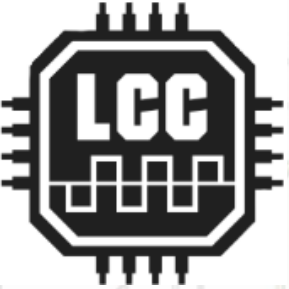
Layout Command Control

It’s no longer just a theory!

NMRA MICHIANA DIVISION



What is it?

- NMRA LCC standard developed by OpenLCB

  Open Local Control Bus, Flexible Controls, and Easily grow as far as you want

- Based on the CAN (Controller Area Network) bus

  automotive based protocol for device control w/o a computer

  program once and the system runs itself (unless dispatcher employed)

- Controls all layout functions except locomotive controls

- Unburdens the DCC

  non-locomotive commands through a different pair of wires

  more capacity, Plain language programming

What's the big deal? Why do we need it?

- With DCC we're trying to control too much
- DCC's a one-way street technology

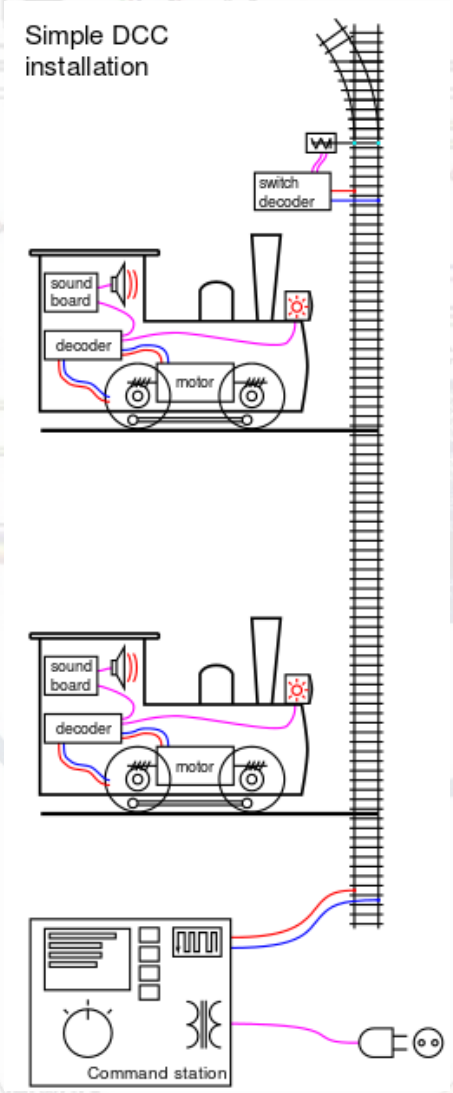
  great for loco commands, but it's bogged down with other things
  too much latency for complex signaling, decoders, etc.
  no real protocols for feedback from sensors, etc.
  Limited bandwidth, LocoNet, CMRI, XpressNet invented to fix DCC issues

- CMRI/JMRI were developed to help resolve these DCC issues

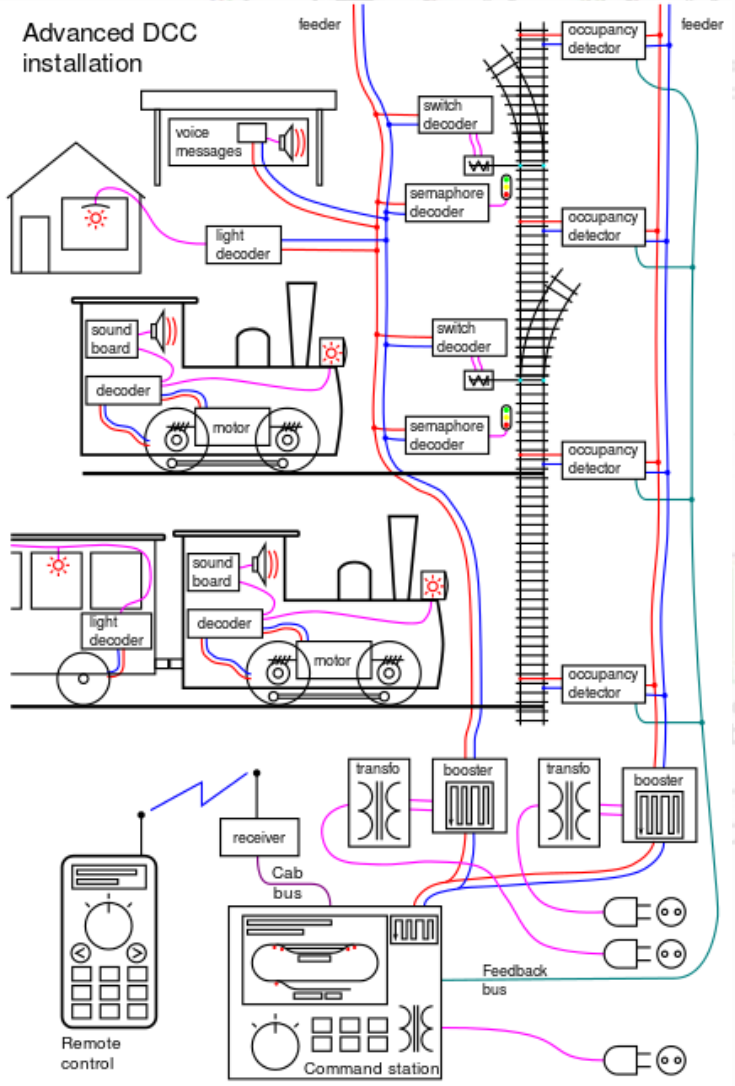
  main drawback is their Master/Slave nature
  programming them requires more than plain language setup

Simple vs. Complex

Ideal for DCC >



DCC & LCC is the better choice >



LCC (CAN) Bus advantages

- It's noise tolerant, an industry standard (automotive), and designed for the 12-24V world.
- CAN is operable over a wide speed range
- The OpenLCB engineers picked a 125Kb rate and 1000' length for model railroad use.
- CAN can operate at 100% data throughput with error free collision resolution, unlike other Peer-Peer systems
- CAN connector option uses the same RJ45 connectors and cables as wired Ethernet does, cheap and easy to make

LCC (CAN) Bus disadvantages

- The high CAN bus speed does not allow for free form network designs.
- A CAN network segment requires a linear bus with a termination at each end.
- Due to timing and other electrical limitations a single CAN segment is limited to 40 or fewer physical nodes. repeaters help overcome this limitation.

LCC Events

- Event driven: Something happened, or should happen

  e.g., LaPorte Turnout West set to normal or set all turnouts to normal, not pin1 or pins 1-16 on some board# are set to high, etc.

- Producers and Consumers

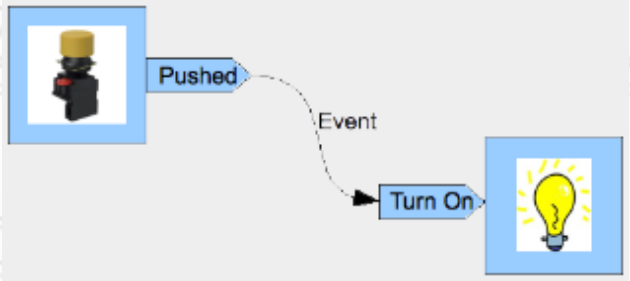
  Producer simply means that some device can create (produce) an Event.
  e.g., a push button or block detector.

  Consumer just means that some device can respond to (consume) an Event.
  e.g., a lamp, a turnout driver, anything you can control

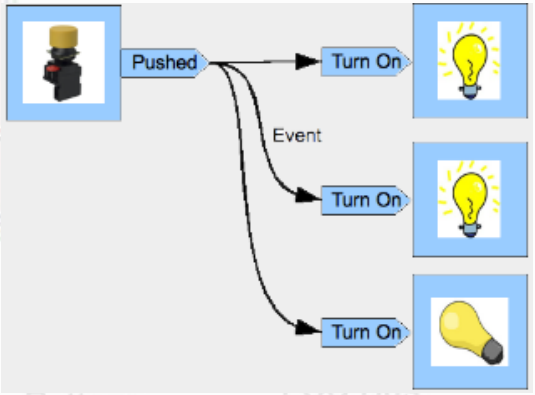
  Events can have from 1 to many Producers. Events can have from 0 to many Consumers.

LCC Events

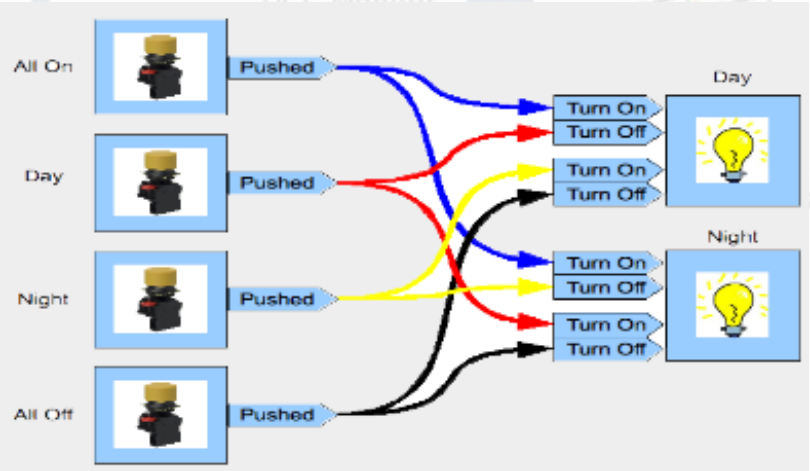
1 producer – 1 Consumer



1 producer – 3 Consumers

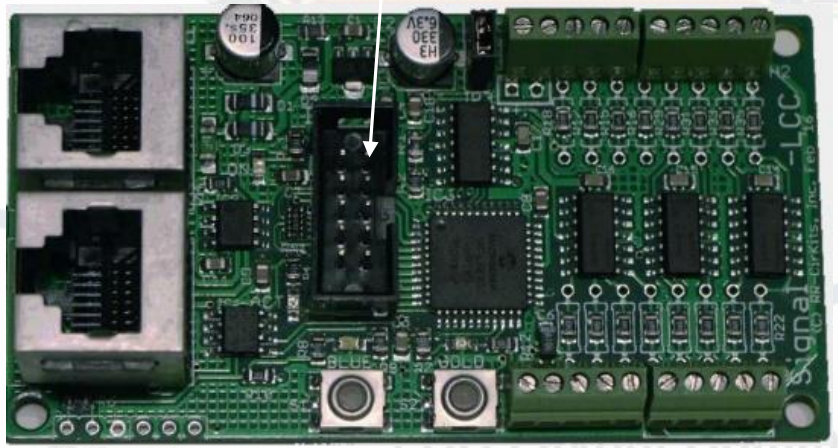


4 producers – 2 Consumers



LCC & Signals

- Signals requires more logic than simple events
  - e.g., is this block occupied? Is LaPorte Turnout West set to normal?
- Enter the RR-CirKits Signal-LCC Signal controller
  - It can process signal related events and control aspects
  - produce events like lighting a control panel
  - Continues the LCC Bus
  - Constitutes one Node w/BOD4-CP

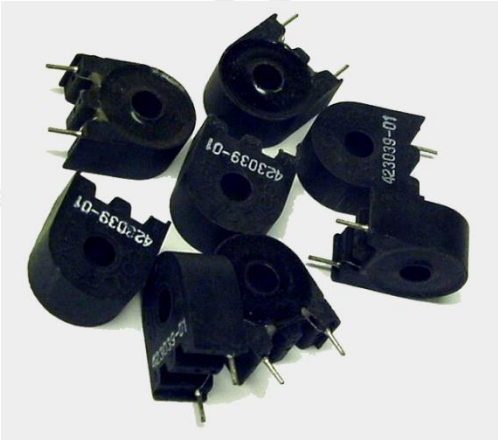


LCC & Signals

- The BOD4-CP Combo (Block Detector & Turnout)Controller

It works with in conjunction with the Signal-LCC

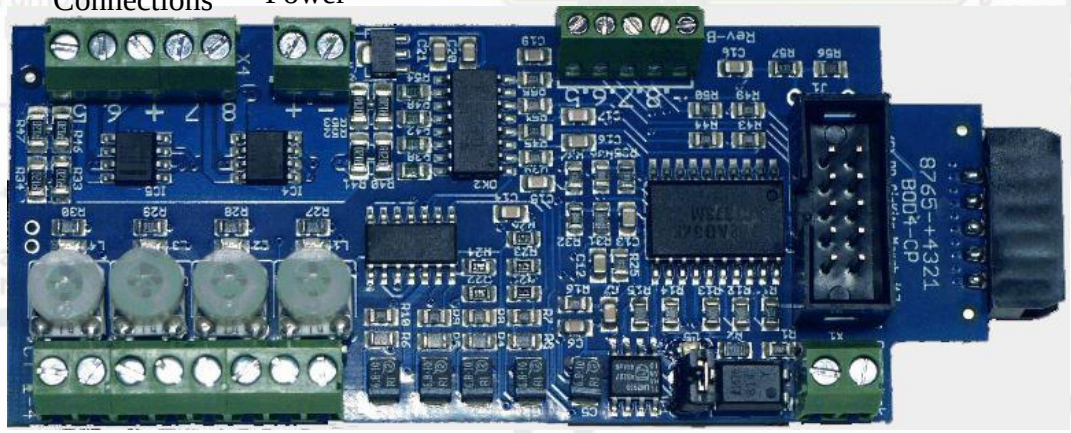
- takes input from CT Coils
- Controls 2 turnouts
- Controls Facia Buttons
- Provides turnout power
- DCC connection



2 Turnout Connections

Turnout Power

Facia Buttons



Ribbon cable connector to Signal LCC

To CT (Current Transformer) coils

DCC Connection

LCC Bus Products

LCC Power-Point ties together 2 LCC jacks, a Traffic Monitor, and a power supply

LCC Bus Terminator

Cat 5/5e/6 Ethernet Cable Connector for CAN Bus

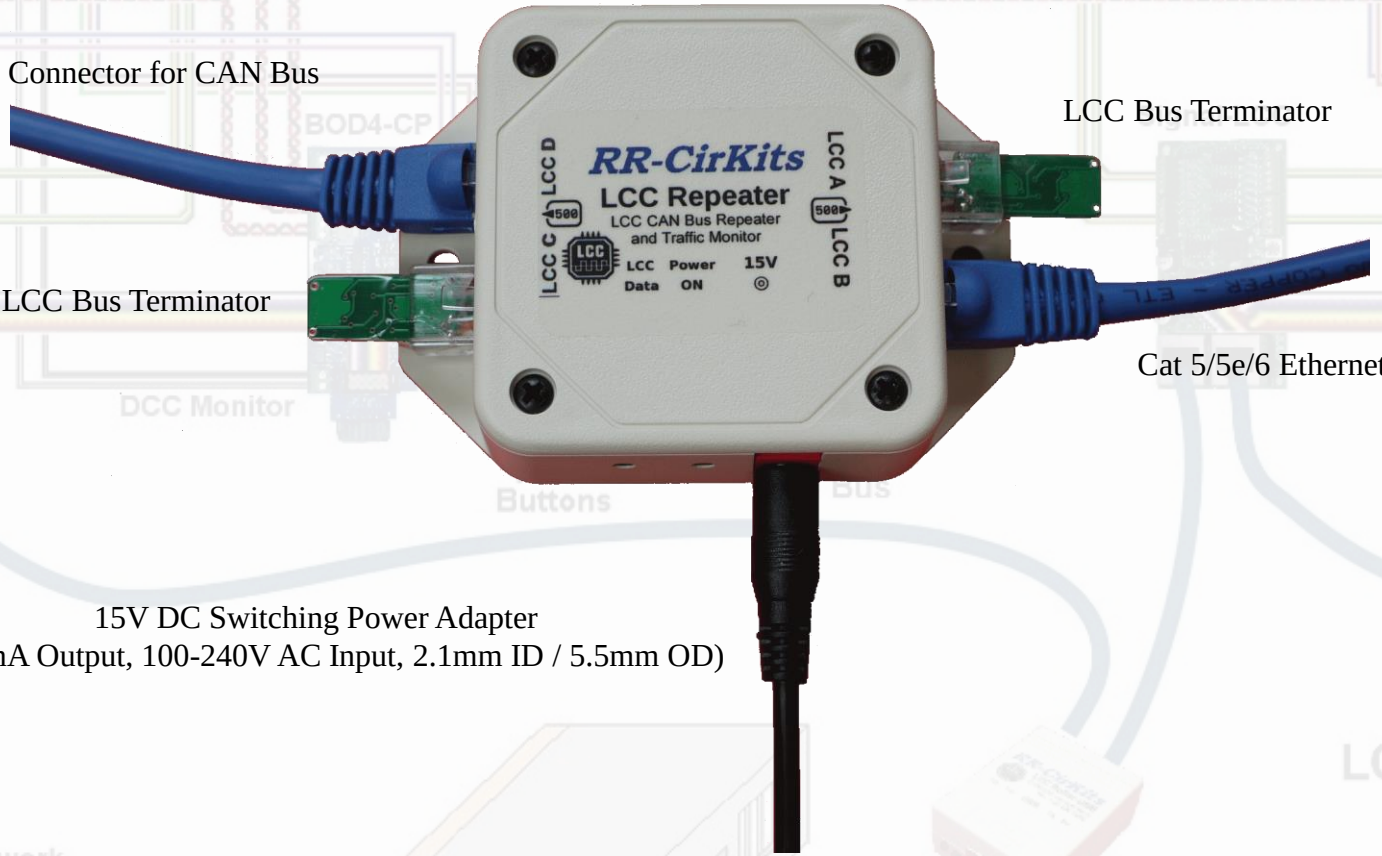
15V DC Switching Power Adapter
(1200mA Output, 100-240V AC Input, 2.1mm ID / 5.5mm OD)

LCC Bus Products

LCC Bit level repeater connects two LCC ® CAN bus segments

Cat 5/5e/6 Ethernet Cable Connector for CAN Bus

LCC Bus Terminator



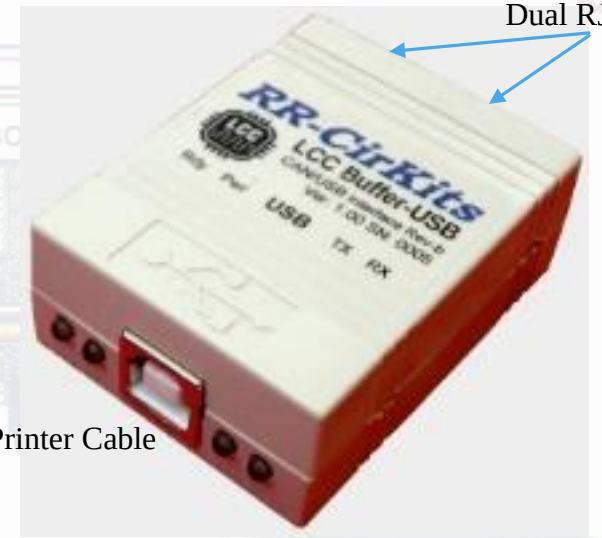
LCC Bus Terminator

Cat 5/5e/6 Ethernet Cable Connector for CAN Bus

15V DC Switching Power Adapter
(1200mA Output, 100-240V AC Input, 2.1mm ID / 5.5mm OD)

LCC Bus Products

LCC Buffer-USB - Connect your CAN bus LCC directly to a computer



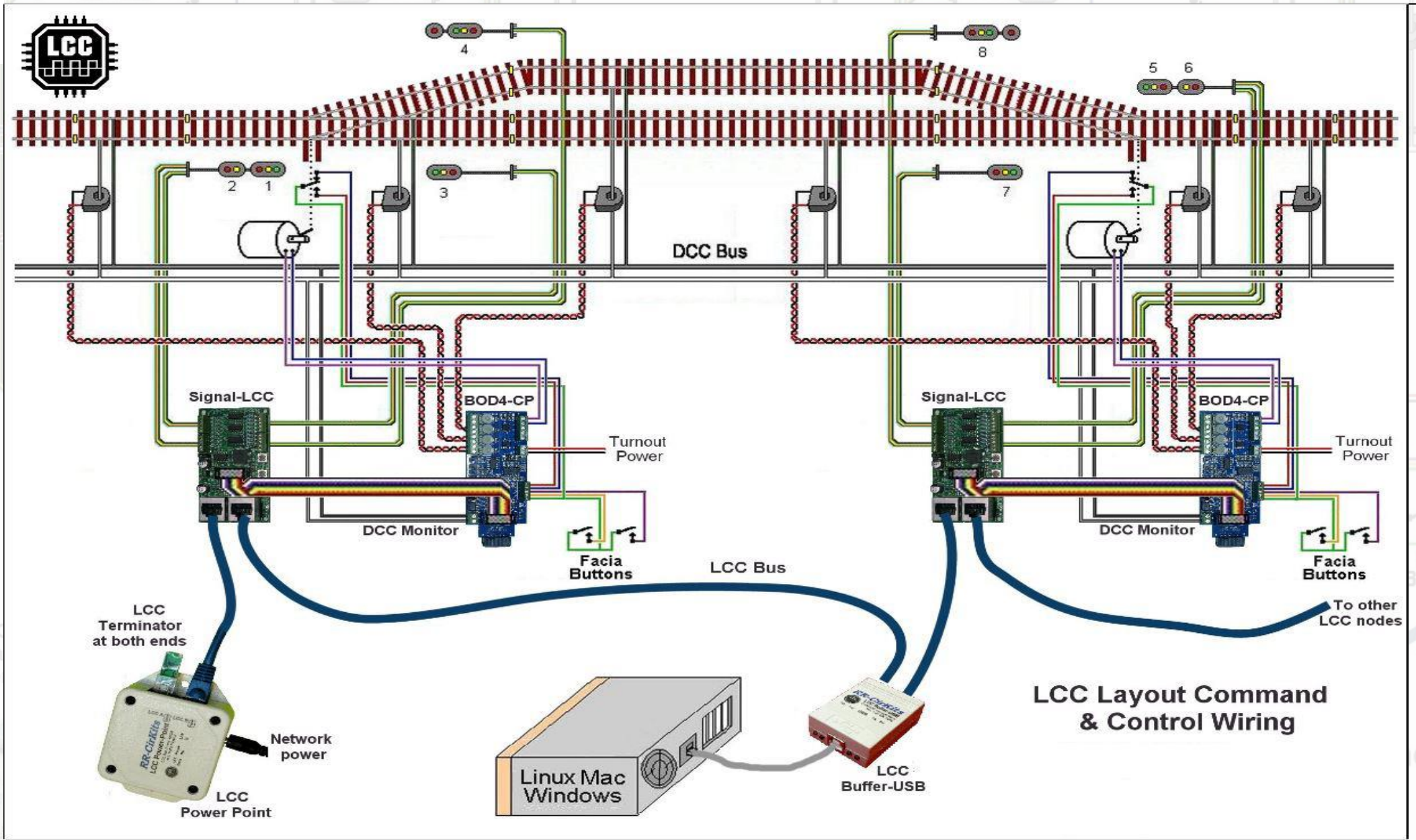
Dual RJ45 connectors for easy CAN bus LCC® loop through connections.

Standard USB Printer Cable

LCC Products – Simple!

- Simple Connections from one interlocking to the next: The DCC bus, turnout power supply wires, and the LCC bus.
 - Local wiring is both short, and identical from one control point location to the next.
 - Computer connection is only required during configuration or remote dispatching.
- Signaling and local controls are active at all times that the system is powered up.

LCC Products at work!



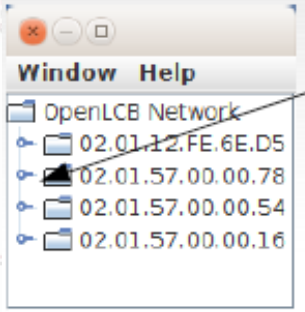
Configure the Node - LCC Protocol Key Concepts

- LCC node can be configured in place on the layout at anytime with no need to access it for jumper changes or button presses.
- Any information required to configure a node should reside in the node itself
- Manufacturers assign a node ID during manufacturing
- No duplication of addresses, EVER (similar to computer MAC addresses)

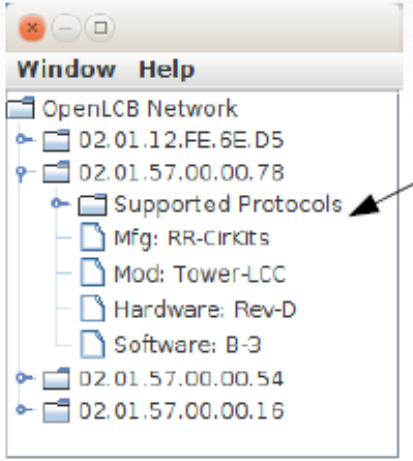
LCC Configuration Tools

- Since the Node contains the configuration, you can use any CDI software (editor)
- No files to manipulate, save, etc.
- Original tool part of JMRI

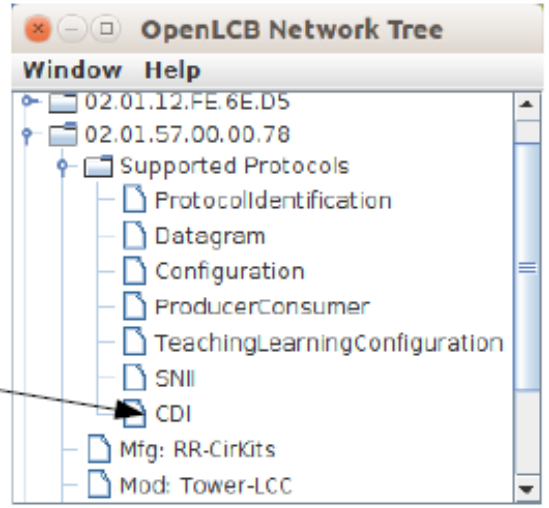
Select OpenLCB and choose 'Configure Nodes'



Next open the node you need to configure.



Open 'Supported Protocols'.

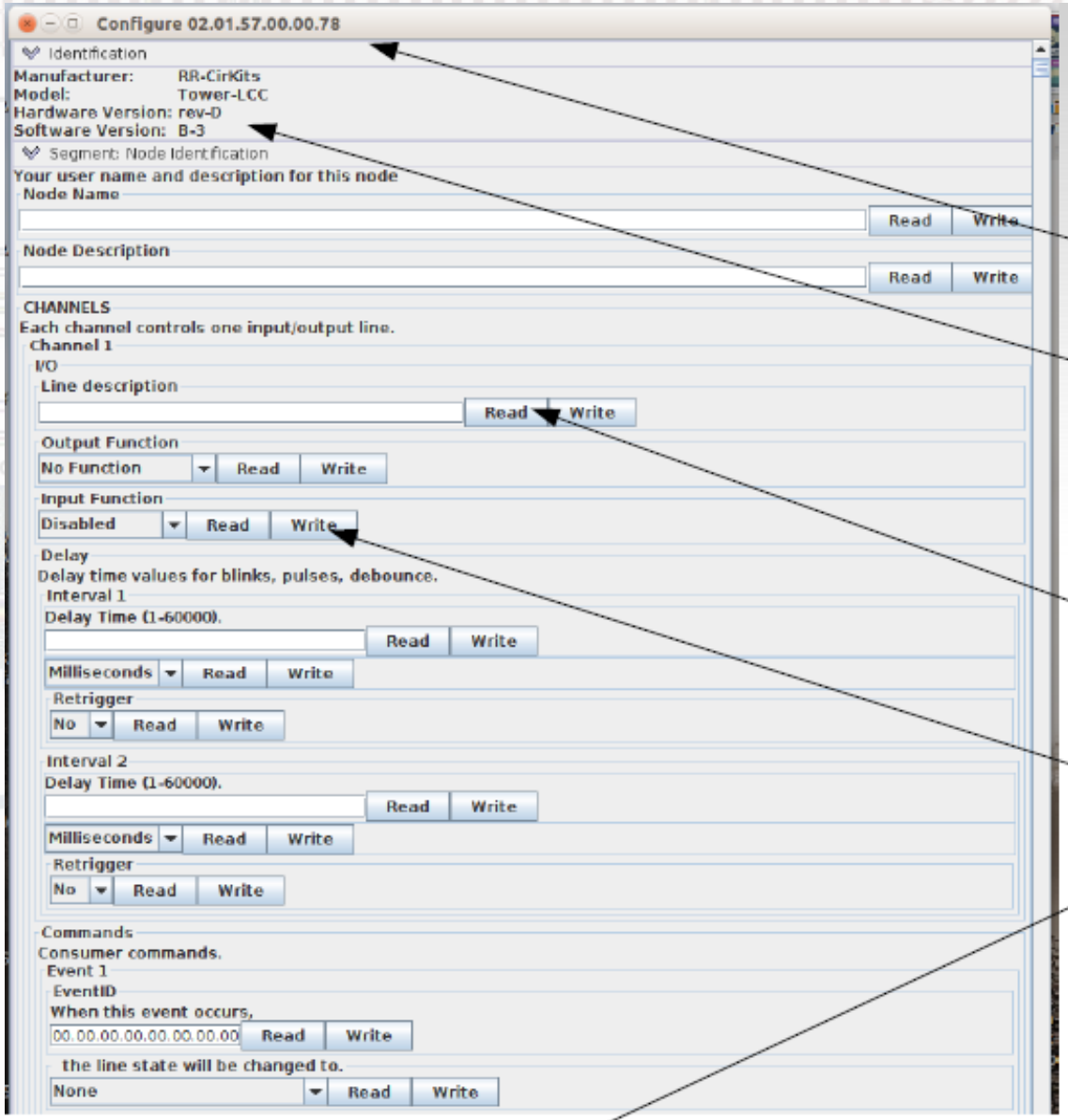


Then choose 'CDI' to open the JMRI CDI tool and read the node.

LCC Configuration Tools

- LCC is an open standard so anyone can develop tools for it. Robert Heller of Deepwoods Software has the CDI editor as part of his model railroad software package.
- Rob's software uses tabs instead of scrolling as does the latest beta of JMRI

http://www.deepsoft.com/home/products/modelrailroadsystem/downloadmr/



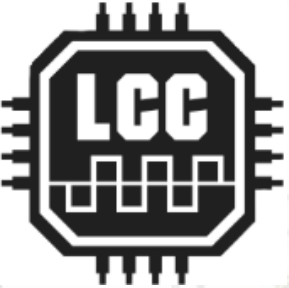
This will open the JMRI CDI tool window and allow you to read and write data to the node. The window header shows the node ID that is open and the Identification shows some basic data about the node.

The actual data will not show up unless you choose to 'Read' it from the node. If you make any changes to the information, then you must 'Write' the data to store it into the node.

There is a 'Read All' button at the bottom of the window, but be forwarned, it takes a lot of time to read all of the data in.

LCC Configuration Tools

- Current configuration tools are still under development. One design target is to eliminate any reference to the actual EventID numbers, and simply use the users own names for items making LCC configuration more about natural names for Node, e.g., LaPorte West or LaPorte East.



Many thanks to Dick Bronson of RR-Cir-Kits Inc. for coaching me through the material in this presentation, and for allowing me to use his content from previous NMRA presentations.