DCC CLINIC

A. Begin with a few terms and descriptions:

DC – Direct Current...

- 1. The main way to power a layout until the mid-80's
- 2. Can only control one train at a time unless layout is real big and then several can minimally be controlled...keep the distance between trains. If one goes forward they all do. If one goes backwards, they all do.
- 3. Can use blocks with different power packs for each block, and then can run one train in each block. Lots of wiring gymnastics.
- 4. Track voltage varies based on speed of loco
- 5. To change loco direction, you change polarity of the rails by changing the power pack direction
- 6. Headlight intensity changes with track voltage
- 7. Virtually no sound is available

DCC - Digital Command Control.

- 1. Digital commands are sent to the locomotives from a handset through the rails.
- 2. DCC allows independent control of multiple locomotives within the same block and all over the layout.
- 3. Electrical wiring much easier since blocks are not required (but can still be used)
- 4. DCC provides for digital control of turnouts and signaling
- 5. Other features include a multitude of sounds, block detection, momentum control, and the ability to consist locomotives together.
- 6. DCC is an NMRA standard. This means locomotives equipped with decoders from various manufacturers may be used with any DCC system!
- 7. Headlights, ditch lights, sounds, bells, whistles can all be controlled from the handset
- 8. Loco speed and direction controlled for each loco independent of others by handset with no polarity changes required. Can have locos running at different speeds and direction at the same time.

- 9. Track voltage is constant and on all the time.
- 10. DCC is computer based but you don't have to use one unless you want to

DCC Current – not same sine wave as DC so some DC and DCC components won't work on the other's current.

DCC Components:

- 1. <u>Command Station</u> smart box that translates keys used on handheld into language that will cause the desired function to occur
- 2. <u>Booster</u> another box, sometimes in same case as Command Station, that sends the DCC power to the rails.
- 3. <u>Power Supply</u> Special plugs are used to provide power to the command station and boosters. They are designed specifically for the matched system and cannot be used elsewhere.
- 4. <u>Cab or throttle</u> the handset operators use to control the locos and such things as turnouts, track signals, or other track accessories
- 5. <u>Program Track</u> a special section of isolated track used to program the cabs and locos
- <u>Cab Buss</u> a special buss using special kinds of wire to carry command signals from wired cabs at various points around the layout back to the command station so action can then be taken
- 7. <u>Decoder</u> circuit boards put in locos or wired to turnout switch machines, signals, or other components so they can communicate with the cabs.

Wireless Operations – most DCC systems now have capabilities to operate from wireless cabs without having to have hard wired Cabs and an extensive cab buss.

Buying DCC Locos

- 1. <u>DCC Loco</u> one that has the decoder board already installed. Sometimes called Ready to Run DCC
- <u>DCC Ready</u> has wiring for DCC decoder installed, but no board. Buy board separately and just plug it in. Sometimes called Plug and Play Loco
- 3. DCC Capable probably has no wiring harness to snap in the

decoder, but loco is designed to work with DCC once the harness and board are installed.

<u>Buyer beware!</u> Different manufactures use different terms! Make sure you know what you are getting.

B. Now Let's Examine What DCC Will Do For You

DCC Benefits

- 1. More prototypical operation.
- 2. Trains go anywhere anytime.
- 3. Watch out for the other Guy --> Cornfield meets are real!!
- 4. Most offer walk-around capability to go with your train.
- 5. Wireless options offers the ultimate freedom.
- 6. For large layouts using block control... Run far fewer wires than DC "block control".
- 7. Operate turnouts, lights and accessories with a push of a button
- 8. Eliminate or build better control panels
- 9. Build optional signaling systems*.
- 10. Locomotive Control Motor Speed: 28, or 128 Steps (Think Throttle Notches)
- 11. Match Loco speeds for greater multi-engine running (consists)
- 12. Momentum control. Simulate variable levels of train size (mass).
- 13. Super low speed
- 14. operation with power

DC and DCC On Same Layout

- 1. Lots of trouble to do, but can be done
- 2. Requires special wiring to accommodate both types of power
- 3. DC Locos on a DCC layout can burn up with no notice
- 4. DCC Locos will run on DC, but most functions cannot be controlled, including speed in some cases
- 5. Never run DC power through DCC Circuit Breakers they will fry
- 6. With DCC wiring, normally ALL tracks are powered when the system is on because the cabs determine which loco will run
- With DC wiring in many cases you will want to be able to turn some tracks off so locos and trains can stay put while others are being run – more wiring

C. Wiring Note

- 1. For DCC you MUST have excellent power on all sections of track. Requires first class track work. It is NOT forgiving.
- Solder all your track joints...ok to leave some loose for expansion and contraction, but make sure those sections of track have drops to the buss.
- 3. Solder 20 or 22 AWG drops no more than approx 10" long with one in each section of track.
- District Busses should be at least 14 AWG wire. I recommend 12 AWG. Use two colors – one for + and one for -
- 5. Turnouts must be wired for DCC to ensure the correct power goes the direction of the train or that all directions are powered all the time.
- 6. Track joints on each end of the turnouts must be excellent if your power is going to be properly distributed.
- 7. Watch the polarity of your drops. Tape a tag to a box car. On the right side mark + and the color of wire to use. On the left side tape a tag that says and the color you will use. Wherever that car is on the track as long as you don't take it off, will always have the correct tag on the correct side.



D. Planning Considerations

- 1. There are many issues to consider. Take your time in planning.
- 2. Visit layouts that use the type of DCC system you wish to use, or think you will use, and pick the owner's brain.
- 3. Decide what brand you are going to use. Makes a difference in how you wire the system and control panel
- 4. Decide if you will use tethered cabs or wireless. Makes a huge difference regarding tether panels, cab buss, and other wiring
- 5. Determine how you) your layout to ensure excellent power at all locations.
- 6. Determine how you are going to make sure your track is trouble free
- 7. Determine the brand and type of turnouts you wish to use. Wiring implications vary widely. Need to be DCC friendly
- 8. Install power districts with circuit breakers
- 9. Install isolated power buss from the power district circuit breaker to the district itself.
- 10. Install command bus
- 11. Decide on accessories like turnouts, signals, gates will they be DCC powered and operated? Major issue regarding how you wire the system
- 12. Check your loco inventory Need decoders if your locos are DC
- 13. Make plans for your programming track

E. Sample Photos



NCE Power Cab



NCE Command Station



NCE Booster



Cabs (Throttle)



Digitrax Command Station



Typical Loco Decoder

F. Links

http://www.wiringfordcc.com/intro2dcc.htm Site is full of great DCC information. Lots of examples and good explanations

<u>https://sites.google.com/site/markgurries/home</u> Mark is an Electrical Engineer and his site is probably the most comprehensive out there, particularly for electrical issues. Highly recommended.

Do google searches. Use YouTube. Go to Yahoo groups and search for groups pertaining to your brand or to the topic you have questions about.

Call vendors and ask them questions about how components work or how to wire them to the layout.