



DT402 Series Digitrax Super Throttle Users Manual

Includes:

DT402 Series Throttles,
DT402 IR Operation with UR90,
DT402R Simplex Radio Operation with UR91,
DT402D Duplex Radio Operation with UR92



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Introduction

Congratulations on your purchase of a Digitrax DT402 Series Super Throttle! This family of throttles brings some exciting features to your operating experience:

- You can select and run your locomotives wirelessly with any of these combinations: a DT402 Infrared Throttle and a UR90 Infrared Receiver; a DT402R Simplex Radio throttle and a UR91 Simplex Radio Receiver; or a DT402D Duplex Radio Throttle and UR92 Duplex Radio Transceiver.
- Operating your trains has never been more realistic with 29 functions available right from your throttle.
- Customizing your Throttle has never been easier with step-by-step throttle option setup.

The design of the Digitrax Complete Train Control system lets you operate your layout your way. With LocoNet you simply connect system components to build the layout control system you've always wanted! The DT402 Series Super Throttle is just one of many different Digitrax Complete Train and Control components available.

Begin with our Quick Start section and you will be up and running trains on your layouts in a matter of minutes!

Your success with and enjoyment of our products are very important to us. After all, this is a hobby and it is FUN!!! Please read this manual carefully before you install your system. We have included lots of hints and operating ideas based on our experience with the Digitrax system. If you have questions not covered by this manual please contact your dealer or visit our web site www.digitrax.com for the latest updates and additional resources.

Digitrax DT402 Series Throttle Users Manual

Includes DT402 Series Throttles,
IR Operation with UR90/UR91/UR92 and Duplex Operation with UR92
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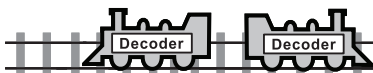
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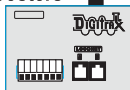
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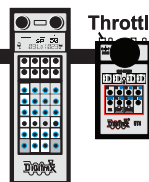
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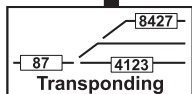


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1.0 DT402 Quick Start Guide

This Quick Start Guide will have running a train in **just a few minutes!** You can begin this process with either an existing layout or a simple test track. Make sure if you are using an existing layout that you take any analog locomotive(s) off the track before you begin.

1. Connect the power supply to your DCS100, DB150, DCS50 or other Digitrax Command Station. Set the DCS100 or DB150 MODE Switch to Run. Plug your power supply in to a wall outlet.
2. Plug the DT402 series throttle into the LocoNet "A" jack on your Digitrax Command Station.
3. Press the **PWR** key then the **N / -** key on your DT402 throttle. The TRACK STATUS LED on the command station should be off.
4. Press the **Y/+** key on your DT402 throttle. The TRACK STATUS LED should come on.
5. Activate the **R** Throttle knob of the DT402 by turning it about 1/4 turn.. You should see the right side "SEL" in the display begin to blink.
6. Press the **LOCO** key, then the **LAMP / 0** key, then the **LOCO** key. You should see "00" replace the blinking "SEL". You have selected locomotive address 00, which is used to operate an analog locomotive."
7. Turn the **R** Throttle Knob clockwise to "99".
8. Press the **REVERSE / R** key and look for a change in brightness (or color) of the TRACK STATUS LED on the command station. Turn **R** Throttle knob counterclockwise to "00".
9. Connect the RAIL A and RAIL B terminals from your Command Station to your track and place an analog locomotive (one without a decoder) on the track. The loco should "sing". Use the **R** Throttle knob to control speed and the **REVERSE / R** key to control direction.
10. Place a locomotive with a decoder with a known address on the track. Turn the **L** Throttle Knob. You should see the left side "SEL" in the display begin to blink. Press the **LOCO** key, then the numbers for the address, then the **LOCO** key again. The loco address will replace the blinking "SEL" in the display.
11. Use the **L** Throttle Knob to control speed and the **L / REVERSE** key to control direction of the decoder equipped loco and the **R** Throttle knob and the **REVERSE / R** key to control the analog locomotive.

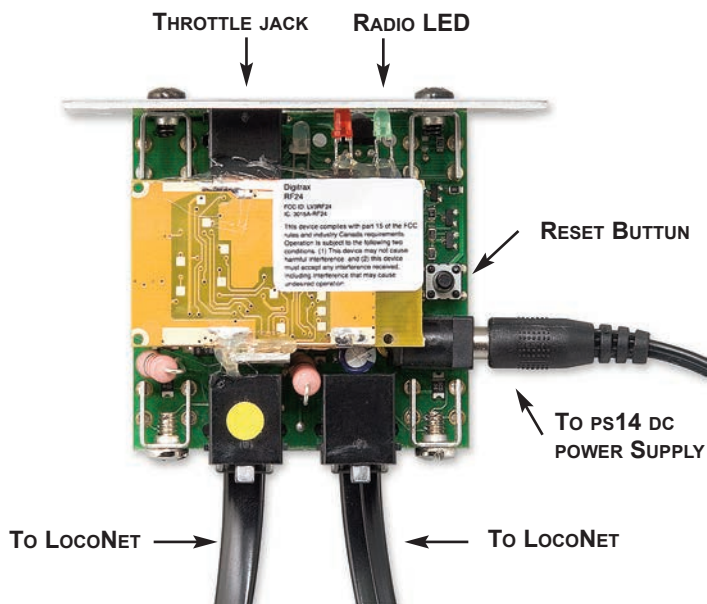
ENJOY running your trains!

2.0 DT402D Duplex Radio Quick Start Guide

2.1 UR92 Installation/Quick Start

The UR92 Duplex Radio transceiver/IR receiver is simple to install and begin using on your layout.

1. In most cases the UR92 should be situated near the physical center of your layout. One UR92 usually covers a circle of about 300+ feet across. Some layouts may require additional UR92s for adequate signal coverage.
2. Connect the PS14 DC power supply to the UR92 via the DC power jack on the side of the UR92. Plug the PS14 into a 110 V outlet. The green and red LEDs should blink and the red LED should stay on.
3. Connect the UR92 to your working LocoNet using one of the RJ12 jacks at the rear of the UR92. The red LED will go off and the **GREEN RADIO** LED will wink at a 2-second interval to indicate that it is configured for duplex radio operation.
4. If your layout has UR91s and/or UR90s installed, re-set the LocoNet ID by plugging in any DT402 throttle while holding down the **EDIT** Key. Release the **EDIT** Key. Use the R throttle knob to set the LocoNet ID (00-07) you want to use and press Enter to complete LocoNet ID set up. As simplex and infrared throttles plug in to LocoNet, they will log on to the LocoNet ID automatically and all three technologies will work together.

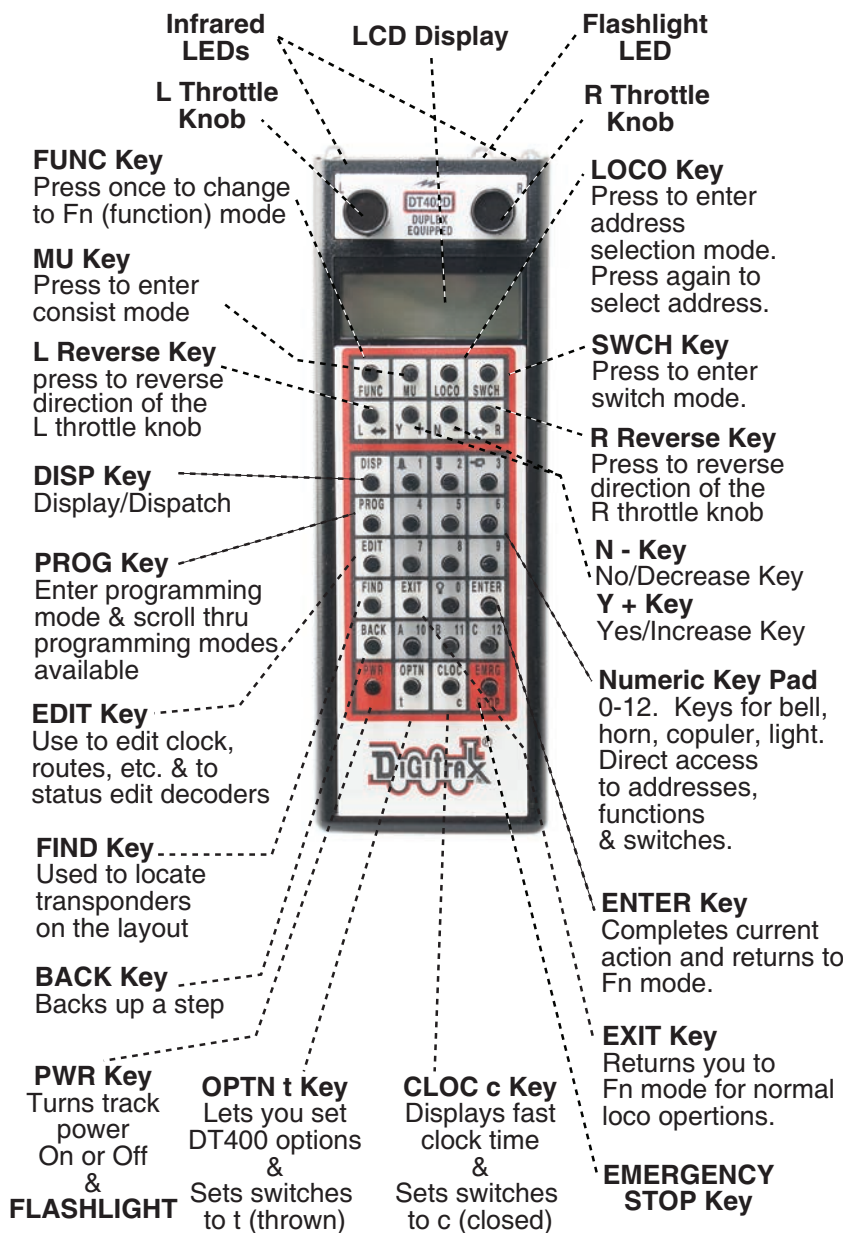


That is all that is required for UR92 installation! You are now ready to join the Duplex Group with your DT402 Duplex Throttle! See UR92 installation guide for additional information on setup and troubleshooting.

2.2 Join Your DT402D Throttle to the Duplex Group

The following plug in method of joining the UR92 Duplex Group is convenient and will always work to join any Duplex throttle to a particular UR92 Group. See Section 8.4 for instructions on tetherless operation of the DT402D, including how to join a Duplex Group without plugging in to LocoNet.

1. Connect a DT402D Duplex Radio Throttle (with a known good battery installed) to the front RJ12 jack of the UR92 until the throttle initializes.
2. Disconnect the DT402D from the LocoNet jack. The DT402D will briefly display an 8 character Duplex Group name and the Channel number (#11 through #26) being used by the Group. The Duplex Group name is not important at this point, it is simply used by the DT402D to join this Duplex group on its particular Duplex channel. Note: If your DT402 throttle displays “Idle” at this point, simply plug in to LocoNet again and allow your throttle to re-initialize.
3. The DT402D has now joined the Duplex Group and can be operated as if it were plugged in to LocoNet.
4. Use the DT402D throttle to select one of the locomotives on your system. The UR92’s GREEN **RADIO** LED will blink to show that good duplex messages are being received. If the RF transmissions are not acknowledged by the UR92, the DT402D will blink its white “flashlight” LED to show that there is a duplex radio communication problem. This usually indicates a range or interference issue. (See the UR92 manual for more information on troubleshooting duplex radio issues.)
5. DT402Ds remember the last Duplex Group they joined, even if the batteries are removed, so when re-powered they will automatically rejoin this particular Group if it is within duplex radio range without being plugged in to the system.



Remember, the EXIT Key will take you back to the Fn Mode for Normal Loco Operations.

DT402 Throttle Controls

3.0 DT402 Series Throttle Control Panel

3.1 General Information

The DT402 series throttles are full function hand held throttles that include 2 independent throttles and a common keypad to control, up to 29 functions (F0-F28), turnouts and programming.

3.2 L (Left) and R (Right) Throttle Knobs

Throughout this manual we refer to the throttle knob on the left side as the **L** Throttle and the throttle knob on the right side as the **R** Throttle. This corresponds to the **L** and **R** that appear on the throttle.

The throttle knobs on the DT402 use “encoders.” They give very smooth, fine speed control. In 128 speed step mode it takes four complete rotations of the knob to go from stop to full speed. When you select a locomotive that is already moving on either throttle knob, that throttle will continue to run the locomotive at the same speed and in the same direction in which it was traveling before being selected to the throttle.

As you turn the DT402 throttle knobs you will feel a mechanical detent (and hear a beep if your throttle is set up for beeps and clicks). Each time you move the knob, the system processes information. In some cases, the LCD display will not change each time you feel the detent. In the case of increasing and decreasing loco speed, this is because each detent does not equal an increase of 1% speed. If your DT402 is set up for ballistic tracking, the speed with which you move the encoder will affect how the display changes.

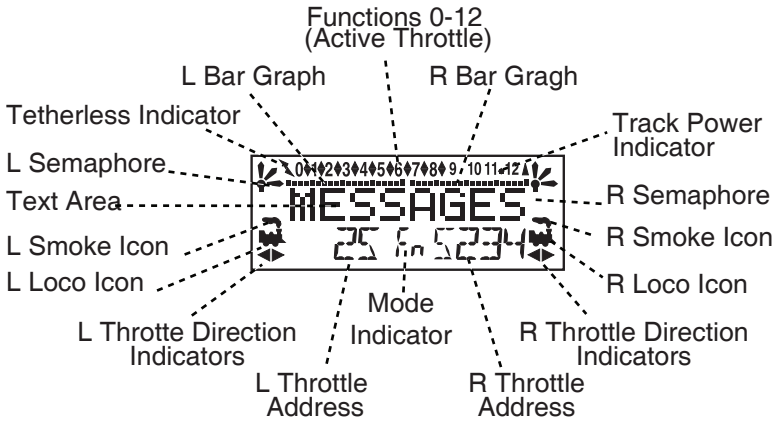
You can customize the tracking characteristics of these knobs for either straight line (normal) tracking or ballistic tracking. With straight line tracking each movement of the knob causes a fixed rate of change. With ballistic tracking, the faster you increase or decrease the throttle knob, the faster the data changes in the throttle. Your DT402 was shipped with ballistic tracking as the factory default setting. To change this setting see Section 10.0 (option: NoBlastic).

The throttle knobs on the DT402 can also be used to access the recall stack and select a locomotive to run on a throttle or to reverse the direction of the locomotive currently selected on that throttle.

When dialing up numbers with the throttle knobs, the **R** Throttle knob changes 1s and 10s and the **L** Throttle knob changes 100s and 1000s. This makes the throttle knobs easy to use when dialing up four digit addresses.


If you prefer larger throttle knobs, simply remove the 1/2" knobs that come standard with the DT402 by pulling gently and replace them with larger knobs (up to 1.25").

3.3 Liquid Crystal Display (LCD)




DT402 LCD

3.3.1 Loco Icon

The L and R Loco Icons  are used to indicate whether an address is available for selection. A blinking loco icon means that the address is available for selection and a steady loco icon means that the loco address is currently selected or in use by another throttle.

3.3.2 Direction Indicators

The direction indicators  are located in the LCD Display of the DT402 directly below the Loco Icon. There are separate indicators for the L (left) and R (right) throttles. If the arrow points to the front of the loco, the throttle is in the forward direction. If the arrow points to the back of the loco, then the throttle is in the reverse direction. If there is not a locomotive selected on a throttle the loco icon will not appear.

 = Forward Direction  = Reverse Direction

Note: These direction indicators are for decoder equipped locos only. They will indicate direction based on the normal direction of travel that you set up for your decoder equipped loco. If you are using an analog loco (without a decoder), the direction indicator may or may not match the physical direction of the analog loco.

3.3.3 Smoke Icon

The Smoke Icon is located just above the Loco Icon. Both the **L** and **R** Throttle have a smoke icon. If a loco is selected on either throttle, the Loco icon will appear beside the address of that loco. If nothing is selected, there will be no Loco icon and the address area will show SEL. The blinking smoke icon indicates which throttle is currently active (having its function states displayed in

the top line of the LCD). Since both throttles share the keypad, only one at a time can use the keypad and function controls. The active throttle has access to the function controls and the status of the functions for the active throttle are displayed in the top line of the LCD. To make either throttle the active throttle simply click it once or turn the Throttle knob a little.

No Loco Icon = nothing selected on this side of the throttle



Loco with steady smoke = Keypad and function display not active for locomotive address selected on this throttle.



Loco with flashing smoke = Keypad and function display active for the locomotive address selected on this throttle.

3.3.4 Mode Indicator

The mode indicator, located at the bottom center of the LCD, shows the DT402's current mode of operations.

The DT402 automatically defaults to the Fn mode and returns to this mode when ever the EXIT Key is pressed. **The Mode indicator usually shows what the numeric keys are associated with.** For example, in Fn mode, any entry on the numeric keypad will affect functions. In Sw mode, keypad entries will change turnouts and in Lo mode, entries on the keypad will enter loco address numbers, etc.

The following table provides a list of the Mode indication displayed, the mode name and the use of the mode by the DT402.

Display	Mode	Used For
Fn	Function	Normal locomotive operation functions available on the keypad
Lo	Loco Selection	Locomotive Address Selection Mode
Mu	MU	Multiple unit (consist) operation set up and break up
Sw	Switch	Accessory decoder control (turnouts, etc.) or option switch control
Pw	Power	Turn track power on and off
SE	Status Edit	Change locomotive speed steps to 14, 28, or 128 as needed
PG	Programming	Paged-Digitrax preferred method
PH	Programming	Physical Register
Pd	Programming	Direct
Po	Programming	Operations Mode (Ops Mode) programming on the mainline.
RE	Recall	Recall one of the last 4, 8, or 16 locomotive addresses used
Fd	Find	Find command issued for active loco, results displayed in text area.
Ec	Edit clock	Edit the time shown on the fast clock
EF	Edit clock rate	Edit the fast clock rate
EA	Edit alarm	Edit the alarm time set for the throttle
Er	Edit routes	Edit routes-shows when your system is running with a DCS100 with routes enabled
E1	Change LocoNet ID	Change LocoNet ID for Infrared or Radio Operation
E?	Other edit modes	Show when your system is running with a LocoNet component that is enabled for additional functionality such as signaling.

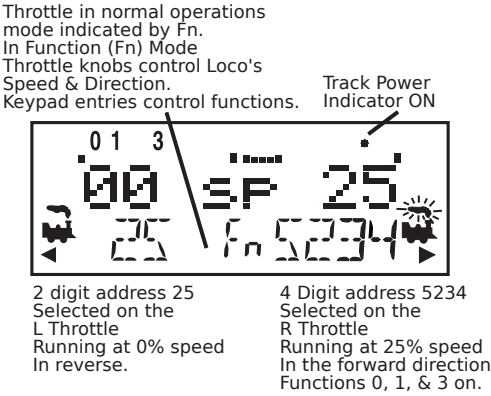
DT402 Mode Indicator Display

3.3.5 Text Area

The Text Area of the LCD consists of the eight characters in the middle line of the display. This is where information like locomotive speed, decoder status, turnout position, fast clock, text prompts, messages and programming data are displayed.

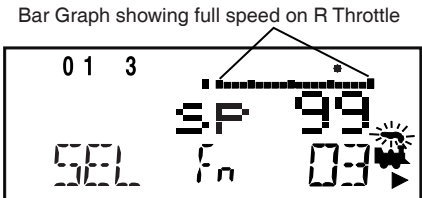
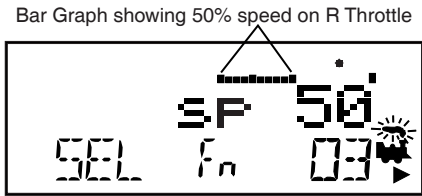
3.3.6 L (Left) and R (Right) Throttle Display

The decoder address selected on the **L Throttle** is displayed on the bottom line of the LCD to the left of the Mode Indicator. The decoder address selected on the **R Throttle** is displayed to the right of the Mode Indicator. The address can show as either the 2-digit or the 4-digit decoder address. If no address is selected the display will show “SEL.” If a 2-digit address is selected (00-127), the display will show two or three digits. If a 4-digit address is selected (0128-9983), the display will show all four digits including the leading zero.



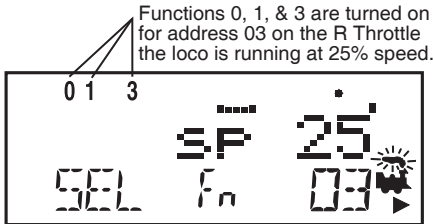
3.3.7 L and R Bar Graph

Each throttle has a bar graph located above the text area of the LCD. Each of these indicates the speed setting of the **L** and **R** Throttles graphically from a single dot (0% throttle) to 20 dots (full throttle). This is useful when the text area is showing information other than speed.




3.3.8 Function Display

Whether functions 0-12 are on or off for the currently active loco address is displayed on the top line of the LCD. In other words, the functions for the active throttle (the one with blinking smoke) are displayed. To view the function status of either throttle, simply press the throttle knob to display the active functions for that throttle.



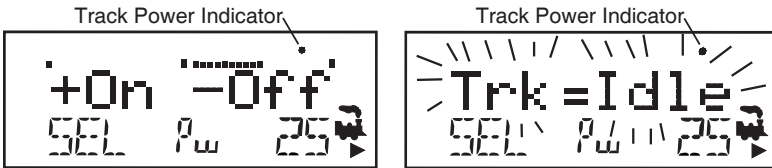
3.3.9 Track Power Indicator

This very small star shaped dot  (shown larger than life) located in the top line of the LCD on the right side indicates the status of the track power.


No indicator = System track power is OFF (Press **PWR** key followed by **N / -** key)

Indicator On Steady = System track power is ON (Press **PWR** key followed by **Y / +** key)


Blinking Indicator = System is in “Idle” and track power is ON (Press **PWR** key followed by **Y / +** key and **Y / +** key again)




3.3.10 Tetherless Indicator

 The tetherless indicator shows when your throttle is using either infrared or radio communications.


3.3.11 L and R Semaphores-Cab Signaling

 The L and R Semaphores are used when cab signaling is implemented on the layout. More information about signaling and detection will be available on our web site, www.digitrax.com as these products become available. Information on how to activate these indicators is in the manuals for our detection and signaling products. Information is also available from other LocoNet Certified developers when they have implemented these features in their products.

The L and R Semaphores will display the following:

 = Clear

 = Approach

 = Stop

3.4 DT402 Keypad

3.4.1 FUNC Key



The **FUNC** key is used to enter function control mode. Function control mode is the default mode for normal locomotive operation with the DT402. Press this key during any throttle task to return to normal loco operation mode with function controls active on the numeric keypad.

3.4.2 MU Key



The **MU** key is used to enter consist set up mode. Once the MU Key is pressed, you will be prompted by the throttle to use the Y+ Or N- Keys to add locos to or remove locos from consists.

3.4.3 LOCO Key



The **LOCO** key is used for selecting loco addresses on to the throttles so that the address is controlled by the throttle. Sometimes people call this “assigning locos to throttles.”

3.4.4 SWCH Key



The **SWCH** key is used for entering switch control mode. Once this key is pressed, you will be prompted to select a switch address and issue a thrown or closed command. Switch control mode is used in normal operation for operating turnout machines and in set up mode for setting up option switches in the throttle and command station.

3.4.5 L and R Reverse Keys

The L and R Reverse Keys change the direction of travel of the loco on the related throttle when the throttle is in Fn (Normal Operation) Mode.



The **REVERSE / R** key changes direction of the address on the “**R**” or Right Throttle.



The **L / REVERSE** key changes direction of the address on the “**L**” or Left Throttle.

3.4.6 Y / + and N / - Keys



The **Y / +** key and



N / - key are used:

- to turn track power on and off,
- to increase or decrease loco speed,
- to link and unlink locos during MU'ing,
- to accomplish tasks using system editors.

These keys can be set up to act in two different ways: See Section 10.0 (NoBlstic) for information on changing this setting on your DT402.

Repeating (also called typematic) so that if you hold a key down it will continue to increase or decrease step by step until you release the key. This option is active when your throttle is set up for ballistic tracking. Your DT402 was shipped from the factory with this feature enabled.

Single Press so that you will must press the key each time you want to increase or decrease. This option is active when your throttle is set up for straight line tracking.

3.4.7 DISP Key



The **DISP** key is used for displaying programming information and dispatching loco addresses.

3.4.8 PROG Key



The **PROG** key is used to enter programming mode and to toggle among the programming modes available for use.

3.4.9 EDIT Key



The **EDIT** key is used to enter the Edit Mode for editing the fast clock, routes, signaling, etc. It is also used to status edit decoders while in locomotive address selection mode.

3.4.10 FIND Key



The **FIND** key is used in conjunction with a layout instrumented for Digitrax Transponding and locos or cars equipped with transponders to find the location of those pieces of rolling stock on the layout.

3.4.11 BACK Key



The **BACK** key is used to go back one step.

3.4.12 PWR Key



The **PWR** key is used to enter power mode for turning layout power on and off. Once you press this key, you will be prompted to use the **Y / +** key to turn power on or the **N / -** key to turn power off.

The **PWR** key is also used to turn on and off the flashlight feature. The flashlight LED will be on as long as you hold down the **PWR** key.

3.4.13 OPTN / t Key



The **OPTN / t** key is used to enter the Option Mode to set throttle and system options. It is also used to issue **t** (thrown) commands when the throttle is in Switch mode.

In the case of turnout control:



t=thrown, turnout is set for the diverging route through the curved leg.

3.4.14 CLOC / c Key



The **CLOC / c** key is used to toggle between displaying and not displaying the current fast clock time. It is also used to issue **c** (closed) commands when the throttle is in Switch mode.

In the case of turnout control:



c=closed, turnout is set for the main line with routing through the straight leg of the turnout.

3.4.15 EXIT Key



The **EXIT** key is used to exit the current throttle task without making changes. Pressing this key will usually return the DT402 to Fn mode for regular locomotive operation.

3.4.16 ENTER Key



The **ENTER** key is used to complete the current throttle task and return to Fn mode for normal operations.

3.4.17 EMRG STOP Key



Your DT402 comes from the factory set for “Local” Stop. When you press the **EMRG STOP** key, the loco address that is active on your display (the one with the blinking smoke) will stop. When you press the **EMRG STOP** key again, the loco address on the other throttle of your DT402 will stop.

You can change the DT402’s Option Setting (ES->Idle) to set the **EMRG STOP** key to “Global Stop”. See Section 10.0. With the Global Stop option enabled, pressing the **EMRG STOP** key sets the track status to IDLE and stops all locos on the layout. You will see the DT402’s TRACK POWER indicator blinking on and off. To resume operations, press the **PWR** key followed by the **Y / +** key to return locos to their speed prior to the EMRG STOP. Press **EXIT** key to leave Pw mode and return to Fn mode after turning track power back on with **PWR** key and **Y / +** key.

3.5 Full Numeric Keypad

The numeric keys on the keypad are usually related to the throttle mode shown in the LCD's mode indicator area. For example, when the mode is Fn, the numeric keys are used for function control. When the mode is Lo, the numeric keys are used to enter loco addresses. When the mode is Sw, the numeric keys are used to enter switch addresses.

The **0-12** keys allow direct entry of loco and switch addresses as well as Configuration variables (CVs) values during selection and programming. These keys also give direct access to functions 0-12 during normal operation of locos. Special number keys:



The **LAMP / 0** key is most often used to turn on and off the loco's head lights. It can also be used for other functions as desired.



The **BELL / 1** key is most often used to turn on and off the bell sound in locos equipped with sound decoders.



The **HORN / 2** key is most often used to turn on and off the horn sound in locos equipped with sound decoders. This function key is a momentary key that will activate the sound as long as the key is held down. This key also pressure sensitive to allow for the use of sound decoders that incorporate a "playable whistle."



The **COUPLER / 3** key is most often used to activate couplers. It can be used for any function.

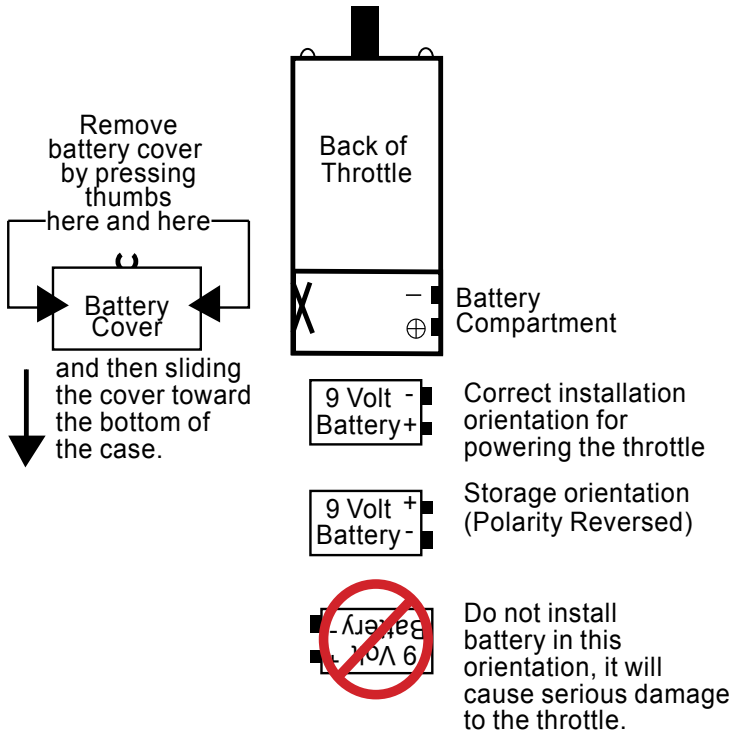


The **A / 10**, **B / 11** and **C / 12** keys make it easy to use functions 10-12 and give more flexibility for future features by providing A, B and C as possibilities.

3.6 Infrared Emitters

Your DT402 has two infrared LEDs in the cable end of the throttle. These emitters send infrared signals that can be used by LocoNet compatible Infrared receivers to give you tetherless operation. See Section 8.2 for infrared operation information.

4.0 DT402 Battery Installation



For normal tethered operation, the DT402 series throttles do not require a battery. However, if you operate your DT402 as a walkaround throttle without a battery, the display will go off when you're not plugged in to LocoNet. Therefore, we recommend that you always use a battery in your DT402.

To use your DT402/R/D as an infrared or radio throttle, you must install a 9-volt battery. When you install the battery, the throttle will report the battery voltage then show the last screen displayed before the throttle was powered down.

We recommend that you remove the battery from your throttle when it is unplugged from the system to conserve battery life.

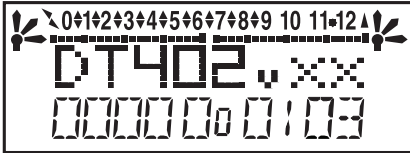
The battery can be stored inside the DT402/R/D by removing the battery and putting it back in the battery compartment with the polarity reversed. Be careful here, see diagram above for proper orientation.

DT402 throttles are shipped with the maximum power save option enabled. To make your batteries last even longer, you may choose to turn off the display backlight. See Section 10.0 for throttle customization options.

5.0 How to Select and Run Trains

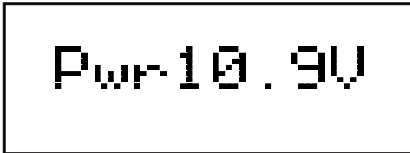
5.1 DT402 Throttle Start Up

1. Plug the DT402 series throttle into any functioning Digitrax System or other LocoNet compatible system and you are ready to get started! You can use any LocoNet throttle jack on your system. Throttle jacks are located on the front of your command stations, boosters, UP and UR panels.
2. After you plug the DT402 into your LocoNet, you will briefly see the DT402 splash screen:



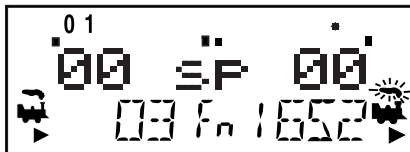
This screen shows the throttle type: DT402, DT402R or DT402D and software version number (xx). It is displayed for a few seconds each time you power your DT402.

3. The DT402D will then momentarily display the Duplex Group name and radio Channel.
4. Next you will see the power indicator screen.



This screen indicates the power available to the throttle. When you are plugged in to LocoNet, this value should be between 9 and 15 volts for proper operation. When you insert a battery or unplug from LocoNet, the value displayed will be the battery power available. When this number is less than 6.2 volts it's time replace your battery. See Section 4.0 for more information about installing/replacing the batteries in your DT402.

5. Then you will see a screen similar to the following.



This screen displays current addresses selected on the L and R throttles along with their current speed and direction. The functions that are turned ON for the active throttle (the one with the blinking smoke icon) are displayed across the top of the display.

6. If you unplug the DT402/R or D from LocoNet the display backlight will go off while it is unplugged. It will come on again when you plug in to LocoNet again.

5.2 Turn track power on and off

The TRACK POWER indicator on your DT402 display shows the track power status. There is also a TRACK STATUS LED on your Command Station. If the TRACK POWER indicator is lit then track power is on. To turn the track power on or off:

1. Press the **PWR** key on the DT402. You will see a screen similar to the one below. You will now be able to toggle the track power on/off:



2. Press the **N / -** key to toggle the track power off. The TRACK POWER Indicator on your DT402 and on your Command Station will go off.
3. Press the **Y / +** key to toggle the track power on. The TRACK POWER Indicator on your DT402 display and on your Command Station will come on solid.
4. Press the **PWR** key again to return the DT402 to the operating mode.
5. If the TRACK POWER Indicator is blinking and you see the “Trk=Idle” message then the layout is in the “IDLE” state and no locomotives will move. To exit this state simply turn on track power again. This is a common issue, and is easy to correct.

5.3 Select and Run An Analog Loco on Address “00”

1. Place an analog locomotive (one without a decoder) on your layout. While the analog loco is sitting still, you will hear the characteristic “singing” caused by the DCC track signal when it is applied to analog locomotives. Once the analog loco is moving, this sound will change and be less noticeable. (Digitrax recommends that analog locos not be left sitting on DCC powered track for long periods of time when they are not running.)
2. Check the Track Power Indicator is steady on your DT402’s display and the TRACK STATUS LED on Command Station is lit .
3. Activate the DT402’s **R** Throttle knob by turning it a 1/4 turn in either direction or by pressing the **R** Throttle knob once if there is a current loco address and double click if SEL appears in the **R** address. If there is a loco address, the **R** Loco Smoke will start flashing. If no loco has been previously selected on this throttle it will flash “SEL”.
4. Press the **LOCO** key then 00 on the keyboard. You can also use the **R** throttle knob to dial in the number. You will see a display similar to this:



5. Press the **LOCO** key again to select address 00 on the throttle. You can also press the **R** Throttle knob once to select the loco address and return to Fn mode for normal operation.

Note: **EXIT** key can be used to return to Fn mode for normal loco operation.

6. Turn the **R** Throttle knob clockwise slowly to increase the speed of the analog locomotive. As the speed increases, the locomotive on the track will begin to move. Your command station’s TRACK STATUS indicator should change color as you change the speed setting.
7. Press the **REVERSE / R** key on the right side of the DT402 or double click the **R** Throttle knob to reverse the direction of the analog loco. The **R** Direction Indicator will toggle between the left and right arrows. In the case of the analog loco, the indicator only indicates a change in track polarity and the physical direction of the analog locomotive-NOT THE ANALOG LOCO’S ACTUAL FORWARD OR REVERSE DIRECTION OF TRAVEL.

Note: To double click the throttle knob, quickly press down on the throttle knob twice within about 1/2 second. You will hear a click each time you press down on the throttle knob.

5.4 Select and Run A Decoder Equipped Loco

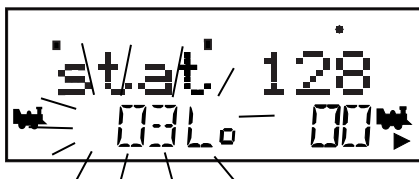
Each decoder has an address. To select a decoder equipped locomotive and run it on either throttle, you must know its address. Digitrax decoders are set up at the factory with the “default” address 03. This means that when you take a Digitrax decoder out of the package and install it in your loco, you can select address 03 on your throttle and run the decoder. The first Configuration Variable (CV) programmed by most users is the decoder’s address since it is not very useful to have all of your locos run on address “03.”

If you do not know the address of the decoder equipped locomotive you want to run, you can simply program the decoder’s address and select it to run using the new, known address. With some command stations (such as DCS100), it is possible to read back the decoder’s address. *See your Digitrax Starter Set Manual for information about reading back addresses and see your Digitrax Decoder Users Manual for a complete discussion of decoder addressing.*

1. Place a decoder equipped locomotive (one with a decoder installed) on your layout.
2. Check the Track Status indicator is steady on your DT402’s display and the Command Station TRACK STATUS LED is lit, so track power is turned on.
3. Activate the DT402’s **L** Throttle knob by turning it a 1/4 turn in either direction or by pressing the **L** Throttle knob once if there is a current loco address and double click if SEL appears in the **L** address. If there is a loco address, the **L** Loco Smoke will start flashing. If no loco has been previously selected on this throttle it will flash “SEL”.
4. Press the **LOCO** key. The left side of the display will begin flashing. You will see a display similar to this:



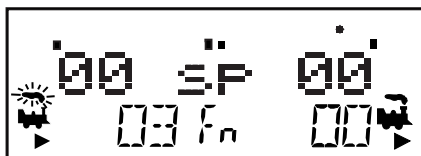
5. Use the numeric keypad to enter 03 or use the **R** Throttle knob to select Address “03” in the left side of the display. (The **R** Throttle knob changes 1s and 10s, the **L** Throttle knob changes 100s and 1000s.)



6. Press the **LOCO** key again to select address 03. Press the **L** Throttle knob

once to select the loco address and return to Fn mode for normal operation.

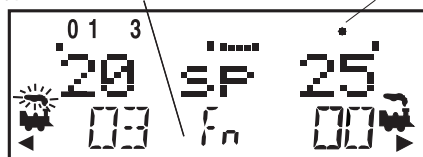
The illustration below shows the display after address “00” is selected on the **R** Throttle and address “03” is selected on the **L** Throttle. We see the Track Power On Indicator in the top line, the speed bar graphs at 0 speed and the text area also at 0 speed for both throttles.



7. Turn the **L** Throttle knob clockwise slowly to increase the speed of the decoder equipped locomotive. As the value in the left display increases, the decoder equipped locomotive on the track will begin to move.
8. Press the **L / REVERSE** key on the left side of the DT402 or double click the **L** Throttle knob to reverse the direction of the decoder equipped loco. The **L** Direction Indicator will toggle between the left and right arrows. In the case of the DCC loco, the arrow indicates locomotive direction (forward or reverse), not the direction on the track.
9. Use the **R** Throttle knob and **REVERSE / R** key to control the analog loco and the **L** Throttle knob and **L / REVERSE** key to control the decoder equipped loco. You can control both at the same time.

Throttle in normal operations
mode indicated by Fn.
In Function (Fn) Mode
Throttle knobs control Loco's
Speed & Direction
Keypad entries control functions

Track Power
Indicator ON



2 digit address 03
Selected on the
L Throttle
Running at 20% speed
In reverse
Function 0, 1, & 3 on.

An analog loco address 00
Selected on the
R Throttle
Running at 25% speed
The direction arrow below
the Loco Icon **does not**
indicate actual direction
for Analog locos.

Notice as you use each throttle knob or direction key that the loco with the “blinking smoke” will change to that side of the throttle. The side with the “blinking smoke” indicator is the active throttle. To control the headlight or other functions, the locomotive must be on the active throttle.

5.5 Locomotive Speed Control

1. Select the loco address you want to control on either the **L** or **R** Throttle.
2. To increase the speed of the loco, either turn the Throttle knob clockwise or press the **Y / +** key. Holding down the **Y / +** key will continue increasing the speed of the loco.
3. To decrease the speed of a loco, either turn the Throttle knob counter-clockwise or press the **N / -** key. Holding down the **N / -** key will continue decreasing the speed of the loco.

The % of full speed will be displayed in the text line of the display on the **L** or **R** side, depending on which throttle is controlling the loco. The % of full speed will also be displayed on the bar graph above the text area in the display.

If a loco address is part of a consist and is not the “TOP” (or controlling locomotive) and you try to change its speed the LCD screen will show “cn” in the text area where % speed would normally appear. The “cn” lets you know that the loco you have selected is part of a consist and that you cannot change the speed or direction of this loco independently of the consist.

5.6 Releasing An Address From A Throttle

When you are finished running a locomotive address, release it from your throttle so that it is available for other throttles to select and run.

Simplex Radio and Infrared Throttles must be plugged in to LocoNet to release an address from your throttle. Duplex Radio Throttles do not need to be plugged in to release an address. You can disable this safety feature by setting your DT402's Options to allow tetherless release (See Section 10.0 (IRRelease) for instructions).

1. Use the throttle to make the locomotive's speed zero (this step is optional but strongly recommended as the loco will continue to move if speed is not reduced to zero).
2. While the loco's address and speed information is displayed, press the **LOCO** key to go into select mode. This will release the address from your throttle immediately.
3. The address will begin to blink in the display. Press the **DISP** key to dispatch the address on the throttle and the address will be released to the system and marked as a dispatched address. See Dispatching below. Pressing the **EXIT** key releases the address from both the throttle and the locomotive stack in the system. The display on your DT402 will show SEL for the throttle.
4. If you press the **LOCO** key again, the throttle will begin flashing the address you just released. You can re-select that address by pressing the **LOCO** key or you can use the throttle knobs or key pad to browse to a new address and select it instead.

5.7 Dispatching addresses or consists

Dispatching is a special feature incorporated in the LocoNet language to meet the needs of operators that wish to enforce a strict discipline in how operators gain access to locomotives during an operating session. Dispatching also lets you run consists with basic throttles that can't set up their own consists and run four digit addresses on basic throttles that only have two digit capability. It lets you have newcomers run trains on the layout without giving them access to the entire operation.

When you dispatch a locomotive address or consist to your LocoNet system, you make it available to be acquired by another throttle. Only one address at a time can be marked as a dispatched address in the system.

To dispatch a locomotive address using a the DT402

1. Press the **LOCO** key to enter address selection, browse to the address you want to dispatch.
2. Press the **DISP** key to dispatch it to your LocoNet system, that's all there is to it!

The dispatched address can be a single locomotive address, either two digit or four digit, or a consist that was set up by the DT402. The TOP locomotive in a consist or MU can be dispatched to transfer control of the entire consist to another throttle.

NOTE: DT402R and DT402 throttles must be plugged in to LocoNet to dispatch loco addresses. DT402D does not need to be plugged in to dispatch.

5.8 Recall a Loco

Your DT402 stores the last 4, 8, or 16 unique loco addresses used by the throttle in a recall stack. Your DT402 defaults to a 4 address recall stack. See Customizing Your Throttle, Section 10.0 (Recall#) for information on how to set the recall stack depth.

For example if you have your DT402 set up for an 8 deep recall stack and the last 8 addresses you selected were: 00, 1987, 52, 0678, 03, 8819, 25, and 2500, these addresses will be in the recall stack. If you have selected any of these addresses more than once, it will not be stored twice, only the addresses not already stored will be added to the stack. The recall stack is not stored in numeric order. This makes it convenient to select locos that you have used previously without having to dial up the address.

To Recall the last 4, 8, or 16 addresses on the R Throttle

1. Press and hold the **R** Throttle knob. The word "Recall" will appear in the text line in the middle of the display.
2. When "Recall" appears in the display, release the knob. "RE" will appear in the mode indicator in the center of the bottom line on the display. The right side address display will begin to flash prompting you to select a locomotive.

3. Turn the **R Throttle** knob to browse through the last 4, 8, or 16 addresses selected in the system. Whether you browse 4, 8 or 16 addresses depends on how you set up your throttle's options. As you browse through the addresses, the throttle will display their current speed on the bar graph and their status in the text line of the display. Addresses are displayed in the order they were used by the throttle (not in numeric order).
4. Press and release the **R Throttle** knob or the **LOCO** key to select the desired loco address. Once the locomotive is selected the R Throttle knob will be able to control the speed control and direction of that locomotive.

Follow the same steps for recall on the **L Throttle**.

5.9 Stealing: Forcing An Address Selection

If you try to select a loco address that is already selected on another throttle the DT402 will display "Steal?=Y" in the text area. This is a safety interlock to prevent operators from taking control of locos that are already selected on other throttles. Occasionally it is necessary to override this interlock to gain control of a loco that is "lost" for whatever reason. This override is called stealing and can result in having a single loco address selected on two different throttles at the same time.

To steal an address with the DT402:

1. Press the **LOCO** key to enter selection mode.
2. Enter the address of the loco you want to steal and press the **LOCO** key again.
3. The DT402 will display "Steal?=Y" in the text area if the loco can be stolen.
4. Press **Y/+** key if you want to steal.
5. Press **N/-** (or any other key) if you do not want to steal.

Once a throttle has "stolen" a loco address, the slot following mode becomes active and both throttles will update speed and direction information for the loco address. This can result in seemingly strange locomotive behavior especially if one throttle is trying to stop the loco and the other is trying to speed it up at the same time.

When you have gained control of the stolen loco and are finished running it, release it from your throttle by setting the loco's speed to 0 and pressing the **LOCO** key followed by the **DISP** or **EXIT** Key.

5.9.1 Slot Following

When a DT402 detects that a loco address that is in-use on one of its throttles is being changed by another throttle or computer, it will cause the DT402 to “click” every time it sees a remote throttle change its locomotive settings. If that locomotive is in the active throttle, its speed display will also show the changes. This is called slot following. This allows two DT throttles to run a single locomotive address with both throttles being able to send commands to the loco. Both throttles will show the current speed and direction of the locomotive in their displays.

Slot following is useful for training new operators. The supervisor can “steal” an address that is selected on a trainee’s throttle and be able to closely supervise that locomotive’s control. The supervisor can gain instant override control without having to “grab” the trainee’s throttle. This lets you have unskilled visitors run your layout without too much anxiety for either party.

Slot following also allows a computer on LocoNet to run CTC and routing control programs with automated control. The computer can control speed and stop engines automatically while letting the engineer with the throttle in his hand know what is happening.

Note: Slot following does not update continuously when DT402D is used in Duplex Power Save Mode (as shipped from the factory). For continuous slot following updates, change Option DxRxLPwr to OFF. This will significantly increase battery consumption when slot following is in use.

5.10 “slot=max” Message

If the text area of the DT402 shows the message slot=max during the selection process this means that the Command Station reached the limit of locomotive addresses that it can manage at one time. If you want to select additional addresses, you will need to release one or more loco addresses to continue the selection process. (See Section 5.6 for more information.)

6.0 Stop

6.1 Setting A Loco to Zero Speed

Turn the Throttle Knob that the loco address is selected on counterclockwise until the speed display shows 00 and the loco stops moving. This lets you slow down your loco and stop it prototypically.

If you have set up deceleration for the loco and you move the throttle knob to 0% speed, your loco will slow down and come to a stop at the programmed deceleration CV value. We strongly recommend that you run your locos with the factory default of no deceleration until you are familiar with your system.

If the deceleration CV value you set for a particular loco is very large, this can make it look like the loco is not stopping on command because the deceleration CV value is causing the loco to take a long time to come to a stop.

6.2 Emergency Stop

DT402s have two ways of handling an emergency stop command. When you

use emergency stop, the deceleration rate programmed into the decoder will not have an effect and the stop will be immediate.

6.2.1 Local Stop-Factory Default

To stop only the locos in the DT402 display.

1. Press the **EMRG STOP** key to stop the loco that is active in the DT402's display. To resume operation, use the throttle knob associated with that address to increase the loco's speed.
2. Press the **EMRG STOP** key again to stop the loco that is associated with the other throttle on the DT402. To resume operation, each operator must use their throttle to set their loco's speeds back to the desired speed.

6.2.2 Global Stop-Optional Setting

1. See Customizing Your Throttle, Section 10.0 (ES->Idle), for setting the DT402 Options for Emergency Stop.
2. Press the **EMRG STOP** key to stop all locos on the layout.
3. To resume operations, press the **PWR** key followed by the **Y/+** key again and the locomotives will start running again at the same speed they were running prior to STOP mode.
3. To exit PWR mode, press the **PWR** key or the **EXIT** key.

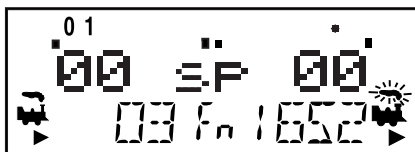
6.3 Track Power Off Stop

To stop everything on the layout.

1. Press the **PWR** key followed by the **N/-** key while the track power is on. This will turn track power off and will cause all locos to stop.
2. Press the **PWR** key followed by **Y/+** key again and the locomotives will start running again at the same speed they were running prior to STOP mode. To exit **PWR** mode, press the **PWR** key or the **EXIT** Key.

7.0 Controlling Functions

The DT402 Throttle will control up to 29 functions in walkaround and radio modes. When operating in IR Mode the DT402 throttles will control up to 9 functions (F0-F8). The numeric keypad is always active in the normal Fn operation mode. The functions that are currently on for the active loco will be displayed on the top line of the DT402 display. The following figure shows an example of how the display looks when functions 0 and 1 are turned on for loco 1652 on the **R** Throttle.



7.1 Controlling Functions F0-F12

1. Determine which throttle you want to control functions on and make it the active throttle by single clicking the Throttle knob or by turning the throttle knob a couple of clicks.
2. If the Mode indicator in the center of the bottom line of the display (between the loco addresses) does not show **Fn**, press the **FUNC** key once to enter the function mode for the active throttle.
3. The DT402's numeric keypad is always active in function mode during normal loco operations. When the mode indicator on your DT402 shows **Fn**, simply press any number on the keypad to activate or deactivate any function from 1 to 12. The functions that are on for the active loco will be displayed on the top line of the display.

7.1.1 Function 0 (F0)

Press the **LAMP / 0** key to toggle F0 between on and off. Each time the **LAMP / 0** key is pressed while in function mode, F0 will change from off to on or vice-versa. The top line of the display will display a 0 when the F0 is on and will be blank when F0 is off. F0 is most often used for reversing head lights but can be set up for other functions as well.

7.1.2 Function 2 (F2)

Press the **HORN / 2** key on the numeric keypad. F2 is labeled with a whistle icon to remind you that this is the preferred function for whistle or horn operation.

F2 is a special non-latching function. This means that F2 can be used to control a whistle or horn sound from the decoder. It will only sound when F2 is being held down. This lets you vary the length of time that the whistle blows, just like the prototype.

7.1.3 Functions 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, & 12

Press the button on the numeric keypad that corresponds with the function number you want turn on/off. The top line of the display will display the numbers of the functions that are on for the active loco address.

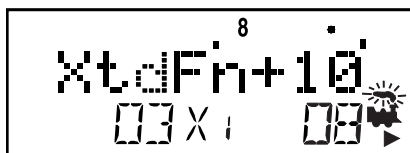
F1 is labeled with a bell icon to remind you that this is the preferred function for bell operation and F3 is labeled with a coupler icon to remind you that its preferred function is coupler operation.

Note: DT402 may process functions slightly differently depending on command station capabilities.

7.2 Controlling Expanded Functions F13-F19

The DT402 series throttles feature an expanded feature set and can address additional functions F13-F28. To address the upper function ranges, the throttle design incorporates a '+10' and '+20' key action. These keys, along with the standard numeric keypad, permit the full function range to be addressed. Here's how it's done:

1. While holding the **FUNC** key down, press the **1** key then release both keys simultaneously. The throttle will go into the '+10' mode and display will show the following:



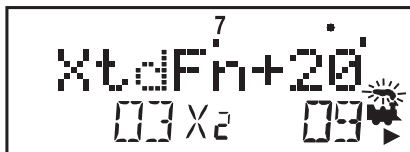
2. Select the second digit from the throttle's numeric keypad and you're done.

Example: To turn on function 18, just hold the **FUNC** key down while pressing the **1** key then releasing both keys simultaneously. Next press the **8** key, just press the **8** key again to toggle off. The figure '8' on the top line of the display will toggle on and off as will the locomotive's function.

3. Press the **FUNC** key once to exit the '+10' function mode and return to the normal single digit function mode. Note that you will have to return to the '+10' mode to check on whether any functions in that range are currently active.

7.3 Controlling Functions 20-28

1. While holding the **FUNC** key down, press the 2 Key then release both keys simultaneously. The throttle will go into the '+20' mode and display will show the following:



2. Select the second digit from the throttle's numeric keypad and you're done.

Example: So if you want to turn on function 27, just hold the **FUNC** key down while pressing the **2** key then releasing both keys simultaneously. Next press the **7** key. That's it. You've just turned function 27 on.

3. Press the **FUNC** key once to exit the '+20' function mode and return to the single digit function mode. Note that you will have to return to the '+20' mode to check on whether any functions in that range are currently active.

7.4 Controlling Functions On Consisted Locomotives

Even though an individual locomotive is part of a consist and you can't control its speed and direction separately from the consist, you can still control its function outputs independently as follows:

1. Press the **LOCO** key and select the address of the locomotive that is a part of consist for which you want to control functions.
2. Press the **LOCO** key again to select the loco address to your throttle. The speed value will show "cn" to remind you that you can only control functions on the loco and not its speed.
3. Use the steps described in Sections 7.0-7.3 above to turn on or off the functions on the consisted loco.

8.0 Tetherless Operation

8.1 General Tetherless Operations

All DT402s can operate without plugging in. This allows you to disconnect from the LocoNet and still control your locomotives while walking around your layout.

- The DT402/402R/402D are all “InfraReady.” All come with IR LEDs that send infrared signals to the layout. To use this InfraReady capability, you just need to install one or more infrared capable receivers (UR90, UR91 or UR92) on your layout and a known good 9-volt battery in the throttle.
- The DT402R is a simplex radio equipped throttle. To use your DT402R as a simplex radio throttle, you will need to install a UR91 simplex radio receiver on your layout and a known good 9-volt battery in the throttle.
- The DT402D is a duplex radio equipped throttle. To use your DT402D as a duplex radio throttle, you will need to install a UR92 duplex radio transceiver on your layout and a known good 9-volt battery in the throttle.

8.1.1 Selecting a Locomotive-Safety Selection

While unplugged, the DT402 (IR only) and DT402R (IR and Simplex Radio) operate as one-way transmitters. The DT402 and DT402R must be plugged into LocoNet to select an available locomotive address. After an address is selected, you can unplug from LocoNet and run the selected addresses with infrared or simplex radio. The throttle will automatically convert to infrared or simplex radio operation for all speed, direction, function, operations mode programming, and switch commands.

The DT402D throttle has full duplex radio capabilities. Once the DT402D has been configured to communicate with a UR92, the full functionality of the DT402 series throttles can be enjoyed without plugging in.

8.1.2 Releasing An Address Using IR or Simplex Radio

There are two options available for tetherless release.

No tetherless release allowed: if the **LOCO** key is pressed while the DT402/R is running in tetherless mode, the addresses selected will not be released unless the throttle is plugged in to LocoNet. This is the factory default, but can be changed in the throttle’s option setup. See Section 10.0 (IRRelease).

Tetherless release allowed: if the **LOCO** key is pressed while the DT402/R is running in tetherless mode, the address selected on that side of the throttle will be released immediately and that throttle will become inactive. To re-select this loco address plug your DT402/R in to LocoNet and select the loco address on the throttle.

8.1.3 Multiple Unit Operations While Tetherless

Consists must be assembled and broken up while the DT402/R is plugged in to LocoNet. MU operations are locked out while the DT402/R is running tetherless. Once a consist is assembled, it can be operated normally using the DT402/R in tetherless mode. In Duplex Radio, the DT402D will keep track of, and display fast time while tetherless.

8.1.4 Programming While Tetherless

Programming is not available when using IR mode.

In Simplex Radio, Ops mode programming is the only programming method that is available. If you press the **PROG** key to enter programming mode, the DT402R running as tetherless will default to the Po mode (ops mode programming). The DT402R must be connected to LocoNet to use service mode programming and access any of the other programming modes available.

In Duplex Radio, all programming modes are available while tetherless.

8.1.5 Switch Mode

The DT402 will operate in Sw mode while tetherless. It can operate turnouts and routes using the **OPTN / t** and **CLOC / c** keys in the normal manner.

8.1.6 Ballistic Tracking

While running tetherless, ballistic tracking will feel slightly different from when you are connected to LocoNet.

8.1.7 Fast Clock

When using the fast clock option, the DT402/R will keep track of and display fast time based on the last synchronized system fast time when the DT402/R was connected to LocoNet. If the fast time is edited by another throttle connected to LocoNet, the DT402/R will not see this change until it is plugged into LocoNet at which time its display will be updated. In Duplex Radio, the DT402D will keep track of, and display fast time while tetherless.

8.1.8 Throttle Keypad Lock

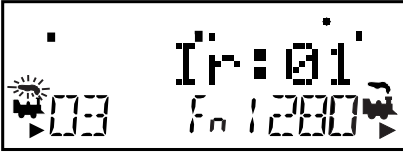
While the DT402/R/D is being used tetherlessly, there are occasions when you may want to disable the throttle's controls to prevent accidental commands being sent to the layout. For example, your train is in a siding waiting for another train to pass. You put your throttle in your pocket and go take a break. By locking the throttle controls, you will not be able to accidentally start your train if you bump your throttle knob or press the **Y / +** key.

To lock/unlock the controls on your DT402

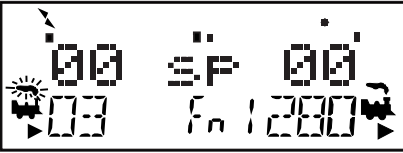
1. Press both the **Y / +** and the **N / -** keys at the same time. When you are locking the keypad be sure to press both the **Y / +** and the **N / -** keys AT THE SAME TIME to avoid sending a speed command to the active loco.
2. The throttle will display "Lock=&-" in the display and none of the controls will function until you unlock them.
3. Press both the **Y / +** and the **N / -** keys at the same time again. This will return the throttle to normal operation.
4. Plugging the throttle into LocoNet will also unlock the throttle.

8.2 Using the DT402 Throttle In IR Mode

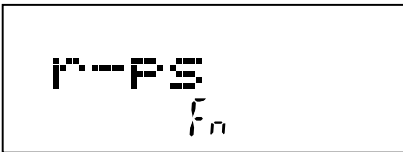
1. For Infrared operation, plug in at least one Digitrax IR receiver (UR90, UR91 or UR92) to your working LocoNet. Because infrared signals are line of sight, more than one receiver may be necessary for optimal performance in your layout room. *See your starter set manual or other installation instructions for more information about installing UR90s, UR91s and/or UR92s on your layout.*
2. Plug your DT402 Throttle (with a known good battery) in to LocoNet and it will verify that at least one infrared receiver is connected LocoNet. The throttle will display Ir followed by the current LocoNet ID. The example below shows that the DT402 has detected a Ir receiver and that the current LocoNet ID is 01. The throttle has loco addresses 03 and 1280 selected.



3. Unplug the DT402 from the LocoNet. The tetherless indicator on the display will come on and the tetherless message will display for a few seconds indicating that the throttle is running in Ir (infrared) mode. It will also display the LocoNet ID (00-07) that the throttle is logged on to.
4. When you single click or turn either throttle knob to activate it, the DT402 will show the normal operating mode Fn display with the tetherless indicator lit in the upper left corner of the display. Remember that in IR mode you have access to 9 functions (F0-F8).



If an unplugged DT402 operating as a tetherless throttle detects no user throttle activity for about 3 minutes, it will enter power save mode show this display:



The throttle may flash the Fn mode indicator about every 60 seconds. This happens when the throttle “pings” to let the command station know that it is still part of the system. This keeps the system from releasing that locomotive back to the system and making it available to be selected by another throttle.

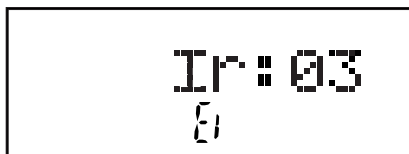
Press and hold the **PWR** key to bring the throttle out of power save mode without making any changes to throttle settings. Any key strokes or movement of the throttle knobs will also bring the DT402/R out of power save.

8.2.1 LocoNet ID Change

Your DT402 will log on to the LocoNet ID offered by compatible infrared or simplex radio receiver it sees when plugged in to LocoNet. The default LocoNet ID is 00. It may be necessary to change the LocoNet ID if more than one club is operating in close proximity at a train show so that the commands sent by one club will not interfere with the commands sent by other clubs. .

To change a LocoNet ID:

1. Disconnect a DT402 from the LocoNet for which you want to change the LocoNet ID. If you are operating several throttles on your layout, it is necessary only to disconnect one throttle.
2. Press and hold down the **EDIT** key on the DT402 and then plug it back in to LocoNet. Release the **EDIT** key after plugging in the throttle.
3. The DT402 will display E1 in the Mode Indicator and the current LocoNet ID "Ir:0n" where "n" is the current LocoNet ID. Use the **R** throttle knob to change the LocoNet ID. You can set the LocoNet ID to be any number from 00 to 07. In the example below the LocoNet ID has been set to 03.



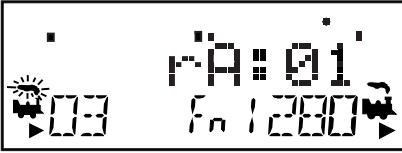
4. Press **ENTER** key to set the system to the new LocoNet ID.
5. The DT402 used to change the LocoNet ID will automatically log on to the new LocoNet ID.
6. Unplug and reconnect any other DT series infrared or radio throttles that will be used on this system so that they can log on to the new LocoNet ID number and be able to operate on the system.

8.2.2 Adding More UR90, UR91 and UR92s To LocoNet

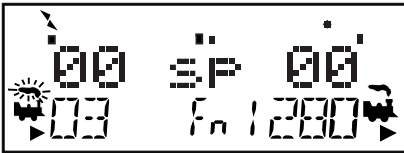
If you add additional UR90, UR91 and/or UR92s to the system you must to re-synchronize the IDs by setting the LocoNet ID (0-7) as described above AFTER all the UR90, UR91 and UR92s you are adding are connected to LocoNet. If you are operating in an area where more than one LocoNet system is operating nearby, be sure to coordinate with other layouts so that each one has its own unique LocoNet ID before beginning operations.

8.3 Using the DT402R in Simplex Radio Mode

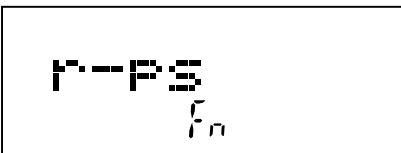
1. For Simplex Radio operation with the DT402R, plug in at least one Digitrax Simplex Radio receiver, UR91, to your working LocoNet. Most layouts only need one UR91. *See your starter set manual or UR91 installation instructions for more information about installing UR91s on your layout.*
2. Plug your DT402R (with battery installed) into LocoNet and it will verify that at least one simplex radio receiver is connected to LocoNet. The throttle will display rA followed by the current LocoNet ID. This example shows that the DT402R has detected a simplex radio receiver and that the current LocoNet ID is 01. The throttle has loco addresses 03 and 1280 selected.



3. Unplug the DT402R from the LocoNet. The tetherless indicator on the display will come on and the tetherless message will display for a few seconds indicating that the throttle is running in rA (simplex radio) mode. It will also display the LocoNet ID (00-07) that the throttle is logged on to.
4. When you single click or turn either throttle knob to activate it, the DT402R will show the normal operating mode Fn display with the tetherless indicator lit in the upper left corner of the display.



If an untethered DT402R operating as a tetherless throttle detects no user throttle activity for about 3 minutes, it will enter power save mode. You will see:



The throttle may flash the Fn mode indicator about every 60 seconds. This happens when the throttle “pings” the system to let the command station know that it is still part of the system. This keeps the system from releasing that locomotive back to the system and making it available to be selected by another

er throttle.

Press and hold the **PWR** key to bring the throttle out of power save mode without making any changes to throttle settings. Any key strokes or movement of the throttle knobs will also bring the DT402/R out of power save.

Note: Fast clock caution. If you use power save mode, the DT402's local fast clock copy will deviate from the LocoNet system clock. The fast clock will re-synchronize with your LocoNet system fast clock when it is plugged in again.

8.4 Using the DT402D Throttle in Duplex Radio Mode

There are three elements involved in duplex radio operation between the DT402D and the UR92: Duplex Group Name, Duplex Group Channel, and Duplex Group Password. These elements can be configured to provide a unique connection when operating in a multisystem environment.

See the Quick Start setup guide, Section 2.0, for setting up the UR92 and Joining the DT402 to the Duplex Group. There are several additional operation and configuration options for the Duplex Group covered below.

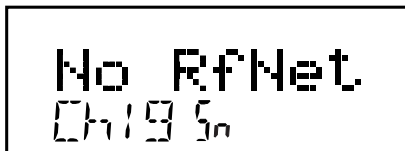
8.4.1 Join a Duplex Group

The DT402D will remember the last Duplex Group that it joined and display that Duplex Group Name upon startup. If the Duplex Group is available, the DT402D will rejoin the Group. If the Group is not available, you will get an Idle screen. To select a Group, follow these instructions

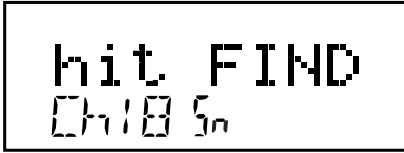
1. Make sure there is a battery installed in the DT402D. Press the **OPT / T** key. (If you are starting from the Idle screen hold the key down for 3 seconds to power up the Throttle.) You will see:



2. Press the **FIND** key to display the rf search mode and scan the last active channel. ScanNets will briefly appear on the display and if there is no Group available on the last Channel used (19 in our example) you will see:



- Press the **Y / +** or **N / -** key to change the Channel up or down. At each channel the display will show “hit Find” to search for a Duplex Group name operating on that channel.



- When the DT402D discovers a Duplex Group the name will blink in the display. In the example below, the Group Name is the default (Dtx0048) for a UR92 that has been installed in another system.



- Press the **ENTER** key to join the Group and then select the loco address you want to run on the layout. You are now ready to run your train.

8.4.2 Configuring the Duplex Group name

The UR92 ships from the factory with a default Duplex Group name of “Dtxnnn”, where nnnn is the serial number. It is easily changed using the following steps:

- Plug a DT402D throttle into the UR92.
- Press the **EXIT** key.
- Press the **OPTN** key then the **EDIT** key.
- Turn the **L** Throttle knob to position the cursor. The character will blink to show it has been selected.
- Turn the **R** Throttle knob to choose the character. The character will continue to blink until you move to the next position or press the **ENTER** key.



- Repeat steps 3 and 4 until desired name is obtained.
- Press the **ENTER** key to change the Duplex Group name. DT402D throttles will need to rejoin on the new Group name.

8.4.3 Configuring the Duplex Group Channel (11-26)

The UR92 ships from the factory with the default Duplex Group default radio channel set to 11. You can select channels 11 through 26 for the radio channel.

1. Plug a DT402D throttle into the UR92.
2. Press the **EXIT** key.
3. Press the **OPTN** key then the **EDIT** key.
4. Press the **Y / +** key to increase the channel number, or
5. Press the **N / -** key to decrease the channel number. In the example below, we have changed the Group name to JBS&J RR and entered 21 for the channel number.

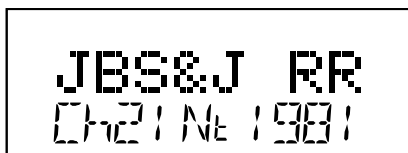


6. Repeat step 4 or 5 until desired channel appears in the display.
7. Press the **ENTER** key to change the **Duplex Group Channel#** for the UR92. DT402D throttles will need to rejoin on the new channel #.

8.4.4 Configuring the Duplex Group Password (Key)

The UR92 ships from the factory with the default Duplex Group Password of 0000, *the value that disables password requirements*. You may have an occasion when operating in a multisystem environment when you may want to restrict access to your layout and operating system via a tetherless Duplex Throttle. The password for your Duplex Group may be activated or changed:

1. Plug a DT402D throttle into the UR92.
2. Press the **EXIT** key.
3. Press the **OPTN** key then the **EDIT** key.
4. Enter a 4-digit number using the numbers on the keypad (0001-9999). In the example below we have entered 1981 as the Duplex Group Password.



5. Press the **ENTER** key to change the Duplex Group Password for the UR92. The throttle will save the new settings in the UR92 and revert to normal operation.

9.0 Advanced Operations Capabilities

9.1 Multiple Unit Operations

Digitrax command stations offers three methods of consist control:

1. **Basic Consisting**
2. **Advanced Consisting**
3. **UniVersal Consisting (the Digitrax preferred method)**

For complete information about these methods, please consult your Digitrax Starter Set Manual.

By definition, Digitrax always adds loco addresses to the “TOP” loco address in a consist.

The “TOP” loco is special, in that it is the address that receives the speed and direction commands for the entire consist.

All non TOP loco addresses added to the consist are controlled by commands sent to the “TOP” loco.

The TOP locomotive does not have to be a physical loco on the track, it can be a phantom.

Digitrax defines the TOP loco as the loco on the **R** Throttle knob at the time when the MU add is performed.

All loco addresses in a consist will have the same status as the TOP loco. They will all be common, in-use or idle based on the state of the TOP loco.

Each loco within a consist maintains its original advanced 28/128 or standard 14 speed step mode setting.

A consist can be released by one throttle and then selected and run by any other throttle.

A consist TOP address can be dispatched and acquired on another throttle just like any other address. See Section 5.7.

9.1.1 Adding a Locomotive To A Consist

DT402 and DT402R throttles must be plugged in to LocoNet to add loco addresses to consists. DT402D may perform this untethered.

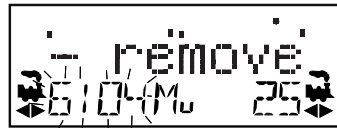
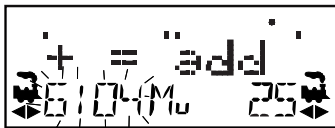
1. Select the loco address of the TOP loco on the **R** Throttle knob.
2. Select the address of the loco you want to consist to the TOP loco on the **L** Throttle knob.
3. Move the two locomotives into position. The locomotives can be headed in either direction. They can be adjacent to each other in the train or one unit can be the mid train helper or a pusher on the end of the train.
4. Before consisting the locos, make sure that both are traveling in the SAME PHYSICAL DIRECTION ON THE TRACK. (The direction indicators may or may not match, the important thing is that the locomotives are set up to move in the same direction and are not pulling against each other.)

- Press the **MU** key, the display will show the following:

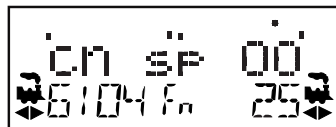


the MU mode indicator on the display is lit. The loco address in the **L** side of the display will blink to show that it is the address that will be consisted to the address on the **R** Throttle.

- The DT402 display will prompt you to press the **Y / +** key to add the loco address or the **N / -** key to remove the loco address from the consist controlled by the TOP loco address selected on the **R** Throttle. You will see the display alternate between the following two screens to remind you of which key to press.



- Press the **Y / +** key to add the left address to the consist.



The **L** Throttle display shows the address of the loco that was added to the consist with a **cn** in the text line above it. The **R** Throttle display shows the address of the TOP loco address and its current % of full speed. The **R** Throttle is now in control of the speed and direction of both locomotives in the consist.

- Once a consist is set up and linked to the TOP locomotive, this TOP loco can be released and selected to run from either throttle on your DT402. The consist can also be dispatched to another throttle.

You can access the functions of the any loco in the consist by selecting the consisted loco to a throttle and using the function keystrokes outlined in Section 7.0. You will not be able to change the speed or direction of any loco that is part of a consist while it is consisted unless it is the TOP loco.

9.1.2 Removing A Loco From A Consist

DT402R and DT402 throttles must be plugged into LocoNet to remove loco addresses from consists. A DT402D can perform this without plugging in.

1. Select the loco address that you want to remove from a consist on the **L** Throttle.
2. Press the **MU** key to enter consist mode.
3. Press the **N / -** key to remove the loco address from the consist.
4. The **L** Throttle automatically becomes active with the loco you just removed from the consist. If you remove the loco from the consist while the consist is moving, the removed loco will be broken out of the consist at the same speed and direction that it was moving in the consist. You can uncouple and run the removed loco as an independent loco again!

9.1.3 Nested Consisting

The loco that was selected in the **L** Throttle to be added to the consist can itself be the “TOP” loco of another consist. When it is added to the current **R** Throttle “TOP” loco it will become a “nested” consist. In this case the whole nested consist is linked and becomes part of the new consist.

The loco that is selected in the **L** Throttle to be removed from the consist can itself be the “TOP” loco of a nested consist that was linked into the current **R** Throttle “TOP” loco. In this case the whole nested consist is removed from the consist and returned to the **L** Throttle as a consist.

9.1.4 MU of Mismatched Locomotives

If all the locomotives in the consist have performance characteristics that are closely matched, you can run all the consisted locomotives in 128 step mode. If the units are completely mismatched (for example if you are running two different brands of locos with noticeably different characteristics), then we recommend speed matching the locos by programming Loadable Speed Tables (See your Mobile Decoder Manual more information).

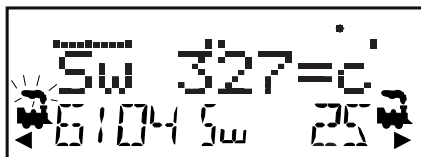
9.2 Sw (Switch) Mode

Switch mode is used for sending commands to accessory decoders and for changing option switches in your LocoNet system components. The most common use of switch mode is for operating turnouts. When you enter Switch mode, the throttle knobs and direction keys will continue to control the loco addresses running on the throttle. Loco speed will be displayed on the bar graph and loco direction will be displayed on the direction indicators for each throttle.

To change the position of a switch or turnout

- 1 Press the **SWCH** key to enter Sw (switch) mode.
- 2 The last switch (accessory) decoder address selected by your throttle is displayed on the text line followed by a “**t**” or “**c**”.
- 3 The display indicates the switch position using the “**t**” or “**c**” as follows:
“**t**” indicates that the switch is “thrown”
(for a turnout, the diverging route is set)
“**c**” indicates that the switch is “closed”
(for a turnout, the mainline route is set)

If the “**t**” or “**c**” indicator is flashing it means that the LocoNet Command Station does not know the current switch position. A steady “**t**” or “**c**” indicates that the command station knows the position of the switch.



- 4 Use the numeric keypad to enter switch number and the **OPTN / t** and **CLOC / c** keys are used to tell the switch in which direction it should operate. Use the numeric keypad to enter the switch address you want to change.
- 5 Once the desired switch address appears in the text area of the throttle, you will see either “**t**” or “**c**” on the right side of the = sign in the display. If the “**t**” or “**c**” is flashing, the command station does not know the position for this turnout. Press the **OPTN / t** key to move the switch to the “thrown” position OR the **CLOC / c** key to move it to the “closed” position.
- 6 If the switch you selected is a turnout connected to an accessory decoder, it will change position from closed to thrown or vice-versa. If the switch you selected is an option switch setting for your command station or other LocoNet component, the software switch inside the command station or other component will be changed.

7. After commanding the switch “closed” or “thrown” the switch position display will stop flashing, since the command station now knows the current switch position.
8. When you have finished your Sw (switch) operations you can return to Fn (Normal Operating Mode) by pressing the **EXIT** key or the **FUNC** key .
9. The next time you enter Sw mode, the DT402 will remember where you left off and start at the last switch address and position you accessed.

Note: Accessory (turnout) decoders in the system are accessible to all throttles and control devices with switch control capabilities and are not reserved in-use to a single throttle like locomotive decoder addresses.

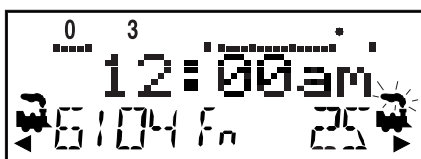
9.3 Fast Clock

The DT402 throttle can edit system functions like the fast clock and routes. Both of these features can be enabled or disabled by your command station. Digitrax command stations ship with fast clock enabled and routes disabled.

9.3.1 Fast Clock Basics

Many operators use a fast clock during operating sessions to simulate prototypical operations. Traditionally, this clock is on the wall and is set up to run at a faster than normal rate. LocoNet has its own networked fast clock for all Digitrax throttles connected to your system.

The fast clock display is a 4 digit 12 or 24 Hour format clock. To display the fast clock simply press the **CLOC / c** key. The fast clock display will remain active while you are running trains until you initiate another throttle task such as loco address selection, programming, MU, Switch mode, etc. To stop displaying the fast clock and return to the default display, press the **CLOC / c** key again. This is the display you will see:



Any DT series throttle (including your DT402) that is plugged in to your LocoNet system will update its fast clock time and rate to be synchronized to the rest of the system a couple of seconds after it is connected to LocoNet.

Each DT402 can be set up with an alarm. When the current fast clock time matches the private alarm time set in any DT402, then that DT402 will beep and flash the message “Alarm” to indicate that the alarm time has elapsed.

The fast clock rate for the fast clock is user selectable from 1:1 to 100:1 in steps of 1. The most popular range of values is 4:1 to 8:1.

9.3.2 Stop the Fast Clock

Setting the clock rate to 00 will stop the fast clock for the entire system at the currently displayed time. Fast time will re-start when a new non-zero rate value is set.

The current fast clock time, fast clock rate and the DT402 alarm time can be changed by using the Edit mode.

9.3.3 Edit Fast Clock Time, Rate and Alarm

DT402 must be plugged in to LocoNet to edit the fast clock settings.

1. From Fn mode, press the **EDIT** key to change to Edit Mode.
2. Press the **EDIT** key to scroll through the different things you can edit.
3. The first time you press the **EDIT** key, the mode indicator in the center of the bottom row of the display will show Ec (Edit Clock Mode) and the text area will show a 12 hour time. See Customizing Your Throttle, Section 10.0 (12HrClock) for setting the clock for 12 or 24 hour operation.
4. Use the Throttle knobs to dial up the “current” time. Use the **L** Throttle for hours and the **R** Throttle for minutes. You can only move time forward. Press the **EDIT** key again to set the time and move on to edit the fast clock rate.
5. When you press the **EDIT** key the second time, the mode indicator will display Ef (Edit Fast Rate) and the text will show Rate=nnn where nnn is the clock rate. Use the throttle knobs to dial up a clock rate that is between 000 and 120 (the throttle will let you dial up to 255 in this case but values above 120 have no meaning to the system). Press the **EDIT** key again to set the fast clock rate and move on to edit the throttle alarm time.
6. Once the time and fast clock rate are set, the mode indicator will display EA (Edit Alarm) and the text will show a 12 or 24 hour time. Use the throttle knobs to dial up the alarm time. Press the **EDIT** key again to set the fast clock alarm. NOTE: The fast clock alarm can’t be turned off.
7. Once the time, fast clock rate and alarm are set, you will automatically return to Fn Mode unless your system is enabled for other types of editing such as routes. If you are set up for command station routes, the clock editing screens will be followed by Er for editing routes as described in the system manual for command stations that support internal routes. To exit Edit mode at any time simply press the **EXIT** key.

10.0 Customizing Your Throttle - Step-by-Step

Changing the Throttle Options

You can change the option settings for each DT402 throttle to customize the way it operates. Option setting changes can be made on your DT402 either plugged in to LocoNet for power or unplugged with a battery installed. You do not need a command station to customize your throttle.

Following the instructions on accessing the Options menu is a chart listing in menu order the Option name as it appears in the DT402 display, a brief description of the Option and the factory default for each. There is also room on the chart for keeping track of your changes to the default settings.

The FactoryD option allows you to easily set the DT402 Options all back to factory defaults.

1. Press the **OPT / t** key to access the Options menu.



2. Use the **R** Throttle to scroll through the options. They are in the same order as the following charts. The names will blink during this part of the process.
3. Use the **Y / +** or the **N / -** key to toggle through the values for each option until the desired value appears on the screen.
4. To change another option, repeat steps 2 and 3.
5. Press **EXIT** key at any time to cancel all of your changes
6. When you are satisfied with the changes, press the **ENTER** key to set all of the changes at once.
7. You can return to the factory defaults by resetting the last option, FactoryD to On and pressing the **ENTER** key.

DT402 Option Screen	Description	Options (Default in Bold)	My Setting
IR mode	On enables IR mode when disconnected and IR receiver detected on LocoNet	Off On	
RF1 mode	On enables Simplex radio (for DT402R)	Off On	
Clicks	On enables clicking when making any key-pad or knob changes	On Off	
Fclock	On enables Fast Clock in center display	Off On	
12HrClock	On selects 12Hr vs 24Hr clock display mode	On Off	
NoBlstic	Off enables ballistic tracking by proving rate-sensitive knob steps so faster turning gives bigger step changes	Off On	
STimeout	On shortens the amount of time before the throttle kicks into Power Save when no changes have taken place	On Off	
F3Static	On makes F3 key On/Off action	On Off	
F2 Mom	On makes F2 key momentary action, used for playable whistle where available	On Off	
F2Analog	On enables optional F2 key pressure- sensitive analog mode	Off On	
MsgFilter	On stops throttle messages from displaying when selecting locomotives	On Off	
SLFollow	On enables slot following mode for locomotives selected in multiple throttles	On Off	
ES->Idle	On freezes all locomotives when Emerg-Stop key pressed. Off stops only locomotive selected in throttle	Off On	
PWRSaver	On enables Radio/IR mode power save on throttle inactivity	On Off	
IRRelease	On allows IR/Simplex Radio throttles to release loco addresses when unplugged	Off On	

DT402 Option Screen	Description	Options (Default in Bold)	My Setting
DplxBad	On enables white flashlight LED to blink when repeated Duplex radio messages fail.	On Off	
DxRxLPwr	On enables maximum Duplex power saving, disables continuous update of slot following	On Off	
NewTypes	On allows throttle to override command station new- type loco speed step settings	On Off	
Nu Type=	128 speed step setting 14 speed step setting reserved 28 speed step setting Advanced 128 speed step setting reserved Advanced 28 speed step setting	128 14 tR1 28 128A RES 28A	
Recall#	Recall stack set at last 4 entries Recall stack set at last 8 entries Recall stack set at last 16 entries	RC04 RD08 RC16	
BackLite	Maximum backlight brightness Maximum backlight brightness-lowest power usage	MAX 2 1 MIN	
RF1 Freq	RF1 channel- info only	A B	
Throt ID	Optional unique throttle ID#	427F	
XPFnHold	On allows mutple expanded function keys per X1 or X2 choice	On Off	
XP Slots	reserved	On Off	
Duplex RF	On enables RF24 to operate in Duplex mode. Off turns off Duplex choice	On Off	
FactoryD	Select ON and press enter key to force all options settings to factory defaults	On Off	

11.0 Programming Configuration Variables (CVs)

The decoders installed in your locomotives provide you with the ability to create a more realistic operating experience through the configuration variables (CVs for short). The DT402 series of throttles support configuration of up to 1024 CVs!

It is a good idea to run your decoders with the default CV values that come pre-programmed in your decoders until you get used to the performance characteristic and how they work on your layout. Once you are comfortable with running the trains, then you can begin customizing loco characteristics.

Each CV (configuration variable) controls a specific characteristic of the decoder, which in turn controls how the locomotive performs. See your decoder manual for a list of the most commonly used CVs and their meanings.

Each decoder comes pre-programmed from the factory with the default settings outlined in your decoder manual. You can change your decoder's performance characteristics by changing the CV values entered in the CVs you want to change. Each of these CVs can be set up when your command station is in the programming mode. The CVs are remembered in the decoder until it is reprogrammed to with a different CV value. Please refer to your Digitrax Mobile Decoder Manual for a complete listing of the CVs supported by each decoder.

It is a good idea to run your decoders with the default CV values that come pre-programmed in your decoders until you get used to the system and what it can do for you. Once you are comfortable with running the trains, then you can begin customizing loco characteristics.

Important Note on Programming:

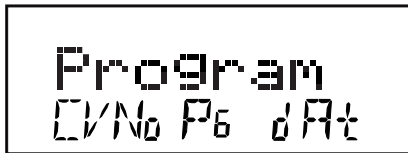
Programming decoder CVs is usually done on an isolated programming track and the following examples use that method. *See your Starter Set Manual for details on setting up the programming track.*

Simplex Radio and infrared throttles must be plugged in to LocoNet to program CVs on the programming track. Ops Mode Programming can be done without plugging simplex radio throttles in to LocoNet. IR throttles must be plugged in for Ops Mode Programming. Duplex radio throttles can program without plugging in.

The latest information on Digitrax Decoders is available online for download at **www.digitrax.com** in the Manuals and Instructions section.

11.1 Programming Mobile Decoder Addresses

1. Be sure that only the loco you want to program is on the programming track. If you are using operations mode programming, the loco you want to program can be anywhere on the layout but it must have a decoder that is capable of ops mode programming installed.
2. Press the **PROG** key to enter programming mode. The DT402 will display the following to show you are in the Program mode:



"CVNo" on the left side indicates that configuration variable numbers will show on the left and "dAt" on the right side indicates that CV values or data will show on the right side of the display.

The mode indicator in the center of the bottom line of the display shows which programming mode the throttle was using the last time it was in programming mode. Press the **PROG** key to cycle through the following options:

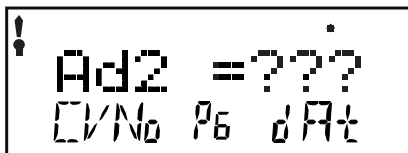
PG = Paged mode (Digitrax Preferred Programming Mode)

PH = Physical register mode

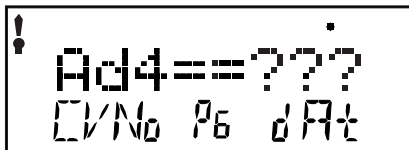
Pd = Direct mode

Po = Operations mode (See your Command Station manual).

3. After a few seconds, the display will display the last CV and CV Value you programmed. If the display does not show Ad2=???, turn the **L** Throttle knob counterclockwise until you see Ad2 in the left side of the display:

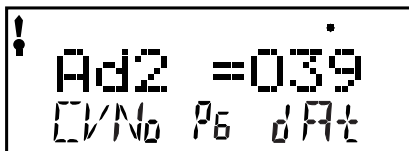


4. If you want to program a 4 digit address, press the **R** Throttle knob once to change the display to:



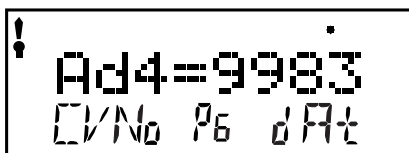
You can toggle between 2 and 4 digit address programming by pressing down on the **R** Throttle knob.

5. Digitrax recommends using the **PG**, or **Paged** mode for programming all Digitrax decoders when using service mode on the programming track. You can use the **PROG** key to select which programming mode you wish to use. Press the **PROG** key to toggle between PG, PH, Pd, and Po. If you are using non-Digitrax decoders you can change to another mode if they are not capable of Paged mode.
6. To program a 2 digit address, use the **R** Throttle knob to dial in the address or use the keypad to enter the address. In the example below we have pressed the 3 and 9 keys to enter the loco address, 39. Press the **ENTER** key to program the decoder.



Note, when programming a 2 digit address, the decoder automatically enables 2 digit addressing.

7. To program a 4 digit address, simply enter it on the keypad. In the example below we have simply pressed **9, 9, 8, 3**, on the keyboard to enter the loco address, 9983..



Alternatively, you can use the DT402's Throttle Knobs to dial in the 4 digit address you want to program. Use the **L** Throttle to dial up 1000s and 100s and the **R** Throttle to dial up 10s and 1s. Press the **ENTER** key to program the decoder

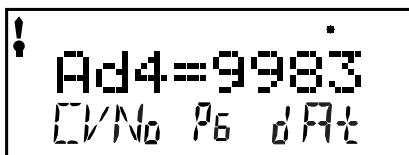
8. When the **ENTER** key is pressed, the throttle will beep and display Ad2=0wr or Ad4=0wr followed by a blinking square during programming. If you programmed a 2 digit address, you can proceed to step 13 to program other CVs or you can exit programming mode and run trains.
9. If you are programming a 4 digit address, there is one more step: the throttle will display Ad4on?=y. Press the **Y / +** key to enable the 4 digit address and automatically set CV29 to the decimal value of 038. The display will show the 4 digit address that you just programmed and enabled.

10. Press the **EXIT** key to quit programming mode and return to normal operations. Or if you want to continue programming additional CVs, see the next section.
11. If your command station is a DB150 and you are using any method other than Operations mode for programming, you will need to turn track power back on after you complete programming. Press the **PWR** key, then press the **Y / +** key, then press the **PWR** key to exit power mode. The DCS50 and the DCS100 do not require this step.

11.2 Programming CVs Other Than Addresses


There are 1024 different CVs that have been defined to handle many characteristics you might want to use for your locomotives. Your decoder manual has a complete listing of CVs that are available in specific decoders, what they do and suggested values for each CV.

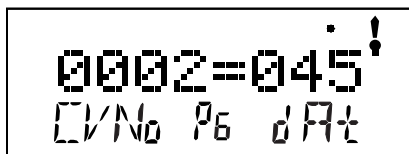
1. Place the decoder equipped locomotive you want to program on the programming track. If you are using operations mode programming, the loco you want to program can be anywhere on the layout but it must have a decoder that is capable of ops mode programming installed.
2. Enter Program Mode by pressing the **PROG** key. The display will show the last CV and CV Value you programmed. In the case below, it is the last loco address



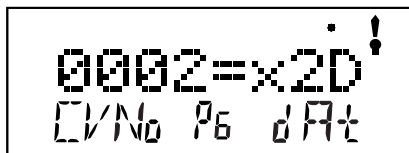
3. Select the programming mode you wish to use by pressing the **PROG** key until the method you want appears in the Mode Indicator. Digitrax recommends using the Pd, or Direct mode for programming Digitrax decoders when using service mode on the programming track.
4. Turn the **L** Throttle to begin selection of the CV# you want to program.

You will see the **!** icon displayed on the left of the DT402 display when you are entering CV Numbers. You can dial up the number using the **L** Throttle or you can use the keypad to enter CV#s 01 through 1024.

5. Press the **R** Throttle to activate the CV value. You will see the  icon displayed on the right of the DT402 display when you are entering CV Values. Use the **R** Throttle to dial up or the keyboard to enter the CV value you want. CV values are displayed as decimal numbers (0-255) by default.



Remember that you can press the R Throttle to toggle the CV value display between decimal and hex as shown below.



6. Press the **ENTER** key to program the selected CV value into the selected CV number.
7. Press the **EXIT** key to quit programming mode and return to normal operations. You can program as many CVs and their values as you want in a session. When you are finished, press the **EXIT** key to quit programming mode and return to normal operations.
8. If your command station is a DB150 and you are using any method other than Operation mode for programming, you will need to turn track power back on after you complete programming. Press the **PWR** key, then press the **Y / +** key, then press the **PWR** key to exit power mode. DCS100 does not require this step.

11.3 Operations Mode Programming

Operations mode programming lets you program CVs in locomotives equipped with Extended Packet Format decoders while they are on the mainline. A typical use for Ops mode programming would be to change the acceleration rate (CV03) or the deceleration rate (CV04) of your locomotives to simulate the weight and braking capability of the train to compensate for changing the number of cars or power units on a train.

Your DT402 can use ops mode programming to change the CV value in ANY CV, including 2 digit and 4 digit addresses.

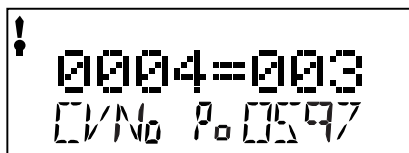
Ops mode programming can be performed by any DT402 at any time since the throttles are not competing for usage of the single programming track.

DT402 throttles must be plugged in for Ops Mode. DT402D and DT402R throttles can do Ops Mode Programming wirelessly.

When you enter programming mode with a DT402R, Ops mode is the only programming mode that will be available unless you plug in to LocoNet.

How to use Operations Mode Programming

1. Select the DCC loco address that you want to program on either the **L** or **R** Throttle. Be sure that the address you want to program is the active throttle, the one with the blinking smoke when you enter programming mode.
2. Enter Program Mode by pressing the **PROG** key to enter programming mode. The display will show the last CV and CV Value you programmed.
3. Press the **PROG** key until the “Po” appears in the Mode Indicator area of the display. If you are using an untethered radio throttle, the display will automatically show Po. The DT402 display will show the address that was selected on the active throttle in the right side of the bottom line of the display. This is the address that you are preparing to program.
4. Use the **L** Throttle knob to dial up the CV you want to modify. Use the **R** Throttle knob to dial up the CV value you wish to program for the CV. This example shows CV04 set to a value of 003 for loco address 597.



5. Press the **ENTER** key to program the selected CV value into the selected CV number. You can program as many CVs and their values as you want in a session.
6. Press the **EXIT** key to quit programming mode and return to normal operations.
7. With ops mode programming, the command station does not turn off track power. If you are using a DB150, you do not need to turn track power back on after programming with ops mode like you do with service mode programming.

11.4 Busy or Fail Message

If you get a “Busy” message in response to any programming task, the system is temporarily busy and you will have to try the task again until you get a “Good” response.

If you get a “Fail” message in response to any programming task, check to be sure that there is a loco on the programming track and that the programming track is powered.

To end a programming read back that is taking too long, simply press the **BACK** key. Note: The DB150 is not able to read back CVs.

11.5 Reading Back CV Values Programmed

Your DCS100, DCS50 and DT402 series throttles together can read back the configuration variable values programmed into your decoders. Since you must use the programming track for this, DT402 and DT402Rs must be plugged in to LocoNet to read back CV and their values. The DT402D can read back while not plugged in.

Systems with a DB150 command station are not able to read back CV Values programmed into decoders.

1. Place the decoder equipped locomotive you want to program on the programming track. You can also do an ops mode read back with Digitrax transponding decoders if you have a LocoNet device that allows ops mode read back plugged in to LocoNet.
2. Enter Program Mode by pressing the **PROG** key to enter programming mode. The display will show the last CV and CV Value you programmed.
3. Select the programming mode you wish to use by pressing the PROG key until the method you want appears in the Mode Indicator. You can read back in PG, PH, Pd, or Po modes with the following restrictions:

PG - Paged Mode no restrictions

PH - Physical Register Mode can only read CV01-CV08. You should not rely on values in the display for CVs above 08 when reading back in physical register mode.

Pd - Direct Mode no restrictions

Po - Operations Mode read back can only be used with Digitrax decoders that are capable of ops mode read back when there is a device attached to LocoNet that supports ops mode read back. Digitrax transponding decoders and DCS100 would allow ops mode read back.

4. To read back the CV value programmed for the *two digit address*, use the **L** Throttle knob to dial up Ad02 (CV01) on the left side of the text area and then press the **DISP** key. The text area will show Ad2 =rd followed by a flashing box. When the read back is finished, the CV value (the 2 digit address) will be displayed on the right side of the text area.
5. To read back the *four digit address* that is programmed into the decoder use the **L** Throttle knob to dial up Ad02 on the left side of the text area, then press the R throttle knob to change to Ad4. The text area of the display will show Ad4=???? (disregard any value that appears at this time). Press the **DISP** key and the display will change to Ad4=8rd followed by the flashing box. When the read back is finished the 4 digit address will be displayed on the right side of the text area.

6. To read back any other CV start at AD2=??? (Use the **L** Throttle knob to dial in Ad2 on the left side of the display or if you were in four digit addressing, press the R throttle knob once). Use the knob to dial up the CV you want to read back or use the numeric keypad to enter the CV Number. Press the **DISP** key the display will show the CV number=rd followed by the flashing box. When the read back is finished, the CV value for that CV will be displayed in the Right side of the text area.
Note: You can abort any read back in progress by pressing the **BACK** key.
7. Once you have read back any CV, you can change its value by dialing in the CV value you want and pressing the **ENTER** key.
8. Press the **EXIT** key to quit programming mode and return to normal operations (Fn Mode). You can read back and re-program as many CVs and their values as you want in a session. When you are finished, press Press the **EXIT** key to quit programming mode and return to normal operations.
9. If your command station is a DB150 and you are using any method other than Operation mode for programming, you will need to turn track power back on after you complete programming. Press the **PWR** key, then press the **Y / +** key, then press the **PWR** key to exit power mode. DCS100 does not require this step.

12.0 How Your Command Station Manages Addresses

Your command station has a finite number of “slots” available in its memory. Once the slots available in your command station are full, the system will display the “slot=max” or “FF” message to let you know that you need to release some locomotive addresses if you want to select and run others. Your command station manual details how many slots your command station can handle. It also explains how your command station handles purging of addresses from the system to allow for more addresses to be selected and run.

Please check your starter set manual for a complete discussion of the purging strategy used by your command station.

13.0 Decoder Status

The command station assigns status codes to each locomotive address in the system. Addresses are either selectable or not selectable. Decoders are not selectable if they are in-use on another throttle or if they are part of a consist. If you try to select an in-use address, you will be prompted to “Steal” the address. If you select a decoder that is part of a consist, you will be able to send function commands but you won’t be able to control its speed or direction. The text line in the DT402 display will show “top”, “cn” or “mid” if the address is part of a consist, otherwise it will show “stat”. This display is followed by the status code for one of the following modes of operation.

Display	Meaning
28	28 Speed Step Mode
14	14 Speed Step Mode
128	128 Speed Step Mode Digitrax Preferred Mode
*28 FX	28 speed step-enable advanced consist mode
x01	Reserved, Do not use
x02	Reserved, Do not use
*128 FX	128 speed step-enable advanced consist mode

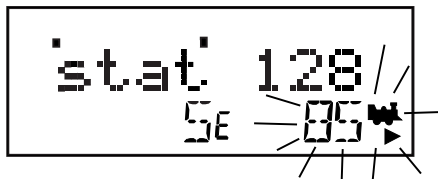
Decoder Status Codes

13.1 Status Editing a Decoder

Status editing is used most often when you are running non-Digitrax decoders that do not have 128 speed step capabilities. If you can’t get a non-Digitrax decoder to work on your layout and you are sure you are using the correct address for the decoder, you probably need to status edit it to run in 14 or 28 speed step mode.

1. Press the **LOCO** key to enter address selection mode, the display will begin flashing the address on the active throttle and will display “Sel Loco” in the text area to prompt you to select an address. Lo will also be flashing.
2. When you use the Throttle knobs or key pad to enter the address of the locomotive you want to select, the display will show the current status of the decoder. To display the status code of the loco address that is flashing in the display when you enter selection mode, just turn the throttle knob up one address and then back to the original address and the status code will display on the Display.

3. To change the status of the decoder simply press the **EDIT** key the flashing Lo will change to SE and the current status code of the address will be displayed. Use either Throttle knob to scroll through the status codes shown in the table above.



4. Once the status code you want to use for the address is displayed in the text area of display, press the **ENTER** key to change the status code of the locomotive and to select it to run on the active throttle knob.
5. If the loco address is in-use on another throttle or in a consist when you press the **ENTER** key to complete the status edit process and select the loco on the active throttle, the DT402 will prompt you to **Steal=Y**. If you want to steal the address, press the **Y / +** key to complete the status edit. If the loco is part of a consist, it will not be selected and will remain part of the consist when the status is edited.

13.2 Note for Non-Digitrax Decoder Users

If you have a decoder that does not have advanced 28/128 speed step mode available, you must “status edit” that locomotive’s address in the your Digitrax system to a standard 14 speed step mode before running it. Changing the address’ status will cause the system to handle this decoder as a 14 step decoder. Status editing does not reprogram anything in the decoder

14.0 Troubleshooting Throttle Problems

See your Starter Set Manual for general system troubleshooting tips.

14.1 I'm lost!

If your DT402 display isn't showing you what you expect based on the manual, press the **EXIT** key to return to normal operating mode Fn. Then try the throttle task again.

14.2 Emergency Stop

If the layout starts to “get away” on you, either:

- Press the **PWR** key followed by the **N / -** key , OR
- turn the track power to “SLEEP” on the DCS100 or DB150 Command Station.

Either way, the layout will stop to give you a chance to regain your composure. Press the **PWR** key followed by the **Y / +** key to resume operations where you left off.

14.3 Nothing is responding

Is track power turned on? Is your throttle in Idle or stopped and displaying a flashing track power indicator or “Trk=Idle” in the throttle display?

Press the **PWR** key followed by the **N / -** key then **Y / +** key then **PWR** key to toggle the Track Power off then on. You should see the track power indicator on the DT402 come on solid.

14.4 Can't select a loco on my throttle

Is the loco in use by another throttle

Did the throttle ask you “STEAL=Y?”.

Is the loco part of a consist?

Do you see a cn in the display when you try to select it? A loco in a consist cannot be selected and run separately. You can still control the locomotive's functions.

Do the settings in CV29, the configuration register, match the command station output?

If your decoder is a 14 step decoder running on any Digitrax system using factory defaults, status editing will be needed for that decoder.

Have you reset any CVs since the last time you ran the loco

If so, go back and change them to their default CV values and then try to run the loco. It is possible to set acceleration so high that it may take 10 minutes or more for a loco to start moving.

Have you changed the loco address?

You can read back the loco address (see Section 11.5) to see if it has been changed. If you are not able to read back the address, simply re-program the loco's address.

Does your throttle say “slot=max”?

This means that the system’s capacity to handle operating loco addresses is full.

The DCS100 that comes with Super Chief Xtra can run up to 120 addresses at the same time. If you have the “slot=max” message, be sure that all locos that are not running are released from throttles or set DCS100 OpSw 44 to closed to increase the number of addresses to 120.

The DB150 command station that comes with Super Empire Builder Xtra sets has a system limit of 22 addresses.

The DCS50 command station that is part of the Zephyr Set has a system limit of 10 addresses.

To prevent slot=max, always hit LOCO, EXIT when you are finished running a locomotive. This removes the address from the slot. This is also a quick way to free up slots when slot=max appears. Using the DT402 throttle, select a loco address you’ve been running and then push the EXIT key. As an example, the key sequence LOCO-1-1-8-EXIT releases loco address 118 from the system and thereby frees a slot.

Was the loco running normally just before it stopped?

If the decoder is very warm it may be in thermal shutdown. Let it cool off and see if it starts again. Also check for localized track problems using the quarter trick outlined in your starter set manual.

Are there burn marks on the decoder?

You’ll need to send it in for repair!

If all else fails, reprogram the decoder address and reset CVs to default values.

14.5 “Strange” Locomotive Lights

If you can’t control the operation of the lights in your locomotive with the DT402 (in default 128, or 28 speed step mode), be sure that the decoder is programmed in advanced 28 speed step mode.

Do this by programming CV29 with a value of 06. See your Decoder Manual for more information about programming decoders.

15.0 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 measures:

- 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 from 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.

The DT402D and DT402R is certified for "unlicensed" operations within the United States by the US FCC and has the identifier as displayed on the unit case. Canadian ID for DT402D and DT402R is displayed on the unit case. See unit case for certification identifiers from other countries.

Important Note: The DT402D and DT402R is certified by the FCC and by Industry Canada using a 12" LocoNet cable only. Any modification to the cable may void the certification. For convenience an extension cord may be attached with a 6 pin adapter for tethered use only.

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 appareil 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.

FCC Information for RF24 module

FCC ID LV3RF24

IC 3015A-RF24

16.0 Warranty and Repair Information



Digitrax gives a one year “*No Worries*” Warranty against manufacturing defects and accidental customer damage on all Digitrax products.

That's it! A simple, straightforward warranty with no tricky language!

Visit www.digitrax.com for complete warranty details and instructions for returning items for repair.

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.

Digitrax, Inc. is not responsible for unintentional errors or omissions in this document.

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