Digitrax Complete Train Control
Run Your Trains, Not Your Track!

RADIO EQUIPPED ™

UR91

Simplex Receiver/IR Receiver

Works with LocoNet Simplex, IR & Walkaround Throttles

For Simplex Equipped LocoNet Throttles

Features:

- **LocoNet makes it easy to add Simplex Radio (UR91) to your layout. And it works alongside Duplex Radio (UR92) and Infrared (UR90) at the same time so you can use all three technologies together.**

- **Provides a Simplex link to the layout with Digitrax Simplex Equipped Throttles.**

- **Supports simplex InfraRed operation with all Digitrax InfraReady Throttles.**

- **Supports up to 10 simplex throttles operating at the same time.**

- **One UR91 provides adequate coverage for most layouts.**

- **Simplex range is approximately a 100 ft diameter circle.**

- **FCC Part 15, Class B RFI compliant.**

* 900 MHz band is in use worldwide, the UR91 may only be operated in countries where it is certified or type accepted for use in that country.

Parts List

1 UR91 Simplex Receiver/IR Receiver Panel   1 2' LocoNet cable
1 Instruction Sheet

Installation Basics UR91

During installation of the UR91 radio receiver, you will need to be able to see and/or hear your command station to be sure commands are being received via the UR panel. In the installation procedures detailed below, you will determine the best location/s in which to install UR91s on your layout for optimal infrared or radio signal reception. You will need to make observations to determine when the system is receiving a signal and when it is not. Your Digitrax equipment gives you several ways you can make the observations. You should choose the observation method that works best with your layout. For example: on a small layout, you may be able to observe the command station directly. But on a large layout, it may be more convenient to set the command station to generate diagnostic clicks so you can hear when the system receives a command (see step 4 below for details).

1. On the DCS100, the red "NET" LED will blink when a good LocoNet message is received by the DCS100.

2. With address 00 selected on the DT400R/DT402R throttle and speed set to 99%, the TRACK STATUS indictor on the DCS100 or DB150 will change from red to green (or green to red) when you reverse the direction of address 00. Do this test without an analog loco on the track and you will still see the indicator color change. By removing the loco from the test environment, you can eliminate one more variable that might cause problems. If you can't see your command station everywhere on your layout, see step 3 below for a way to observe this effect.

3. Use your LT1 as a local track testing tool. See the figure below.
   a. Twist together the black and blue leads.
   b. Twist together the yellow and white leads.
   c. Connect the black/blue leads to one rail and the yellow/white leads to the other rail of any section of track.
   d. The two outside LEDs on the LT1 will be lit.
   e. Use your throttle to change the direction of address 00 that is set to 99% speed, one of the LEDs on the LT1 will be brighter than the other.
   f. Change direction again, the other LED will be brighter.

   This allows you to observe that the command station is receiving the tetherless throttle's command.

   This tool can be carried with you as you move around the layout and

will give a local indication that the radio or infrared signal is being received by the system without having to look at the command station for confirmation.

LT1 Set Up As A Track Tester

Yellow & White

Led will be lit

Black & Blue

Green & Red wires not used

Led will be lit
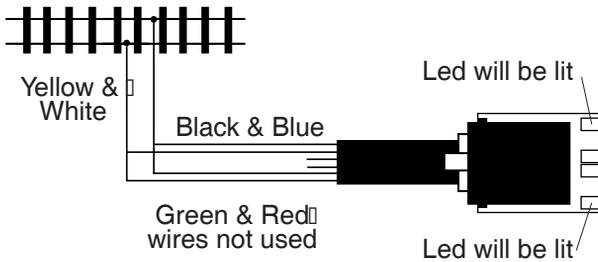
You can also use a bi-color LED indicator lamp, with a 500 to 1k ohm resistor in series, connected to the two rails of the powered track.

4. Set your command station's Option Switch #41 to closed to generate a diagnostic "click" sound each time it receives a good LocoNet message. See the DB150 or DCS100 Option Switch Setup Section in your Super Chief or Super Empire Builder manual for information about changing this options switch. This has no effect on command station operation except that it causes the diagnostic clicks. Once you have finished installing the UR91, set OpSw#41 back to thrown and the clicking will be disabled.

UR91 Installation

THROTTLE JACK   RADIO LEDS

TO PS14 DC POWER SUPPLY

TO LOCONET →   ← TO LOCONET
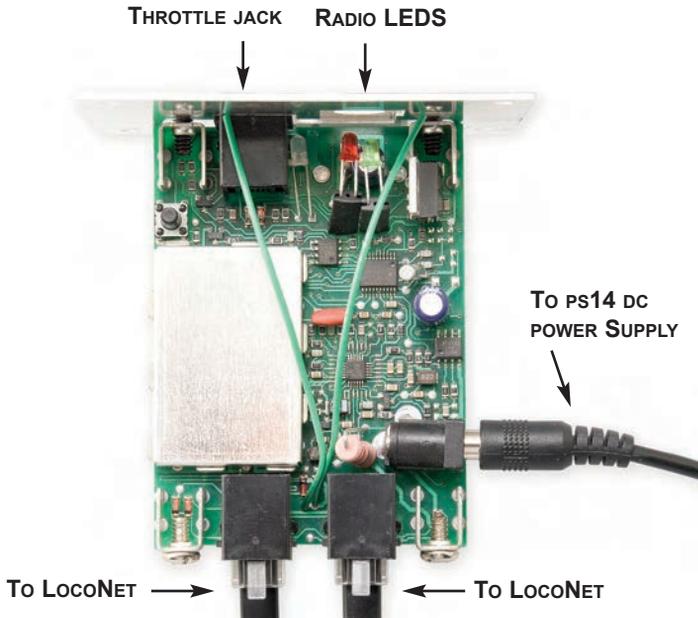
The following procedure will help you determine the best location on your layout for installation of your UR91.

1. Decide how you will observe whether signals are being received (as discussed on pages 2 and 3).
2. Remove all locomotives from the layout and turn off the power to the system.
3. Gently straighten the UR91's two small flexible antennas so that they are pointing up from the PC Board. Spread the 2 antennas about 20 degrees apart. Be sure not to bend the green antenna wires too many times as this could cause damage. Do not allow the UR91 antennas to connect to bare conductors or layout wiring. It is good practice to keep other wires below the antenna level and about 1-2 feet away from them.
4. Plug the Digitrax PS14 +14 volt DC power supply into the 2.0 mm power jack on the side of the UR91.
5. Plug the UR91 into a LocoNet jack near where you plan to install it. We recommend that you start with a central location that will likely provide best coverage.
6. Power up the layout and track.

7. The Green LED on the UR91 will be lit indicating the UR91 has passed its internal self-tests and is ready to receive radio signals.

8. Install a 9 volt battery in your DT400R/DT402R and plug it in to LocoNet.

9. While still plugged in, use the DT400R/DT402R to select loco address "00" and run it at 99% speed. (Since there are no locos on the track, nothing is actually running. We will use this as a diagnostic to help determine the best location for your UR91 for optimal radio reception.

10. Change the direction of address "00" by pressing the Reverse Key or double clicking the throttle knob associated with address 00. Observe whether the signal was received by the system by the color change on the command station's TRACK STATUS indicator or other method chosen from page 2 and 3.

11. Unplug the DT400R/DT402R. Move around the layout area stopping to test at several locations. At each location, change the direction of address "00" and observe that the command was received by the system. Slowly rotate in place at each test location to check reception from various directions. By moving around the whole layout area, you will be able to determine whether any radio "blind spots" exist.

12. When you locate blind spots, adjust the location of the UR91 until you have good radio reception everywhere in the room.

13. Once you have determined the installation location that gives the best reception, you can permanently mount the UR91 and hook up the wiring under the layout.

The UR91's green RADIO LED indicator on the UR91 will flicker as it receives a good radio message from the DT400R/DT402R. This indicates that the radio link is working properly.

Troubleshooting Tip: If the green RADIO LED flickers but there is no response from the command station or loco address, you probably have a plug crimped in the reverse orientation on one of the LocoNet cables. You should test all LocoNet cables using your LT1 to avoid this problem. To correct the problem, just cut off the reversed plug and re-crimp a new one in the correct orientation. You can also eliminate this problem by splitting the insulation on any LocoNet cable and shorting the two center wires (red and green) together. Make sure that the shorted wires continue through the cable as before.

Troubleshooting Your Installation

Most layouts don't experience problems with radio reception but, if you are having trouble, try the following suggestions for improving reception.

1. Electrical wiring, metal plumbing and A/C ducting and other items may cause areas of poor reception around the layout. This is typically due to the multipath reflections or echoes of the radio waves. Moving the throttle about 6" to 12" in any direction or varying the orientation of the throttle will usually overcome any blind spots. Another option is to re-locate the UR91. Sometimes a more central location is better, other times moving the UR91 to a completely different area is the answer. Since every layout is different, this will be a matter of trying different locations until you find the right one for your particular situation.

2. Adjust the two antenna wires on the UR91from the recommended vertical "V" orientation to a horizontal orientation. This orientation gives better reception of horizontal polarization that may be experienced in some buildings with metal floors and roofs. Changing the UR91 antennas will **not** lead to improved range performance.

3. If adjustment of UR91's location and antenna wires does not clear a stubborn dead spot or range problem, consider adding a second UR91 installed away from the first UR91 to achieve better reception in the problem area. If you use more than one UR91 on the layout, they will automatically work together on LocoNet.

4. Note that the Digitrax simplex radio throttles & UR91 share the radio spectrum with other types of radio services and might sometimes experience transient interference. If interference persists then consider using the UT4R/DT400R/DT402R in the tethered mode until the problem clears. You may turn off the DT400R/DT402R radio option by modifying the DT400R/DT402R Op#2 Value. See Section 25.2 for information on changing this setting.

Tetherless Operation of DT400R/DT402R

DT400R/DT402R is an IR/radio equipped throttle. To use your throttle as a radio throttle, you will need to install a radio receiver on your layout.

A 9 volt battery must be used to power the DT400R/DT402R for tetherless

operation. Using DT400R/DT402R as a tetherless throttle is easy:

1. For Radio operation, plug in at least one Digitrax Radio receiver UR91 to your working LocoNet (see page 4). Most layouts only need one UR91.
2. Install a 9 volt battery in your DT400R/DT402R.
3. Plug your DT400R/DT402R in to LocoNet and it will verify that at least one infrared and/or radio receiver is connected to LocoNet. The throttle will display either rA or Ir (depending on whether it finds an infrared or radio receiver first) followed by the current LocoNet ID. This example shows that the DT400R/DT402R has detected a radio receiver and that the current LocoNet ID is 01. The throttle has loco addresses 03 & 1280 selected.
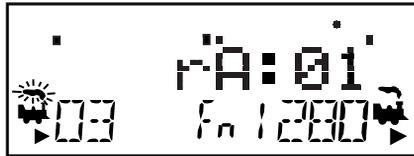
4. The DT400R/DT402R will use the **LocoNet ID** of the LocoNet it was plugged in to and will begin to operate as an IR throttle when you unplug it from LocoNet. When you unplug from LocoNet, the tetherless indicator will come on and the tetherless message will display for a few seconds indicating whether the throttle is running as Ir (infrared) or rA (radio). It will also display the LocoNet ID that the throttle is logged on to.

5. When you single click or turn either throttle knob to activate it, the DT400 will show the normal operating mode Fn display with the tetherless indicator lit.
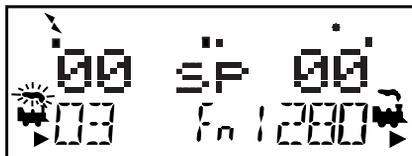
If an untethered DT400R/DT402R, operating as a tetherless throttle, detects no

---

user throttle activity for about 3 minutes it will enter power save mode. The display will show:

```
r-PS
```

The throttle may flash the normal Fn Mode screen 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 throttle.

Press and hold the PWR button 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 DT400/R out of power save and return to the normal Fn mode screen.

Fast clock caution: If you use power save mode, the DT400/R'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.

LocoNet ID Change
Your DT400R/DT402R will log on to the LocoNet ID offered by compatible infrared or 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 DT400R/DT402R from the LocoNet for which you want to change the LocoNet ID.

2. Press and hold down the EDIT Key 🔘 on the DT400R/DT402R and then plug it back in to LocoNet. Release the EDIT Key 🔘 after plugging in the throttle.

3. The throttle will display E1 in the Mode Indicator and the current LocoNet ID "Ir:0n" or "rA:0n", where "n" is the current LocoNet

DIGITRAX®

2443 Transmitter RD
Panama City, FL USA 32404
www.digitrax.com

T 850-872-9890
F 850-872-9557

ID. Use the R throttle knob to change the LocoNet ID. You can set the LocoNet ID to be any number from 0 to 7.

```
Ir:03
   Ed
```

This display shows a DT400 that has found an Infrared receiver on LocoNet with a current LocoNet ID of 03. The DT400 is ready to Edit the LocoNet ID. Other characters may be displayed on the screen at this time depending on the current throttle state.

4. Press ENTER Key **[ENTER]** to set the system to the new LocoNet ID.

5. The DT400R/DT402R 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.**

If you add a new UR91 to the system and are using a LocoNet ID other than the initial default value of 0, you must to re-synchronize the IDs in all the UR91s by setting the LocoNet ID as described above.

If you are operating in an area where more than one LocoNet systems is operating nearby, be sure to coordinate with other layouts so that each one has its own unique LocoNet ID before beginning operations.

Tetherless Operation

Selecting a Locomotive-Safety Selection
While tetherless, the DT400R/DT402R operates as a one-way transmitter. The throttle must be plugged into LocoNet to select an available locomotive address. After an address is selected on your DT400R/DT402R, you can unplug from LocoNet and run the selected addresses with infrared or radio. The throttle will automatically convert to infrared or radio operation for all speed, direction, function, operations mode programming, and switch commands.

Releasing a Locomotive

Two options are available for tetherless release. These options are set by DT400 Option #3, or DT402 option 'IRRelease'.

No tetherless release allowed: if the LOCO Key ![LOCO key] is pressed while the DT400/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.

Tetherless release allowed: if the LOCO Key ![LOCO key] is pressed while the DT400/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 DT400/R in to LocoNet and select the loco address on the throttle.

Multiple Unit Operations

Consists must be assembled and broken up while the DT400/R is plugged in to LocoNet. MU operations are locked out while the DT400/R is running tetherless. Once a consist is assembled, it can be operated normally using the DT400R/DT402R in tetherless mode.

Programming

Ops mode programming is the only programming method that will work while the DT400R/DT402R is operating as a radio throttle. If you press the PROG Key ![PROG key] to enter programming mode, the throttle running as a radio throttle will default to the Po mode (ops mode programming). The DT400R/DT402R must be connected to LocoNet to use service mode programming and access any of the other programming modes available.

Switch Mode

The DT400/R will operate in "Switch" Mode while tetherless. It can operate turnouts and routes using the OPTN t ![OPTN key] & CLOC c ![CLOC key] Keys in the normal manner.

Ballistic Tracking

While running tetherless, ballistic tracking will feel slightly different than while connected to LocoNet.

2443 Transmitter RD   **T** 850-872-9890
Panama City, FL USA 32404   **F** 850-872-9557
www.digitrax.com

Fast Clock

When using the fast clock option, the DT400R/DT402R will keep track of and display fast time based on the last synchronized system fast time when the throttle was connected to LocoNet. If the fast time is edited by another throttle connected to LocoNet, the DT400/R will not see this change until it is plugged into LocoNet at which time its display will be updated.

23.2.1 Control Lock

While the DT402R/DT400R is being used tetherless, there are occasions when you may want to disable the throttle's controls to prevent accidental commands being sent to the railroad.   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 the controls on your DT400/DT402R

1. Press both the Y + and the N - Keys at the same time. When you are locking the keyboard be sure to press both the Y+ & 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.

To un-lock the controls with "Lock =+&-" on the display:

1. Press both the Y + and the N - Keys at the same time again. This will return the throttle to normal operation.

2. Plugging the throttle into LocoNet will also unlock the throttle.

31.0 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 form that to which the receiver is connected.
> -Consult the dealer or an experienced radio/TV technician for help.

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

The DT400R is certified for "unlicensed" operations within the United States by the US FCC and has the identifier: FCC ID: LV3RF1 or other as displayed on the unit case. Canadian ID for DT400R is 3015102960. See unit case for certification identifiers from other countries.

The UR91 is certified for "unlicensed" operations within the United States by the US FCC and has the identifier: FCC ID: LV3UR91 or other as displayed on the unit case. Canadian ID for UR91 is 30151002940A. See unit case for certification identifiers from other countries.

Important Note: The DT400R 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.

2443 Transmitter RD   T 850-872-9890
Panama City, FL USA 32404   F 850-872-9557
www.digitrax.com

For Canadian Users:

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

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

Warranty

Digitrax gives a one-year "no worries" warranty against manufacturing defects and accidental customer damage on all Digitrax products. That's it! Simple, straightforward warranty, no tricky language!

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

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

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

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

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

This Page Intentionally Blank

2443 Transmitter RD   T 850-872-9890
Panama City, FL USA 32404   F 850-872-9557
www.digitrax.com

This Page Intentionally Blank

Go Beyond DCC With DIGITRAX ®

Complete Train Control

Main Station

Starter Sets
LocoNet ®
Power Supplies

DUPLEX EQUIPPED
Available

Your Digitrax LocoNet® Starter Set is just the beginning of an exciting trip! Pick the one that's right for you!

Super **Chief** *xtra* ™

Super **EMPIRE BUILDER** *xtra* ™

ZEPHYR ™

LocoNet®
The Digitrax Difference

Locomotive Shops

Mobile Decoders
Function Decoders
SoundFX™ Decoders

Decoder | Decoder
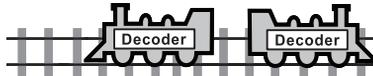
More Fun For Everyone

Add More Boosters,
Advanced & Simple Throttles,
Power Supplies,
Universal Panels,
IR and/or Radio
for more trains and operators.

Universal Panels

Throttles

Boosters
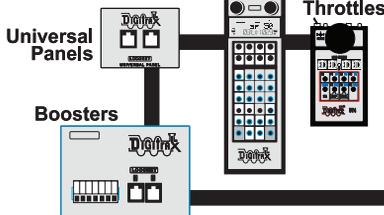
Maintenance Of Way

Make your layout more fun & simpler to operate!

Automatic Reversing & Power Management

Stationary Decoders
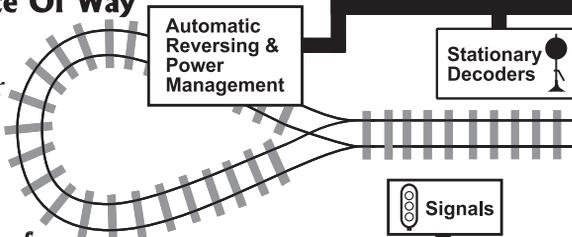
Computer Controls

Computer Interface
Decoder Programmer
Sound Programmer

Signals

It All Adds Up To Complete Train Control

Detection

Transponding
87 | 4123 | 8427

UR91 Radio Receiver

6 52667 11004 4

1k/10/09

307-UR91-0000