

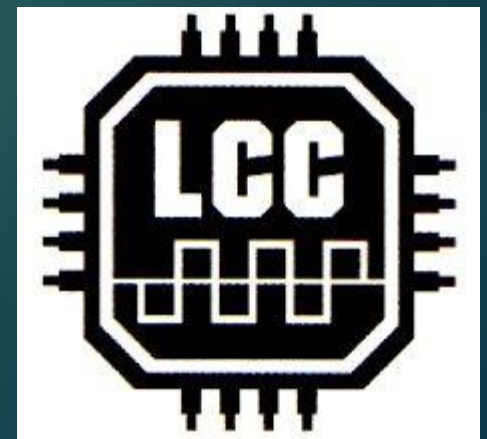
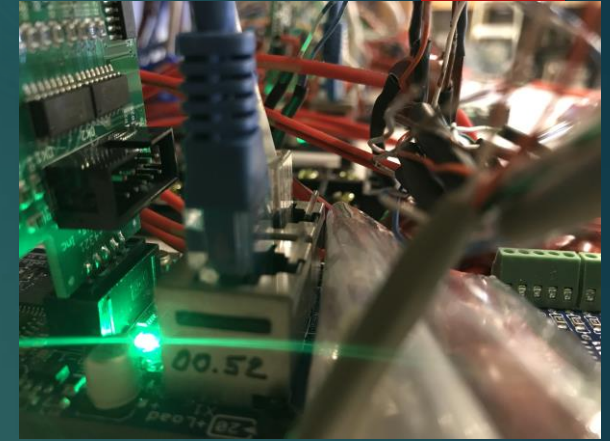
Layout Command Control

WHAT IT IS AND WHAT IT CAN DO FOR YOU



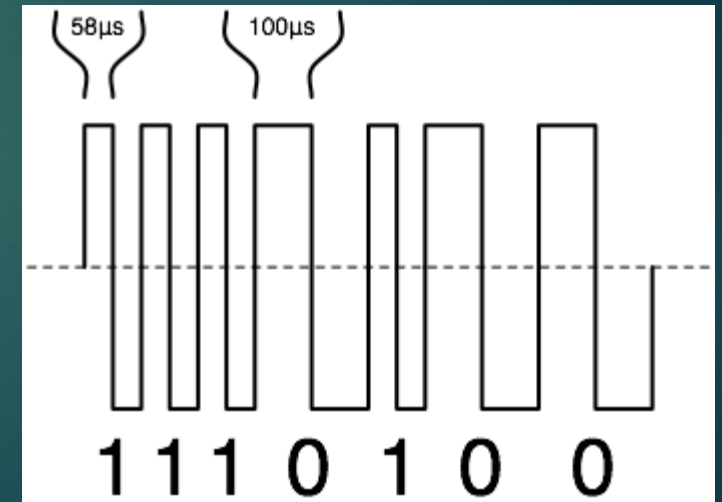
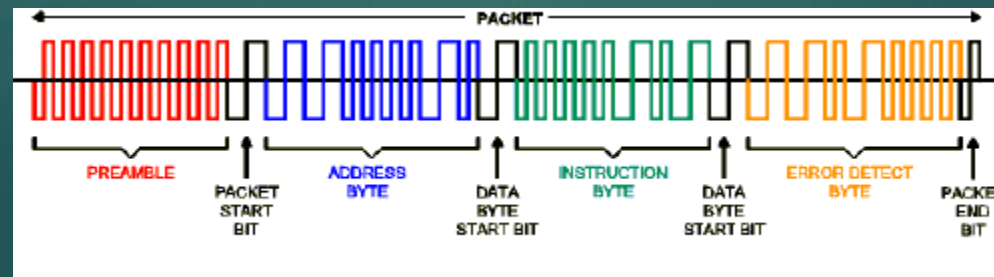
OUTLINE

- ▶ A brief introduction to what LCC is and does.
- ▶ How LCC works (without getting into the weeds!)
- ▶ The pieces needed to make it work
- ▶ Integrating it into your layout
- ▶ Configuring a Node
- ▶ Some simple examples of how to install and use
- ▶ Q&A



DCC vs LCC – What is DCC?

- ▶ DCC puts digital control information into the electrical power of the train. It can be referred to as the DCC signal, although it is both power and control information.
- ▶ Rather than relying on voltage and polarity to move your train, there is a constant power level on the track, and the train has a decoder in the locomotive.
- ▶ Designed to run TRAINS, but can also run “stationary” decoders.



DCC vs LCC – Limitations of DCC

- ▶ Single direction communications – From command station
 - ▶ Reliability comes from repeating commands
- ▶ “Network Contention” – Theoretically can have 10,000 addresses. Practically, this is considerably less
 - ▶ Noisy room with announcements image
 - ▶ Results in lagging response
- ▶ Data Rate: 8,000 bits per second
- ▶ Sound equipped locos add a lot of data
- ▶ Gets worse as the DCC system is loaded up
 - ...then add stationary decoders, signals,*



So the BIG IDEA IS.... SET UP ANOTHER NETWORK

- ▶ Just for running accessories:
 - ▶ Track Detection
 - ▶ Turnouts
 - ▶ Signals
 - ▶ Turntables
 - ▶ Crossing Gates
 - ▶ Accessory and Train Room Lighting



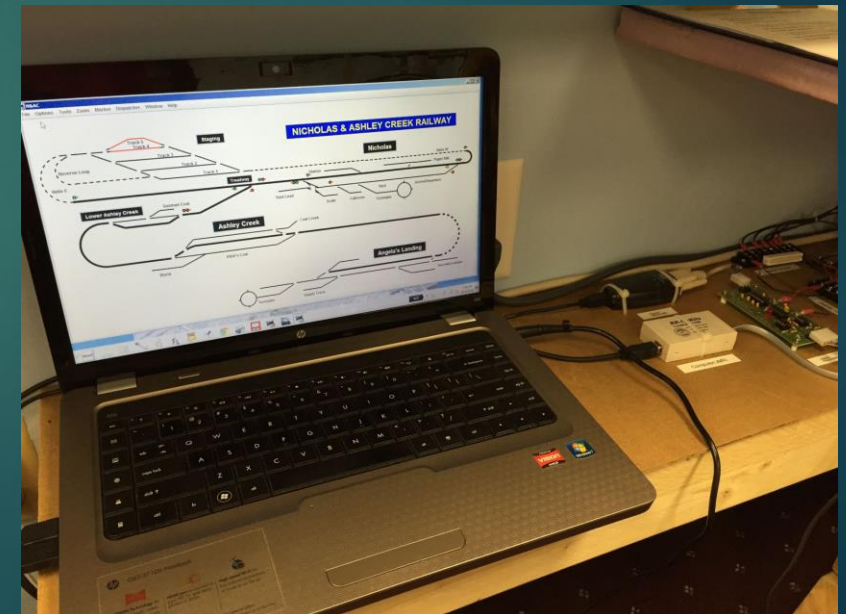
How to unload the DCC bus?

Other (popular) options:

- ▶ LocoNet (Digitrax)
 - ▶ Peer-to-Peer
 - ▶ One of the most popular
 - ▶ Proprietary/Licensing
 - ▶ Relatively slow
- ▶ Xpress Net (Lenz)
 - ▶ Popular in Europe
 - ▶ Based upon RS-485 protocol.
- ▶ Computer Model Railroad Interface (CMRI) (JLC Enterprises)
 - ▶ Bruce Chubb's system
 - ▶ Requires a central computer

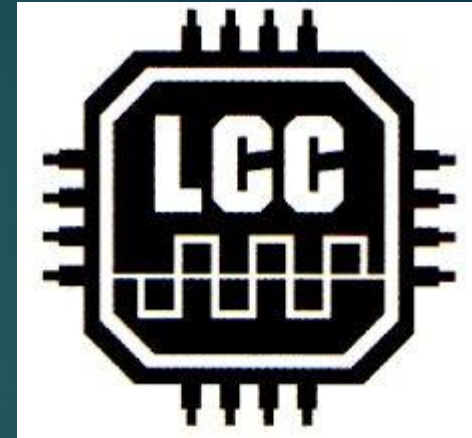


**The Digitrax
Difference**



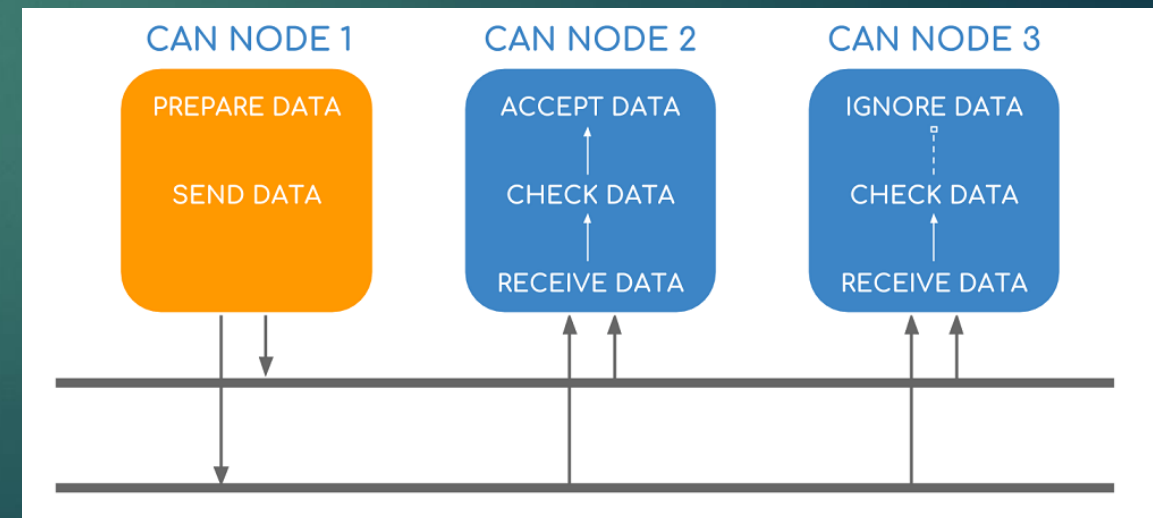
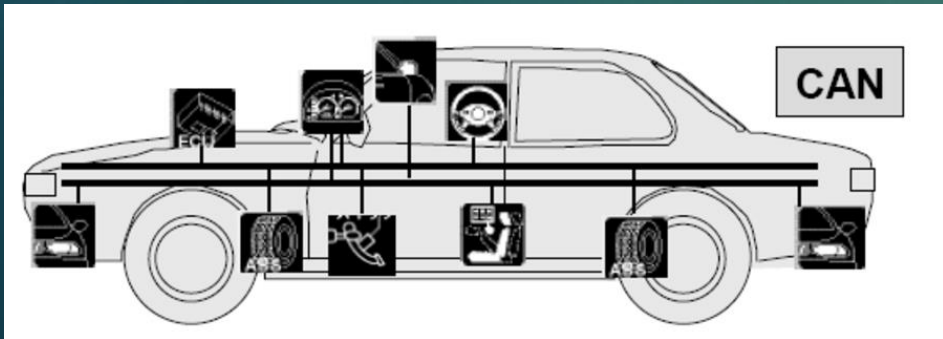
Enter LCC – Layout Command Control

- ▶ Layout Command Control (LCC) is a peer-to-peer system for controlling all of the functions on your layout unrelated to the DCC system.
 - ▶ Peer-to-Peer means any device can talk to any other device independently.
 - ▶ Bi-directional access to the system
 - ▶ Take the load off the DCC bus
 - ▶ [Actually CAN talk to DCC as well.]
- ▶ Open architecture – license free
- ▶ Layout Command Control (**LCC**) is the NMRA approved part of **OpenLCB**.



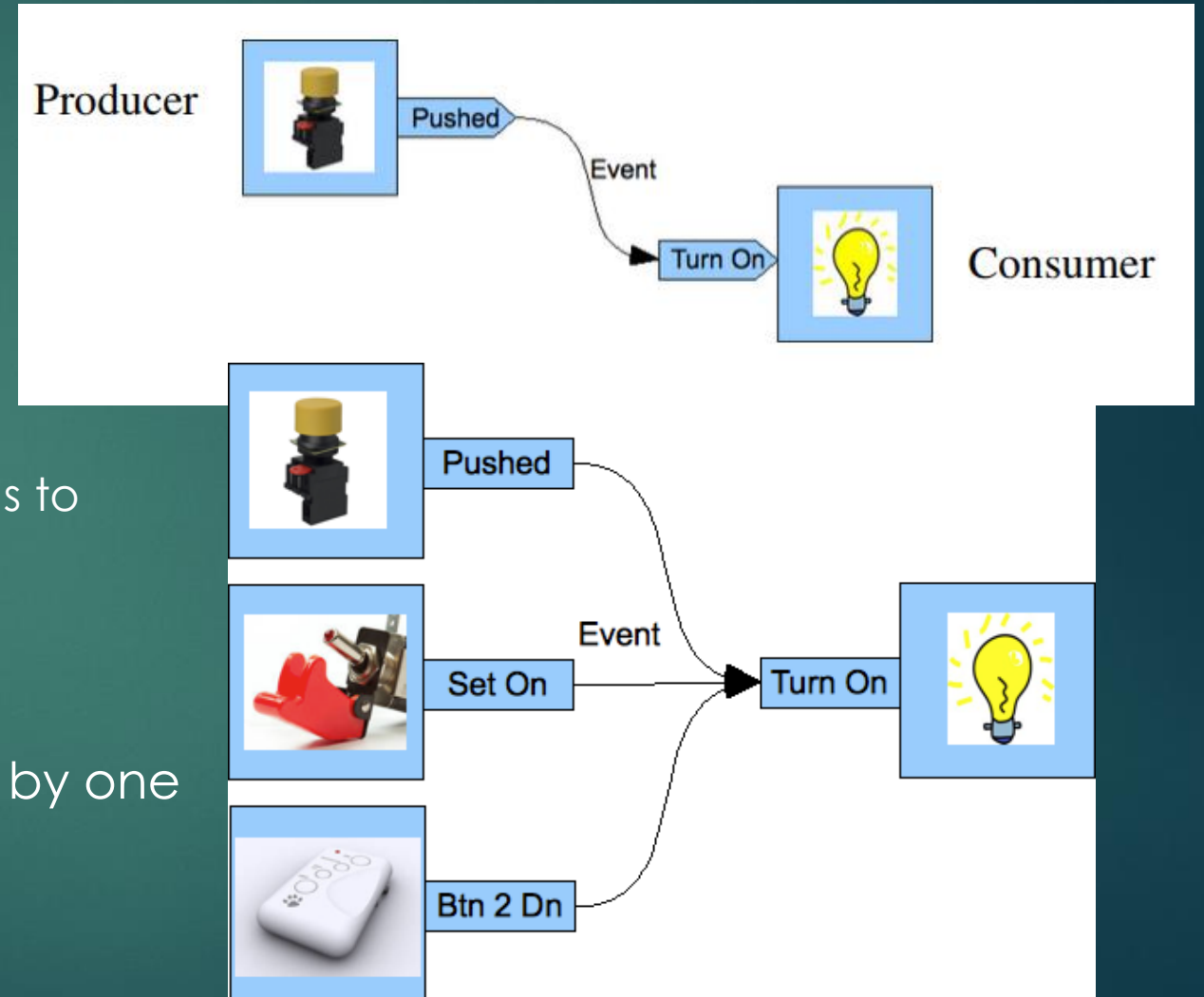
What is LCC?

- ▶ Based on CAN bus: Control Area Network.
 - ▶ CAN found adoption with the automobile industry. (OBD-II)
- ▶ Noise tolerant, an industry standard, and designed for the 12/24V world.
- ▶ LCC CAN bus operates at 125Kb rate and 1000' maximum bus length
(125,000 vs 8,000!)
- ▶ Operates at 100% data throughput rate with error free collision resolution.
- ▶ Allow microcontrollers and devices to communicate with each other without a host computer.



How does it work?

- ▶ “Event” based
- ▶ Producers and Consumers
 - ▶ Producer: Some Event
 - ▶ Block Detector
 - ▶ Push button
 - ▶ Consumer: Something that responds to an event
 - ▶ Turnout – Stall Motor Drive
 - ▶ Signal Lamp
- ▶ One or ANY Producer can be used by one or MANY Consumers
 - ▶ Example: Yard throat logic



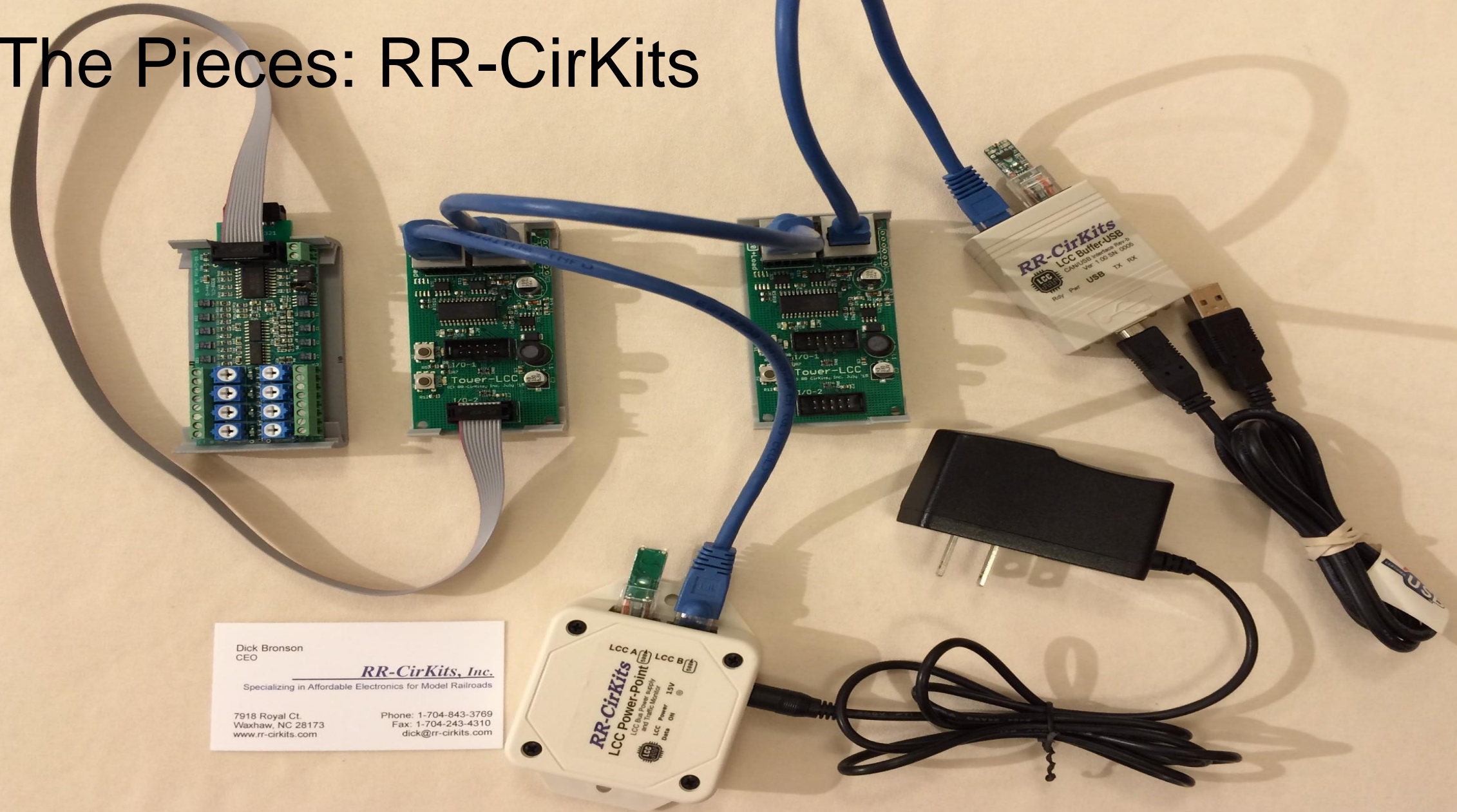
But I don't want to program!!!

You don't have to!

- ▶ LCC is set up for you to CONFIGURE the nodes
 - ▶ Programming already included!
- ▶ You assign an “event” a name
 - ▶ Can be numerical, text, combo, whatever you want
 - ▶ In effect, self-documenting
(But you DO need to keep track of whatever you called it)
 - ▶ The event will be recognized UNIVERSALLY throughout the LCC system



The Pieces: RR-CirKits



Dick Bronson
CEO

RR-CirKits, Inc.
Specializing in Affordable Electronics for Model Railroads

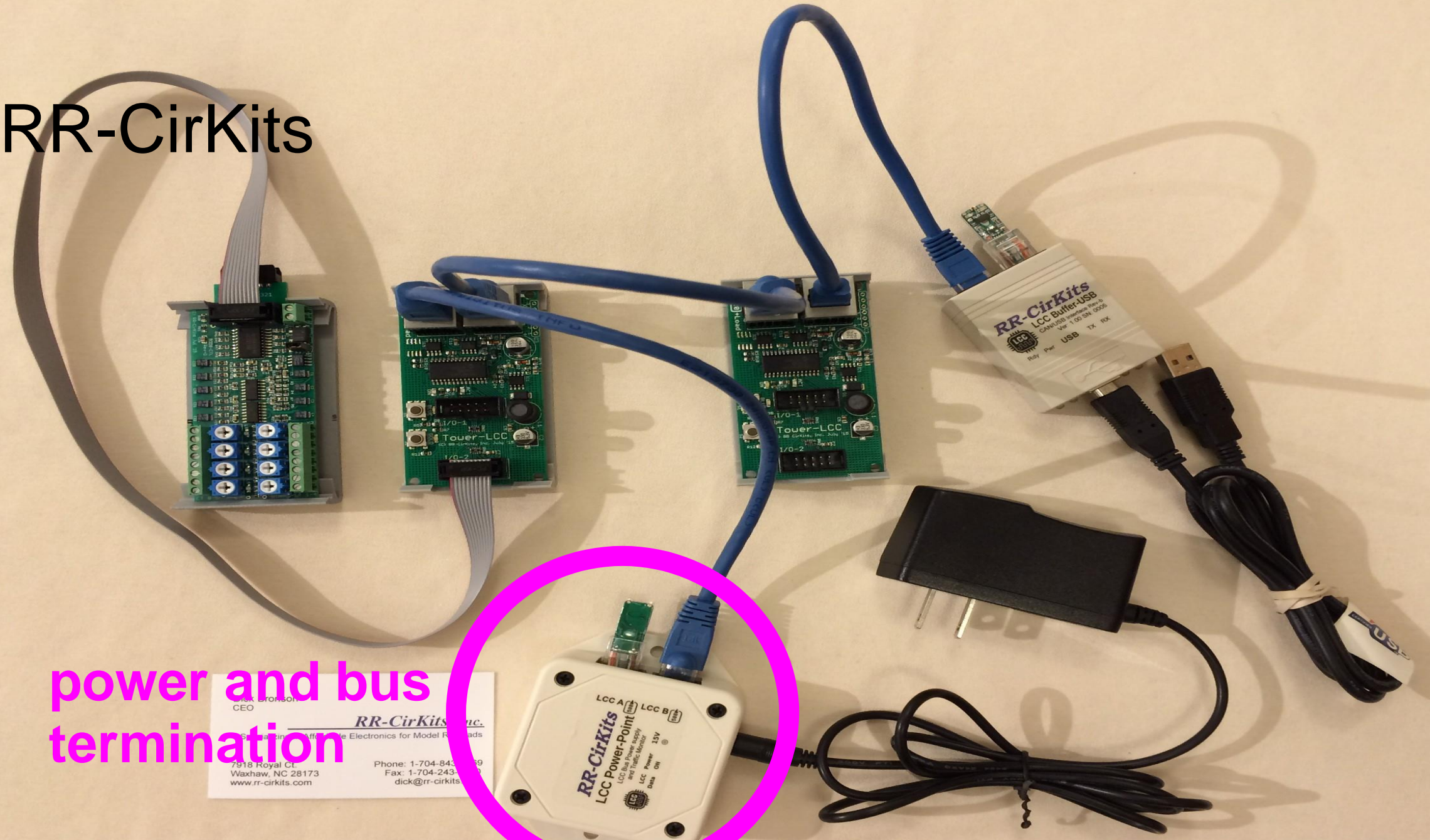
7918 Royal Ct.
Waxhaw, NC 28173
www.rr-cirkits.com

Phone: 1-704-843-3769
Fax: 1-704-243-4310
dick@rr-cirkits.com

RR-CirKits

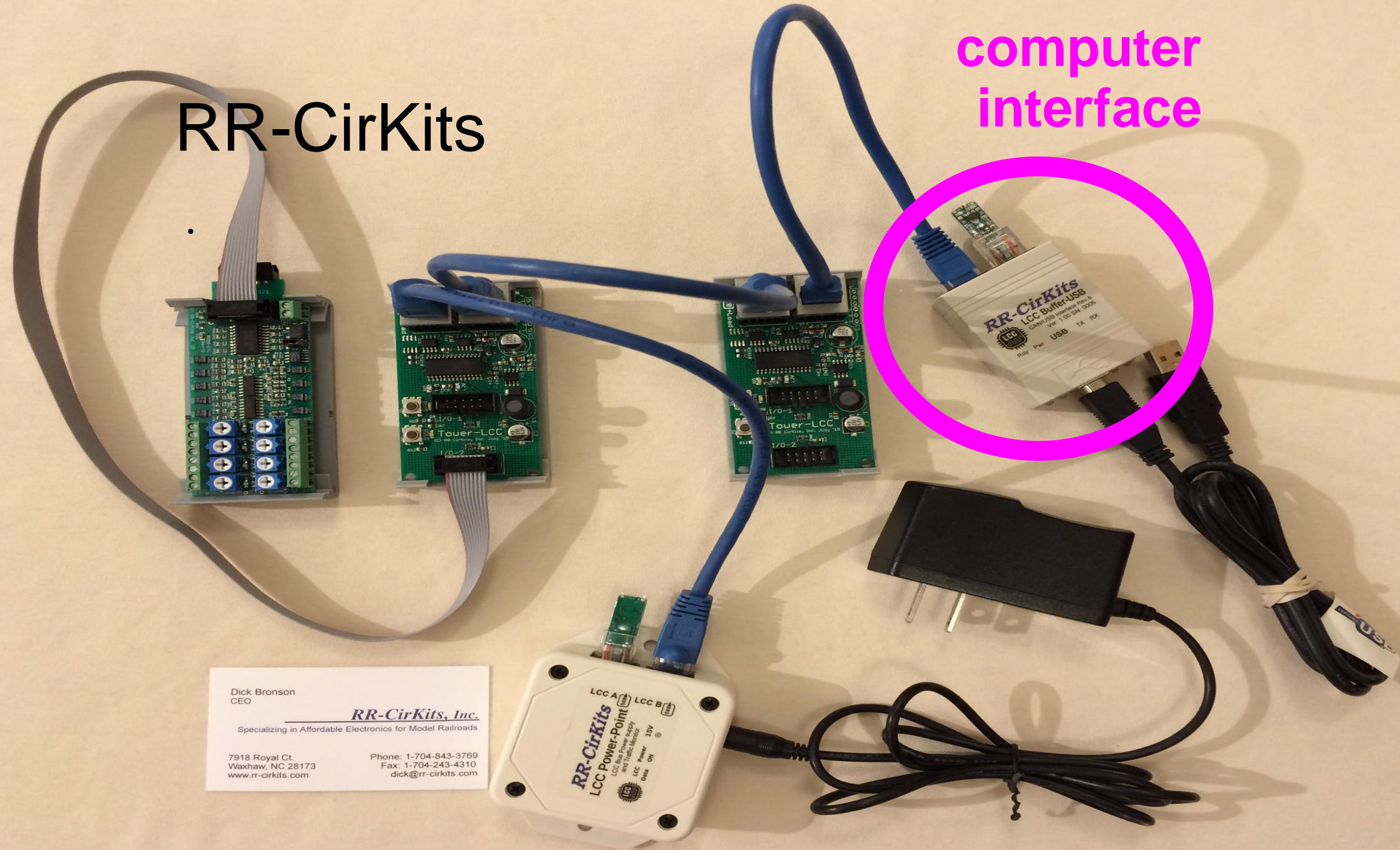
power and bus
termination

Dick Brownson
CEO
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www.rr-cirkits.com
Phone: 1-704-843-1899
Fax: 1-704-243-1899
dick@rr-cirkits.com



RR-CirKits

computer
interface



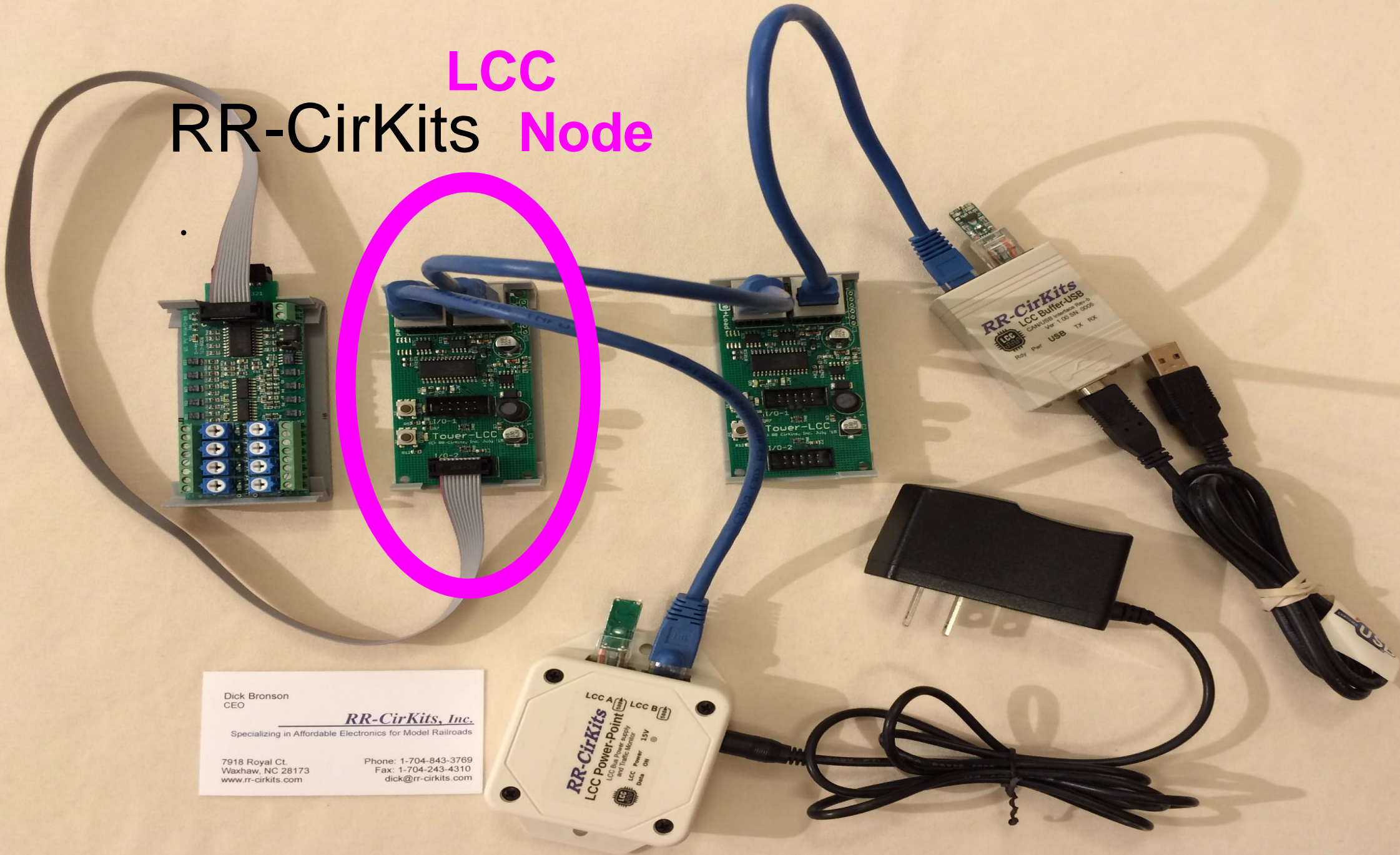
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RR-CirKits LCC Node



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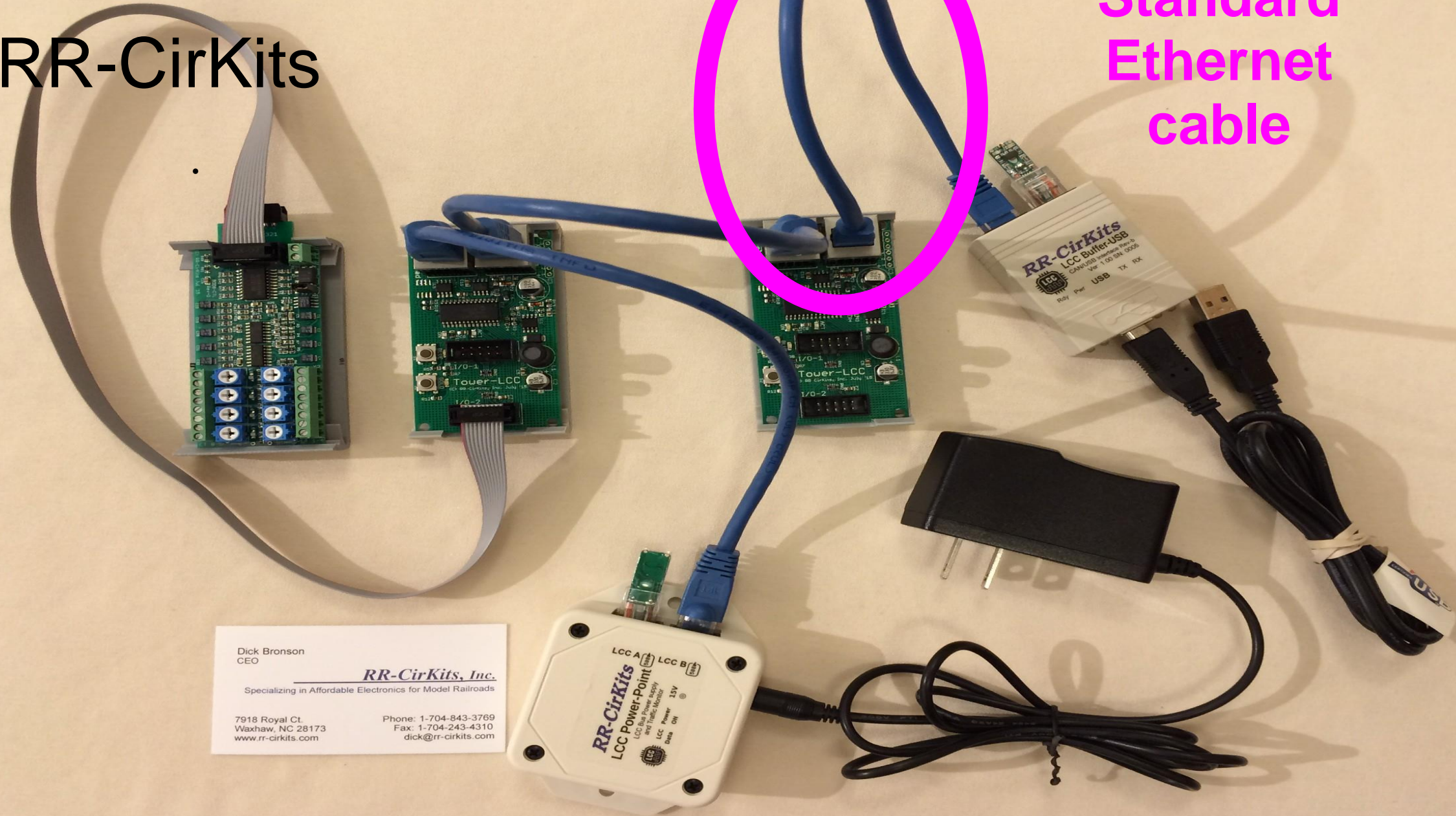
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RR-CirKits
LCC Power-Point
LCC Bus & Power Supply
and Traffic Monitor
LCC Power 15V
LCC Data Off

LCC A LCC B

RR-CirKits

Standard Ethernet cable



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RR-CirKits
LCC Power-Point
LCC Buffer Power Supply and Traffic Monitor
LCC Power 15V
LCC Data On

LCC A LCC B

Look at Typical LCC Nodes

This is where the brains live

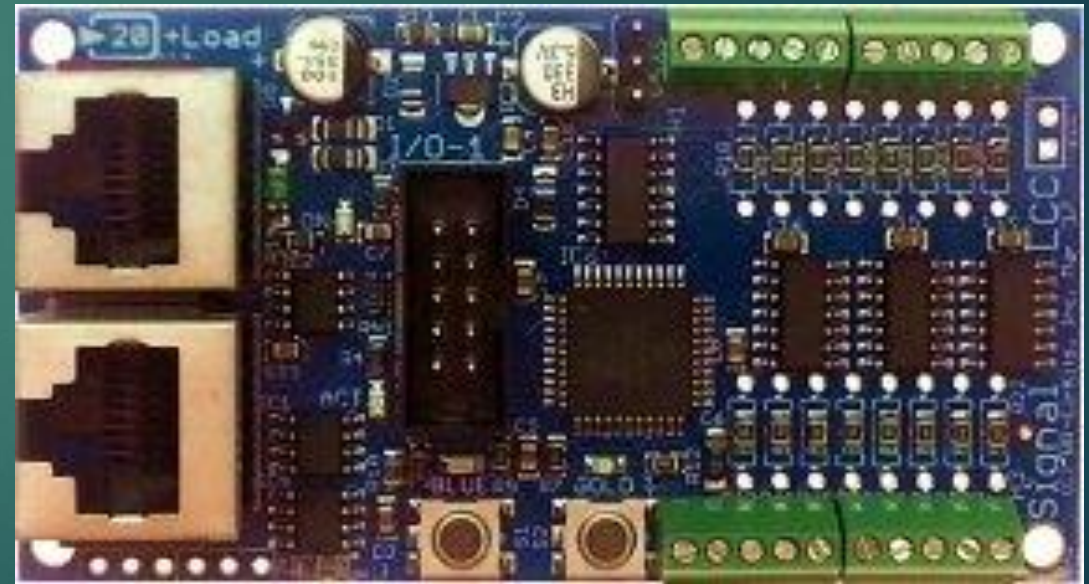
- ▶ Tower-LCC

16 Input/Output lines.



- ▶ Signal-LCC

Support for 16 signal lamps plus 8 I/O lines.

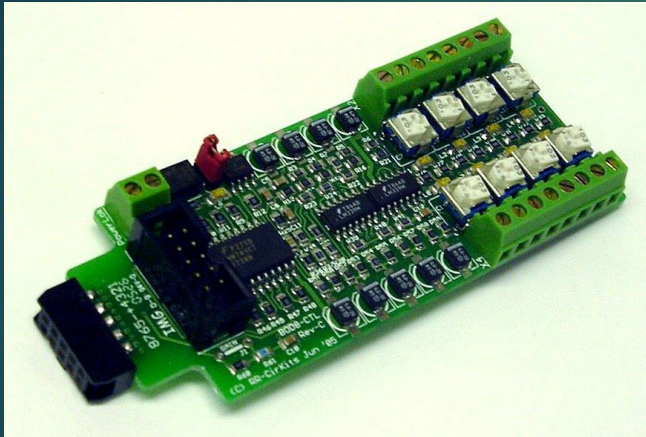


Some Examples of I/O Cards

(How the nodes interface with the world)

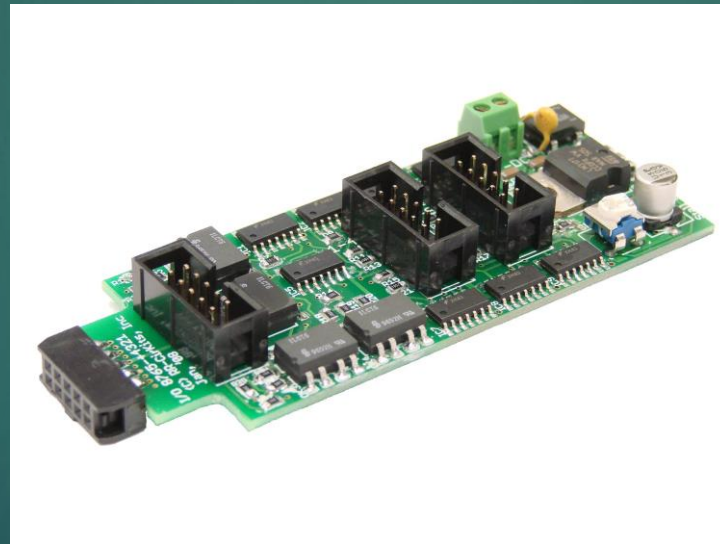
▶ BOD-8

Detection input card



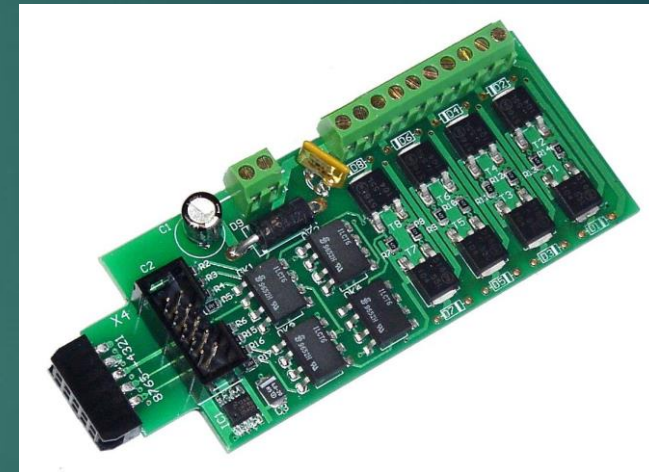
▶ SMD-8

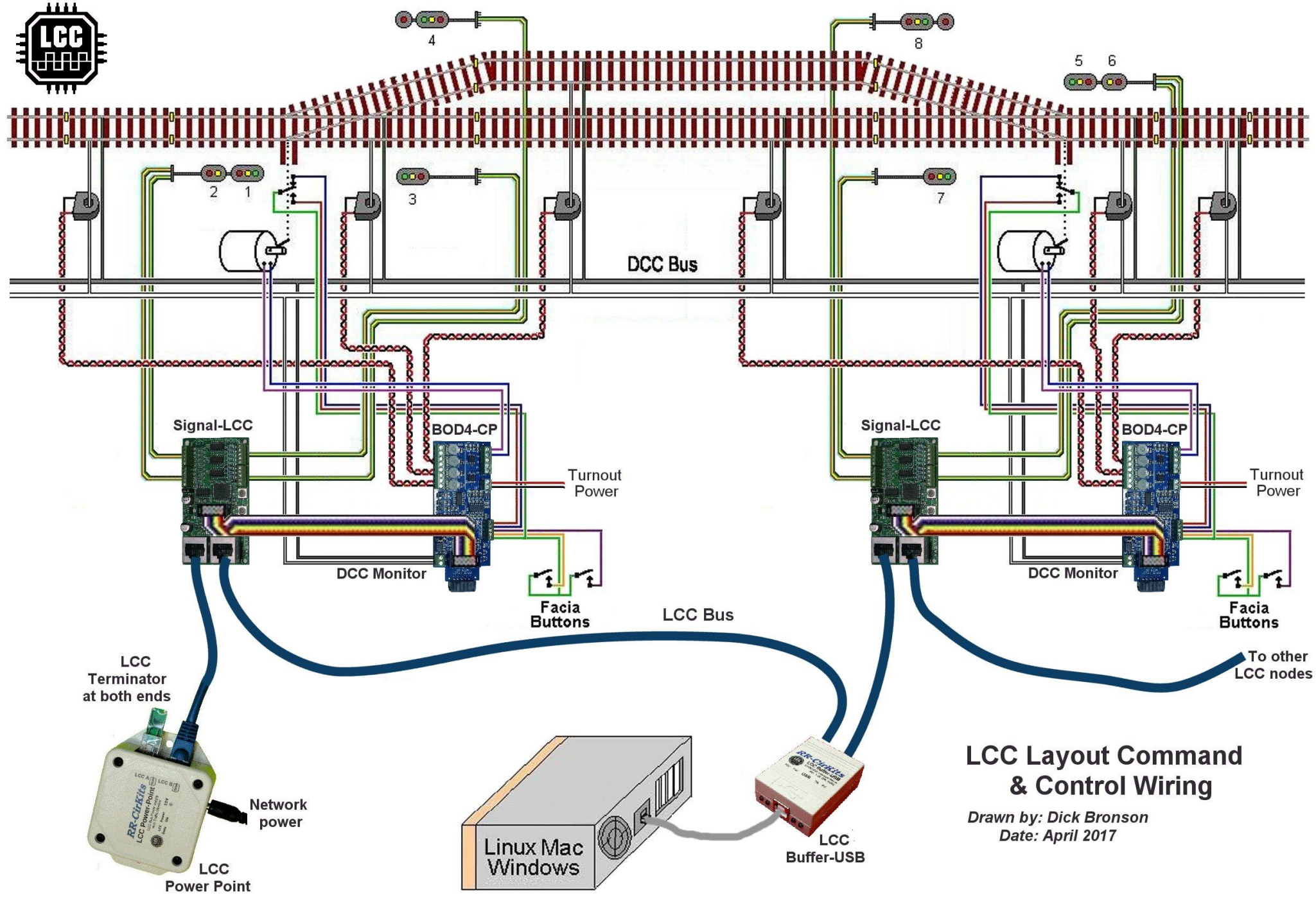
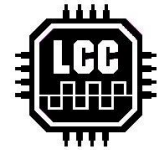
Stall motor driver



▶ SCSD-8

Single Coil Solenoid driver

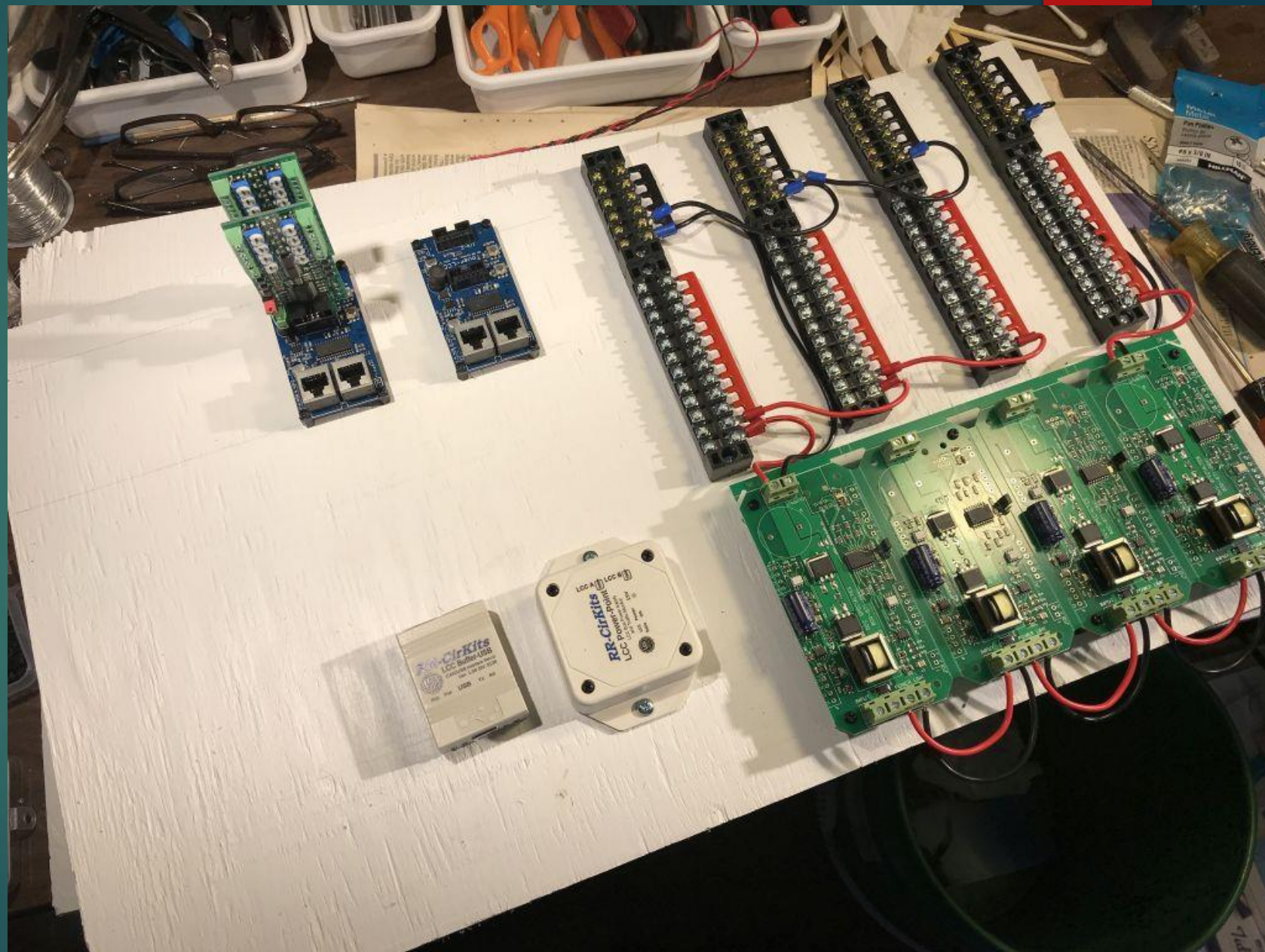




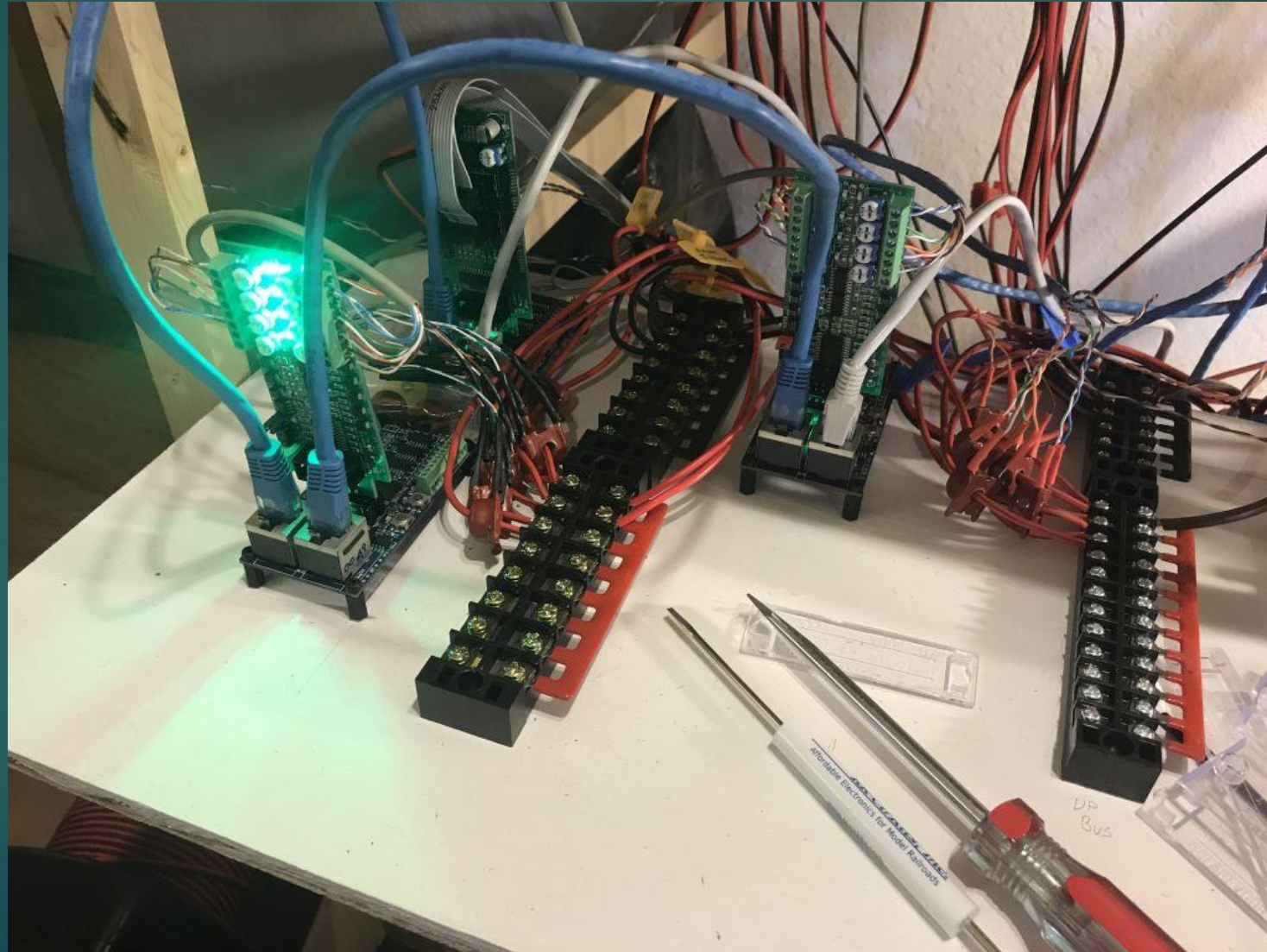
LCC Layout Command & Control Wiring

Drawn by: Dick Bronson
Date: April 2017

Installation

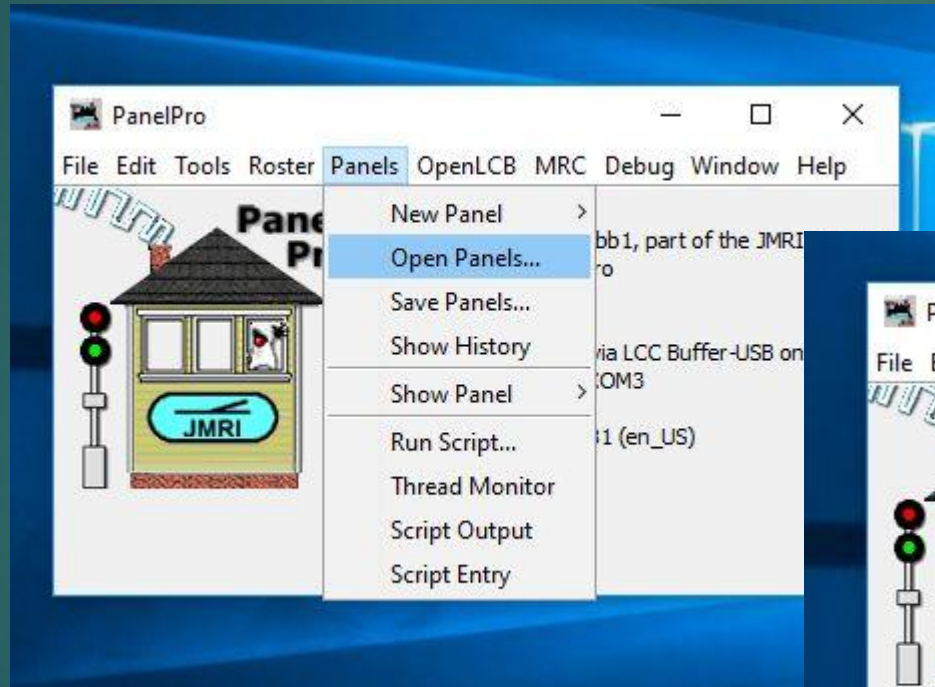


An example

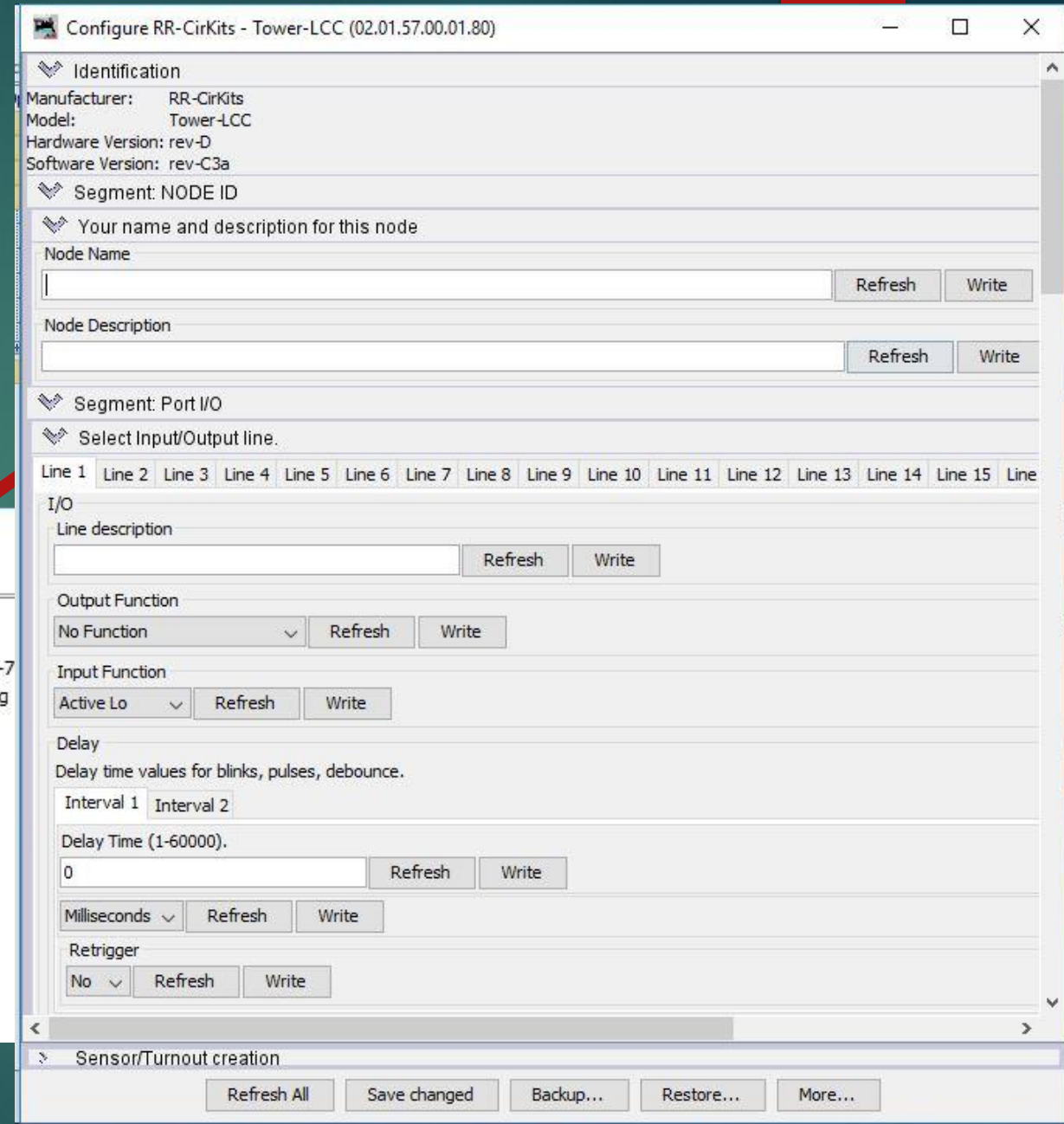
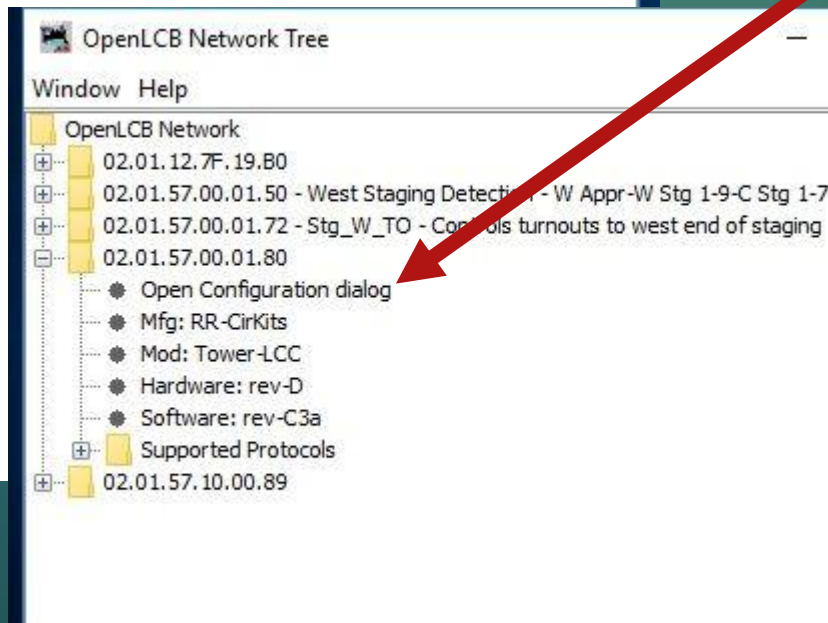
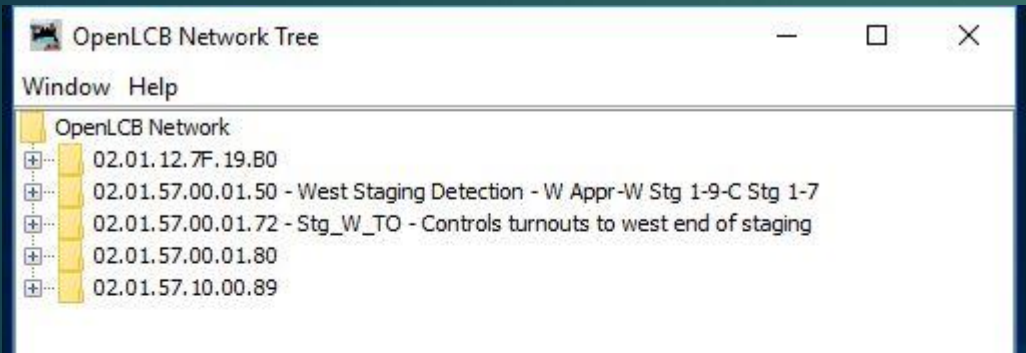


Configuring a Node

- ▶ Use JMRI to interface...



Configure a Node



Configure a Node

Configure RR-CirKits - Tower-LCC (02.01.57.00.01.80)

Identification
Manufacturer: RR-CirKits
Model: Tower-LCC
Hardware Version: rev-D
Software Version: rev-C3a

Segment: NODE ID

Your name and description for this node

Node Name
 Refresh Write

Node Description
 Refresh Write

Segment: Port I/O

Select Input/Output line.

Line 1	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8	Line 9	Line 10	Line 11	Line 12
--------	--------	--------	--------	--------	--------	--------	--------	--------	---------	---------	---------

I/O

Line description
 Refresh Write

Output Function
No Function

Input Function
Active Lo

Delay
Delay time values for blinks, pulses, debounce.
Interval 1 Interval 2

Segment: NODE ID

Your name and description for this node

Node Name
Staging Detect-Center and West End Refresh Write

Node Description
Staging Detect-Center and West End Refresh Write

Segment: Port I/O

Select Input/Output line.

Line 1	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8	Line 9	Line 10	Line 11	Line 12	Line 13	Line 14	Line 15	Line 16
--------	--------	--------	--------	--------	--------	--------	--------	--------	---------	---------	---------	---------	---------	---------	---------

Configure a Node – A Detector

Select Input/Output line.

Line 1 (S1C) Line 2 Line 3 Line 4 Line 5 Line 6 Line 7 Line 8 Line 9 Line 10 Line 11 Line 12 Line 13 Line 14 Line 15

I/O

Line description
S1C Refresh Write

Output Function
No Function Refresh Write

Input Function
Active Lo Refresh Write

Delay
Delay time values for blinks, pulses, debounce.
Interval 1 Interval 2
Delay Time (1-60000).
0 Refresh Write
Milliseconds Refresh Write

Retrigger
No Refresh Write

Commands

Consumer commands.

Event 1 Event 2 Event 3 Event 4 Event 5 Event 6

EventID
(C) When this event occurs,
02.01.57.00.01.72.00.78 Refresh Write Copy Paste Search

the line state will be changed to.
None Refresh Write

Indications

Producer commands.

Event 1 Event 2 Event 3 Event 4 Event 5 Event 6

Upon this action
Input On Refresh Write

EventID
(P) this event will be sent.
02.01.57.00.01.72.00.7E Refresh Write Copy Paste Search

Configure a Node – A Detector

Commands

Consumer commands.

Event 1 Event 2 Event 3 Event 4 Event 5 Event 6

EventID
(C) When this event occurs,
02.01.57.00.01.72.00.78 Refresh Write Copy Paste Search

the line state will be changed to.
None Refresh Write

Indications

Producer commands.

Event 1 Event 2 Event 3 Event 4 Event 5 Event 6

Upon this action
Input On Refresh Write

EventID
(P) this event will be sent.
02.01.57.00.01.72.00.7E Refresh Write Copy Paste Search

Indications

Producer commands.

Event 1 Event 2 Event 3 Event 4 Event 5 Event 6

Upon this action
Input On Refresh Write

EventID
(P) this event will be sent.
02.01.57.00.01.80.00.06 Refresh Write Copy Paste Search

Indications

Producer commands.

Event 1 Event 2 Event 3 Event 4 Event 5 Event 6

Upon this action
Input Off Refresh Write

EventID
(P) this event will be sent.
02.01.57.00.01.80.00.07 Refresh Write Copy Paste Search

Indications

Producer commands.

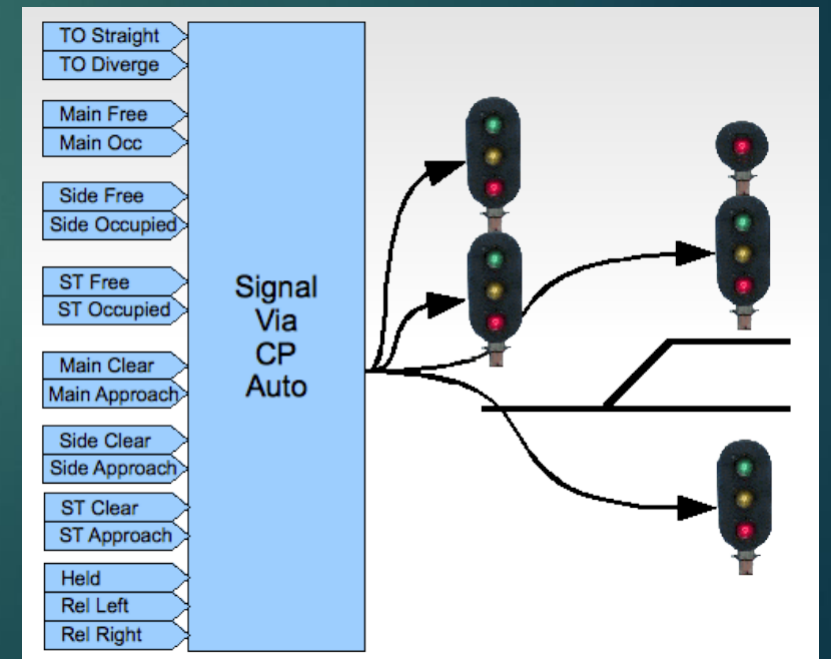
Event 1 Event 2 Event 3 Event 4 Event 5 Event 6

Upon this action
None Refresh Write

EventID
(P) this event will be sent.
02.01.57.00.01.80.00.08 Refresh Write Copy Paste Search

LCC: The Slick Implications

- ▶ Executes logic and control... without your PC on!
- ▶ Multiple control points for specific functions (example: wye)
- ▶ Economy of communication;
Local 'decoding' of command



Tying It All Together

▶ **Questions?**

▶ **Live Demo!**