Model Railroad Hobbyist |

DCC IMPULSES

column

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Digitrax Duplex Radio Hints

Digitrax has built a reputation for reliable wireless operation. Things are evolving in their camp, so I felt that it was time to delve a bit into the history and current status.

History

When I started Litchfield Station (2000) there were a limited number of options for wireless cab connection of your DCC system. One of the most reliable and robust versions available at that time was the Digitrax radio system. It utilized a communication protocol known as simplex. The simplex radio cabs are distinguished by the letter "R" at the end of the part number, such as UT4R [1].

1. UT4R simplex radio cab from Digitrax.
Digitrax photo

At that time, I recommended Digitrax to my customers who wanted radio, as the competitive (duplex) system from NCE was not as reliable.

As time went by, NCE found what was limiting their range and reliability. Their system became the go-to one for radio, in my book.

Both the Digitrax and NCE radio cabs utilized the same frequency in the (unlicensed) 915MHz band. Thus, if you had two layouts in the same general area, such as a train show, they would interfere with (step-on) each other. One of the tenants of unlicensed operation is that the user must accept any interference.

2. Digitrax duplex engineer's cab, the UT4D.
Digitrax photo

Not to be outdone, Digitrax released a duplex system in the middle of 2009. Their duplex system was established in the 2.4GHz band where there was less chance of interference from other DCC systems, cordless telephones, etc.

The duplex cabs carried the "D" suffix, such as the UT4D shown in figure [2]. The only thing that externally distinguishes the two radio cabs from each other is the letter at the end of the model number (R = simplex; D = duplex) and the text near the model number ("RADIO EQUIPPED" vs. "DUPLEX EQUIPPED".)

Many early adopters of the Digitrax duplex system reported less than perfect performance: short battery life being one of the most prominent complaints. Digitrax listened and worked on the issues.

When the duplex radio was announced, in 2009, Digitrax discontinued selling sets with the simplex radio components included. Only duplex components have come as part of a radio system from Digitrax since then.

In October of 2016, Digitrax announced the end of simplex. They would build base units and simplex cabs until February 2017. Maintenance support will continue until they run out of parts.

Simplex vs. duplex

Okay, what's the big difference between simplex and duplex?

3. Digitrax UR91 base unit that receives simplex radio and infrared wireless signals. The two green wires seen in the photo are the antenna - remember rabbit-ears TV antennas? *Digitrax photo*

Simplex means that the base unit [3] only listens for signals coming from the cabs. The base never transmits anything by radio. So, there is no verification

of commands being received. Since the process of acquiring a loco on a cab requires some communication in both directions, the simplex radio cabs cannot change locomotives without being plugged into the layout. This requires a LocoNet panel on the layout every place the operator(s) will need to address a new loco. It is a good design practice to have a number of cab panels scattered around the layout so that one can easily plug-in in the event of a loss of radio communication.

Duplex means that base unit [4] and the cabs both transmit and receive. This additional communication allows the operator to acquire a loco without plugging-in. Also, communication can be much more reliable, due to the base station's ability to acknowledge commands received and the cab's ability to resend commands that are not acknowledged in a reasonable period of time.

4. UR92 duplex radio base unit with infrared capability. The antenna is built into the (yellow) radio module. *Digitrax photo*

Can I run both together?

In conjunction with the move to duplex communications protocol, the "D" series cabs operate on a different frequency and in a radio band far removed from where the "R" series systems operate. This diversity allows both systems to operate on a single layout at the same time. Of course, each system will have its own set of features and limitations. But folks don't have to completely scrap the cabs they have to start migrating from simplex to duplex.

How difficult is it to change from simplex to duplex or add duplex to an existing layout?

In order to explain this process, I obtained a duplex radio cab (UT4D) and a duplex radio base (UR92). Our PebbleCreek Model Railroad Club (**pcmrc.org**) layout has had simplex Digitrax operation from the beginning in 2006. Here is what I did to install the base unit on the layout.

Near the middle of the room, I removed one of the (UP5) Universal LocoNet Panels, as shown in [5].

5. Mounting screws have been removed allowing the UP5 panel to slide out of the PCMRC layout. *Bruce Petrarca photo*

Once the UP5 was loose, I slid it out from the fascia a bit and unplugged the two LocoNet cables from the rear of the panel.

The new UR92 receiver is virtually the same size as the UP5 that it will be replacing. However, it will need A.C. line voltage layout power. The power supply that comes with the UR92 works on any mains voltage and frequency in the world, but has a North American plug. I selected the specific UP5 to replace due, in part, to its location. It was close to an outlet that is connected through our power switch to the Uninterruptible Power Supply. I plugged the power supply into the outlet and snaked the power cable out through the hole in the fascia [6].

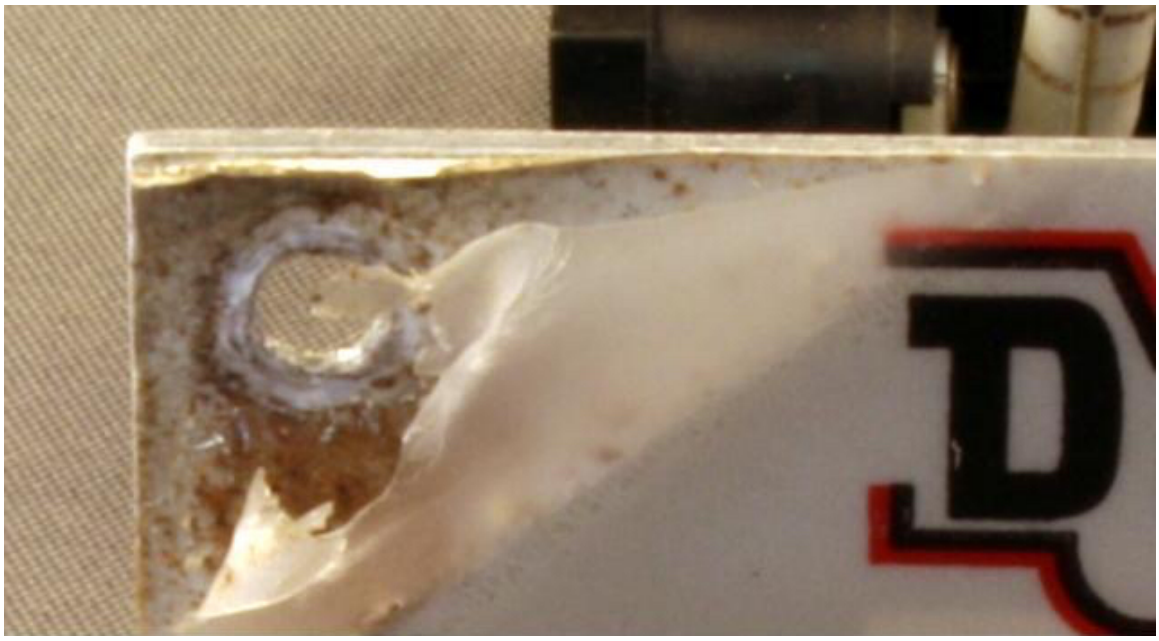
I plugged the power cable and the two LocoNet cables into the rear of the UR92 and slid it back into the fascia [6].

6. UR92 sitting in the fascia, ready to be screwed into place. ***Bruce Petrarca photo***

Now it is time to screw the new UR92 in place on the layout. I like to use washers between the screws and the plastic-coated aluminum front panel.

The washers keep the screw heads from grabbing the plastic and pulling it away, as shown in [7]. My preferred washers are the white nylon ones, as they disappear next to the white faceplate.

7. Screw damage to a Digitrax UP or UR plate caused by a lack of washers to protect the plate. *Bruce Petrarca photo*



Once the new base station (UR92) was installed [6], all that was left was to power up the layout, plug the new UT4D into any LocoNet socket on the layout, select a loco and run a train.

Wait a minute, I said you didn't have to plug in to select a loco. Yup, but the cab and the UR92 and the command station must agree that they are all part of the same family for communication to happen. Plugging the UT4D in and selecting a loco gives it time to get all those planets aligned. From then on, loco selection can be wireless.

Can I convert my cab(s)?

Digitrax offers duplex radio conversions for DT400 series cabs (DT400, DT400R, DT402 and DT402R). When a DT400 or DT400R is converted to duplex, it will also be upgraded to the functionality of a DT402D. Similarly, the UT4 or UT4R can be upgraded to a UT4D. They must be sent to the Digitrax factory. Information and pricing is available on the Digitrax website. DT500 cabs can be converted to DT500D.

Where can I use a cab with a “D” suffix?

These cabs can be used with the UR92 base in the USA, Canada, Australia and New Zealand.

What about Europe?

There is a separate version of the duplex hardware to comply with European Union rules. The base panel is known as a UR92CE. The cabs have a “CE” suffix, instead of the “D” suffix. “CE” panels and cabs must be used with each other. They will not communicate with “D” or “R” series hardware.

What about infrared cabs?

I understand why Digitrax offers an infrared option. It allows folks outside the EU and the USA, Canada, Australia & New Zealand block to have Digitrax wireless operation. Some folks feel it is better than no wireless option. I find that the line-of-sight needed to get a signal from the cab to the base to be very limiting. So, I do not recommend it.

Okay, so you can add a UR92 (or UR92CE) to your layout and immediately use “D” or “CE” series cabs wirelessly. If your layout is already wireless with a UR90 (infrared only) or UR91 (simplex and infrared), the UR92 can be added and not interfere, allowing both simplex and duplex cabs to operate simultaneously.

How did it work?

With a couple of operating sessions under my belt, I have found fewer operating glitches with the UT4D than I’ve had with my UT4R recently. Things seem to run more smoothly. I had fewer times where the loco ignored a direction change command. I never had loss of control, even on a friend’s layout where the simplex system rarely operates properly for more than 10 minutes at a time, due to some local interference.

Check out Mr. DCC’s Workbench after this column. I’ll be showing you how to keep from damaging your Digitrax cab when you shut off the battery power.

Please share your experiences and ideas. Just click on the Reader Feedback icon at the beginning or the end of the column. While you are there, I encourage you to rate the column. “Awesome” is always appreciated. Thanks.

Until next month, I wish you green boards in all your endeavors.

Mr. DCC's Workshop

Hints for Digitrax cab batteries

Mark Juett has become a friend of mine. Mark writes the DCC column for the ***NMRA Magazine***. In a recent issue he shared an idea that I really like. I asked him for permission to share it with my readers and he was gracious enough to allow me to do so.

All Digitrax cabs prior to the DT500 require that you remove the battery connection to power down the cab. This involves either completely removing the battery, or rotating it 180 degrees to reverse the battery voltage. The cab is protected against reverse polarity, so this rotation effectively disconnects the battery.

Some talented folks even cut a slot in the battery door, allowing them to insert a piece of plastic between the battery and the terminal to shut the cab off.

The problem is that some folks will flip the battery end-for-end. This places the battery terminals in contact with the spring clip in the housing. The resulting short circuit is hard on the batteries and can melt the plastic housing.

8. UT4 cab with the tubing installed and shrunk. I did both sides of the spring. Theoretically, only one needs to be insulated. However, I believe in over-kill for safety. *Bruce Petrarca photo*

Covering the spring side with shrink tubing [9] will keep the spring from shorting out the battery if someone puts the battery in flipped.

Such a simple solution, thanks for this great tip, Mark.

9. DT500 cabs have an on/off switch included, so they don't need their batteries flipped to shut them off. They have a different style of spring, making the insulation technique discussed here difficult. I have chosen not to insulate my DT500. *Bruce Petrarca photo*