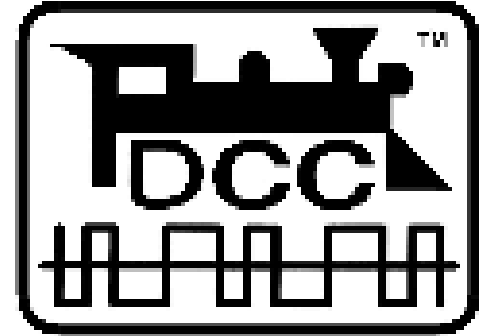




Model Railroad Skills Institute

**Boston in the Fall
November 9th, 2002**



What is DCC ?

STEFANO CURTAROLO



Digital Command Control

PURPOSES

Run multiple trains without BLOCKS

Control accessories

HOW ?

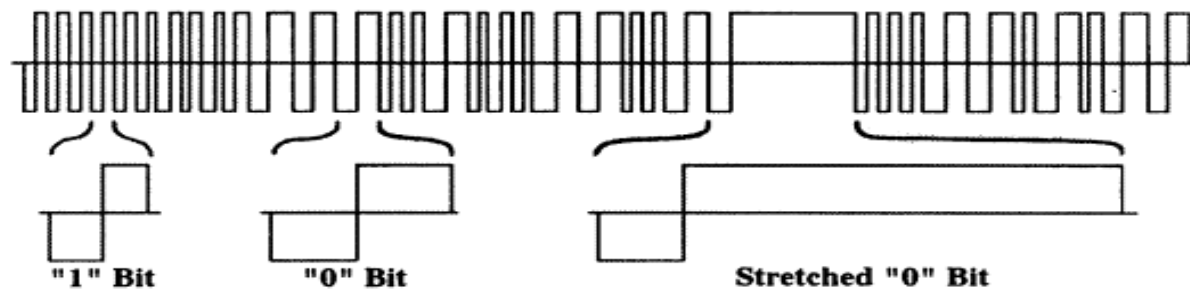
SIGNAL is POWER and POWER is SIGNAL

NMRA standard: interoperability

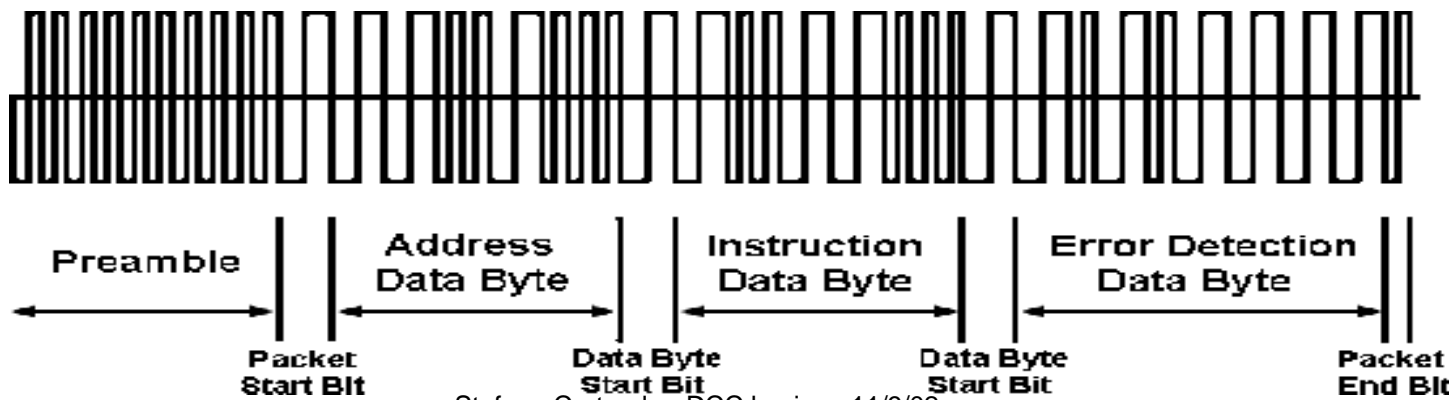
[thanks to Mr. Lenz]

NMRA standard: electric+protocol

DIGITAL voltage = signal on the track [1/0 = alphabet]



PROTOCOL = words, instructions, addresses, etc.





DCC vs. DC

FOR YOUR NEXT LAYOUT

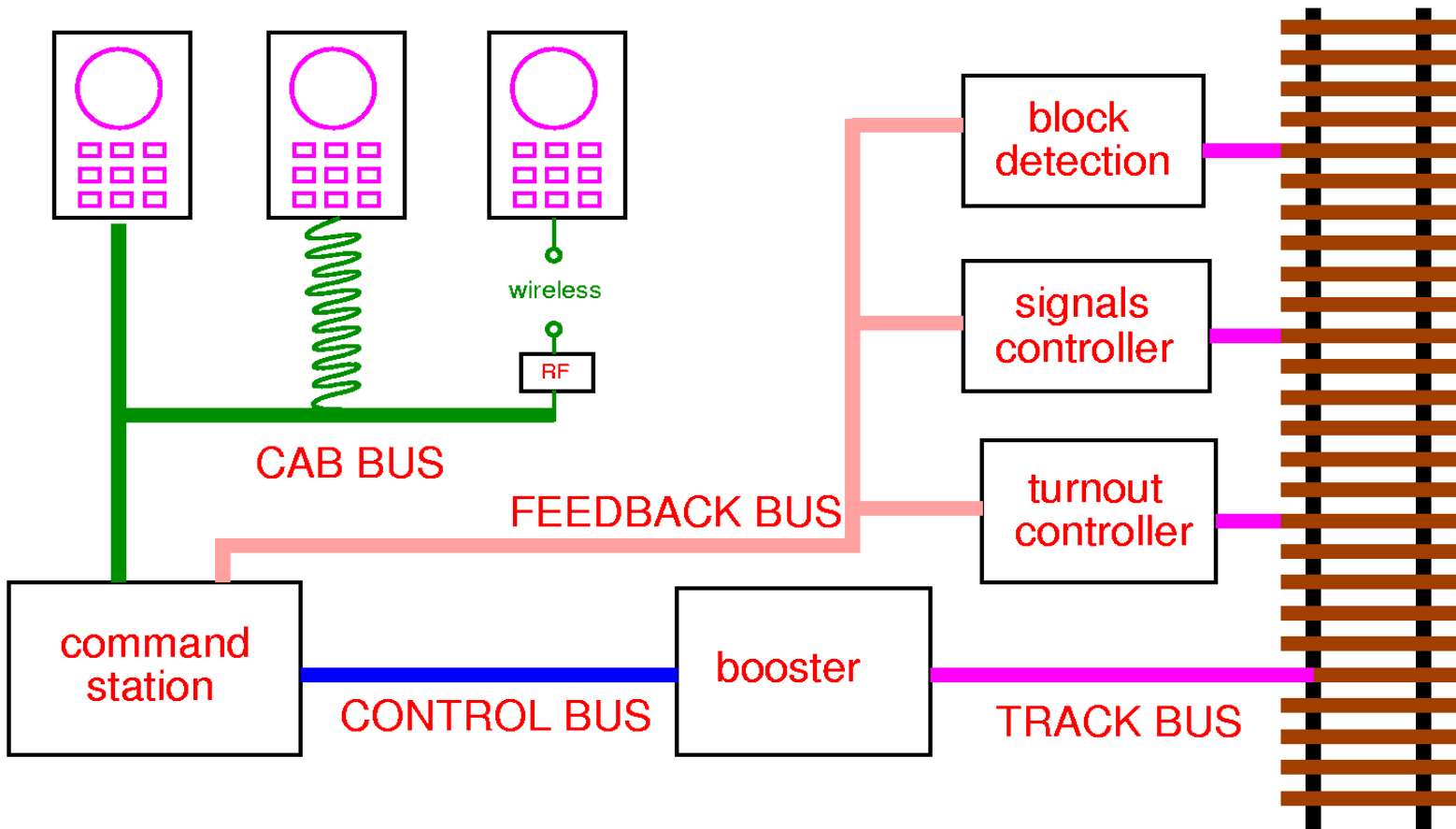
- ✍ Simpler wiring
- ✍ Control 9999 engines with only 2 wires
- ✍ DCC voltage always present on the track to feed lights, functions, accessories
- ✍ Turnouts/signals can be controlled with the track



DCC idea

1. DCC system sends commands
2. LOCO decoders receive and act
(mobile/stationary decoders)

DCC System & stationary stuff



Different Solutions

- ✍ NMRA standard: TRACK BUS ONLY !!
- ✍ Proprietary: control/cab/feedback bus



MANUFACTURER APPROACHES

LENZ

control ? cab ? feedback

NCE

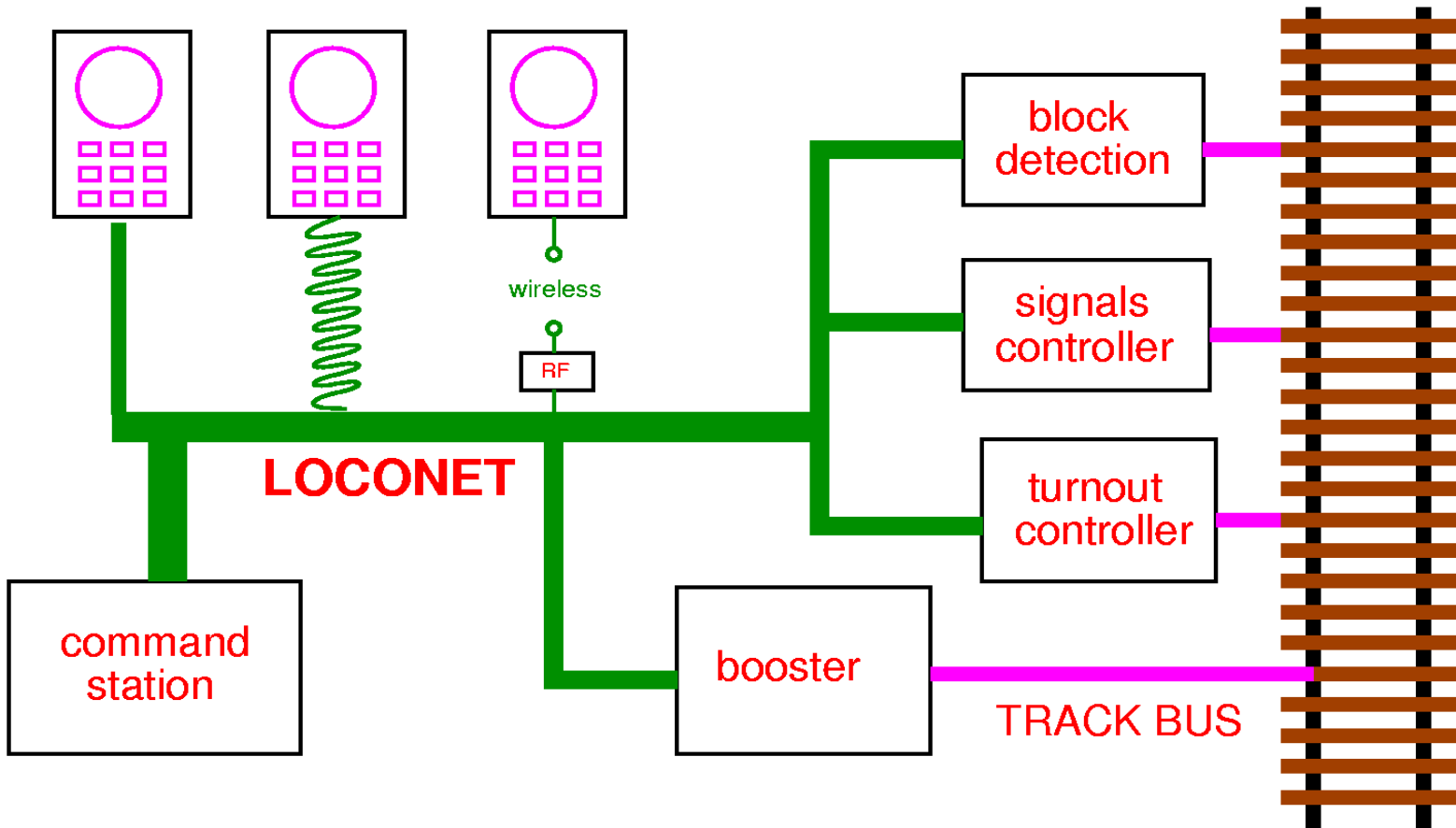
control ? cab = feedback

DIGITRAX

control = cab = feedback = LOCONET



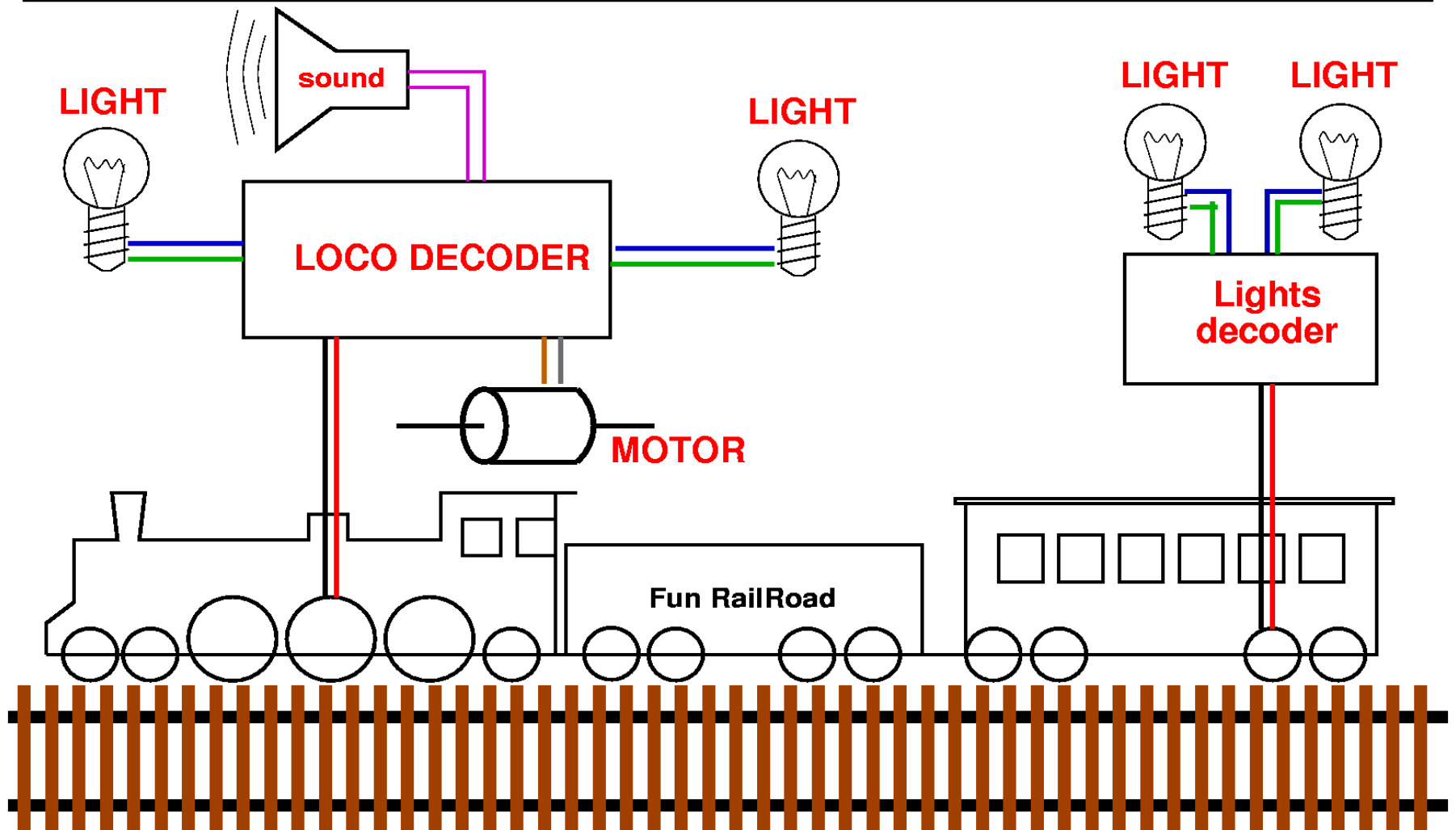
DIGITRAX LocoNet



Components of DCC System

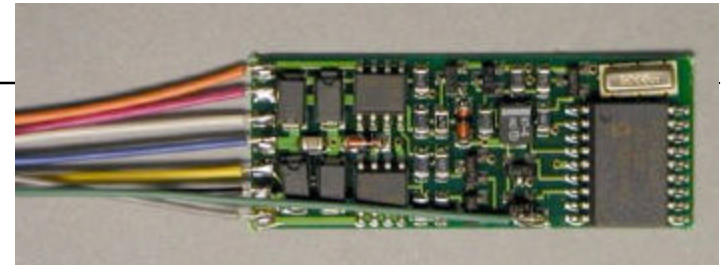
- ✍ **CABS**: fixed - tethered – wireless
- ✍ **COMMAND STATION**: brain of the system
- ✍ **BOOSTER**: feed power to track
- ✍ **TURNOUT** accessories
- ✍ **BLOCK** detectors
- ✍ **COMPUTER** interface
- ✍ **SIGNAL** accessories (under development)

LOCO decoder (mobile)



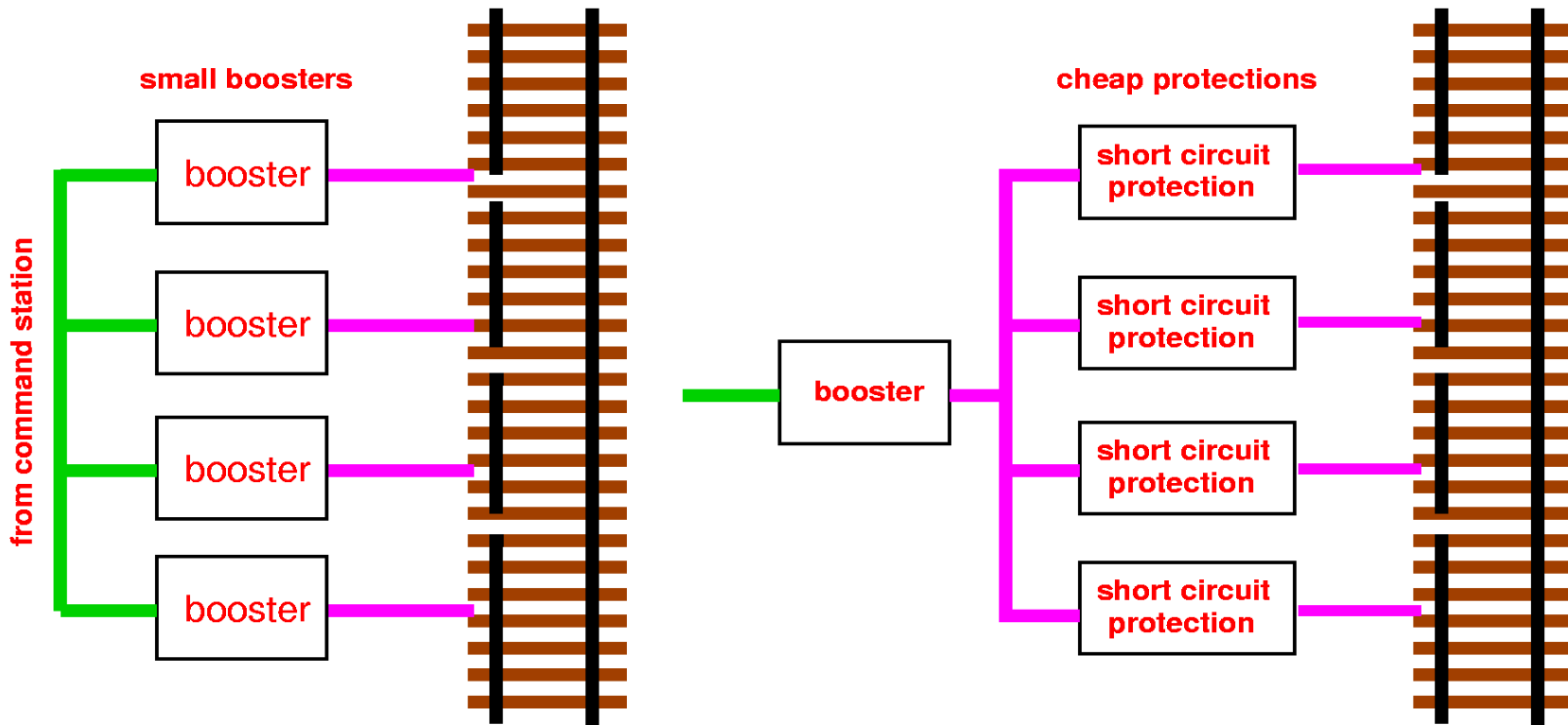
LOCO decoders

- ✂ **1-9999** addresses
- ✂ 14/28/128 Speeds
- ✂ **Momentum**: ACC, DEC
- ✂ Load Compensation (**BEMF**)
- ✂ 2-8 lights and functions (up to 12)
- ✂ Special Lights **Effects**
- ✂ **Speed table** to match prototypes
- ✂ **Plug and Play** decoders
- ✂ **Sound** (diesel/steam)
- ✂ Smoke/uncoupler output (development)



Wiring for DCC

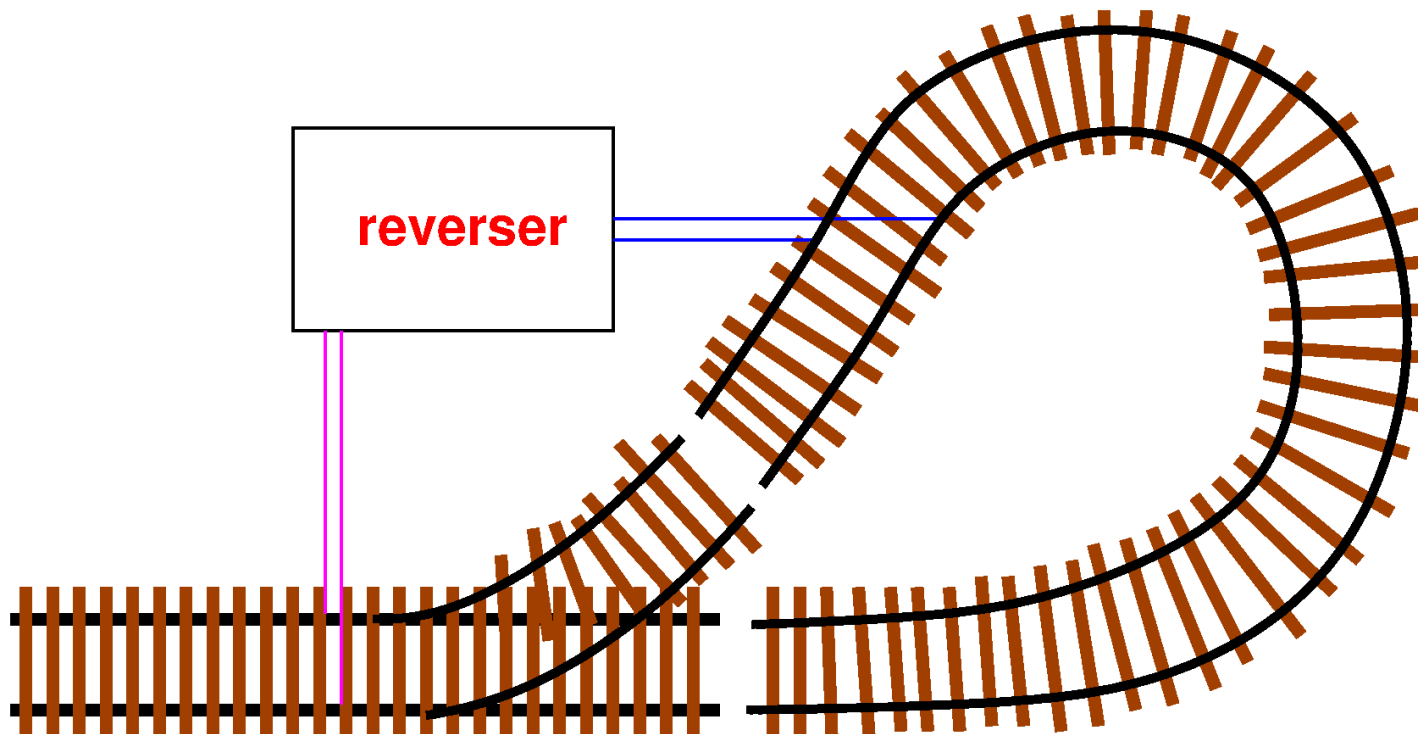
More Power + Short circuits = need sections



Wiring for DCC

Reverse section = POWER REVERSER

(with/out turnout control)



How Many Trains Can I Run?

- ✍ Command station has a finite number of “*available slots*”
- ✍ Booster power (2-3-5-10 Amps):
- ✍ Nscale @ 12V ~ 100-200mA
- ✍ H0 scale @ 15V ~ 500-1000mA
- ✍ 0 scale @ 18-20V ~ 1-2A
- ✍ **CHECK THE VOLTAGE ON THE TRACK TO AVOID DESTROYING DECODERS**
- ✍ **CHECK THE AMPS YOU USE TO AVOID OVERLOADING THE BOOSTER**



How can I customize each Locomotive?

Write/Read/Verify CV settings !

Programming Track [RW]: need piece of track wired to the command station !!

“**on-the-main**” (OPS MODE) [W]: just write CVs while the train is running (all new decoders and systems support the feature)

Typical CVs

- ✂ **Locomotive address: 2digits (CV1), 4 digits (CV17,18)**
- ✂ **Momentum: Acceleration and Deceleration rates (CV3,4)**
- ✂ **Voltage to the motor: MIN, MID, MAX (CV2,5,6)**
- ✂ **Consist Address (CV19)**
- ✂ **Configuration: 14/28 speeds, brake on DC, (CV29)**
- ✂ **Speed tables (CV67-94)**
- ✂ **Manufacturer and version (CV8,7)**
- ✂ **Extra Lights Effects (depends on the manufacturer)**
- ✂ **Load Compensation (depends on the manufacturer)**
- ✂ **PWM period/frequency (high numbers, low frequency, CV9)**



New Technologies

- ✍ Sound (QSI, Soundtraxx, ESU, Phoenix ...)
- ✍ Silent (quiet, ultrasonic,)
- ✍ Transponding (Digitrax)
- ✍ RailCom (Lenz)
- ✍ Uncouplers (Lenz is working)



Which decoder for my engine ?

- ✍ Check if there is any plug and play decoder available
- ✍ Plan in advance the capabilities you want:
BEMF, eXtra Lights, sound
- ✍ Measure/ask/find the stall current
- ✍ Get a decoder able to drive such current

Is It Difficult To Install Decoders ?

- ✍ New H0 (and bigger) engines do have the NMRA plug: fast and easy installation.
- ✍ ATLAS engines come with Dual Mode™ Decoder: DC and DCC.
- ✍ New N engines “might” be DCC ready or “easy”. Lenz has very small decoders.
- ✍ **READ INSTRUCTIONS !!!!!**

What about sound decoders ?

- ✍ Speakers need a lot of space.
- ✍ The right engine-decoder-speaker match !
- ✍ Brass engines sound better !
- ✍ Mylar (plastic) cones sound better than “carton” cones !
- ✍ SMART RULE: Speakers move air: smaller speaker with longer cone displacement might be louder than bigger speaker !
- ✍ Sound in N scale is not trivial (send me email)

Limitations of DCC

- ✍ The only “big” limitation is the one-way communication: system => decoder.
- ✍ Lenz (Railcom) and Digitrax (Transponding) have developed solution for two-ways communications: must be cheap and compatible with previous products.

Future of DCC

- ✍ Two way communication
- ✍ One decoder in every engine and car
- ✍ Car/engine “finder”: where is the car in the layout ?*
- ✍ Automatic train routing* and advanced signal system.
- ✍ Smaller-smoother decoders
- ✍ Car detection accessories* for yard “database”



Resources over the INTERNET

- ✍ Mailing lists, newsgroup, and websites
- ✍ Too many to mention here !

SOLUTIONS

- ✍ I will setup a web page for your website !
- ✍ Or send me an email !