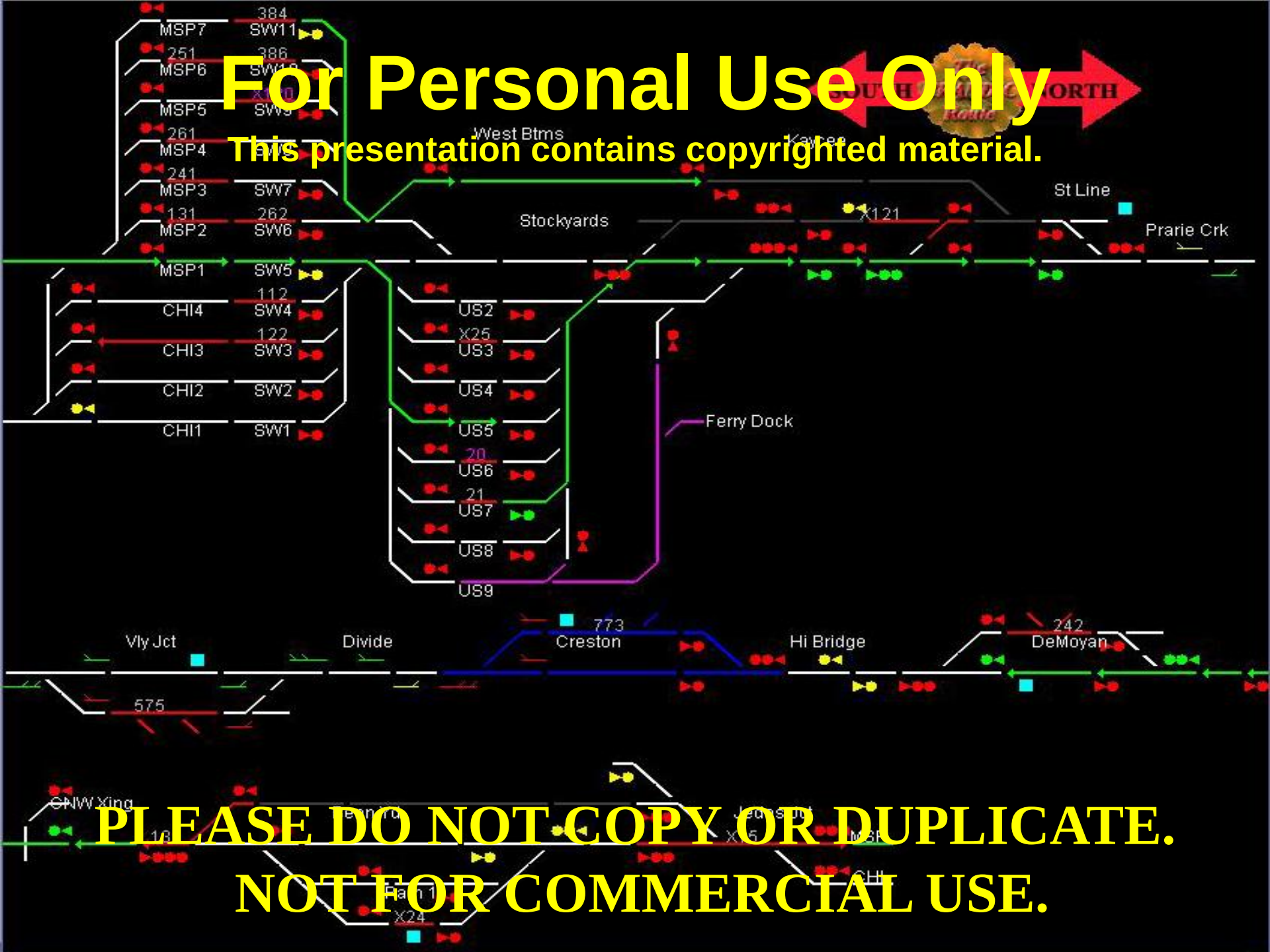
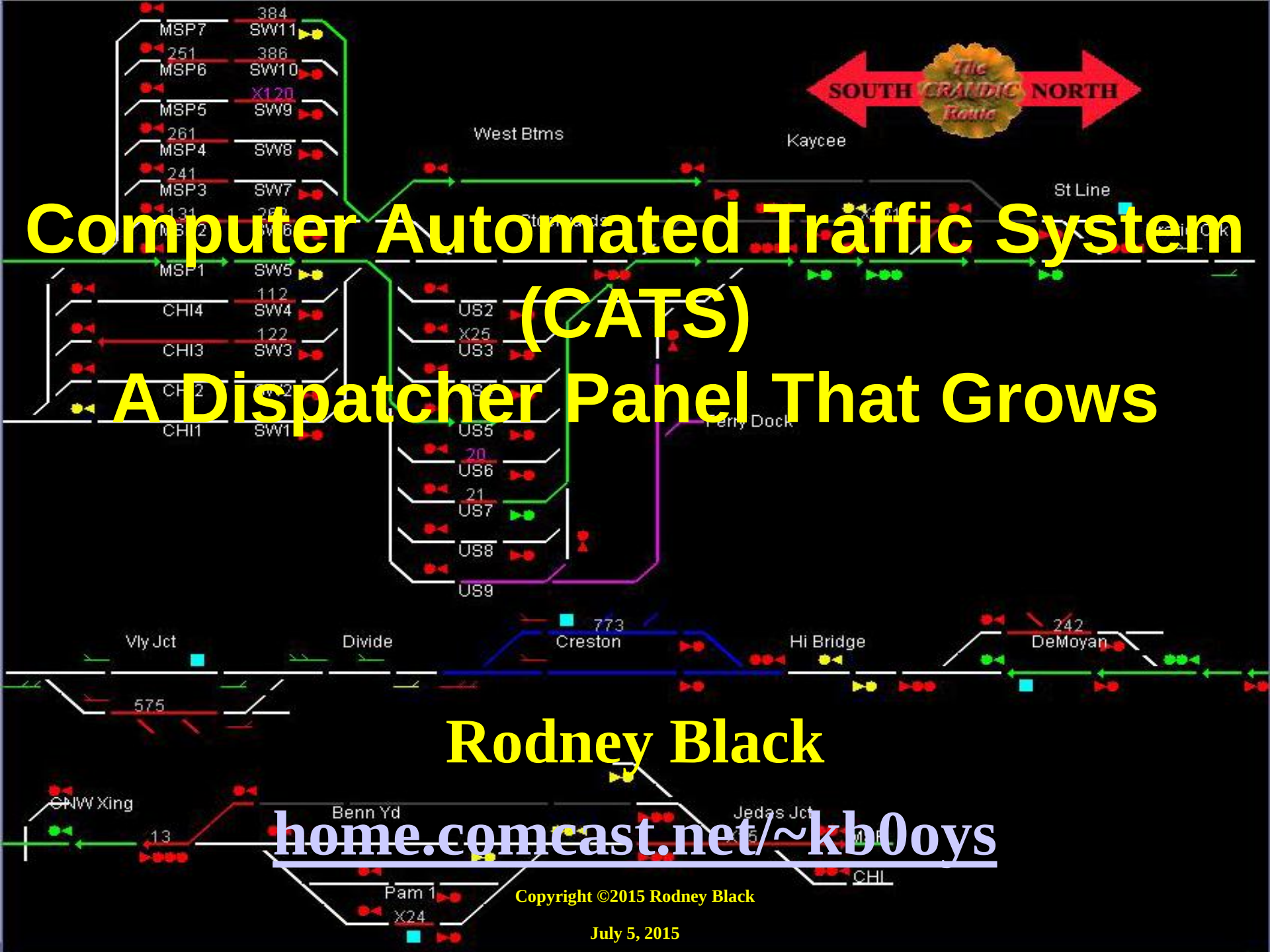




Computer Automated Traffic System (CATS)

A Dispatcher Panel That Grows

Rodney Black

home.comcast.net/~kb0oys

July 5, 2015

Resources

Computer Automated Traffic System (CATS)

- CATS – home.comcast.net/~kb0oys
- 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

Prototype Signalling

Computer Automated Traffic System (CATS)

"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

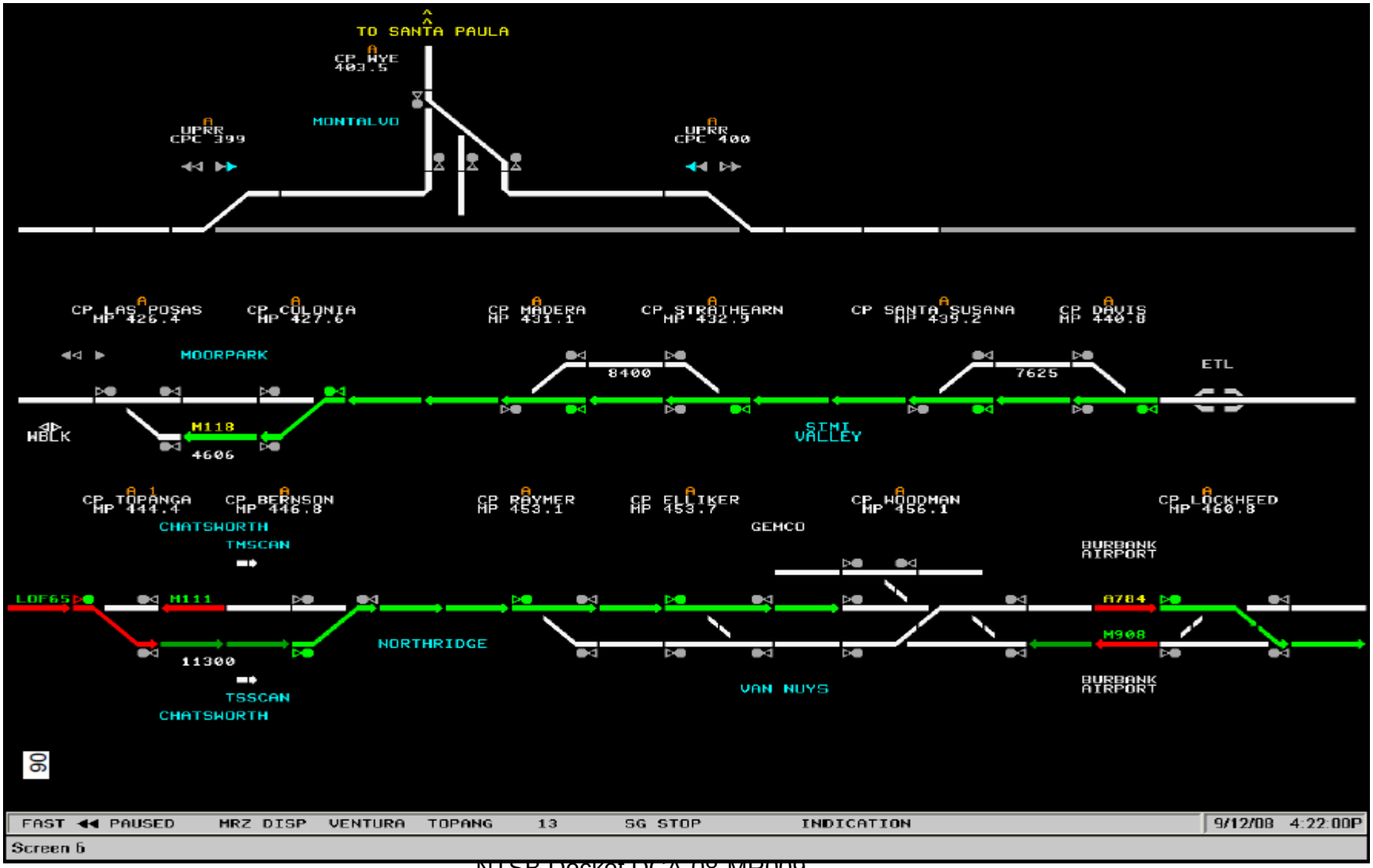
Issue 03

Prototype Research - Digicon

Computer Automated Traffic System (CATS)

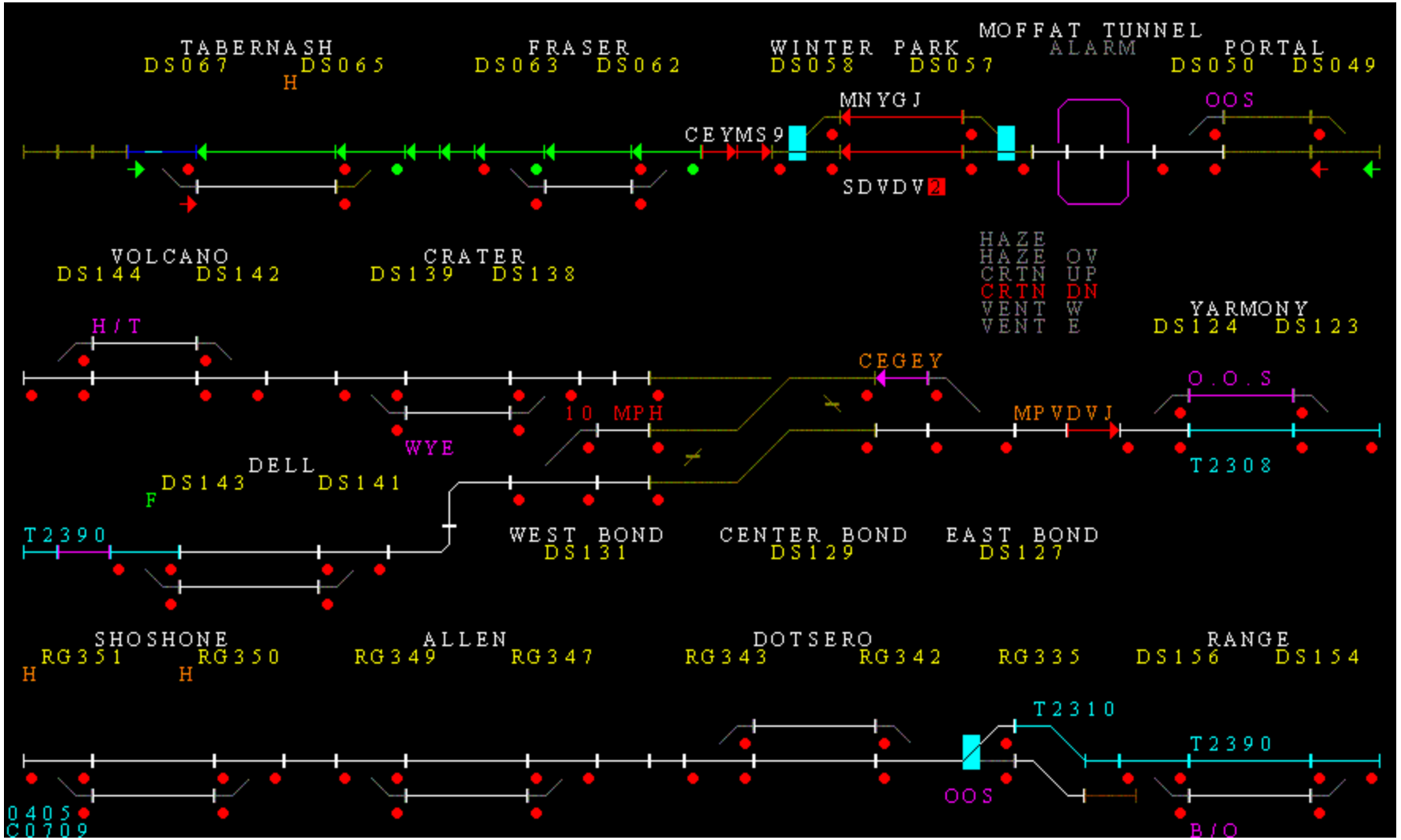
Prototype Research - Digicon

Computer Automated Traffic System (CATS)



Prototype Research – UP CAD

Computer Automated Traffic System (CATS)

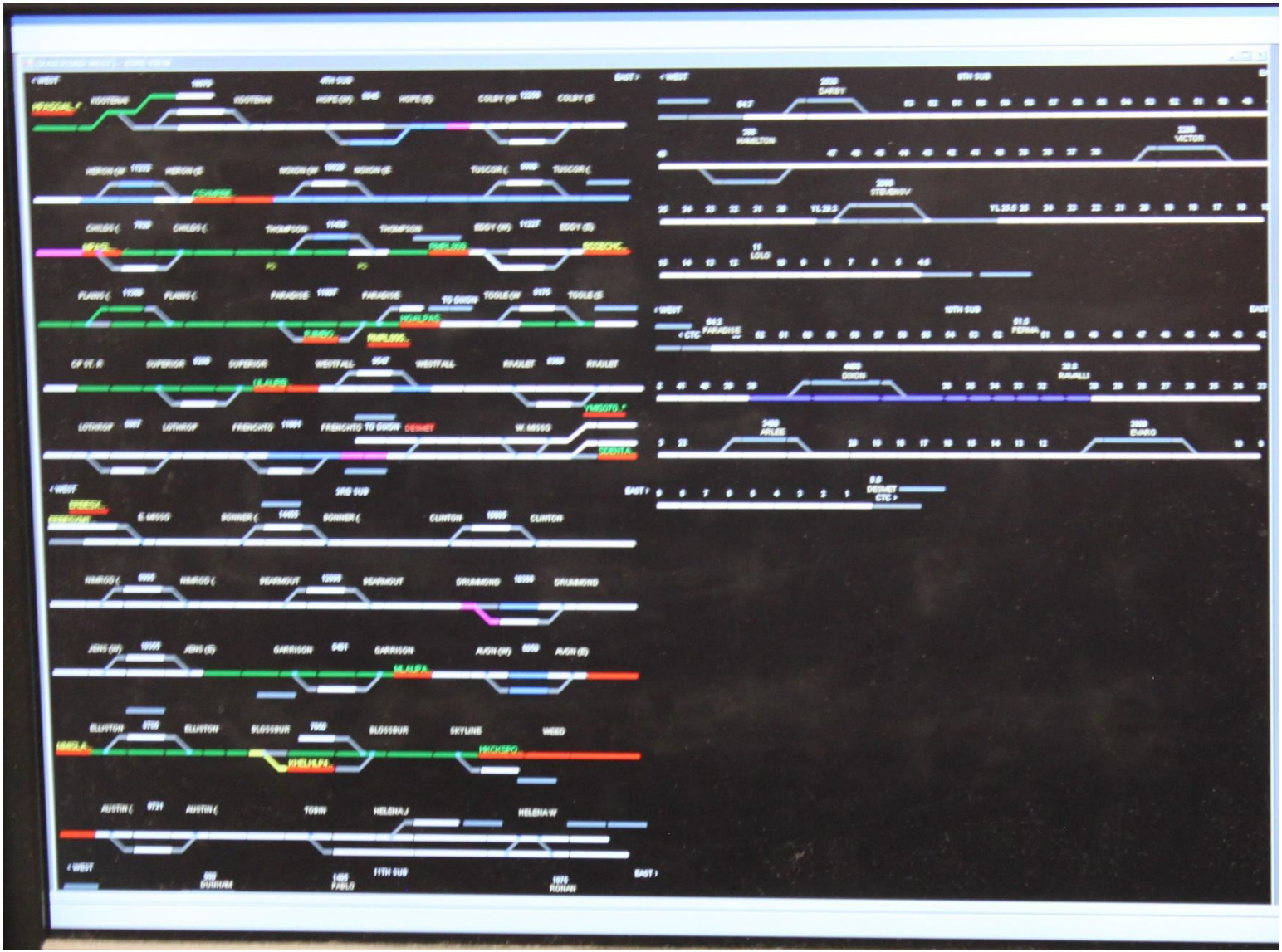


Prototype Research – BNSF TMDS

Computer Automated Traffic System (CATS)

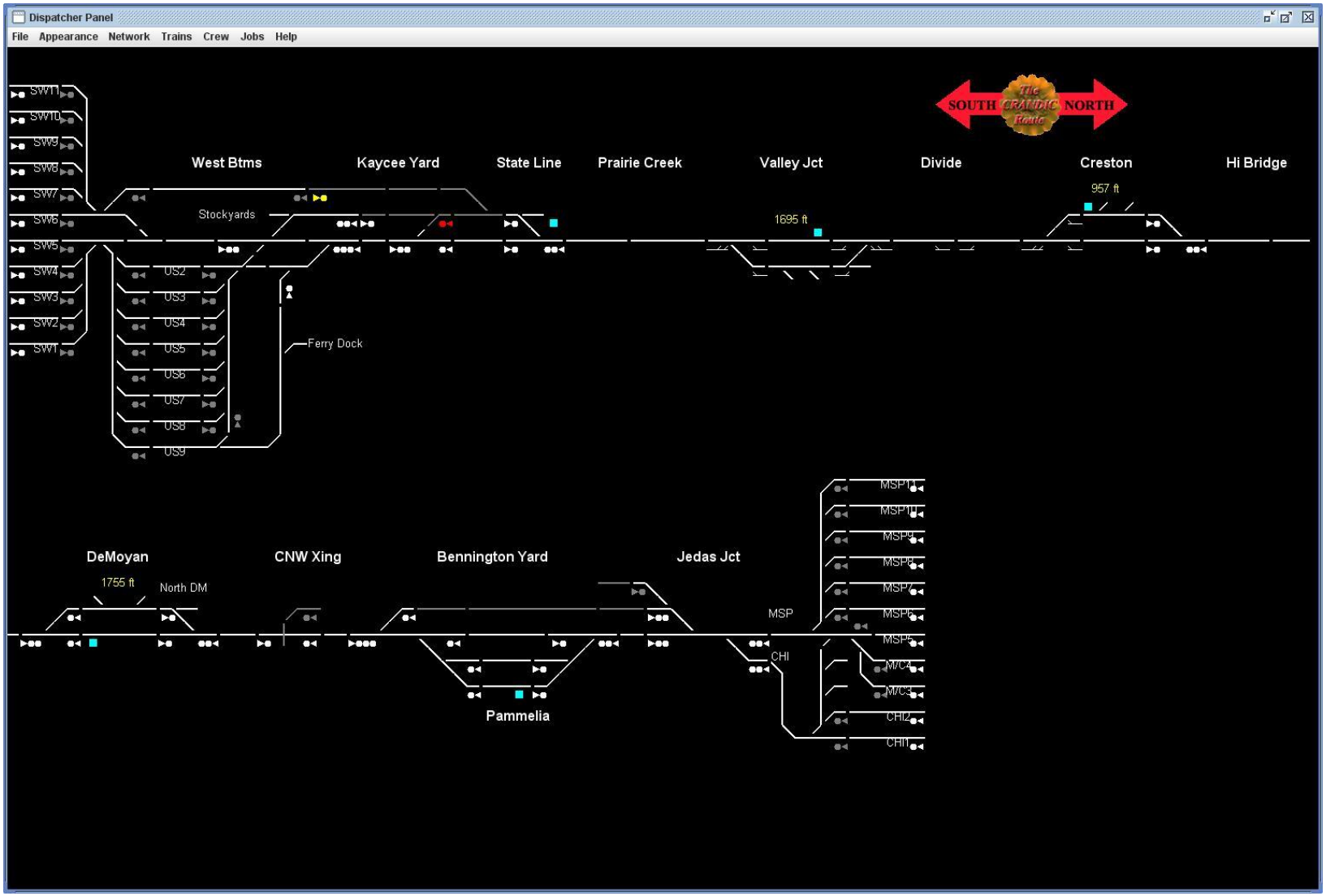
Prototype Research – MRL TMDS

Computer Automated Traffic System (CATS)



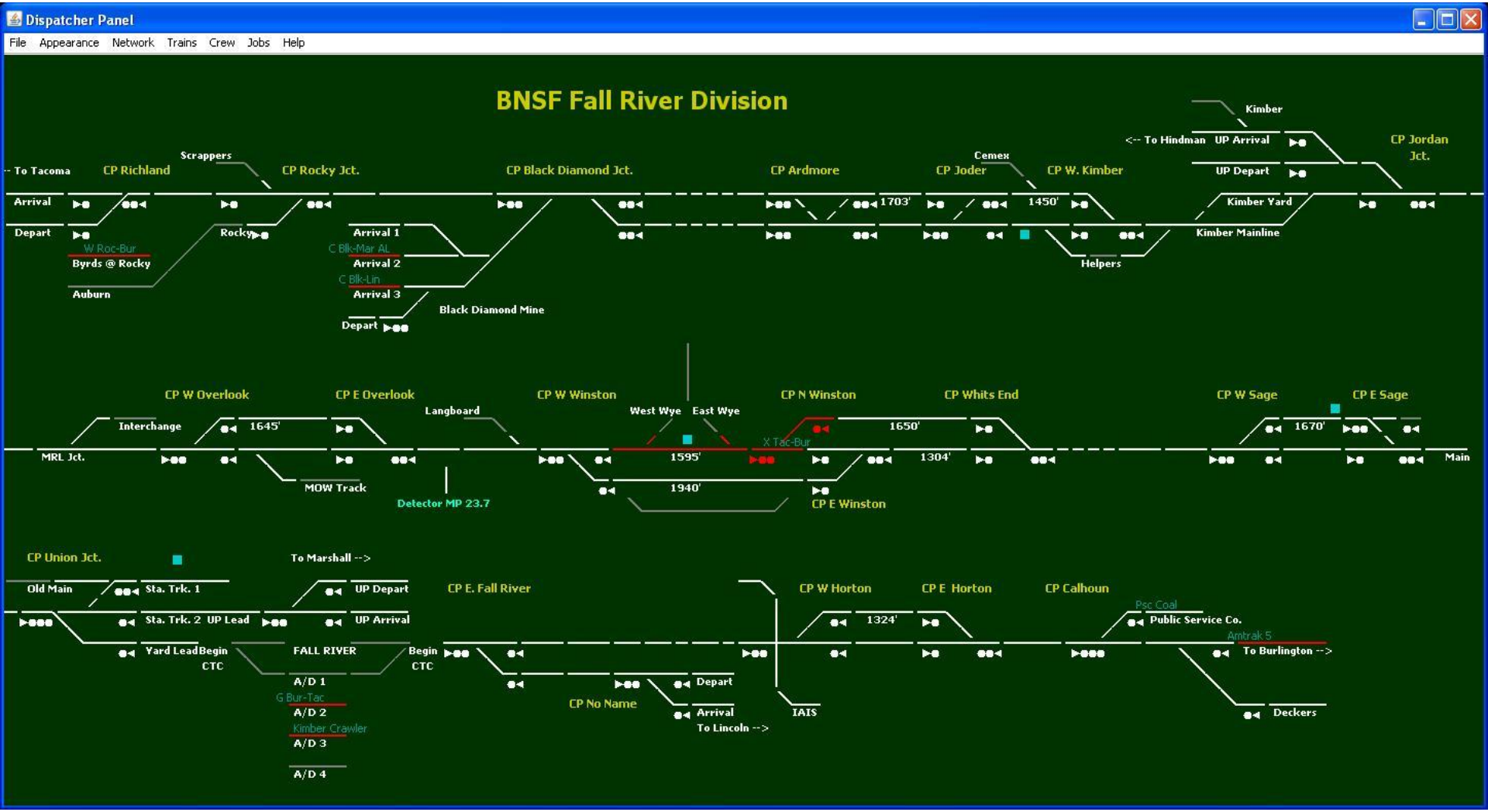
Model RR – Pat Lana's Crandic

Computer Automated Traffic System (CATS)



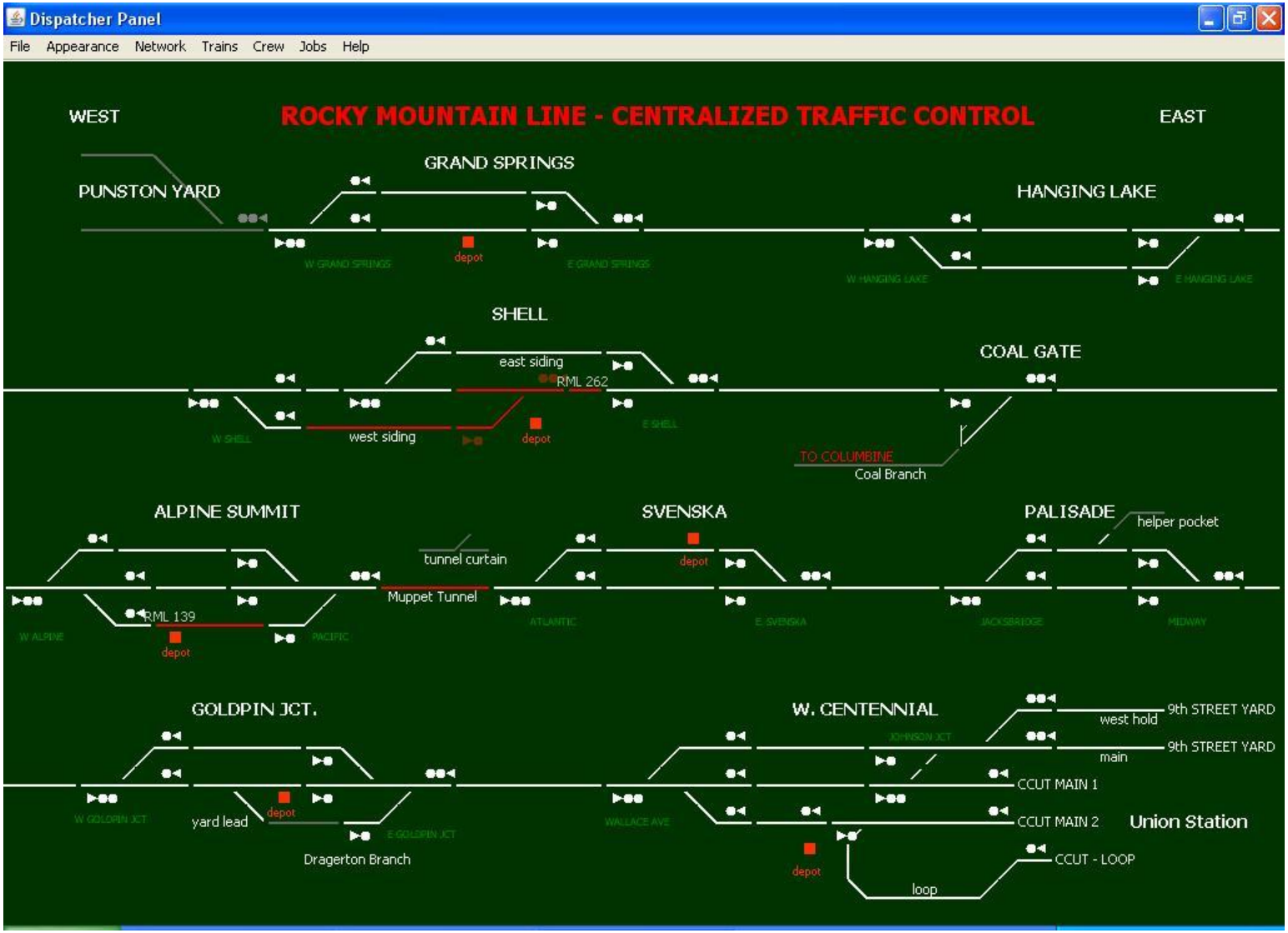
Model RR – John Parker's BNSF

Computer Automated Traffic System (CATS)



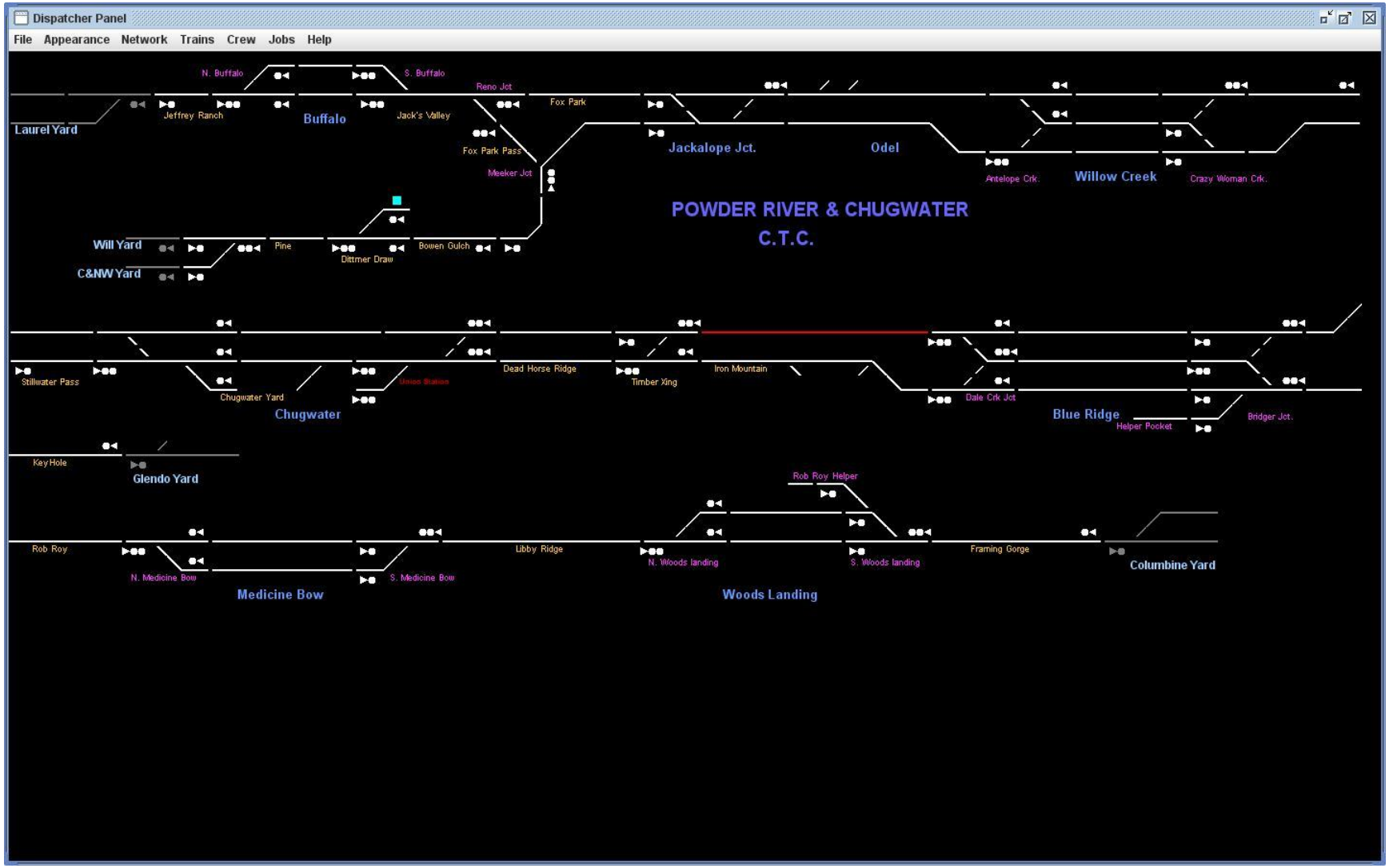
Model RR – Don Meeker's RML

Computer Automated Traffic System (CATS)



Model RR – Chuck Shell's PR&C

Computer Automated Traffic System (CATS)



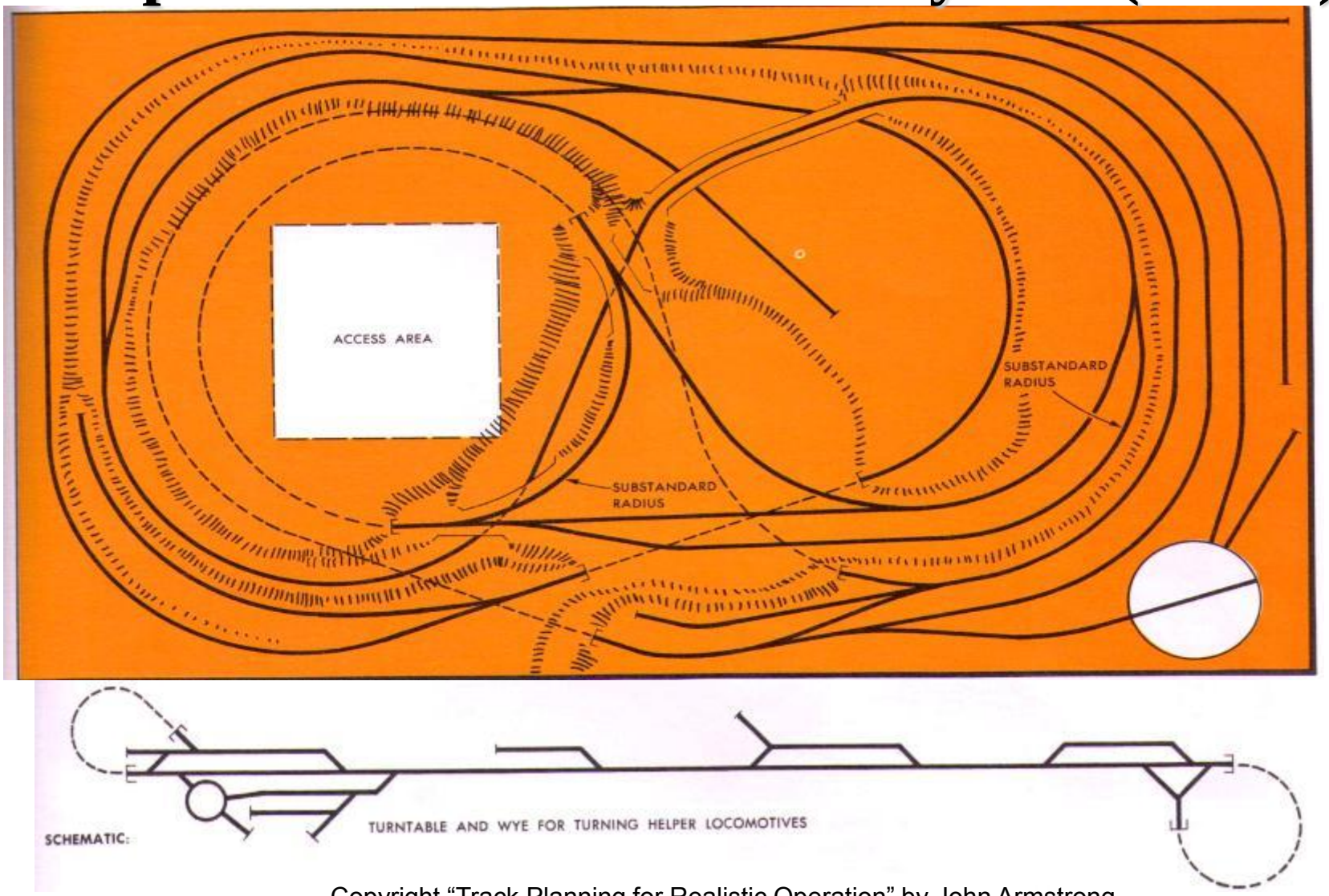
Game Plan #1

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 → Signal
- Details → Tracks
- Details → Track Ends
  - Block definitions
  - Signal placement
  - Turnout definitions
- Details → Stations
- Details → Labels
- Trains
- Crew

Dispatching Tasks

Computer Automated Traffic System (CATS)

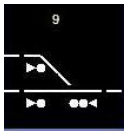
What tasks does a typical model railroad dispatcher do (caveat: every model railroad is unique)?

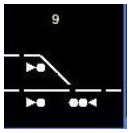
- Direct trains (throw turnouts and set signals)
- Release CTC machine control (unlock a turnout for local use; grant “track authority”)
- Follow a train’s progress (log OS times; assist in knowing which routes to set up → add a train’s label to the board, move the train’s label, remove a train’s label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

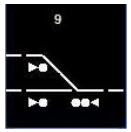
Aligning Points

CTC Machine and CATS



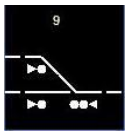


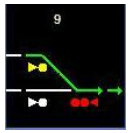




Setting Traffic

CTC Machine and CATS





Mouse Usage

Computer Automated Traffic System (CATS)

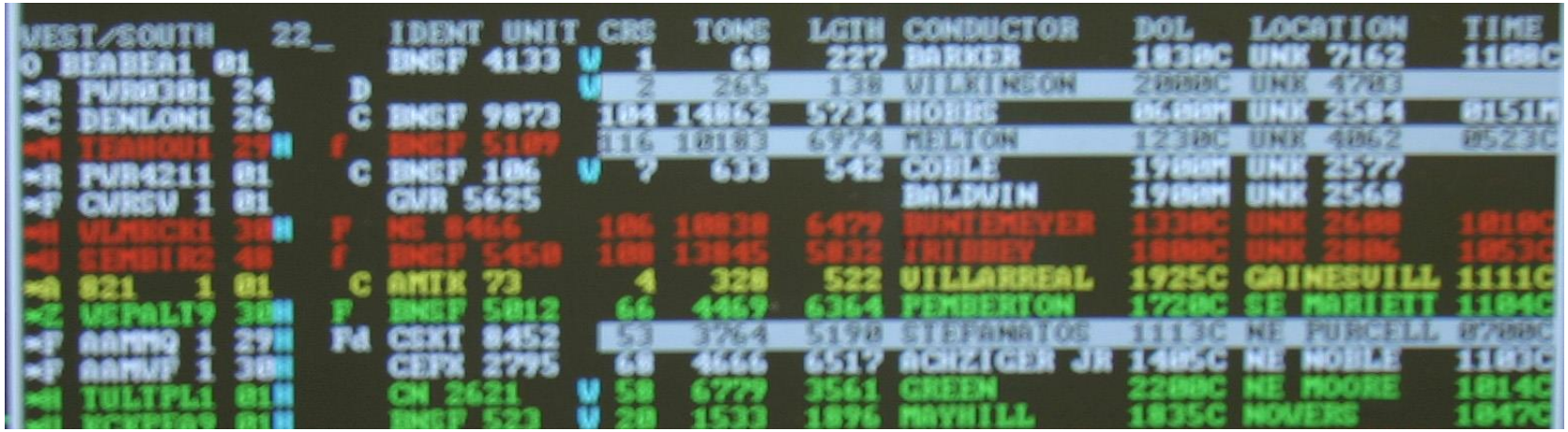
CATS uses the Microsoft paradigm:

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

	Left Mouse Button	Right Mouse Button
Signal	Set/clear a route to the next control point	• Turn on/off fleeting
Train	Move the label (drag and drop)	• Open the train edit screen for the train
Otherwise	Throws a turnout	• Grant/Remove Track Authority • Grant/Remove Out of Service • Position a Train • Force or remove occupancy

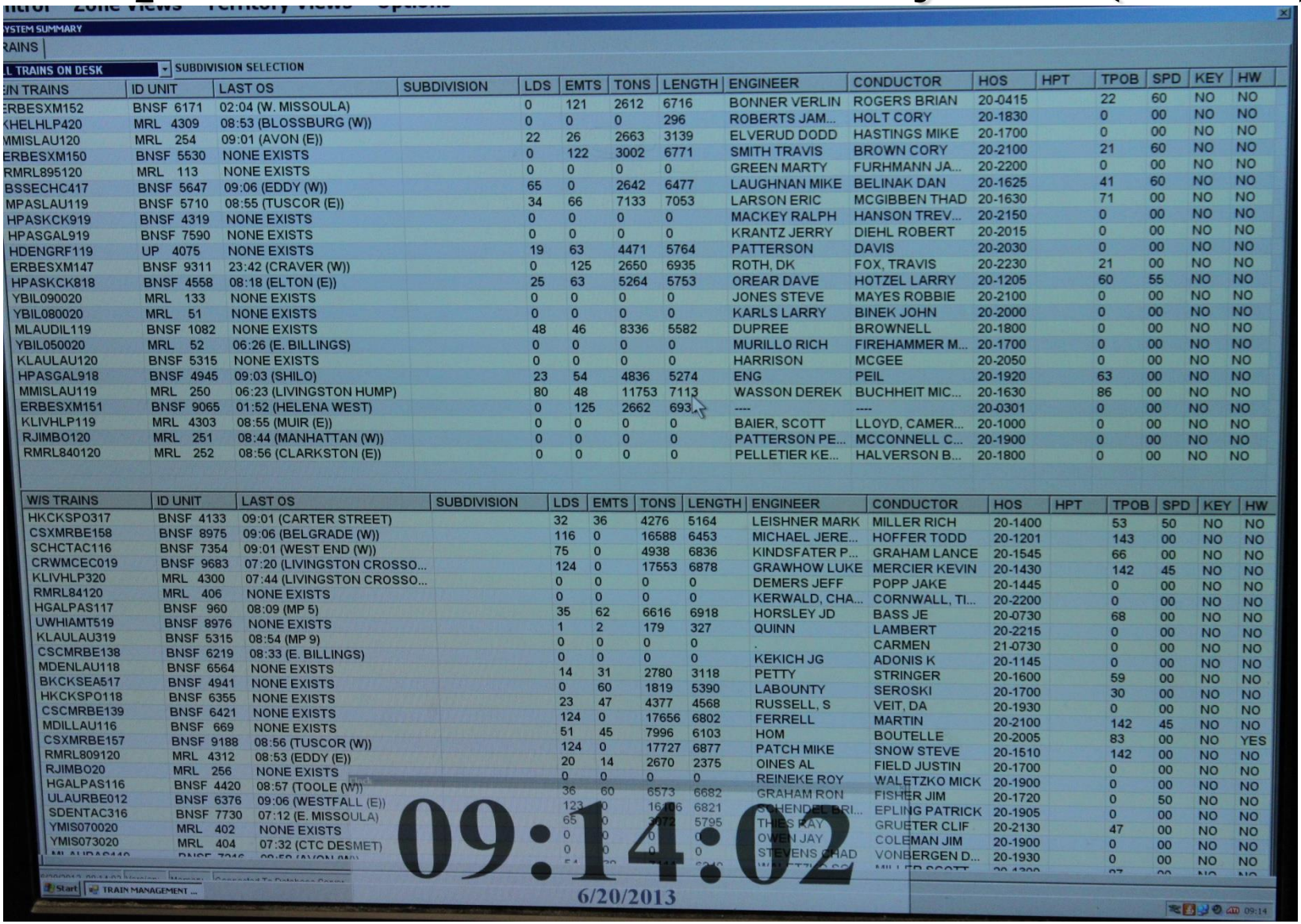
Prototype Research – BNSF Train Status

Computer Automated Traffic System (CATS)



Prototype Research – MRL Train Status

Computer Automated Traffic System (CATS)



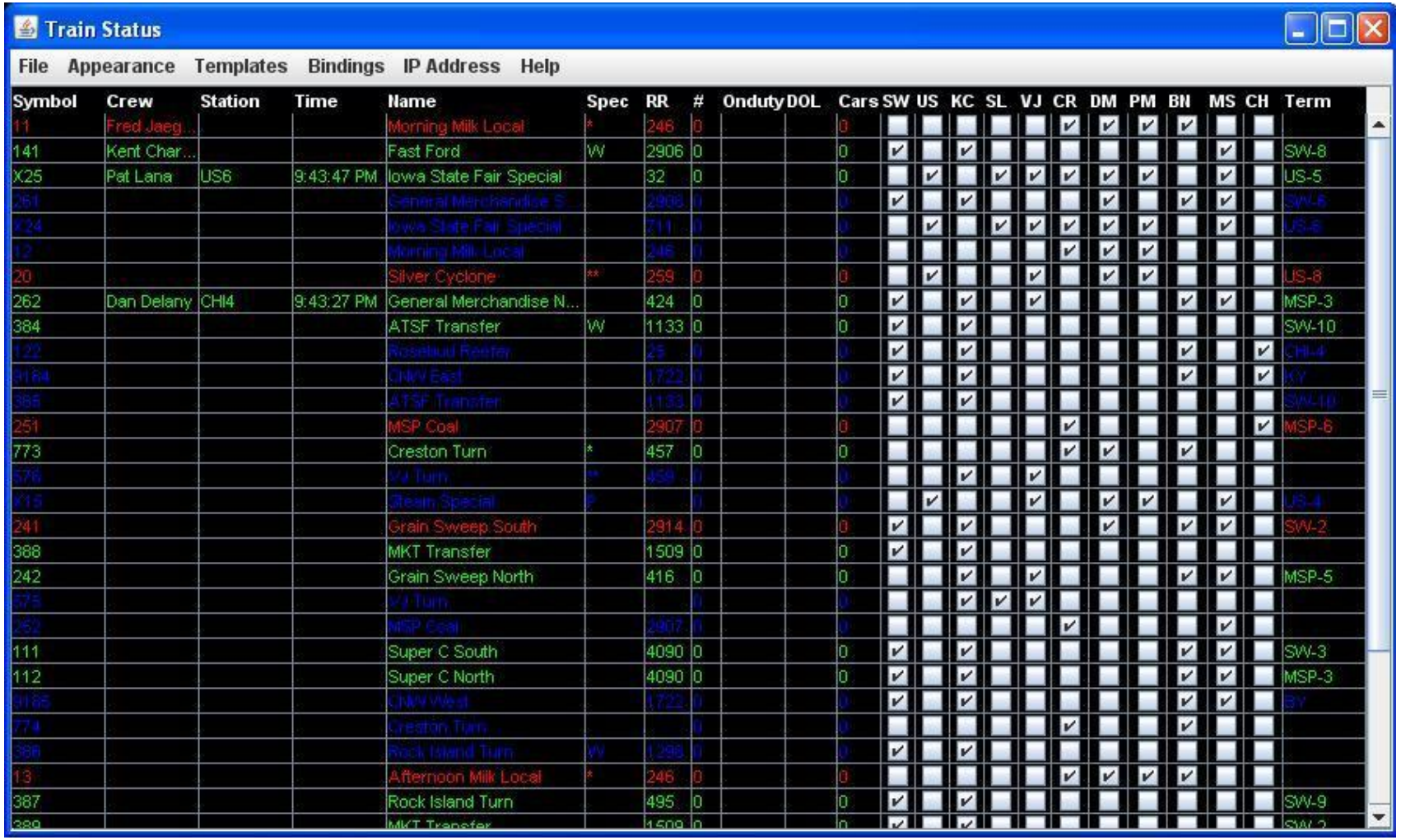
EN TRAINS	ID UNIT	LAST OS	SUBDIVISION	LDS	EMTS	TONS	LENGTH	ENGINEER	CONDUCTOR	HOS	HPT	TPOB	SPD	KEY	HW
ERBESXM152	BNSF 6171	02:04 (W. MISSOULA)		0	121	2612	6716	BONNER VERLIN	ROGERS BRIAN	20-0415		22	60	NO	NO
KHELHLP420	MRL 4309	08:53 (BLOSSBURG (W))		0	0	0	296	ROBERTS JAM...	HOLT CORY	20-1830		0	00	NO	NO
MMISLAU120	MRL 254	09:01 (AVON (E))		22	26	2663	3139	ELVERUD DODD	HASTINGS MIKE	20-1700		0	00	NO	NO
ERBESXM150	BNSF 5530	NONE EXISTS		0	122	3002	6771	SMITH TRAVIS	BROWN CORY	20-2100		21	60	NO	NO
RMRL895120	MRL 113	NONE EXISTS		0	0	0	0	GREEN MARTY	FURHMANN JA...	20-2200		0	00	NO	NO
BSSECHC417	BNSF 5647	09:06 (EDDY (W))		65	0	2642	6477	LAUGHNAN MIKE	BELINAK DAN	20-1625		41	60	NO	NO
MPASLAU119	BNSF 5710	08:55 (TUSCOR (E))		34	66	7133	7053	LARSON ERIC	MCGIBBEN THAD	20-1630		71	00	NO	NO
HPASKCK919	BNSF 4319	NONE EXISTS		0	0	0	0	MACKEY RALPH	HANSON TREV...	20-2150		0	00	NO	NO
HPASGAL919	BNSF 7590	NONE EXISTS		0	0	0	0	KRANTZ JERRY	DIEHL ROBERT	20-2015		0	00	NO	NO
HDENGRF119	UP 4075	NONE EXISTS		19	63	4471	5764	PATTERSON	DAVIS	20-2030		0	00	NO	NO
ERBESXM147	BNSF 9311	23:42 (CRAVER (W))		0	125	2650	6935	ROTH, DK	FOX, TRAVIS	20-2230		21	00	NO	NO
HPASKCK818	BNSF 4558	08:18 (ELTON (E))		25	63	5264	5753	OREAR DAVE	HOTZEL LARRY	20-1205		60	55	NO	NO
YBIL090020	MRL 133	NONE EXISTS		0	0	0	0	JONES STEVE	MAYES ROBBIE	20-2100		0	00	NO	NO
YBIL080020	MRL 51	NONE EXISTS		0	0	0	0	KARLS LARRY	BINEK JOHN	20-2000		0	00	NO	NO
MLAUDIL119	BNSF 1082	NONE EXISTS		48	46	8336	5582	DUPREE	BROWNELL	20-1800		0	00	NO	NO
YBIL050020	MRL 52	06:26 (E. BILLINGS)		0	0	0	0	MURILLO RICH	FIREHAMMER M...	20-1700		0	00	NO	NO
KLAULAU120	BNSF 5315	NONE EXISTS		0	0	0	0	HARRISON	MCGEE	20-2050		0	00	NO	NO
HPASGAL918	BNSF 4945	09:03 (SHILO)		23	54	4836	5274	ENG	PEIL	20-1920		63	00	NO	NO
MMISLAU119	MRL 250	06:23 (LIVINGSTON HUMP)		80	48	11753	7113	WASSON DEREK	BUCHHEIT MIC...	20-1630		86	00	NO	NO
ERBESXM151	BNSF 9065	01:52 (HELENA WEST)		0	125	2662	693...	----	----	20-0301		0	00	NO	NO
KLIVHLP119	MRL 4303	08:55 (MUIR (E))		0	0	0	0	BAIER, SCOTT	LLOYD, CAMER...	20-1000		0	00	NO	NO
RJIMBO120	MRL 251	08:44 (MANHATTAN (W))		0	0	0	0	PATTERSON PE...	MCCONNELL C...	20-1900		0	00	NO	NO
RMRL840120	MRL 252	08:56 (CLARKSTON (E))		0	0	0	0	PELLETIER KE...	HALVERSON B...	20-1800		0	00	NO	NO

W/S TRAINS	ID UNIT	LAST OS	SUBDIVISION	LDS	EMTS	TONS	LENGTH	ENGINEER	CONDUCTOR	HOS	HPT	TPOB	SPD	KEY	HW
HKCKSPO317	BNSF 4133	09:01 (CARTER STREET)		32	36	4276	5164	LEISHNER MARK	MILLER RICH	20-1400		53	50	NO	NO
CSXMRBE158	BNSF 8975	09:06 (BELGRADE (W))		116	0	16588	6453	MICHAEL JERE...	HOFFER TODD	20-1201		143	00	NO	NO
SCHCTAC116	BNSF 7354	09:01 (WEST END (W))		75	0	4938	6836	KINDSFATER P...	GRAHAM LANCE	20-1545		66	00	NO	NO
CRWMCEC019	BNSF 9683	07:20 (LIVINGSTON CROSSO...		124	0	17553	6878	GRAWHOW LUKE	MERCIER KEVIN	20-1430		142	45	NO	NO
KLIVHLP320	MRL 4300	07:44 (LIVINGSTON CROSSO...		0	0	0	0	DEMERS JEFF	POPP JAKE	20-1445		0	00	NO	NO
RMRL84120	MRL 406	NONE EXISTS		0	0	0	0	KERWALD, CHA...	CORNWALL, TI...	20-2200		0	00	NO	NO
HGALPAS117	BNSF 960	08:09 (MP 5)		35	62	6616	6918	HORSLEY JD	BASS JE	20-0730		68	00	NO	NO
UWHIAMT519	BNSF 8976	NONE EXISTS		1	2	179	327	QUINN	LAMBERT	20-2215		0	00	NO	NO
KLAULAU319	BNSF 5315	08:54 (MP 9)		0	0	0	0	.	CARMEN	21-0730		0	00	NO	NO
CSCMRBE138	BNSF 6219	08:33 (E. BILLINGS)		0	0	0	0	KEKICH JG	ADONIS K	20-1145		0	00	NO	NO
MDENLAU118	BNSF 6564	NONE EXISTS		14	31	2780	3118	PETTY	STRINGER	20-1600		59	00	NO	NO
BKCKSEA517	BNSF 4941	NONE EXISTS		0	60	1819	5390	LABOUNTY	SEROSKI	20-1700		30	00	NO	NO
HKCKSPO118	BNSF 6355	NONE EXISTS		23	47	4377	4568	RUSSELL, S	VEIT, DA	20-1930		0	00	NO	NO
CSCMRBE139	BNSF 6421	NONE EXISTS		124	0	17656	6802	FERRELL	MARTIN	20-2100		142	45	NO	NO
MDILLAU116	BNSF 669	NONE EXISTS		51	45	7996	6103	HOM	BOUTELLE	20-2005		83	00	NO	YES
CSXMRBE157	BNSF 9188	08:56 (TUSCOR (W))		124	0	17727	6877	PATCH MIKE	SNOW STEVE	20-1510		142	00	NO	NO
RMRL809120	MRL 4312	08:53 (EDDY (E))		20	14	2670	2375	OINES AL	FIELD JUSTIN	20-1700		0	00	NO	NO
RJIMBO20	MRL 256	NONE EXISTS		0	0	0	0	REINEKE ROY	WALETZKO MICK	20-1900		0	00	NO	NO
HGALPAS116	BNSF 4420	08:57 (TOOLE (W))		36	60	6573	6682	GRAHAM RON	FISHER JIM	20-1720		0	50	NO	NO
ULAURBE012	BNSF 6376	09:06 (WESTFALL (E))		123	0	16706	6821	SCHENDEL BRI...	EPLING PATRICK	20-1905		0	00	NO	NO
SDENTAC316	BNSF 7730	07:12 (E. MISSOULA)		65	0	3072	5795	THIES RAY	GRUETER CLIF	20-2130		47	00	NO	NO
YMIS070020	MRL 402	NONE EXISTS		0	0	0	0	OWEN JAY	COLEMAN JIM	20-1900		0	00	NO	NO
YMIS073020	MRL 404	07:32 (CTC DESMET)		0	0	0	0	STEVENS CHAD	VONBERGEN D...	20-1930		0	00	NO	NO

TrainStat

Computer Automated Traffic System (CATS)

- On dispatcher computer
- On networked computer(s)



Symbol	Crew	Station	Time	Name	Spec	RR	#	Onduty	DOL	Cars	SW	US	KC	SL	VJ	CR	DM	PM	BN	MS	CH	Term
11	Fred Jaeg...			Morning Milk Local	*	246	0			0						✔	✔	✔	✔			
141	Kent Char...			Fast Ford	W	2906	0			0	✔		✔							✔		SW-8
X25	Pat Lana	US6	9:43:47 PM	Iowa State Fair Special		32	0			0		✔		✔	✔	✔	✔	✔		✔		US-5
261				General Merchandise S...		2908	0			0	✔		✔				✔		✔	✔		SW-6
X24				Iowa State Fair Special		711	0			0		✔		✔	✔	✔	✔	✔		✔		US-6
12				Morning Milk Local		246	0			0						✔	✔	✔				
20				Silver Cyclone	**	259	0			0		✔			✔		✔	✔				US-8
262	Dan Delany	CHI4	9:43:27 PM	General Merchandise N...		424	0			0	✔		✔		✔				✔	✔		MSP-3
384				ATSF Transfer	W	1133	0			0	✔		✔									SW-10
122				Rosebud Reefer		25	0			0	✔		✔						✔		✔	CHI-4
9164				CNW East		1722	0			0	✔		✔						✔		✔	KY
385				ATSF Transfer		1133	0			0	✔		✔									SW-10
251				MSP Coal		2907	0			0						✔					✔	MSP-6
773				Creston Turn	*	457	0			0						✔	✔		✔			
576				VJ Turn	**	459	0			0			✔		✔							
X15				Steam Special	P		0			0		✔			✔		✔	✔		✔		US-4
241				Grain Sweep South		2914	0			0	✔		✔				✔		✔	✔		SW-2
388				MKT Transfer		1509	0			0	✔		✔									
242				Grain Sweep North		416	0			0			✔		✔				✔	✔		MSP-5
575				VJ Turn			0			0			✔	✔	✔							
252				MSP Coal		2907	0			0						✔				✔		
111				Super C South		4090	0			0	✔		✔						✔	✔		SW-3
112				Super C North		4090	0			0	✔		✔						✔	✔		MSP-3
9165				CNW West		1722	0			0	✔		✔						✔	✔		SY
774				Creston Turn			0			0						✔			✔			
386				Rock Island Turn	W	1298	0			0	✔		✔									
13				Afternoon Milk Local	*	246	0			0						✔	✔	✔	✔			
387				Rock Island Turn		495	0			0	✔		✔									SW-9
389				MKT Transfer		1509	0			0	✔		✔									SW-2

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 a Magnet Board

Computer Automated Traffic System (CATS)

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)

Speed versus Route Signals

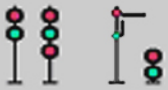
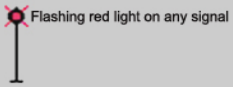
Computer Automated Traffic System (CATS)

- Speed Signals – the signal indication tells the speed limit on the block being protected and one or more subsequent blocks
- Route Signals – the signal indication tells what route thru an interlocking plant (security element, OS section) will be taken

Aspects and Indications – The Keystone

Computer Automated Traffic System (CATS)

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

Signal Aspect	Name	Indication
	Clear	Proceed.
	Approach	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.
	Approach Medium	Proceed. Speed passing next signal must not exceed 30 MPH.
	Diverging Clear	Proceed on diverging route at prescribed speed through turnout.
	Diverging Approach	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.
	Diverging Clear Slow	Proceed on diverging route. Speed through turnout must not exceed 15 MPH.
	Diverging Approach Slow	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.
	Flashing Stop and Proceed	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.
	Stop	Stop before any part of train or engine passes the signal.

Sources: Atchison, Topeka and Santa Fe System Timetable No. 5, April 16, 1995
Union Pacific System Timetable No. 6, May 15, 1988

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

End of the Line

Computer Automated Traffic System (CATS)