Computer Automated Traffic System (CATS) - A Dispatcher Panel That Grows
Presentation 1 of 3

Wiring for Signals

Part 1: Wiring

Part 2: Signals

Part 3: CATS
Presentation 2 of 3

Wiring for Signals

Part 1: Wiring

Part 2: Signals

Part 3: CATS
Presentation 3 of 3

Wiring for Signals

Part 1: Wiring

Part 2: Signals

Part 3: CATS
Resources

Computer Automated Traffic System (CATS)

• CATS – cats4ctc.org
• JMRI – jmri.org
Outline

Computer Automated Traffic System (CATS)

• Introduction to CATS
• Prototype examples of dispatcher panels
• Model railroad examples of CATS panels
• Setting up CATS as a better magnet board
• Setting up CATS as a dispatcher panel for a model railroad
Introduction – What is CATS?

Computer Automated Traffic System (CATS)

- CATS is a computer program for controlling the signals on a model railroad (ABS, APB, CTC)
- CATS is a dispatcher’s panel for a model railroad
- CATS is a model of a dispatcher’s panel
- CATS is a suite of programs to assist in operating a model railroad in a prototypical manner
Introduction – What is CATS?

Computer Automated Traffic System (CATS)

• CATS is computer system independent
• CATS is not tied to a particular control system
• CATS is a JMRI application
• CATS is not PanelPro
• CATS is freeware and open source
• CATS is a modern looking dispatcher panel inspired by Digicon
Introduction – What is CATS?
Computer Automated Traffic System (CATS)

• The primary CATS user is the model railroader who wants a “kit” for signaling
  – Simple to set up
  – Simple to use
  – Realistic

• The secondary CATS user is the purist
  – CATS cannot be everything to everyone
  – CATS follows the “good enough” principle
“Wayside rail signaling practice in the U.S. is a nightmarish web of operating rules, signal types, aspects, aspect names, and indications, differing between the different roads and even their individual divisions and locations. Much of the protocol involved is extremely curious and often counter-intuitive, a result of the long historical evolution of this field and of the industry.”

Rail Signal Aspects and Indications
Douglas A. Kerr, P.E.
March 20, 2007
Issue 03
Prototype Research - Digicon

Computer Automated Traffic System (CATS)

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Computer Automated Traffic System (CATS)
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Computer Automated Traffic System (CATS)
Prototype Research - Digicon

Computer Automated Traffic System (CATS)
Prototype Research – UP CAD

Computer Automated Traffic System (CATS)
Prototype Research – BNSF TMDS

Computer Automated Traffic System (CATS)
Prototype Research – MRL TMDS

Computer Automated Traffic System (CATS)
Model RR – Pat Lana’s Crandic

Computer Automated Traffic System (CATS)
Model RR – John Parker’s BNSF

Computer Automated Traffic System (CATS)
Model RR – Don Meeker’s RML
Computer Automated Traffic System (CATS)
Model RR – Chuck Shell’s PR&C

Computer Automated Traffic System (CATS)
Game Plan #1

Computer Automated Traffic System (CATS)

- Convert a track plan to a CTC panel diagram
- Draw the mainline
- Locate the blocks
- Define the turnouts
- Add some signals
- Run some trains as a magnet board
Creating the Panel

Computer Automated Traffic System (CATS)
Map to CATS (Magnet Board)

Computer Automated Traffic System (CATS)

- Files – loading, saving, creating anew, importing
- Edit – geometry changes, cell clearing and copying
- Devices → Signals
- Details → Tracks
- Details → Track Ends
  - Block definitions
  - Signal placement
  - Turnout definitions
- Details → Stations
- Details → Labels
- Trains
- Crew
Dispatching Tasks
Computer Automated Traffic System (CATS)

What tasks does a typical model railroad dispatcher do (caveat: every model railroad is unique)?

• Direct trains (throw turnouts and set signals)
• Release CTC machine control (unlock a turnout for local use; grant “track authority”)
• Follow a train’s progress (log OS times; assist in knowing which routes to set up → add a train’s label to the board, move the train’s label, remove a train’s label from the board)
• Assign crew to trains → must know who is on each train and who is free
Aligning Points

CTC Machine and CATS
Setting Traffic

CTC Machine and CATS
Mouse Usage

Computer Automated Traffic System (CATS)

CATS uses the Microsoft paradigm:

- Left mouse button has an immediate action
- Right mouse button brings an object specific menu

<table>
<thead>
<tr>
<th>Left Mouse Button</th>
<th>Right Mouse Button</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal</td>
<td>Set/clear a route to the next control point</td>
</tr>
<tr>
<td>Train</td>
<td>Move the label (drag and drop)</td>
</tr>
</tbody>
</table>
| Otherwise         | Throws a turnout | Grant/Remove Track Authority  
|                   |                   | Grant/Remove Out of Service  
|                   |                   | Position a Train  
|                   |                   | Force or remove occupancy |
Prototype Research – BNSF Train Status

Computer Automated Traffic System (CATS)
## Prototype Research – MRL Train Status

### Computer Automated Traffic System (CATS)

<table>
<thead>
<tr>
<th>Train ID</th>
<th>Time (GMT)</th>
<th>Last OS</th>
<th>Subdivision</th>
<th>LMS</th>
<th>EMUs</th>
<th>Tons</th>
<th>Length</th>
<th>Engineer</th>
<th>Conductor</th>
<th>HOV</th>
<th>TPOB</th>
<th>SPD</th>
<th>KEY</th>
<th>HW</th>
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<tbody>
<tr>
<td>ERBESXM152</td>
<td>02:04 (W, MISSOULA)</td>
<td>0</td>
<td>121</td>
<td>2612</td>
<td>6716</td>
<td>JOHN VERLIN</td>
<td>ROGERS BRIAN</td>
<td>20-0415</td>
<td>22</td>
<td>50</td>
<td>NO</td>
<td>NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEILHSL540</td>
<td>08:53 (BLOOMSBURG (W))</td>
<td>0</td>
<td>0</td>
<td>296</td>
<td>ROBERTS JAM</td>
<td>HOLL CORY</td>
<td>20-1380</td>
<td>00</td>
<td>00</td>
<td>NO</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>MMISLAI510</td>
<td>00:01 (AVON (E))</td>
<td>22</td>
<td>26</td>
<td>2663</td>
<td>3139</td>
<td>ELVERD DODD</td>
<td>HASTINGS MIKE</td>
<td>20-1700</td>
<td>00</td>
<td>00</td>
<td>NO</td>
<td>NO</td>
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<tr>
<td>ERBESXM150</td>
<td>122</td>
<td>3002</td>
<td>6771</td>
<td>SMITH TRAVIS</td>
<td>BROWN CORY</td>
<td>20-2100</td>
<td>21</td>
<td>60</td>
<td>NO</td>
<td>NO</td>
<td></td>
<td></td>
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<td>RMLR955120</td>
<td>011</td>
<td>NONE EXITS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>GREEN MARTY</td>
<td>FURKHAN J.</td>
<td>20-2200</td>
<td>00</td>
<td>00</td>
<td>NO</td>
<td>NO</td>
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<tr>
<td>BBSCHEC417</td>
<td>09:06 (EDDY (W))</td>
<td>65</td>
<td>2642</td>
<td>6477</td>
<td>LAUGHNAM MIKE</td>
<td>BELINAK DAN</td>
<td>20-1620</td>
<td>41</td>
<td>60</td>
<td>NO</td>
<td>NO</td>
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<tr>
<td>HPA41119</td>
<td>08:55 (TUSCOR (E))</td>
<td>34</td>
<td>66</td>
<td>7133</td>
<td>7053</td>
<td>LARSON ERIC</td>
<td>MCGIBBEN THAD</td>
<td>20-1370</td>
<td>00</td>
<td>00</td>
<td>NO</td>
<td>NO</td>
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<td>HPASK311</td>
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<td>0</td>
<td>0</td>
<td>MACKIE RALPH</td>
<td>HANSON TREY</td>
<td>20-1250</td>
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<td>00</td>
<td>NO</td>
<td>NO</td>
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<td>HPASGAL919</td>
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<td>0</td>
<td>0</td>
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<td>KRAUZ JERRY</td>
<td>DIEHL ROBERT</td>
<td>20-1510</td>
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<td>00</td>
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<td>NO</td>
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<td>HNDENGRF119</td>
<td>04:07</td>
<td>NONE EXITS</td>
<td>19</td>
<td>63</td>
<td>4471</td>
<td>5764</td>
<td>PATTERSON DAVIS</td>
<td>20-2030</td>
<td>00</td>
<td>00</td>
<td>NO</td>
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<td>ERBESX147</td>
<td>23:42 (CRAYER (W))</td>
<td>0</td>
<td>125</td>
<td>2650</td>
<td>6935</td>
<td>ROTH, DK</td>
<td>FOX, TRAVIS</td>
<td>20-2230</td>
<td>21</td>
<td>00</td>
<td>NO</td>
<td>NO</td>
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<td>HPASK318</td>
<td>08:18 (ELTON (E))</td>
<td>25</td>
<td>63</td>
<td>5264</td>
<td>5753</td>
<td>OREAV DAVE</td>
<td>HOTZEL LARRY</td>
<td>20-1205</td>
<td>60</td>
<td>55</td>
<td>NO</td>
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<td>YBIL50020</td>
<td>133</td>
<td>NONE EXITS</td>
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<td>0</td>
<td>JONES STEVE</td>
<td>MAYES ROBBIE</td>
<td>20-2500</td>
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<td>YBIL50020</td>
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<td>KARLS LARRY</td>
<td>BINEK JOHN</td>
<td>20-2000</td>
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<td>MLAUDIL119</td>
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<td>MURRIO RICH</td>
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<td>0</td>
<td>DUPREE</td>
<td>BROWNE</td>
<td>20-1800</td>
<td>00</td>
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<td>0</td>
<td>DUPREE</td>
<td>BROWNE</td>
<td>20-1800</td>
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<td></td>
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</tr>
</tbody>
</table>

- **Time:** 09:14.02
- **Date:** 6/20/2013
TrainStat

Computer Automated Traffic System (CATS)

- On dispatcher computer
- On networked computer(s)
Integration with JMRI Operations

Computer Automated Traffic System (CATS)

- Operations – JMRI car routing and switch lists
- CATS tells JMRI Operations where trains are
- JMRI Operations tells CATS how long, how heavy, how many cars are in a train
- Information can be shared with Trainstat
The Lifecycle of a Train

Computer Automated Traffic System (CATS)

• Trainmaster
  – Build train in Operations
  – Print manifest and deliver to engineer
  – Assign crew in Trainstat

• Dispatcher
  – Move train around the territory
  – Tie down or terminate train

• Trainmaster
  – Terminate train in Operations
Demonstrate Armstrong’s Panel

• Show integration with JMRI Operations
  a. On dispatcher screen or
  b. On TrainMaster screen

• Show integration with TrainStat
  a. On dispatcher screen
  b. On TrainMaster screen
  c. On YardMaster screen(s)
Aspects and Indications – The Keystone

Computer Automated Traffic System (CATS)

<table>
<thead>
<tr>
<th>Signal Aspect</th>
<th>Name</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Signal Icon]</td>
<td>Clear</td>
<td>Proceed.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Approach</td>
<td>Proceed prepared to stop before any part of train or engine passes the next signal. Trains exceeding 30 MPH must immediately reduce to that speed.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Approach Medium</td>
<td>Proceed. Speed passing next signal must not exceed 30 MPH.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Diverging Clear</td>
<td>Proceed on diverging route at prescribed speed through turnout.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Diverging Approach</td>
<td>Proceed on diverging route at prescribed speed through turnout prepared to stop before any part of train or engine passes the next signal. Trains exceeding 30 MPH must immediately reduce to that speed.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Diverging Clear Slow</td>
<td>Proceed on diverging route. Speed through turnout must not exceed 15 MPH.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Diverging Approach Slow</td>
<td>Proceed on diverging route prepared to stop before any part of train or engine passes the next signal. Speed through turnout must not exceed 15 MPH. Speed to next signal must not exceed 30 MPH.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Flashing Stop and Proceed</td>
<td>Stop before any part of train or engine passes the signal then proceed at restricted speed, not exceeding 15 MPH prepared to stop at any obstruction, through the entire block.</td>
</tr>
<tr>
<td>![Signal Icon]</td>
<td>Stop</td>
<td>Stop before any part of train or engine passes the signal.</td>
</tr>
</tbody>
</table>

Target Signals (Scratch built & Sunrise)
Sunrise signal at North De Moyan

Copyright Pat Lana
**Game Plan #2**

**Computer Automated Traffic System (CATS)**

- Tell the panel about the layout
- Define occupancy detectors for the blocks
- Add turnout feedback
- Construct the signal aspects and indications
- Define the aspects
- Define the turnout control
- Run some simulated trains
Map to CATS (Connected to Layout)

Computer Automated Traffic System (CATS)

- Devices → JMRI Names
- Details → Track Ends → Block Boundary
  - Occupancy
  - Station
- Devices → Signal Template → Aspects
- Details → Track Ends
  - Signals → Layout
  - Switch Points
    - Command
    - Feedback
References

Computer Automated Traffic System (CATS)

• **Railroader’s C/MRI Applications Handbook, Volume 2 – Signaling Systems**, Dr. Bruce Chubb, 2010
• “Understanding Signals”, Dr. Bruce Chubb, **Railroad Model Craftsman**, 14 parts, December, 2015 thru April, 2017
• “Absolute-Permissive Block Signals”, Jay S. Boggess, **Model Railroading**, January, 1992
• “Introduction to Signals for Your Model Railroad”, Seth Neumann, [http://www.x2011west.org/handouts/Planning-for-Signals.pdf](http://www.x2011west.org/handouts/Planning-for-Signals.pdf)
• JMRI, jmri.org
End of the Line

Computer Automated Traffic System (CATS)