off. Back in the operating mode, you will note that the speed indicator will stop at 15 instead of 31 as it did before.

A good indication of a decoder being programmed in a 14 step mode is the fact that the headlight will come ON and OFF as the speed up button is pressed while the station is in the 28 step mode. At this point, you can either reprogram the station to 14 step mode as described above or better yet, re-program the decoder (see CV29 literature) to respond to the full 28 step mode.

Trouble Shooting and Various Characteristics

The station itself is fairly rugged however care must be taken not to mix up the power leads. As well, the built-in booster has a high temperature detecting circuit that will attempt to protect it in case of direct short on the track – It is not designed to withstand constant or repeated multiple shorts. While the internal circuits will shutdown the unit, it is recommended that the cause of the short on the layout be remedied before re-applying power to the station when it is connected to that layout.

Upon power up, the power the MiniStation must be applied in a quick manner. In other words, the unit will not reset and initialize properly if for example it is fed from a variable power supply and the power is increased very slowly from zero to 13 or 14 volts – It must come on at once as when someone throws a switch!) Failure to do so will result in a blank lit display with no data showing – As well, in rare circumstances, internal data may be lost and the Station address may need to be re-programmed. This does not indicate a bad unit, simply that the Micro-controller was not initialized properly. Re-initializing (and sometime address re-programming) may be necessary for the unit to return to normal working condition.

The Booster will not operate at a voltage lower than about 10 volt DC. This is a limitation of the chip used in the design. The output of the MiniStation is within the recommended standards for all scales with an upper limit output of about 20 volts DC at 3 amps. This is enough to run about 4 or 5 loco at the average 500/600-ma load. This booster uses an advance MOSFET chip with the very low RdsON resulting in cool operation even at the maximum load. The heat generated inside the case comes mostly from the 5.5 volt regulator used to power up the display – This regulator is on an heatsink and the heat generated is normal and controlled; even for prolonged period.

Finally, as described in the programming instructions – it is very important that only ONE locomotive be on the track when programming decoders. A good sign of such error is when all locomotives starts responding to the same address and will no longer respond to the address they were assigned...

(Revised – 19 February, 2001)

Operations Mode

In operations mode, pressing the black pushbutton will cycle the screen through various displays showing Turnout sequence play mode and additional function mode F2-F5. These functions become operational only with decoders that support them. This will be explained in more details later.

AutoRepeat feature

Holding any key down for more than a second will cause the auto-repeat feature to kick in, thereby allowing a quick access to high end numbers.

Normal Precautions

The DCC output signal is generated using a sophisticated MosFet driver chip. This chip is located in the battery compartment of the case. Care should be taken if this compartment is opened, as the leads are fragile.

There is no provision for short circuit protection other than the protection afforded by the chip design itself, using a built-in temperature sensor. While we have tested the unit under various conditions, we do not recommend deliberately shorting the output. Repeatedly doing so may cause the device to exceed its maximum rating and cause unpredictable damage.

It is normal for the back of the unit to become warm during operation. This is due to the voltage regulator used to feed the LCD display backlight.

Acknowledgment

The software version of the MiniStation was arrived at thanks to the help of Johnny Zajdler who came up with the idea of turnout sequencing and who helped developed the concept (as well as designing the PCB). Dr. David Harris developed the autokey repeat feature and helped in implementing the various concept imbedded in this new version.

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