Signals in 90 Minutes

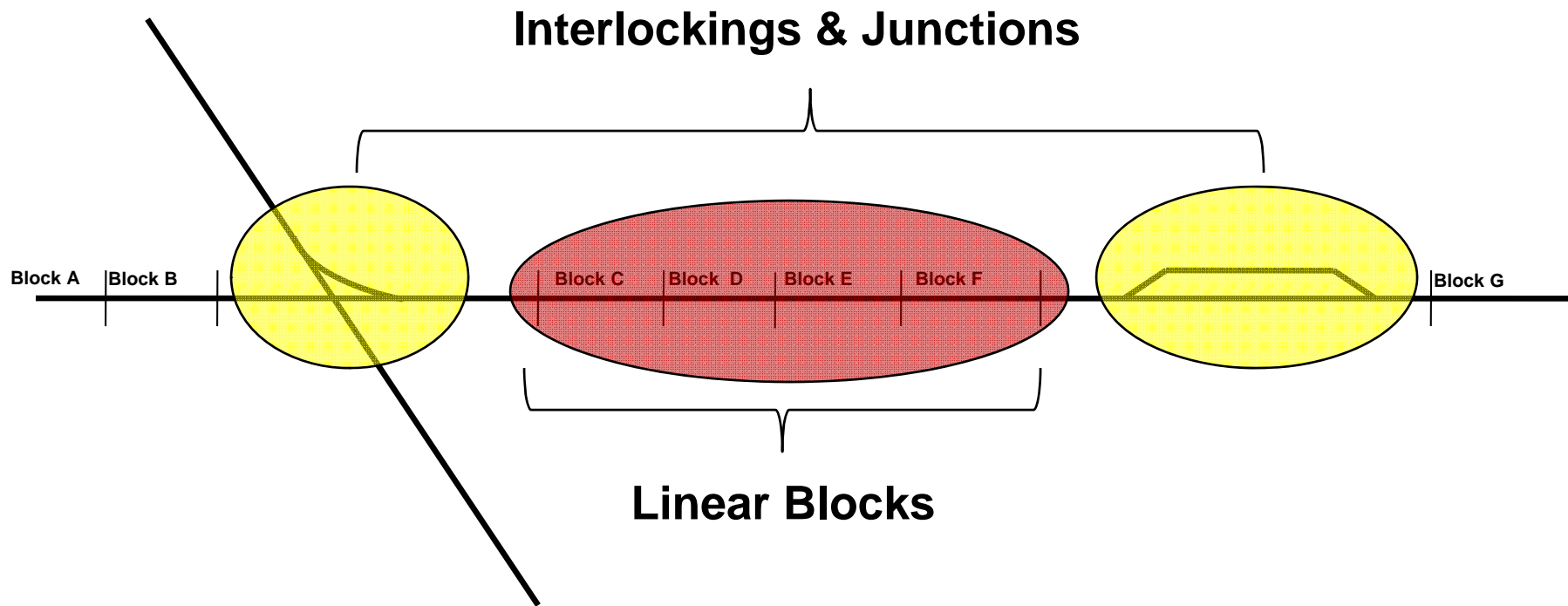Dick Johannes

June 17, 2011

Overview

- Quick review from my earlier Signals Primer
- JMRI based (Open Source / Java Based)
  - DecoderPro
  - Panel Pro
  - WiThrottle
- CATS Demo
  1. Start with a "standard" DCC track section
  2. Add Occupancy Detection
  3. Demonstrate functionality even without signals
  4. Add Signals
  5. Describe relevancy to the Modular railroad

Two types of "regions"

Interlockings & Junctions

Block A | Block B

Block C | Block D | Block E | Block F

Block G

Linear Blocks

Three Key Implementation Questions

1. **INPUTS:** What is the incoming information needed and how do I get it?

2. **PROCESSING:** How do I process the incoming information?

3. **OUTPUTS:** How do I output the processed information?
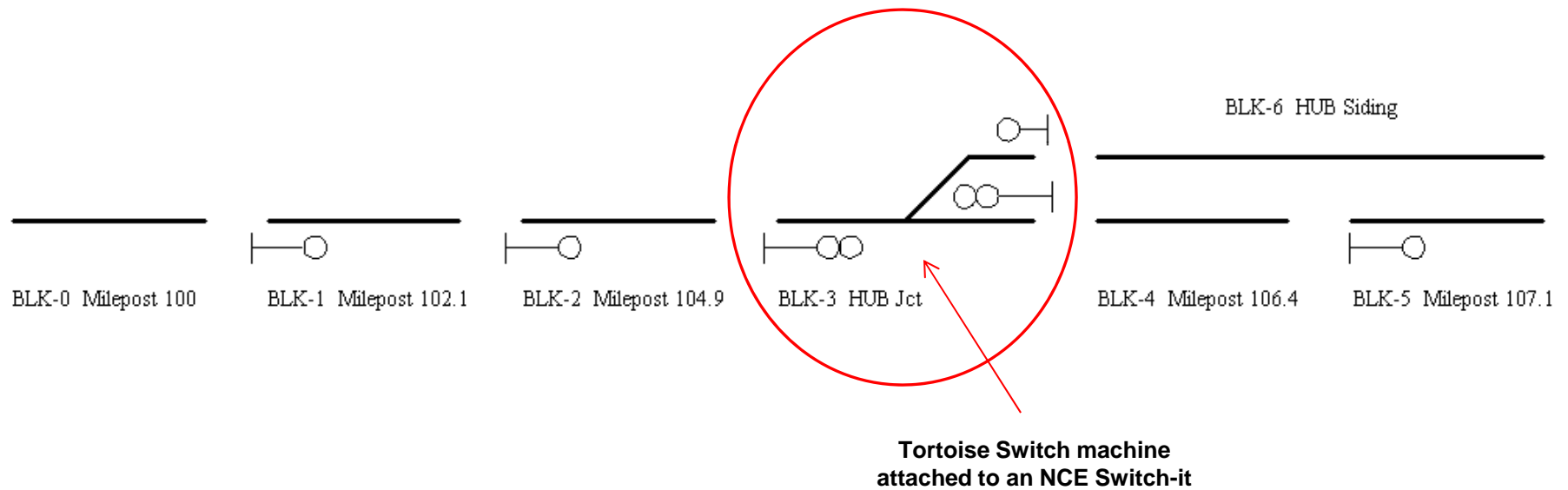
My Three Key Implementation Answers

1. INPUTS: **BD20s and NCE AIUs**

2. PROCESSING: **A Computer & CATS**
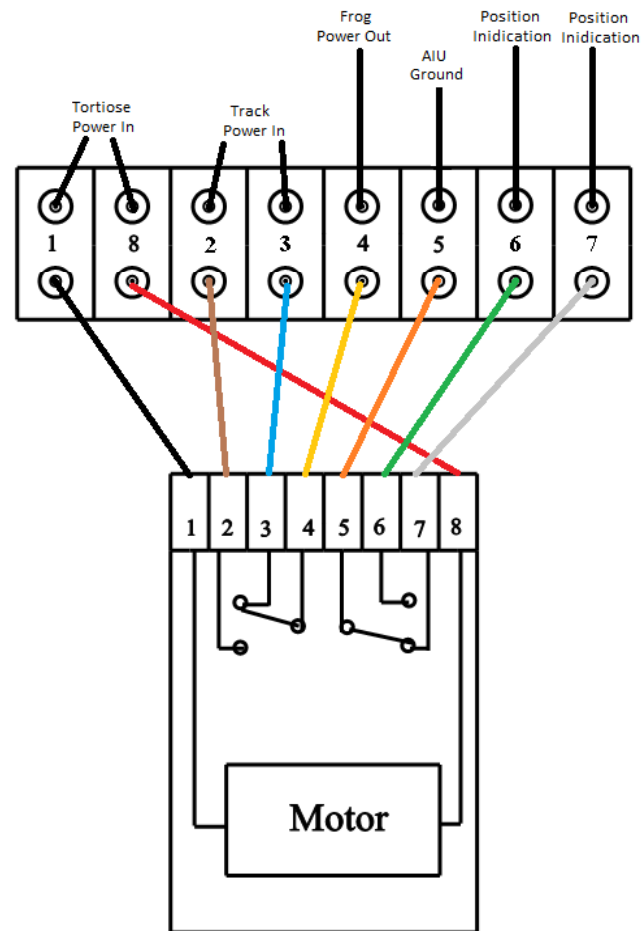
3. OUTPUTS: **Oaktree Systems**

The Sample Layout

OS Section

BLK-6 HUB Siding

BLK-0 Milepost 100   BLK-1 Milepost 102.1   BLK-2 Milepost 104.9   BLK-3 HUB Jct   BLK-4 Milepost 106.4   BLK-5 Milepost 107.1

**Tortoise Switch machine
attached to an NCE Switch-it**

Turnout Connections
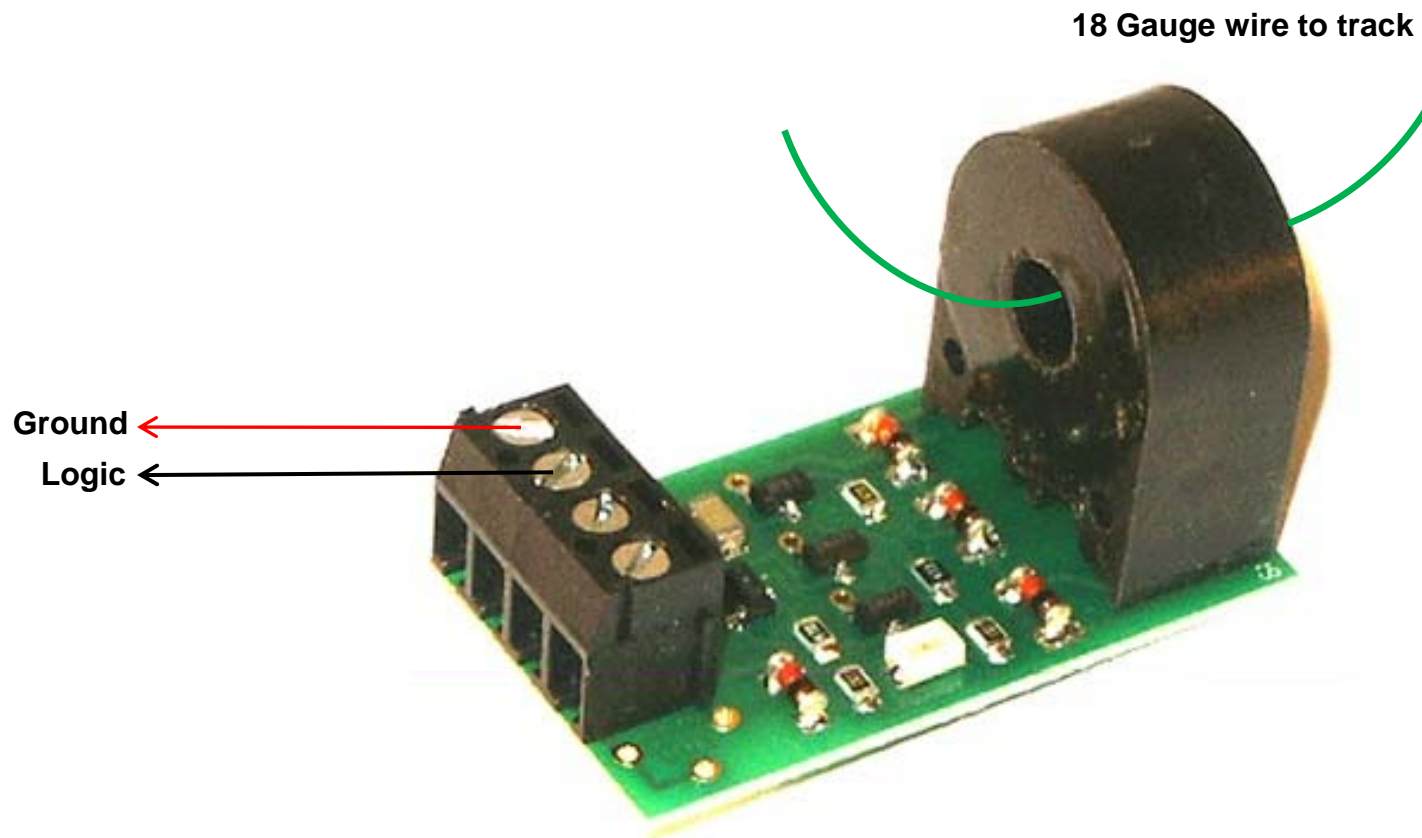

Tortiose
Switch
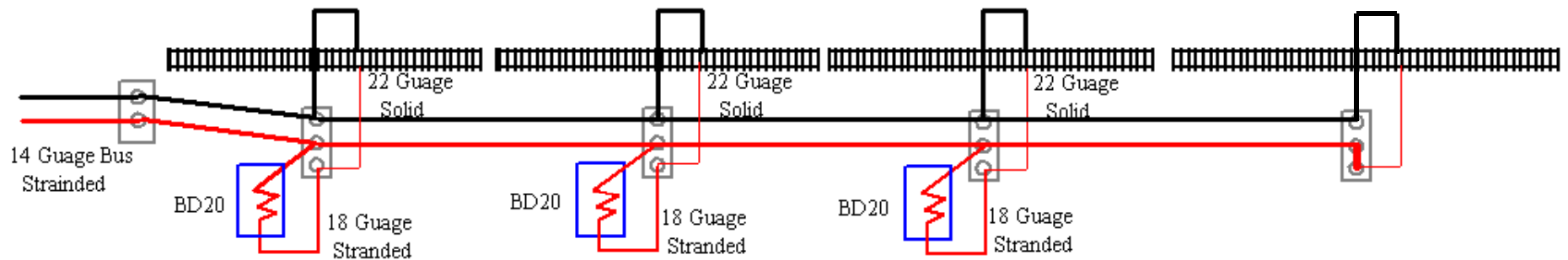Machine

Inputs

- **NCE BD20s (electrically isolated)**
  - Just indicate off or on.
  - Need to convert to a meaningful address
- **NCE AIU card**
  - 14 inputs / card
  - Daisy chain directly into the throttle bus
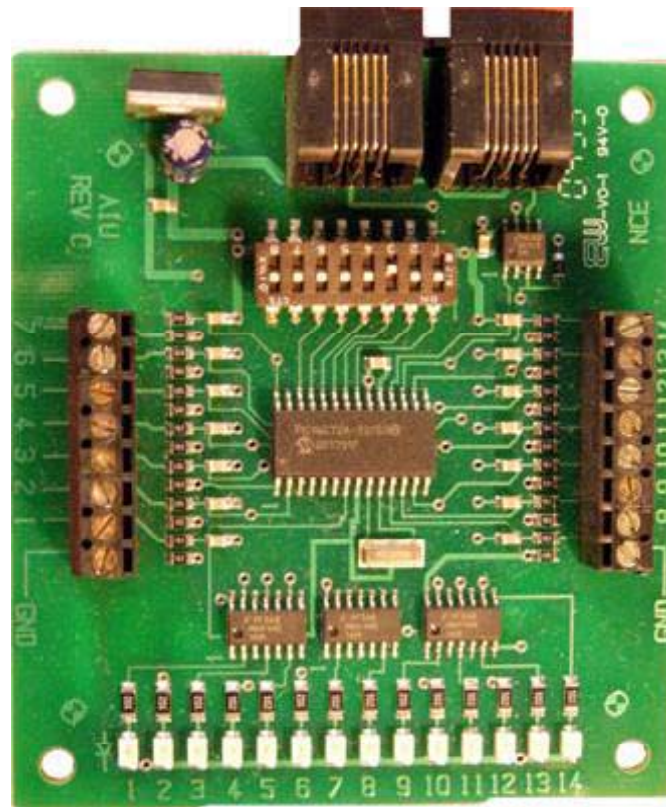 - Each has it's own unique address

BD20

18 Gauge wire to track

Ground

Logic

BD20 Wiring

The NCE AIU Card

RJ Connections to
Throttle bus

Inputs 1-7 plus
GND

Inputs 8-14 plus
GND

LEDs show inputs

AIU Addressing

AIU (Input) Numbering

The NCE "AIU" device allows the NCE command station to check the status of inputs from the layout. These are referenced in JMRI as "Sensors" with names like "NS785". "NS" means "NCE Sensor", and 785 is the number of a specific sensor input.

The sensor number can be found by using the following formula:

Sensor ID = (AIU Cab Address - 1) * 16 + (Pin Number On AIU) -1

For example: The AIU cab address is set to 50 and one of the BD20s is connected to pin 2. Therefore the Sensor ID would be:

Sensor ID = (50 - 1) * 16 + (2) -1

Sensor ID = 785

In the hardware address field of the Add Sensor window you can enter in the AIU Cab Address followed by the Pin Number seperated by a ":"
So for a sensor on AIU Cab Address 50, pin 2 you would enter the following : **50:2**

Turnout Numbering

JMRI can access accessory decoders as NCE Turnouts and Lights. They are addressed using the same numbers that you would use on your NCE throttle to throw the accessory decoder. For example, if you can access turnout 21 from your throttle, JMRI would address it as "NT21" or just "21".

Now onto CATS

- Java application that runs atop JMRI
- Modern CTC Panel modeled after Digicon
- Authored by Rodney Black
- A few really outstanding features
  - Uses all the debugging tools in JMRI
  - Track speeds
  - Great benefits even without signals
  - "Pre-programmed" signal logic

CATS

Three components

1. Designer (draw and design)

2. CATS (runtime application)

   – Draw track

   – Add turnouts

   – Define blocks and protocols

   – Add occupancy & turnout dectection

   – Define signals

3. TrainStat (train tracking application)

CATS Demo - Phase 1

1. Draw Track

2. Add Turnouts

3. Show occupancy detection

4. Show turnout position

5. Demonstrate CATS & TrainStat

Pretty Impressive without any signals!!

Time for Signals

- Many different wiring formats
- Especially true for the searchlight signals common in the Northeast
- My choice: Let simplicity rule. I adopted common anode wiring everywhere. This can work for D-type, G-Type, searchlights & PRR position light signals.

Pin #1

Pin #2

Pin #3

LEDs
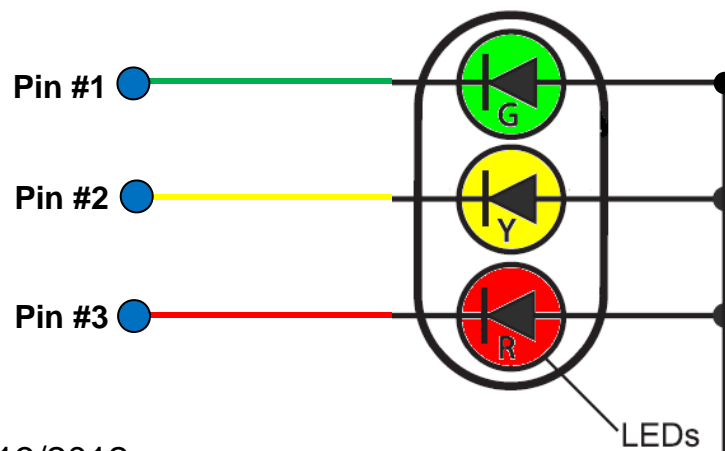
Common Anode (+12v)

RJ22 Connectors

- Handset connectors & can be found in the Mouser Catalog

- Pre-Wired with 4 color coded (red, yellow, green & black) wires

- Label and click connect at either end

- I used 4 connector flat telephone cable

Oaktree Systems

- JMRI Compatable

- 6 wire telephone cable, up to 64 Cards

- IO24, IO48, O48 Cards

- They support the B&O railroad museum layout

CATS Demo – Phase II

- Signal templates
  - These allow defining aspects/rules
- Signal placement
- Testing
- Define can perform as ABS, APB, or CTC
- Detail the CTC panel
  - Labels
  - Remove intermediate signals

2/13/2012

CATS Functionality

- Super approach to aspect definition
- Speed signaling (great for Northeast RRs)
- Support for out-of-service and giving track authority
- Route locking, Indication Locking
- Occupancy tracking
- Train tracking
- Supports arbitrary order of modules in software

References

- Download site:
  http://home.comcast.net/~kb0oys/

- 2010 NMRA Clinics (.ppt & .xml) are in the documentation section of on the website

- Download contains MS-Word Manuals for CATS, Designer and TrainStat

- Open web based user group

- Oaktree site: http://www.oaktreesystems.com

Thank You

The CATS Demo

- Phase I
  - Lay track
  - Add turnout
  - Add occupancy
  - Show TrainStat (Trains, Crew, Tracking, Fast Clock)
- Phase II
  - Signal Templates
  - Load ABS version and demo
  - Convert to CTC and ABP
  - Show aspect difference at turnout
  - ABP effect (red tumble down)
  - Effect of clearing CTC plant
  - Show "Granting Occupancy"
  - Show "Out of Service"