



Setting up Modular Layouts with
Digitrax

Complete Train Control

Digitrax
INC

Modular Layouts

The clinic is being presented to help clubs successfully combine multiple modular layouts into one large combined layout.

These are only guidelines based on my experiences as an N-Trak member and from helping clubs troubleshoot issues at public shows.

Its not uncommon for someone to come over to our booth frantically looking for help 15 minutes before the show opens. Trains aren't running and nobody knows why.

Hopefully this clinic will help ease the pain of setup and layout operation.

Modular Layouts

With some advanced planning and preparation, setup will go more smoothly and everyone will be able to enjoy running trains.

After all, that's what its all about.

The North Raleigh Model Railroad Club has several excellent downloadable PDF files available on their website. The PDFs cover all aspects of N Scale Modular Layout setup and Digitrax DCC integration.

<http://trainweb.org/nrmrc/>

I highly suggest you print a copy of their PDFs and follow them during your next setup.

Modular Layouts

Chain of Command

Layout Master

Club Layout Coordinator

Module Owner

Everyone has responsibilities!

When those responsibilities are fulfilled,

EVERYONE HAS FUN!

Modular Layouts

Chain of Command

Layout Master

Someone has to be in charge of the entire layout and its setup.

The Layout Master implements the plan and has assistants from each club to handle smaller responsibilities.

They need to be knowledgeable in layout wiring and DCC setup.

They have the final word and are responsible for the entire combined layout.

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Chain of Command

Club Layout Coordinator

Each Club should have an their own Layout Coordinator.

The Club Layout Coordinators report to the Layout Master.

The Club Layout Coordinators are responsible for their Club's portion of the combined layout.

They ensure that their layout is setup and operating properly.

Modular Layouts

Chain of Command

Module Owners

The individual Module Owner is responsible for compliance of their modules with the specifications and standards set forth by N-Trak, T-Trak, One-Trak, Bend-Trak or whatever standard the club is using.

They report to the Club Layout Coordinator for their Club.

Modular Layouts

Planning-Overview

- A thorough, detailed plan is essential. The plan should include module placement and DCC component requirements and placement.
- Each club should submit their requirements to the Layout Master for inclusion in the layout.
- Having a plan before setup begins will make the layout easier to setup, and fun to run.

It's not fun for anyone if the layout doesn't run properly.

Modular Layouts

Planning-DCC Operation

List of items to have on hand for DCC

- Primary Command Station (CS)
- Backup Command Station
- Boosters DB150 set as a booster, DB200, & DB100 properly jumpered.
- Power Supplies for each CS, Booster, and Loconet devices (UR91, UR92, LNRP etc.
- LocoNet Cables (tested in advance)
- LT-1 LocoNet Tester
- 9v Batteries
- RJ12 Adapters & Couplers for LocoNet.

Modular Layouts

Planning-Things to Bring

List of items to have on hand for DCC

- Quality Multimeter
- Quality RJ12 Crimping Tool
- Quality 6 Conductor Flat Telco Cable
- Spare RJ12 Connectors
- Tools – Screwdrivers, Wire Strippers, Needle Nose Pliers, Cutters, etc.
- Misc. electrical adapters for the layout wiring
- Heavy Gauge Ground Wire (Green)
- Manuals and Instruction Sheets for each piece of equipment!

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Planning-DCC

- Do Not use a DCS100 or DCS200 as a Booster! They can accidentally get reset to a CS. Strange things happen when there is more than one Command Station.
- Power the CS and each Booster with its own Power Supply which is properly rated for the device it is powering.
- Each UR92, UR91, LNRP, etc. requires its own DC Power Supply. A PS14 is ideal.

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Planning-Modules

- Every LocoNet cable should be tested before the show. If it's bad, fix it before the show!
- Modules should be tested before being added to the layout.
- ALL wiring should be verified to be correct and in perfect working order.
- If a module is not 100% it shouldn't be used.

Modular Layouts

Digitrax DCC and Modular Layouts

- The combined layout can only have ONE Command Station. DCS100 or DCS200.
- A DCS50 or DCS51 can also be used as a CS especially on a smaller layout where a limited number of trains will be run at a time. DCS50 has 10 slots and a DCS51 has 20 slots.
- The CS should not supply power to any track.
- A fresh CR2032 Battery should be installed before the show. The CS should be reset to Factory Defaults. OPSw 39=c.

Modular Layouts

Setup-Spline First

The Spline or backbone as it is sometimes called, can be several modules allowing multiple clubs to connect their layouts to make one large layout or it can be as simple as one junction module allowing two clubs to join their layouts together.

Since the Spline is common to the Individual Club Layouts, it is crucial that everything is in perfect order - track, electrical and DCC operation.

Modular Layouts

Setup-Spline First

- If the Spline isn't 100% it will affect **EVERYTHING** else!
- Start layout construction by placing the Modules that will act as the Spline together.
- Once all the Modules are physically in place, connect the first Module track and electrical connections to the second Module.
- Power the Spline with its own Booster.

Modular Layouts

Setup-Spline First

- Connect the Primary Command Station via LocoNet to the Spline Booster.
- Test the first two Modules. Test each and every newly added Module as it is connected!
- Make sure everything is operating properly before adding the next Module.
- Once everything operates flawlessly on the Spline, it's time to start setup of the Individual Club Layout Modules.

Modular Layouts

Setup-Individual Clubs

- When combining modular layouts, work outward from the Spline.
- From personal experience, each club should setup their portion of the layout independently of the other club(s).
- During Setup, each club should use their own Command Station for testing purposes. Once setup is complete the Individual Club Command Station will be removed.

Modular Layouts

Setup-Find & Fix As You Connect Modules

- The Modules can physically be in place and connected together but the track, electrical, and LocoNet connections should not be made.
- Once all the Modules are physically in place, connect the first Module track and electrical connections to the second module and test for proper operation.
- If a problem is found, fix the problem. Then test the module again **BEFORE** adding the next module.

Modular Layouts

Setup-Almost there!

- Once everything has been tested and is operating properly, its time to connect the Individual Club Layout to the Spline.
- I can't stress enough to test everything as it is connected! It could save you hours of troubleshooting later.
- Make the track connections remembering to double gap the tracks between the Individual Club Layout and the Spline.
- Connect LocoNet between the Individual Club Layout and the Spline.

Modular Layouts

Setup-Phasing The Layout

- It is now time to Phase the Layout.
- Connect all the Boosters together with a Heavy Gauge Green Ground or Common wire. This wire should also be connected to the Primary Command Station.
- Make sure you don't form a Ground Loop.
- Phasing the layout ensures LocoNet and Rail Sync are consistent throughout the layout wiring. Besides having Modules that meet the standards, proper Phasing is a must for good operation and layout enjoyment.

Modular Layouts

Setup-Phasing The Layout

- Phasing can easily be completed by selecting Address 00 on a throttle and turning the speed up to 99. If necessary, change the direction so that the Track Status light on the Primary Command Station glows more **Green** than **Red**. Go around to every Booster on the layout and look at the Track Status light. They all should be glowing **Green**. If a booster is not glowing **Green** check your LocoNet cable to make sure it was built as a straight through cable, not as a data cable.

Modular Layouts

Setup-Phasing the Layout

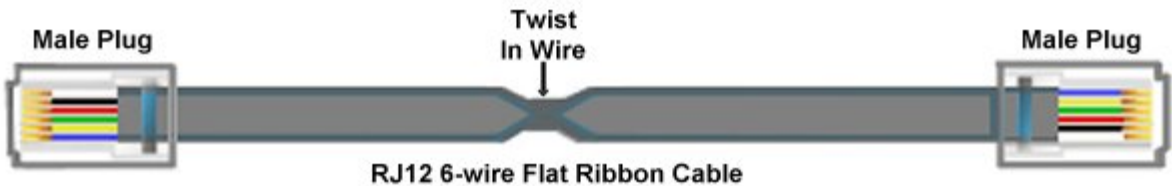
- If necessary, cut one end off the cable and crimp another RJ12 connector which is ‘flipped’ over or opposite the one you cut off.

• Note: Changing the end on one cable will affect all the other Boosters down the line.

Modular Layouts

Setup-LocoNet Wiring

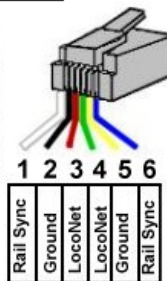
LocoNet Cables



Digitrax Wiring Standards

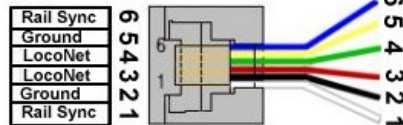
Pin No	Colour	Function	Voltage
1	White	Rail Sync-B	7 vdc
2	Black	Ground	—
3	Red	LocoNet	14.5 vdc
4	Green	LocoNet	14.5 vdc
5	Yellow	Ground	—
6	Blue	Rail Sync-A	7 vdc

All components are RJ12 6-wire
Do not use RJ11 4-wire.



Male Plug

Female Jack



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Setup-Phasing The Layout

- Once ALL the Track Status lights are glowing the same **color**, Phasing is complete.
- With Phasing complete, take a Quarter or other metallic item and short the track in several places around the layout. The booster should shutdown. If the Booster does not show the short, the gauge of the wiring is too small or there aren't enough feeders for proper operation.

Remember – Follow the Modular Standards!

Modular Layouts

Setup-Club Final Test

- Now is the time to run a few locomotives on the layout to make sure everything runs properly and there are no shorts or hesitation between the Spline and Individual Club Layout and between Booster sections within the Individual Club Layout.
- If you experience the above, Phasing is not correct. Go back and re-Phase the Boosters.
- Test everything again for proper operation.

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Setup-Primary Command Station

- The Primary Command Station will control the entire Combined Layout but will not power any track. It should have a new CR2032 Battery installed before the start of the show. It should be powered by its own Power Supply.
- Earlier the Primary Command Station was located on the Spline. This will simplify setup and aid in troubleshooting, if necessary.

Modular Layouts

Setup-Command Station Settings

Command Station Suggested Settings

I would do the following to configure the Primary CS:

Reset OPSw39= 'c' – Factory Defaults

Follow the instructions in your manual for setting Option Switches!

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Setup-Command Station Settings

After resetting the Command Station to the factory settings, I would set the following Option Switches:

OPSw05 = c - Command Station is Master

OPSw20 = c - Turns off Analog *

OPSw44 = c - Allows 120 slots

* Note: With Analog Turned Off, a locomotive without a decoder installed, will not run under address 00.

Modular Layouts

Setup-LocoNet Repeater

- Consider using an LNRP to isolate the individual club layouts from each other.
- Power the LNRP with its own Power Supply.



Modular Layouts

Setup-LocoNet Repeater

- Connect the Primary Command Station to one of the ‘protected’ side ports.
- The other ‘protected’ side port can be used to connect a computer running software such as JMRI or LocoNet Checker.
- Connect the LocoNet cables coming from the individual club layouts to the rear ‘Unprotected’ ports.
- Use more than one LNRP when necessary.

Modular Layouts

Setup-LocoNet Repeater

- By using a LNRP, the individual club layouts are isolated from each other.
- The LNRP will show any faults on LocoNet and can be used as a quick way to troubleshoot to determine which individual club layout is causing a problem.
- Properly powering the LNRP is crucial to its operation. The minimum voltage should be no less than 14VDC.

Modular Layouts

Setup-Wireless Operation

- Once everything has been connected to the Command Station, make sure you set the LocoNet ID.
- When using Duplex, set the Channel and Layout Name.
- Plug EVERY throttle into LocoNet so it can update its information.
- I suggest keeping Duplex Throttles plugged in for a minimum of 30 seconds.

Modular Layouts

Troubleshooting

With proper planning, properly wired modules and a good LocoNet, things should go smoothly.

However, if you've ever been involved in setting up a Modular Layout, you know that something, somewhere is going to go wrong.

We'll touch on some of the LocoNet related issues that might cause problems.

Modular Layouts

Troubleshooting Bad LocoNet Cables

- The LT-1 can be used to check individual LocoNet cables.
- It can also be used to test LocoNet cables which are wired between multiple modules.
- When plugged into LocoNet and Track Power is on, 3 LEDs will glow (4 LEDs with a throttle plugged in) on the LT-1



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Troubleshooting

Low LocoNet Voltage

- Check the LocoNet voltage with a quality multimeter. LocoNet should be greater than 9 volts for proper operation.

To check the voltage:

- Use a short LocoNet cable with one end cut off.
- Strip the Red and Green (positive) wires and twist together. Strip the Black and Yellow (ground) wires and twist together.

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Troubleshooting Low LocoNet Voltage

- Measure the DC voltage between Red/Green and Black/Yellow. It should read greater than 9 volts.
- Check to make sure any UR-92s, UR-91s, PM-42s, etc. are properly powered.
- Power UP-5 panels.

Modular Layouts

Troubleshooting

Use the half-split method when troubleshooting

Divide and Conquer!

- The half-split method basically is dividing the layout or modules in half. Check LocoNet at the division point. If the problem you're having still shows up at the division point, the problem is BETWEEN that point and the Command Station. If everything operates correctly, the problems is PAST that point.
- Keeping dividing the layout until you zero in on the problem.

Modular Layouts

Troubleshooting

Make sure Throttles have a new known good 9 volt battery.

- Test the batteries even if they are new. Some throttles give an indication of low voltage if you know where to look.
- I would suggest using the Powerex 9.6 volt rechargeable batteries. They last longer than single use and regular 9 volt rechargeables.
- At the end of the day, recharge the battery overnight so it's fresh in the morning.

Modular Layouts

Troubleshooting

- Use discipline when releasing Locomotives or Consists. Speed to 0, release the address.
- Use a computer program such as JMRI or LocoNet Checker to monitor Slots and LocoNet.
- If the Layout will be operating for several days, consider resetting the Command Station to Factory Defaults or at least clearing the slots with a OPSw36 reset each morning.

Modular Layouts

Summary

Digitrax DCC and LocoNet are very robust systems. At the NSC Louisville Convention in 2008, Digitrax was able to power 702 modules and simultaneously run 106 trains.

There's no reason your club can't do the same.

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Modular Layouts

Questions and Answers?

