Digitrax ®

Complete
Train
Control

DCS240+ Manual

Includes Instructions for:
DCS240+ Advanced Command Station Booster

LocoNet ®

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Introduction

Congratulations on your purchase of a Digitrax DCS240+ Command Station (CS)!

The design of the Digitrax Complete Train Control® system lets you operate your layout the way you choose. With LocoNet® you simply connect system components to build the layout control system that you've always wanted! The Digitrax system reduces and simplifies layout wiring.

The DCS240+ is an advanced CS that is intended to be used in conjunction with an existing Digitrax installation. The DCS240+ offers a number of features that make it ideal for large layouts, clubs, and modular groups who will be running many operators and trains. These features included in the DCS240+ are as follows:

• Run up to 400 locos and support up to 400 throttles in command station mode
• Direct USB connection for easy computer interface
• Independent SoundFX and decoder programing function via USB port using Digitrax SoundLoader PC software
• Hardware Loco Reset button for easy clearing of mobile decoder info from DCS240+
• Option Switch (OPSW) settings for CS operation customization
• Hardware EZ Routes button for simple route setup
• Automatic CS collision detection via LocoNet. Layouts can have only one CS!
• Continuous F0-28 refresh support
• Transponding detection support on Local booster tracks
• Improved Program Track output with automatic support for Power Extender equipped locos
• All storage is in non-volatile memory, no battery changes required!
• User selectable multi-scale operation for Z, N, HO, and large-scale layouts
• Electronic Non-Volatile track voltage customization for each scale setting

In addition to your DCS240+ you'll need:
• A DC 13.8V to 24V power supply with 5 or 8 amp capability. You may be able to use an existing *DC supply* if it supplies sufficient current and suitable DC voltage for the scale setting in use; typical N scale = 13.8V, HO = 15.8V and G scale = 23V.
• A Digitrax Throttle
• One or more mobile decoders for your locomotives.

Note: This manual is written assuming you will be using a DT602 or later throttle. Some throttles may not have access to all features. All throttles can select Locomotives, and most can turn ON/OFF track power. For specific instructions for other throttles please refer the throttle's manual.
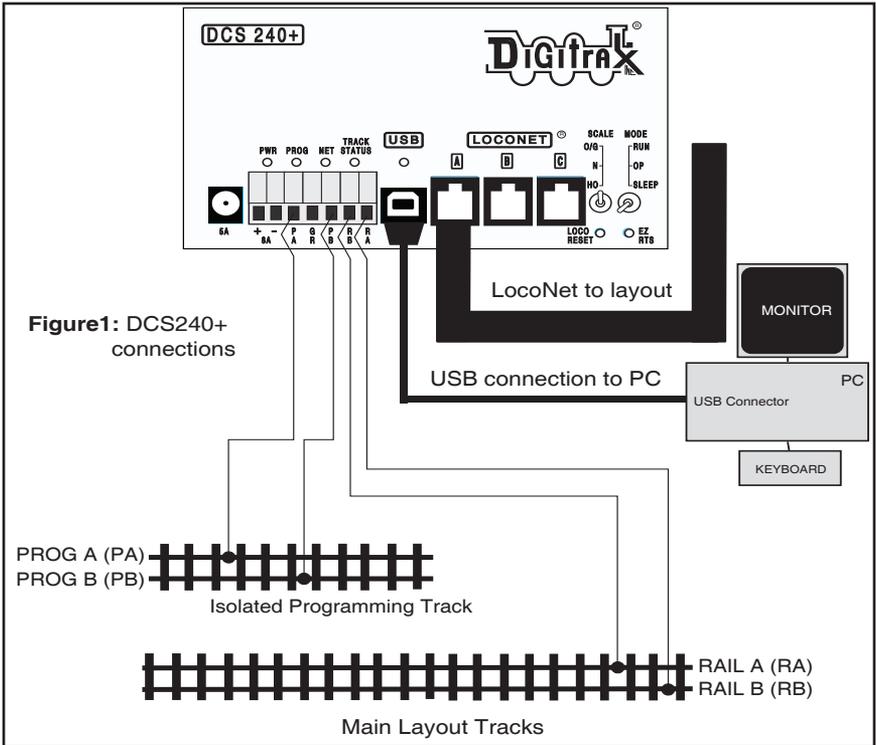
Figure1: DCS240+ connections

LocoNet to layout

USB connection to PC

PROG A (PA)
PROG B (PB)
Isolated Programming Track

RAIL A (RA)
RAIL B (RB)
Main Layout Tracks

1.0 DCS240+ Quick Start Guide

These instructions will get you up and running in just a few minutes! It is recommended that you use this quick start guide before adding the DCS240+ to an existing Digitrax installation to ensure the DSC240+ is configured in working order, and to observe any features you may be unfamiliar with. Once you've completed the initial review of your DCS240+ on a test bench, you can remove your existing CS from your layout and replace it with. the DCS240+. These setup steps are broadly similar to debug steps of a DCS240+ if problems are encountered. Figure 1 shows the DCS240+ connection and front panel layout.

1.1 Standalone DCS240+ setup and powering:

1. Disconnect the RA/RB and PA/PB leads on the 7-pin layout connect plug. Disconnect the 3 LocoNet RJ12 and USB ports. This isolates layout wiring issues.
2. Set the DCS240+'s SCALE switch to the scale you are running: N, HO, O/G. Use the lowest setting and DC input voltage that will run your layout.
3. Set the MODE switch on the DCS240+ to the RUN position.
4. Connect the 5A capacity DC power supply of 13.8V DC minimum voltage via the 2mm DC jack, or an e.g. 8A/13.8V supply via the 8A+/- terminals.
5. The DCS240+ will beep twice and its PWR indicator will light GREEN, winking off every 3 seconds as a "Heartbeat". At first power up the RED PROG led will flash for about 3 seconds and then go off, showing internal diagnostics are complete.
6. NET led will light RED showing LocoNet is active hi, and not held off. The BLUE

USB led should be off.

1.2 Initial DCS240+ testing:

1. Press the "LOCO RESET" button below the SCALE switch to ensure the CS powers with NO locomotives selected or consisted. The DCS240+ will beep 3 times to confirm reset has occurred.
2. Plug a DT602 into the LocoNet "A" jack on your DCS240+.The DT602 should beep and power up.
3. During this plug-in the red NET led should wink off several times showing the DCS240+ has seen the DT602 logon messages OK.
4. Press the DT602 PWR key and then; the TRK_On or A-softkey and then the TRK_OFF or B-softkey. The TRACK STATUS led should light slightly "yellow" with TRK power ON and dark when the TRK is powered OFF.
5. Press the "LOCO RESET" button below the SCALE switch to ensure the CS starts with NO locomotives selected or consisted. The DCS240+ will beep 3 times to confirm this has occurred.
6. On The DT602, press keys: Loco, then 0, then Loco again to select the Analog or "address 00" locomotive. Watching the TRACK STATUS led, turn the active throttle speed up to 99% and observe this led color changing. Press the Direction key below the active throttle and you should now see a noticeable color shift.
7. This checks out locomotive selection and track control without requiring a known functioning decoder install.

NOTE: These are DT602 instructions, please refer to your specific throttle manual for similar steps to perform these tests.

1.3 DCC Decoder functional test: These steps will allow you to verify DCC control with an unknown DCC decoder in a test locomotive.

1. Connect two wires from a short piece of isolated test track to the PA and PB programmer terminals.   Place a test locomotive with a DCC decoder installed onto this temporary programmer track.

2. On the DT602 press keys: Menu, 1 , then the READ or A-softkey.

3. The DT602 will read a DCC decoder on the programming track and show Quick Decoder Setup result screen as shown at right. During this read process, the PROG led will flash RED.

4. This example line #8 shows AD4 is OFF, so we will address this DCC decoder with AD2 or Short address, shown in line #1 as 0003.

5. If 'Use AD4' is ON, then we would use line #2 or AD4 or Long Address value of 4425 to select this locomotive.

6. If there is a problem and the DCS240+ cannot see the test locomotive and installed DCC decoder on the program track, the status line shows "Program Track Empty!" and you will need to correct this likely connection

```
Quick Decoder Setup:
       Pd Mode
0- Last Menu
1- AD2 ShortAdr =   0003
2- AD4 Long Adr =   4425
3- CV29 Value    =   06
   4- NDOT Rev           OFF
   5- 28 not 14 Step     ON
   6- Analog             ON
   7- Speed Table        OFF
   8- Use AD4            OFF
9-


  READ   |   WRITE   |   DATA
```

problem before proceeding.

7. If the PROG led *does not flash after you press the READ key*, the program track has a stray voltage or isolation problem, and you will have to power cycle the DCS240+ *after* you fix this program track issue.

8. Now move the two test track wires over to the RA/RB main track terminals. Make sure the TRK STATUS led is lit, so the locomotive is energized.

9. On the DT602, for the active throttle press the Loco and the detected active AD2 or AD4 address number from steps 4 or 5 earlier. Press the Loco key again to complete decoder address selection.

10. Ensure that as you increase the now active throttle speed the locomotive responds in both directions by movement on the track.

11. At this point you have proven the DCS240+ will operate properly and you can now install this on your layout.

1.4 Layout hookup test: These steps will introduce the DCS240+ to an existing layout.

1. Before connecting the DCS240+ RA/RB terminals to the layout, perform a short-circuit detection test. With TRACK STATUS lit/ON, short these two terminals or connected wires together. The DCS240+ should beep 4 times and turn OFF the track for about 1 second, then briefly pulse on the led to show it is attempting to restart track power.

2. If the DCS240+ does not shut down reliably, check that the DC supply is rated for 5A if connected via the 2mm DC jack, or 8A if connected to the 8A+/- terminals.

3. If the PWR or NET leds flash quickly during this short test, this indicates that the DC supply voltage collapses too low at the short circuit current draw, so a better DC supply is required to properly operate.

4. If the Short circuit test is OK, you can now connect the RA/RB terminals to your layout, and check you can now run the locomotive from *section 1.3* step 10, OK on the mainline tracks.

5. Now you can connect the layout LocoNet connection to a RJ12 port on this CS. If the NET led remains lit red, you can connect the DT602 to a loconet jack around the layout and check it will again operate the test locomotive OK.

6. As you operate the test locomotive the NET led will flash indication loconet control messages are being received. If the NET led stays off, the loconet has short problem in the layout cabling.

7. You can now hook up an isolated program track and test it works as for *section 1.3*.

8. If your DCS240+ detects two command stations on the LocoNet at power up, it will issue 10 long beeps and turn off all track power.

1.5 Shutting Down the System

When you are finished with your session, you can shut down the DCS240+ by turning off power to the system, but this may fail to save some just-modified data. Some users prefer to "dispatch" or release all addresses active in their system before shutting down. This can prevent unexpected results when you power up the layout again. *You can simply press the Loco Reset Button on the DCS240+ to clear all addresses from the command station at the end of a session.*

1.6 Best practice System Shut Down:
1. Press the DT602 PWR key and then the TRK_OFF or B-softkey. The TRACK STATUS led should go dark when the TRK is powered OFF.
2. Move the command station's MODE switch to the SLEEP position and wait 5 seconds.
3. For zero power draw, turn off the power to the whole DCC layout system.
4. Alternately power to the CS can be left on if desired. In "sleep" mode, this CS consumes very little energy. In this state the CS provides keep alive power to all throttles that are connected to LocoNet, and DT602/UT6's can be configured to Charge their batteries during this sleep time.

2.0 Resuming your session
When you are ready to resume your session:
1. Turn on the power to the system
2. Move the command station's MODE switch to the RUN position.
3. If required press the DT602 PWR key at bottom left and then the TRK_ON or A-softkey. The TRACK STATUS led will light when the TRK is powered ON. By default the DCS240+ will resume in whatever state it is powered off in

2.1 Programming DCC decoders:
Figure 1 and Section 1.3 detail connecting an Isolated program track for Service mode CV programming.

2.1.1 Service mode programming
Service mode programming broadcasts a message to all decoder equipped locos that are on a programming track connected to PA/PB terminals. Because this is a broadcast method and will affect all locos, you will need to set up this programming track so that the programming instructions only go to the loco you want to program.

Your DCS240+ sends these broadcast commands using the Program A(PA) and Program B(PB) outputs.
Follow the steps outlined in your Throttle and decoder documentation to program your decoder equipped locomotives.

2.1.2 Ops mode programming
Ops mode **write** CV programming is done on the layout tracks connected to any booster, with programming directed to a *specific decoder address on the main layout tracks*. Operations mode programming is used to make changes to locos while they are running on the layout main tracks. *See your throttle manual for further instructions on Ops mode programming.*

If the DCS240+ has Booster Transponding mode enabled (OPSW29 =T, default) then a compatible Transponding decoder on the track supplied by the DCS240+ booster RA/RB terminals will also be able OPS Read CV's, as well as writing values. See *section 6.0.*

3.0 DCS240+ Front Panel

3.1 Power (PWR) Indicator

This LED indicates there is power supplied to the DCS240+. It will light either green (command station mode) or red (booster mode). The PWR indicator will light GREEN or RED winking off every 3 seconds as a "Heartbeat" when the unit is in RUN mode. *See Section 3.17 for full light (LED) indication list.*
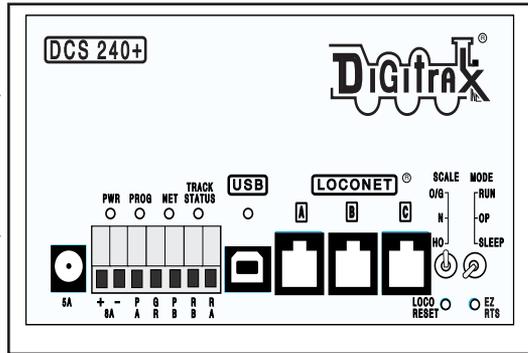
3.2 DC Power In 2mm Jack (5A) or screw Terminals ("+" and "-" 8A)

The DCS240+ may be powered either using the 2mm jack or the screw terminals labeled 8A "+" and "-". The 2mm center positive jack is rated for a maximum of 5 amps. The screw terminals can be used with any suitable power supply up to the unit's maximum 8 amps. *The DCS240+ sets the current limit based on the active DC input.* Make sure your DC power supply is rated for your desired voltage and amperage. When using the screw terminals make sure that the polarity of the DC supply matches the correct terminals on the connector. The DCS240+ is reverse input protected, but it will not power on if the DC polarity is incorrect. **Never power with AC voltage.**

The DCS240+ is for use with DC voltage input ONLY, MAXIMUM INPUT is 8 AMPS, 24VDC, 192 VA MAXIMUM CONTINUOUS, DO NOT Exceed 25VDC Input. Minimum Input 13.8 VDC.

It is recommended that when selecting a DC power supply the voltage should slightly exceed by about 1V the track voltage you plan to run your layout at. However, the DC input voltage should not exceed track voltage by more than 3V. If the DC supply voltage exceeds track voltage by more than approximately 3V the DCS240+ will enter Safe Operation Mode and may limit its current capacity.

3.3 Program A and B terminals (PA and PB)

The PA and PB terminals are the output for the second set of command signals for the programming track that can be used while the rest of the layout continues to run. These outputs are used for both programming via USB or by programming using a throttle. When programming using USB and Digitrax SoundLoader or other software, the program track will not be available for throttle programming. You will receive a "fail" message on your throttle if you try to program in Service Mode. Operations mode programming is unaffected by USB programming.

3.4 Program (PROG) Indicator

The PROG indicator will blink red when the program track is active. This light will flash constantly when using the DCS240+ with SoundLoader.

3.5 Ground (GR) Terminal

The center terminal marked GR provides electrical safety features and an RF ground reference for minimum radiated noise. This should be the ONLY point of any DCS240+ installation that is connected to the AC safety ground pin provided on most 3 pin 110V AC power sockets. Grounding the system is a sensible safety precaution that should not

be ignored.

3.6 Rail B (RB) and Rail A (RA) Terminals

Connect these terminals to the track sections powered by the DCS240+ booster. If you are using more than this booster, be sure to use double gaps between each layout booster section and always connect the same rail to the same terminal on each booster. For example connect all Rail A terminals to the right rail and all Rail B terminals to the left rail or vice versa to match rails on all track sections.

3.7 USB Connector

The USB connector is used to connect the DCS240+ to a computer. See Connecting the DCS240+ to a Computer in Section 8.0.

3.8 USB Indicator

The USB indicator will light Blue when there is an enumerated USB connection to a PC. This means the PC is connected using the proper drivers.

3.9 TRACK STATUS Indicator

The TRACK STATUS indicator shows the voltage on RA and RB terminals. The indicator will be lit when there is track voltage, and not lit when track voltage is off. The indicator will change color indicating various degrees of "Zero Stretching" used to operate a conventional (analog) locomotive.

3.10 LOCONET Jacks A, B and C

These jacks let you expand your Digitrax system by simply plugging LocoNet devices in to the system. They can be used for throttles and other LocoNet devices. These jacks are functionally the same and can be used interchangeably.

3.11 SCALE Switch (O/G, N, HO)

This switch sets the nominal track voltage from 3 choices.

3.11.1 DCS240+ Voltage Trim Settings

The DCS240+ is capable of custom voltage output ranging from approximately 8v to 24v with a suitable power supply. Each of the 3 scale settings can be trimmed to a custom voltage setting.

The following ranges correspond with each track setting:

	Nominal Voltage default	Nominal Voltage @ max decreased trim	Nominal Voltage @ max increased Trim
O/G	20.4v	18v	24v
HO	14.7v	14.5v	18v
N	12.4v	9v	14.5v

Note: The DCS240+ can only OUTPUT approximately as much voltage as it is receiving. If you are only using a 15V DC power supply the DCS240+ cannot output more than 15V DCC. Use a power supply that approximates your planned track voltage.

To Adjust Voltage Trim:
1. Set Mode Switch to OP. PWR indicator will flash GREEN alternating with the PROG indicator flashing RED.
2. Press the LOCO RESET button. The unit will start beeping continuously.
3. Select Address 00 on a throttle plugged in directly to the DCS240+.

4. Set Scale Switch to the Scale voltage you wish to adjust.
5. Using the Throttle with 00 selected, adjust Forward Speed to increase Voltage trim up **above** default. Adjust Reverse Speed to decrease voltage trim down **below** factory default settings.
6. The voltage can only be adjusted up or down by the range referenced in the chart above. The DCS240+ will beep continuously as long as it is in range. When you reach a value that is out of range the DCS240+ will stop beeping. Once you decrease the trim UP or Down the DSC240 will beep again once you are in range.
7. To determine the actual track voltage, measure the DC voltage (unloaded) from RA to Ground and Rail B to Ground, then add the two values together.
8. Once you have set your desired voltage press the EZ RTS button and the DCS240+ will beep once indicating the trim setting is saved. If the button is not pressed your voltage changes will be discarded. You may select a different scale and set its trim in the same manner as above before exiting Voltage Trim Mode.
9. To exit Voltage Trim Mode set the Mode switch to RUN.

To Reset to Voltage default:
1. Set Mode Switch to OP. PWR indicator will flash GREEN alternating with the PROG indicator flashing RED.
2. Press the LOCO RESET button. The unit will start beeping continuously.
3. Select Address 00 on a throttle plugged in directly to the DCS240+.
4. Set Scale Switch to the Scale voltage you wish to reset.
5. Using the Throttle with 00 selected set speed to 0.
6. Press the EZ RTS button the DCS240+ will beep once indicating the trim setting is saved. If you wish to reset other scales voltages repeat steps 4 thru 6.
7. To exit voltage trim adjust set the Mode switch to RUN.

Note: Voltage trim values for all scales will reset if OPSW40 (factory default) is Closed. All other settings will be reset to defaults.

3.12 MODE Switch
The MODE switch settings are:

RUN   normal operations.

OP   customize the DCS240+ by changing its OPSW settings.

SLEEP   shutdown the system and all throttles that are plugged in to the system.

3.13 NET Indicator
The NET indicator is a red LED indicating when valid messages are seen on LocoNet. When your layout is wired correctly and LocoNet is operating properly, the NET indicator will be on and it will wink off any time a good LocoNet message is detected by the DCS240+. The table below explains the patterns you will see for this indicator.

NET LED Indication	Meaning
Solid Red	LocoNet OK
On, wink off	DCS240+ detects a valid LocoNet message
Off	DCS240+ detects low voltage on LocoNet

3.14 LOCO RESET Button

The LOCO RESET button allows you to clear all decoder info and consists from your DCS240+. Pressing this button preforms the same function as closing OPSW 36. This button is useful in clearing all locos from the system after a large operating session or if you are getting a slot full error.

3.15 Easy Routes (EZ RTS) button

The EZ RTS button give your simple access to setting up routes in your DCS240+. For information on setting up routes refer to the Routes in *section 5.2*.

3.16 DCS240+ Audible Sounds

The DCS240+ uses several beeps and clicks that can be used as diagnostic tools that help you debug a number of conditions. Some Audible sounds mean different things depending on the DCS240+'s current mode.

Sound	Meaning
Continuous short beeps	In Voltage Trim Mode, selection is in range.
1 Short Beep	Diagnostic Beep when OPSW41 = c, LocoNet commands incoming. In EZ routes mode indicates a switch has been saved. During operation, DCS240+ has recovered from a fault
2 Short Beeps	Initial DCS240+ Power on or DCS240+ had purged a loco address
3 Short Beeps	Entered quick routes mode
4 short Beeps	Booster short circuit shutdown.
5 Short Beeps	Route Error, looping route
8 Short Beeps	Route Error, Maximum switch commands issued.
1 Long Beeps	In EZ routes, initial Route ID saved
2 Long Beeps	In EZ routes, route saved and exit EZ Routes
3 Long Beeps	When pressing the Loco Reset Button, all loco addresses purged from the system.
4 Long Beeps	Input Voltage is out of the range 13.8V to 24V DC
10 Long Beeps	DCS240+ has detected another Command Station on LocoNet and has turned off track power.

3.17 DCS240+ Indication Lights

The DCS240+ uses different combinations of the PWR, PROG, NET,TRACK STATUS, and USB indicators to provide information. The indicators can show what mode the DCS240+ is in as well as indicate errors and operations.

Indications	Meaning
PWR GREEN winking off every 3 seconds as a "Heartbeat"	The DCS240+ is powered on in Command Station Mode, Normal Operation Mode.
PWR RED winking off every 3 seconds as a "Heartbeat"	The DCS240+ is powered on in Booster Only Mode, Normal Operation Mode.
PWR off blinking on GREEN or RED every 4 seconds	The DCS240+ is in SLEEP mode. (GREEN = Command Station Mode) (RED = Booster Only Mode)
PWR flashing RED, all other indicators off	Input Voltage out of Range 13.8V to 24V DC.
PWR flashing GREEN	DCS240+ Internal fuse blown, replace fuse.
PWR RED or GREEN winking off 2 times every 4 seconds	The DCS240+ is in Safe Operation Mode. Check your power supply to make sure it is appropriate for your track voltage settings. (GREEN = Command Station Mode) (RED = Booster Only Mode)
PWR flashing GREEN alternating with PROG flashing RED	The DCS240+ is in Options Switch Mode.
PWR flashing alternating GREEN/RED once a second	The DCS240+ is overheated and has shutdown.
PWR flashing GREEN alternating with NET flashing RED fast	The DCS240+ is updating IPL firmware Via direct USB connection.
PWR flashing Green alternating with NET flashing RED slow, about once a second	The DCS240+ is updating IPL firmware Via LocoNet.
PROG blinking RED	The DCS240+ program output is active.
PROG flashing RED fast continuous	Program output is active via SoundLoader II or other software.
PROG blinking RED slow, once a second	DCS240+ is in EZ Routes mode.
USB lit BLUE	USB is enumerated and connected to a computer responding with proper drivers.
USB lit BLUE, winking off	USB is receiving data over USB.
TRACK STATUS is lit	Indicates there is power to the track. This indicator will be GREEN or different shades of Yellow/Orange depending on Zero Stretching.
NET indicator Solid RED on	LocoNet OK.
NET indicator Solid on RED, wink off	DCS240+ detects a valid LocoNet message.
NET indicator off	DCS240+ detects a low voltage on LocoNet.

DCS240+ INDICATION LIGHTS

4.0 Customizing DCS240+, Option Switch / OPSW Setup

The OPSW setup allows you to customize the operation of the unit to meet your layout and operation preferences. The DCS240+'s power up defaults are fine for most applications and the DCS240+ will run "out of the box."

4.1 Changing DCS240+ Option Switches

1. See the Option Switch Table below to decide which option switches you want to change.
2. Move the MODE toggle switch on the front of the DCS240+ into the "OP" position. The LocoNet Railsync will go inactive and all other boosters plugged in to LocoNet, including the one that is built into the DCS240+, will shut down. The PWR indicator will flash GREEN alternating with the PROG indicator flashing RED.
3. Disconnect LocoNet from the DCS240+ you are configuring.
4. Connect your DT602 throttle directly to any DCS240+ LocoNet A,B,or C.
5. Press the **SWITCH** key on the DT602 to enter Switch (SW) mode. Since the DCS240+'s MODE toggle switch is set to "OP", SW commands from your throttle will now control DCS240+ internal option switch settings instead of the accessory decoders (usually turnouts) on the layout.
6. Key in the number of the OPSW to edit.
7. Use the Closed or B-softkey key to set the OPSW to **Closed** (C) or the Thrown or A-softkey to set the OPSW to thrown (T). In the example above we have changed OPSW 6 from its factory setting of **t** to **c**
8. Exit DCS240+ OPSW Mode by moving the MODE toggle switch on the DCS240+ to "RUN." Remember to reconnect LocoNet to the DCS240+. Track power will resume to the state it was in when you entered Option Switch Mode

Note: Do not adjust any Op Switches not in the table!
These OPSW are reserved and changing them may cause problems with your system.

4.2 Special Instructions for DCS240+ Op Switches 36, 37,39 and 40

For these OPSW to work properly,

1. Set the OPSW to C by pressing Closed or B-softkey key.
2. Set the DCS240+'s MODE Switch to "SLEEP" mode.
3. Set the DCS240+'s MODE Switch back to "RUN" mode.
4. The operation will occur (data will be cleared) and the option switch will reset to "**t**".
5. Your throttle display will still show "**c**" even though the reset has occurred.
6. The display will update the next time you access the OPSW.

4.3 DCS240+ Option Switch Tables

The following tables provide a list of the DCS240+ Option Switches and the impact of the change on the system.

Option Switch #	Effect on System operation	Factory Default
OPSW 02	**t** = Command Station Mode	t
	c = Booster only Mode (not recommended)	
OPSW 03	**t** = DCS240+'s booster normal	t
	c = DCS240+'s booster is auto reversing	
OPSW 06	**t** = check for decoder before programming	t
	c = program without checking for a decoder	
OPSW 13	**t** = Loco address purge time 200 seconds	t
	c = Loco address purge time 600 seconds	
OPSW 14	**t** = Loco address purging enabled	t
	c = Loco address purging disabled	
OPSW 15	**t** = Purging will not change loco speed	t
	c = Purging will force a loco to 0 speed	
OPSW 17	**t** = Automatic advanced decoder assisted [FX] consists are enabled	t
	c = Automatic advanced decoder assisted [FX] consists are disabled	
OPSW 18	**t** = Normal DCS240+ booster short circuit shutdown time	t
	c = Extended DCS240+ booster short circuit shutdown time	
OPSW 20	**t** = Enable address 00 or analog stretching for conventional locos	t
	c = Disable address 00 or analog stretching for conventional locos	
OPSW 21	OPSW 21-23 set the global system default type for "NEW" loco selections. SW21/22/23 set as follows:	c
OPSW 22	**c-c-t** = 128 step mode **c-c-c** = 128 step FX mode **t-c-t** = 14 step mode	c
OPSW 23	**t-t-t** = 28 step	t
OPSW 25	**t** = enable Route echo over LocoNet	t
	c = Disable Route echo over LocoNet	
OPSW 26	**t** = Disable routes	c
	c = Enable routes	
DCS240+ Option Switch Tables		

Option Switch #	Effect on System operation	Factory Default
OPSW 27	**t** = Enable normal switch commands, a.k.a. the "Bushby bit"	t
	c = Disable normal switch commands, a.k.a. the "Bushby bit" Allows attached PC to handle switch control logic	
OPSW 28	**t** = Enable interrogate commands at power on	t
	c = Disable interrogate commands at power on	
OPSW 29	**c**= Disable DCS240+ Booster transponding	t
OPSW 31	**t** = Normal route/switch output rate	t
	c = Fast route/switch output rate	
OPSW 33	**t** = Track power off at power on	c
	c = Allow track power to restore to prior state at power on	
OPSW 34	**t** = Disallow track to power up to run state, if set to run prior to power on	t
	c = Allow track to power up to run state, if set to run prior to power on	
OPSW 35	**t** = Enables Loco Reset Button	t
	c = Disables Loco Reset Button	
OPSW 36*	**c** = Clears all mobile decoder info & consists	t
OPSW 37*	**c** = Clears all routes	t
OPSW 39*	**c** = Clears all internal memory states, including OPSW 36 & 37.	t
OPSW 40*	**c** = Clears all internal memory states and sets Voltage Trim to default. Resets DCS240+ to factory default	t
OPSW 41	**t** = Diagnostic click disabled	t
	c = Diagnostic click when valid LocoNet commands incoming & routes being output	
OPSW 42	**t** = Enable 2 short beeps when loco address purged	t
	c = Disable 2 short beeps when loco address purged	
OPSW 43	**t** = Enable LocoNet update of command station's track status	t
	c = Disable LocoNet update of command station's track status	
OPSW 44	**t** = Maximum slots to 400	t
	c = Limit slots to 120	
OPSW 45	**t** = Enable reply for switch state request	t
	c = Disable reply for switch state request	

DCS240+ Option Switch Tables

* See special instructions in Section 4.2 for setting OPSW 36,37,39, and 40.

5.0 DCS240+ Routes:

The DCS240+ supports up to 64 routes. Each route consists of a list that contains a TOP turnout address and its position **c** or **t** and up to 16 other turnout addresses and their positions. Routes are stored in the DCS240+'s memory and can be operated by any throttle in the system that can send switch commands. Each of these 64 routes is operated by setting the TOP turnout address to the position saved in the route list. When a route is triggered, a route can include a switch that is the Top of another route and all the entries in the second route will be added to the string of turnout commands the initial route request generates. The second route called is a "nested" route.

From the initial route you can "nest" up to 3 levels deep. Note that a route that itself does not contain another Top switch (i.e., another route) will not increase the nest depth. You can combine routes as needed to issue a maximum of 120 switch commands.

When executing a route the DCS240+ will check to see if it exceeds these limits or contains the same switch command more than once. If the route exceeds the 120 switch maximum the DCS240+ will short beep 8 times. If the route contains the same switch command twice or "loops" on itself the DCS240+ will short beep 5 times. When the DCS240+ indicates these errors no switch commands will be issued. You will need to edit the route and correct the errors in the list before trying the command again.

5.1 DCS240+ Route OPSW's:

By default the DCS240+ is set route enabled. OPSW #26 enables and disables routes. To disable routes set OPSW #26 to **T**.   You can erase all current routes in the DCS240+ by setting OPSW 37 to **C** and returning to Run mode.

You can disable LocoNet Route Echo by setting OPSW #25 to C. This will prevent the DCS240+ from copying Route commands to LocoNet when a route executes, and the SW commands will only go out over the DCC track.

*See section 4.1 for instructions for changing OPSWs.*

5.2 Setting up Routes using the EZ RTS button

To Setup EZ routes with any Switch control device:

1. Press the EZ RTS button. DCS240+ will issue 3 short beeps and PROG indicator will blink on once a second
2. Using your throttle in Switch mode select the turnout address to set as the Route ID or Number. Press **C** to close the switch and set the Route ID. The DCS240+ will make 1 long beep indicating it is ready to add turnout addresses to the route.
3. Select the first turnout address in your route and press as **T/C** to set the turnout position in the route. This first address will be your TOP address and the one you use to access the route when operating.
4. Continue selecting turnout addresses (including other route's TOP address) in this manner until you have reached the 16 turnout maximum or you are ready to end your route.
5.   To end the route, enter the same turnout address twice in sequence. The DCS240+ will long beep 2 times indicating it is saved and exited Easy Routes. The DCS240+ will also save and exit Easy Routes if more than 16 turnout addresses are entered.
6. EZ routes do not allow reading of the routes. A DT602 allows full Read/Write editing of complete routes as per *section 5.3*.

5.3 DT602 Reading and Editing DCS240+ routes:

5.3 DT602 Reading and Editing DCS240+ routes: Using a DT602 (of at least IPL version 0.6 or later) plugged into LocoNet, press the; Menu>3>4 keys to enter the advanced graphics **Route Editor** menu.

1. The "EDIT CS Route# :" screen at right will appear.
2. The LH encoder knob now selects a Route# and the RH encoder selects the black *outlined* Entry# to edit in the route.
3. Soft A key will toggle the entry from T to C direction choice.
4. Numeric keys will change the SW# in the outlined Entry position. "Add" soft key allows inserting another entry at current position and "Delete" will remove the current entry. The "SW test" soft key will send just the outlined switch# and direction to LocoNet to test a switch, or trigger a route.
5. After editing a Route is complete **be sure** to press the "Save" soft key to update this in DCS240+ non-volatile memory.
6. Press "X" to exit DT602 Route Editor.
7. If *any* 7 series Accessory device is on LocoNet during this Route edit, the DT602 will beep after about one second and also show "DS7x" routes at the D soft key position. These are additional editable route choices above DCS240+ capability.
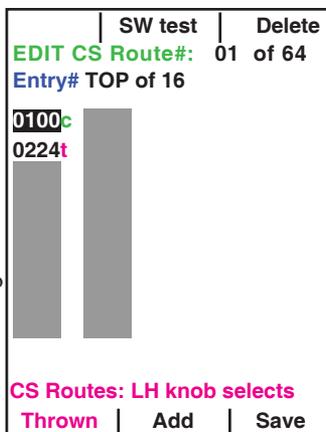
Note: If there is an error with the route the DCS240+ will beep 5 times when the route is triggered.

6.0 DCS240+ Booster Operations (OPS) Mode read-back

6.0 DCS240+ Booster Operations (OPS) Mode read-back As for *section 5.3*, with a DT602, press the; Menu>2>1 keys to enter OPS Mode programming for the *currently selected active throttle address.*

1. The initial screen allows OPS mode CV number setting or CV data read/write modify.
2. For this example, press the 5 then 8 keys to select CV#58, then press the CVDATA or B-softkey to change to the CV Read/Write screen, as at right.
3. Press the READ or B-softkey to read back CV58 for *active decoder 03 on the tracks powered by the DCS240+ booster, or RA/RB terminals.*
4. In this case the Ops Mode read is OK, and the result is the CV58 value shows 10 in GREEN.
5. If decoder 03 was a Digitrax SFX Sound decoder step 4 actually reads the Sound Volume CV. You can us the number keys to set a valid CV58 value and then press WRITE or A-softkey to change the decoder to this new volume value in CV58. This CV change is NOT on PA/PB track.
6. For Ops Read success the DCS240+ must have OPSW29=T, the decoder must be Transponding capable and enabled. Additionally for reliable OPS read there should not be incompatible or noisy decoders on these RA/RB booster tracks.
7. Detection of a transponder will provide its address in Zone 2047.
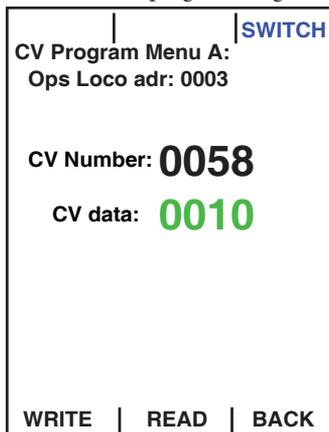
7.0 How the DCS240+ Manages Addresses

Your DCS240+ has a finite number of "slots" available in its memory. The factory default is set for 400 addresses. Once the slots available in your command station are full, the throttle will display the "slot=max" or "FF" message to let you know that you need to release some locos if you want to select and run others. *Find details on loco dispatching in your throttle user manual or you can simply press the Loco Reset Button to clear all addresses and consists from the DCS240+ CS.*

7.1 Purging of addresses:

Purging is the process by which the DCS240+ changes the status of decoders that are either not being used or are unattended to make room for other addresses to be selected and refreshed by the command station. *See Section 4.0 for setting the DCS240+ OPSW 13,14, and 15 to manage how the DCS240+ purges addresses.*

The DCS240+'s default setting for purging are:	
OPSW 13	**t =** Loco address purge time 200 seconds
OPSW 14	**t =** Loco address purging enabled
OPSW 15	**t =** Purging will not change loco speed

8.0 Connecting the DCS240+ to a Computer

The DCS240+ can be connected to a computer using the USB socket on the front. It provides all the same functionality as a PR3/PR4/DCS210+ and DCS52, giving you access to Digitrax SoundLoader and other computer utility programs. It can also be used as a LocoNet interface for other compatible PC layout control software.

SoundLoader and the DCS240+ have been tested to work on many PC compatible computers running 550MHz and faster, using Windows: XP, Vista, 2000, 7, 8 and 10, with 512MB of RAM.

Other combinations of hardware and software may also work, but are not guaranteed to work by Digitrax, if they have not been tested to operate properly. Drivers must be installed on the PC for the DCS240+ to operate over USB.

Installation consists of three steps: (a) Driver installation, (b) Hardware Setup, (c) Software setup:

8.1 Driver Installation

Before the DCS240+ USB can be used, drivers for your specific Windows version must be installed. Drivers and Windows version specific instructions are available from the Digitrax website PR3 Xtra Product page: http://www.digitrax.com/PR3Xtra.

The DCS240+ uses the same drivers and instructions as the PR3. If you've previously installed a; PR3/PR4/DCS210+ or DCS52 on the PC you are connecting to, you will **not need** to reinstall new drivers.

8.2 Hardware Installation

The DCS240+ does not require any additional special setup to be used with a PC. Once you have installed the Drivers simply connect your DCS240+ to your computer via a matching USB cable.

The USB led will glow BLUE to indicate when the USB is enumerated and connected to a PC responding with proper drivers. The DCS240+ can then be accessed with PC apps by using the new COM port.

You can use Windows or a utility like the free "UsbTreeView.exe" to determine which PC COM port the DCS240+ has been enumerated on.

The DCS240+ uses the DCS240+'s Program A(PA) and B(PB) terminals for decoder programming from the PC app. The PC communicates directly to the DCS240+, and the LocoNet A,B,or C ports echo any non-programming USB data exchanges with the PC.

8.3 Software Installation
The DCS240+ uses the same Digitrax SoundLoader program and Utilities like; LocoMonII, DTNetSetup, DigiIPL II etc, as the PR3, PR4, DCS52 and DCS210+. It is recommend that you go to http://www.digitrax.com/PR3Xtra and download the latest editions of these programs to get the most out of your DCS240+.

8.4 Connecting the DCS240+ to a Computer Additional Troubleshooting
The DCS240+ requires a driver for Windows. If the driver is not installed or not installed correctly the DCS240+ will not operate with the PC.

To verify proper installation of the drivers:

Start the Windows Device Manager. Under Ports (COM & LPT) there should be a new Communications Port (COMx) listed when enumeration occurs, where COMx is the communications port number or COM port.

Right clicking on this communications port and then clicking on Properties, Details and then "Bus reported device description" property line should show "Vcom DCS240+".

This correct enumerated DCS240+ COMx port number is used by Soundloader or other utility programs for proper operation. If the Windows allocated COM port is above the software's range, you may have to make Windows re-number the COM port.

9.0 IPL Updating the DCS240+ to the latest firmware
Occasionally Digitrax makes updates and improvements to the operational code of its products. In order to update your DCS240+ you will need to have the DigiIPLII utility installed on a computer connected to your LocoNet and the latest IPL firmware (.dmf) file.   The DCS240+ can be updated either directly using its USB connection (fastest method) or via LocoNet using a PR3, PR4 or other computer to LocoNet interface.

When IPL updating via USB the PWR indicator will flash GREEN alternating with the NET indicator flashing fast RED.

When updating via LocoNet the PWR indicator will flash Green alternating with the NET indicator flashing RED slow, about once a second.

For additional information, FAQ's and the latest firmware files visit http://www.digitrax.com/downloads/ or the DCS240+ product pages.

FCC Information

Radio or TV Interference: (this information is MANDATED by the FCC) This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measure

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different form that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note that any modifications to the equipment not expressly approved by Digitrax voids the user's authority to operate under and be in compliance with CFR 47 rules, as administered by the Federal Communication Commission. Digitrax believes any conscientiously installed equipment following guidelines in this manual would be unlikely to experience RFI problems.

For Canadian Users:

"This digital apparatus does not exceed the Class B limits for Radio noise emission from digital apparatus set out in the Radio Interference Regulation or the Canadian Department of Communications."

Le present appariel numerique n emet pas de bruits radio-electriques depassant les limites applicables aux appareils numeriques de la classe B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Patents and Trade Secret

Digitrax uses material covered by US Patents 6,220,552, 6,275,739, 6,318,678, 6,367,742, 6,545,886, 6,513,763, 6,747,579, 6,536,716, 6,533,223, 6,533,224, 8,229,582, 8,292,237, 6,729,584 and others under non-exclusive licenses and/or assignments from Anthony J. Ireland. Licensing for material covered by these patents are available to other companies and individuals. Other patents covering technology used by Digitrax are pending. Measures to protect trade secret information are enforced.

Digitrax licenses the commercial use of LocoNet, which is trade secret technology, to other companies on a non-exclusive basis. LocoNet is copyrighted property.

Warranty and Repair Information:

Digitrax gives a one-year warranty against material and manufacturing defects for the DCS240+.

All warranties on Digitrax products are limited to repair or replacement of Digitrax products at the discretion of Digitrax. Except to the extent expressly stated, there are no warranties, express or implied, including but not limited to any warranties of merchantability or fitness for a particular purpose.

For items that are no longer covered under warranty, whenever possible we will make repairs to units at fair and reasonable rates.

Please visit our warranty and repair page at www.digitrax.com/warranty for warranty and repair information and procedures.

Digitrax, Inc. reserves the right to make changes in design and specifications, and/or to make additions or improvements in its products without imposing any obligations upon itself to install these changes, additions or improvements on products previously manufactured.

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Need Help?

Digitrax Tech Support Team

Need Help?: helpdesk.digitrax.com

Digitrax Tech Support Depot 24/7/365
www.digitrax.com/support

Contains links to all instructions sheets and manuals, application notes, videos and tons of helpful information.

Digitrax Decoder Selector
www.digitrax.com/decoderselector
Helps you find which decoder will fit in a particular locomotive.

Digitrax CV Calculators
www.digitrax.com/support/cv
Calculate a CV value to program your locomotive,

Digitrax Tool Box App
Download our Mobile App for on the go help at your fingertips. This app contains links to all manuals and instruction sheets, videos, CV calculator, decoder selector, news and events & dealer locator,

Warranty and Repairs
www.digitrax.com/support/returns
Fill out the online form, print it out and return it with your item for repair

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