DCC Clinic – 2003

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What is DCC?

Digital Command Control. Specification developed by the NMRA to provide independent control of many trains without separate power blocks.
Power and commands are integrated and applied to all tracks. Signal on the track is an AC square wave at the full voltage. Each powered unit has a decoder, which will recognize commands addressed to it and ignore commands sent to other addresses. The decoder rectifies the input signal and applies pulses to the motor to effect speed and direction control. The decoder provides other functions such as headlight control, horn and bell.

Why DCC for trolley?

DCC is ideal for trolley because of the nature of trolley operation. More frequent and closely operated cars over more complex track work are difficult to do with block control. It requires many, small blocks and a lot of toggle throwing. My city layout in an 8 x 10 room has 21 blocks. Of course, since DCC, I never throw a block toggle. DCC eliminates it! Now you can run a car right up to the back of the leading car or bring many cars into the same intersection.

DCC Manufacturers

I have provided a list of DCC manufacturers and their WWW addresses. Atlas and MRC make “Basic” units, with limited expandability. But they may be enough for your needs. Which is the “BEST” system? The system YOU like! You should try different systems and decide what features and throttles you like. The throttle is the MAIN interface and you must be comfortable with it. Prices vary by system and by dealer. Some retail prices as of April 2003:

Atlas: $150
MRC: $190
Digitrax: $200 - $450
Lenz: $290-350
NCE: $500

I have also given you a few DCC dealers and their WWW address. Tony's has a very nice system comparison page.

System Components

Power Supply: usually not provided with a DCC system, except some of the newer, starter sets. You must purchase it separately or provide it yourself. 14 – 18 volt at about 5 amps.

Command Station: Connects throttles and other control components to the system.

Booster: Applies the command from the command station to the power and sends the combined signal to the layout. Boosters will handle between 2.5 and 10 amps, depending on make and model.

Throttle: Your interface to the system. Probably the most important component to the user and to system satisfaction. You need to try different systems and decide what you want!

Decoder: The brain of each powered unit. Recognizes commands sent to its address and controls the motor and other actions via function outputs. Decoder prices keep falling like computer prices. Look for a decoder that provides high frequency operation.

Options:

- Radio or infra-red throttle
- Transponder: senses the location of decoders by their addresses. (Digitrax)
- Switch Machine decoder: allows automatic routing and / or control of switches from the throttle.
- Auto Reverse module: For two-rail layouts, provides an automatic control of polarity for reverse-loops.

Layout Wiring

Simplicity for trolley. In the simplest form, one wire to the overhead and one wire to the track. For larger layout, there may be a need for additional power handling. This is accomplished by adding additional power supplies and boosters, then dividing the layout into power districts. Still only two wires to each district. The command station is linked to each booster through a network.

These networks are designed by each manufacturer and vary in capability and speed. If you are looking for a large capacity system, the network may be a critical part. In my opinion, Digitrax has the best network.

Module / Layout Wiring

A small or medium sized layout can consist of one power district supplied by one booster. With an 8 or 10 amp system, that may be all you need.

What about signaling or stop sections? On my modules, I have incorporated the East Penn stop section control. I also added an on / off switch for it. When I run the modules with DCC, I turn off the stop sections so I can control each car individually and run them close. However, if I am running the modules for display I will turn on the stop sections, even with DCC. This way I will not have any crashes if I get talking or otherwise distracted. With DCC I can adjust the speed of each car individually. That way the cars stay separated and do not get caught in the stop sections.

Decoders

I use HO decoders for all my O scale cars. They all have HO sized motors in them! (A class C freight motor has two power units, so it has an O decoder with 2.5 amp capacity.)

Decoders are rated for their continuous and maximum current load. Many are rated 1.5 amps continuous and 2 amps peak. The peak is with the motor stalled. Most can motors fall within this range. Older open-frame motors will pull more current when stalled, but when is the last time you stalled a motor. I hold the car and let the wheels spin at max voltage to get the maximum current draw. If the motor ever does stall, I may loose the decoder, but that has not happened. NOTE: the decoder current capacity INCLUDES ALL power used in the decoder. That is motor and any lights or other function current draw.

Trolley Wiring

You have some sample car wiring diagrams in the handout. You have to decide what you want. Do you want pole-reverse or not. If you are only going to run your cars on DCC, do you need pole-reverse? However, decoders can be programmed to run on normal DC and DCC. When running on DC, pole-reverse would still be useful. Diagrams are shown for pole-reverse and non-pole-reverse operation.

Motors MUST be isolated from the frame! This is usually the case, at least in O.

All decoders have front and rear headlight outputs. They can be wired as shown or can be set up for pole reverse and not use the decoder output. NOTE: you get constant lighting with DCC!

Notice the relay driven from the decoder. This could be used for almost anything. I use it in my sweeper model to turn the brooms on and off. It could be used to control all the lights (body and head) for the car. Just like the prototype, throw a switch (function button) to turn on lights. Very handy for parking the car in the barn. You don't want the lights on then.

Note the resistor: lamps draw a LARGE current for the first few milliseconds. This current could damage a decoder over time. (Also the reason bulbs blow out when you first turn them on.) The resistor is doing current-limiting to prevent damage to the decoder and lengthen the life of the bulb.

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DCC Internet Links

http://jdb.psu.edu/nmra/dccsig.html	NMRA DCC Special Interest Group

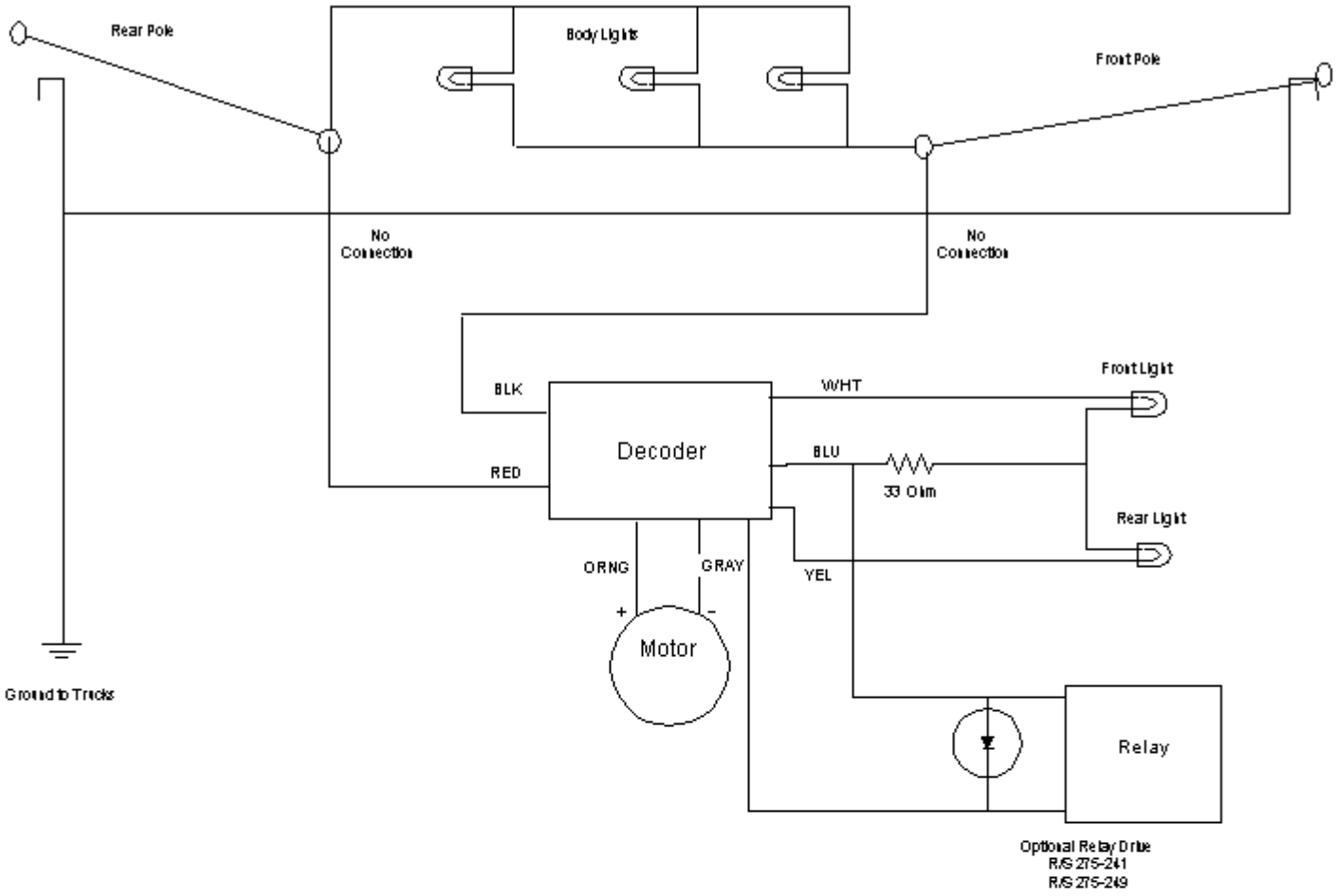
DCC Manufacturers

http://www.atlasrr.com/dcc/welcome.asp	Atlas
http://www.digitrax.com/	Digitrax
http://www.lenz.com/	Lenz
http://www.modelrectifier.com/	Model Rectifier Corp.
http://www.ncedcc.com/	North Coast Engineering
http://www.tcsdcc.com/	Train Control Systems
http://www.wangrow.com	Wangrow System One
http://w3.zimo.at/	Zimo

DCC Dealers

http://www.linsjunction.com/	Lin's Junction – Lansdale, PA
http://www.loystoys.com/	Loy's Toys
http://www.ttx-dcc.com/	Tony's Train Exchange

Pole Reverse for DCC and Analog Operation



Non-Pole Reverse