

Cleveland NMRA 2014

Automatic train control using Warrants

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JMRI Control Panel Editor

for

Auto Train Running Using Warrants

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OBlocks, Portals, Paths, Signals, Warrants?

What in the world are we talking about?

- **OBlocks** – Occupancy Blocks
 - More than just your typical train sensors.
- **Portals** – The ways into or out of an 'OBlock'.
- **Paths** – The route from one 'Portal' to the next.
- **Signals** – Tell us about the 'Path' set before us.
- **Warrants** – Places to go, and 'Signals' to obey.
 - Includes how to get there and things to do along the way.

Items - Portal Table

- The 'Portal Table' is part of the Occupancy Blocks Window. <Ctrl + b> to open.

Occupancy Blocks, their Portals and Paths

File Edit Options OpenTables Window Help

Occupancy Block Table

Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block

System Name	User Name	Comment	Sensor	Paths	Delete	Length		Reporter
OBMA-E1	Manion East Main 1		Manion East Main 1	Paths	Delete	0.00	in	
OBMA-E2	Manion East Main 2		Manion East Main 2	Paths	Delete	0.00	in	
OBMA-OS-M1	Manion OS Main 1		Manion OS Main 1	Paths	Delete	0.00	in	
OBMA-OS-M2	Manion OS Main 2		Manion OS Main 2	Paths	Delete	0.00	in	
OBMA-W1	Manion West Main 1		Manion West Main 1	Paths	Delete	0.00	in	
OBMA-W2	Manion West Main 2		Manion West Main 2	Paths	Delete	0.00	in	
OBWH-E1	Whithead East Main 1		Whithead East Main 1	Paths	Delete	0.00	in	
OBWH-E2	Whithead East Main 2		Whithead East Main 2	Paths	Delete	0.00	in	
OBWH-OS-M1	Whithead OS Main 1		Whithead OS Main 1	Paths	Delete	0.00	in	

Enter a Portal Name into the blank (last) row of the table to add a Portal

Block Name	Portal Name	Block Name	Clear
			Clear

add a Signal

To (Protected) Block	Offset(sec)
	0

OBlocks? Portals? Paths?

- In the first half of this clinic we covered some of the basics of creating a panel with the Control Panel Editor. Some review on Blocks:
- Blocks are implemented as JMRI OBlocks, (Occupancy Blocks) which are extensions of JMRI Blocks. They have the following characteristics:
 - An OBlock has from 1 to N Portals, or ways to enter/exit the block.
 - Although an OBlock can be defined without a sensor, i.e. a "Dark Block", it should normally have a sensor. If it has more than one physical sensor, these sensors should be "OR"ed together and trigger a single internal sensor for the block. This may be done electrically or logically by using Logix or layout hardware.
- An OBlock has from 1 to N paths. A Path is a route through the block from one Portal to another. It could just be from a Portal into an OBlock with no exit.

OBlocks? Portals? Paths?

- An OBlock has 0 to N turnouts.
- When deciding where to place OBlocks the primary consideration is signaling. Signaling is normally concerned with separating trains from each other. Think about where different trains may be operated without conflicting with one another. These are the likely candidates for different OBlocks.
 - A turnout can only hold a single train, so it is one OBlock.
 - A crossover can hold two separate trains when it is in the normal direction, so it should be two OBlocks, one for each side.
 - A slip switch may have multiple routes, but only one train at a time may use it. It is a single OBlock.
 - A yard ladder may have multiple turnouts, but normally only one train at a time uses it. A single OBlock will suffice.
 - A single track section of approximately one train length is one OBlock.

OBlocks? Portals? Paths?

- Portals – These are the transition points where one occupancy block (OBlock) ends and the next one begins. This is where signals will normally be placed to govern when trains are allowed to proceed from one section of track (OBlock) into the next.
 - A Portal has exactly two OBlocks. (no more, no less)
 - A portal may have 0 to 2 Signal masts. If a portal has a signal, it faces one of its 2 OBlocks. A second signal, if it exists, faces the other OBlock. Each signal controls the movement of a train exiting the OBlock it faces and thus the entrance of the train into the next OBlock.
 - Depending on the detection method used, a portal may be located at the physical gaps located between two blocks that are using current detection, or it may be at the logical 'gaps' in some other detection method.

OBlocks? Portals? Paths?

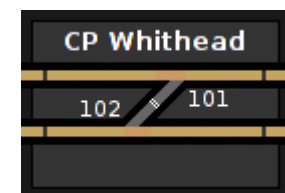
- Paths – These are the possible routes into and/or through an OBlock. There may only be a single Path, for example into a spur track, or there may be a multitude of Paths through a complex yard interlocking.
 - A Path may include from none, to any number, of turnouts. The turnout positions, of course, will determine the Path the train will take.
 - Each Path includes at least one, but no more than two Portals.

OBlock & Portal Tables

Occupancy Block Table					
Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block					
System Name	User Name	Comment	Sensor		
OBMA-W1	Manion West Main 1		Manion West Main 1	Paths	Delete
OBMA-W2	Manion West Main 2		Manion West Main 2	Paths	Delete
OBWH-E1	Whithead East Main 1		Whithead East Main 1	Paths	Delete
OBWH-E2	Whithead East Main 2		Whithead East Main 2	Paths	Delete
OBWH-OS-M1	Whithead OS Main 1		Whithead OS Main 1	Paths	Delete
OBWH-OS-M2	Whithead OS Main 2		Whithead OS Main 2	Paths	Delete
OBWH-W1					
OBWH-W2					

Portal Table			
Enter a Portal Name into the blank (last) row of the table to add a Portal			
Block Name	Portal Name	Block Name	
Whithead West Main 1	Whithead W1	Whithead OS Main 1	Delete
Whithead OS Main 2	Whithead Crossover	Whithead OS Main 1	Delete
Whithead East Main 1	Whithead E1	Whithead OS Main 1	Delete
Whithead West Main 2	Whithead W2	Whithead OS Main 2	Delete
Whithead East Main 2	Whithead E2	Whithead OS Main 2	Delete
			Clear

- OBlocks, Portals, and Paths are closely interrelated and all appear in one group window. This makes it easy to enter data by selecting entries from the OBlock Table and dragging them directly into the Portal Table. The Portal table does not imply any direction. It simply lists the OBlock pairs that meet together at each Portal, in either order. Name each Portal.
 - Here we show the five portals related to the OS at CP Whithead. They correspond to the five gaps shown here.
 - There are five similar portals located at CP Manion, plus two more located at Cressman. Enter them now.



Blocks and Portals

The screenshot shows a software window titled "Occupancy Blocks, their Portals and Paths". The menu bar includes "File", "Edit", "Options", "OpenTables", "Window", and "Help". The "OpenTables" menu is open, showing options: "Show Occupancy Block Table", "Show Portal Table", "Show Block-Portal CrossReference", "Show Signal Table", "Open Block-Path Tables...", and "Open Block-Path-Turnout Tables...". The "Show Block-Portal CrossReference" option is selected. Below the menu, there is a table with columns "System Name" and "Comment".

Below the main window, there is a "Portal Table" window. It has a header "Enter a Portal Name into the blank (last) row of the table to add a Portal" and a table with columns "Block Name" and "Portal Name".

Overlaid on the right is a "Block-Portal Cross Reference" window. It has a table with columns "Block Name" and "Portal Name".

Block Name	Portal Name
Manion East Main 1	Manion E1
Manion East Main 2	Manion E2
Manion OS Main 1	Manion W1
	Manion E1
	Manion Crossover
Manion OS Main 2	Manion Crossover
	Manion E2
	Manion W2
Manion West Main 1	Manion W1
	Cressman M1
Manion West Main 2	Manion W2
	Cressman M2
Whithead East Main 1	Whithead E1
	Cressman M1
Whithead East Main 2	Whithead E2
	Cressman M2
Whithead OS Main 1	Whithead W1
	Whithead Crossover
	Whithead E1
Whithead OS Main 2	Whithead Crossover
	Whithead W2
	Whithead E2
Whithead West Main 1	Whithead W1
Whithead West Main 2	Whithead W2

- Select 'OpenTables' and then click on 'Show Block-Port CrossReference' to get a complete list of Block Names and the Portals that you have defined.
- Be sure to save panels as you continue to add data. (don't even ask why)

Blocks and Portals

Block Name	Portal Name
Manion East Main 1	Manion E1
Manion East Main 2	Manion E2
Manion OS Main 1	Manion W1
	Manion E1
	Manion Crossover
Manion OS Main 2	Manion Crossover
	Manion E2
	Manion W2
Manion West Main 1	Manion W1
	Cressman M1
Manion West Main 2	Manion W2
	Cressman M2
Whithead East Main 1	Whithead E1
	Cressman M1
Whithead East Main 2	Whithead E2
	Cressman M2
Whithead OS Main 1	Whithead W1
	Whithead Crossover
	Whithead E1
Whithead OS Main 2	Whithead Crossover
	Whithead W2
	Whithead E2
Whithead West Main 1	Whithead W1
Whithead West Main 2	Whithead W2

- Sidings or off panel blocks will have a single Portal entry. (e.g. Manion East Main 1)
- Single blocks will show two Portals, one for each end. (e.g. Manion West Main 1)
- Interlockings will have three or more references depending on their complexity. (e.g. Manion OS Main 1) This demo layout has just four simple interlockings.

Paths

Occupancy Block Table							
Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block							
System Name	User Name	Comment	Sensor			Length	
OBMA-W1	Manion West Main 1		Manion West Main 1	Paths	Delete	0.00	in
OBMA-W2	Manion West Main 2		Manion West Main 2	Paths	Delete	0.00	in
OBWH-E1	Whithead East Main 1		Whithead East Main 1	Paths	Delete	0.00	in
OBWH-E2	Whithead East Main 2		Whithead East Main 2	Paths	Delete	0.00	in
OBWH-OS-M1	Whithead OS Main 1		Whithead OS Main 1	Paths	Delete	0.00	in
OBWH-OS-M2	Whithead OS Main 2		Whithead OS Main 2	Paths	Delete	0.00	in
OBWH-W1	Whithead West Main 1		Whithead West Main 1	Paths	Delete	0.00	in
OBWH-W2	Whithead West Main 2		Whithead West Main 2	Paths	Delete	0.00	in
					Clear	0.00	cm

- Paths are possible ways to traverse a block. They are implemented as JMRI OPaths, which are extensions of JMRI Paths. They have the following characteristics:
 - A Path has 0 to N turnouts.
 - A path has at least one (a dead end track) and no more than two portals. (a through track)
- To enter the possible Paths through an OBlock click on the 'Paths' button.

Paths

The image shows a software interface with two tables. The top table is titled "Occupancy Block Table" and contains the following data:

System Name	User Name	Comment	Sensor	Length	
OBMA-W1	Manion West Main 1		Manion West Main 1	0.00	in
OBMA-W2	Manion West Main 2		Manion West Main 2	0.00	in
OBWH-E1					in
OBWH-E2					in
OBWH-OS-M1					in
OBWH-OS-M2					in
OBWH-W1					in
OBWH-W2					in

The bottom table is titled "Path Table for Block 'Manion West Main 1'" and is currently empty. It has columns for "From Portal", "Path Name", and "To Portal". A "Clear" button is visible in the bottom right corner of the table.

- There is only one way to go through 'Manion West Main 1'. It is from the Portal 'Manion W1' to the Portal 'Cressman M1'. The Block-Portal Cross Reference tells you this information.
- Drag Portal 'Manion W1' to one side and 'Cressman M1' to the other side.

Paths

The screenshot displays two overlapping windows from a software application. The background window is titled 'Occupancy Block Table' and contains a table with columns for System Name, User Name, Comment, Sensor, Length, and units. The foreground window is titled 'Path Table for Block "Manion West Main 1"' and contains a table with columns for From Portal, Path Name, and To Portal, along with 'Turnouts', 'Delete', and 'Clear' buttons.

System Name	User Name	Comment	Sensor	Length	
OBMA-W1	Manion West Main 1		Manion West Main 1	0.00	in
OBMA-W2	Manion West Main 2		Manion West Main 2	0.00	in
OBWH-E1					in
OBWH-E2					in
OBWH-OS-M1					in
OBWH-OS-M2					in
OBWH-W1					in
OBWH-W2					in
					cm

From Portal	Path Name	To Portal	Turnouts	Delete
Manion W1	MA-CR M1	Cressman M1		
				Clear

- Give the path a name, e.g. 'MA-CR M1'. (then hit <Enter> to register the new value)
- This path does not include any turnouts.
- Close the window.

Paths

The image shows two overlapping windows from a software interface. The background window is titled "Occupancy Block Table" and contains a table with columns: System Name, User Name, Comment, Sensor, Length, and units. The table has two rows of data: OBMA-W1 (Manion West Main 1) and OBMA-W2 (Manion West Main 2). Each row has "Paths" and "Delete" buttons. The foreground window is titled "Path Table for Block 'Manion West Main 1'" and contains a table with columns: From Portal, Path Name, To Portal, Turnouts, and Delete. The table has one row of data: Manion W1, MA-CR M1, Cressman M1. There are "Turnouts", "Delete", and "Clear" buttons. The "Delete" button is highlighted.

System Name	User Name	Comment	Sensor	Length	Units
OBMA-W1	Manion West Main 1		Manion West Main 1	0.00	in
OBMA-W2	Manion West Main 2		Manion West Main 2	0.00	in
OBWH-E1					in
OBWH-E2					in
OBWH-OS-M1					in
OBWH-OS-M2					in
OBWH-W1					in
OBWH-W2					in
					cm

From Portal	Path Name	To Portal	Turnouts	Delete
Manion W1	MA-CR M1	Cressman M1		
				Clear

- Give the path a name, e.g. 'MA-CR M1'. (then hit <Enter> to register the new value)
- This path does not include any turnouts.
- Close the window.
- A warning window pops up.
- JMRI is trying to point out missing items. At the start that is just about everything, so don't worry about them yet.

The image shows a dialog box titled "Block/Portal/Path Warnings". The text inside reads: "The following are possible sources for errors: Portal 'Manion W1' has no path into block 'Manion OS Main 1'." There is an "OK" button at the bottom.

Paths

Occupancy Block Table								
Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block								
System Name	User Name	Comment	Sensor			Length		
OBMA-E1	Manion East Main 1		Manion East Main 1	Paths	Delete	0.00	in	
OBMA-E2	Manion East Main 2		Manion East Main 2	Paths	Delete	0.00	in	
OBMA-OS-M1	Manion OS Main 1		Manion OS Main 1	Paths	Delete	0.00	in	
OBMA-OS-M2	Manion OS Main 2		Manion OS Main 2	Paths	Delete	0.00	in	
OBMA-W1	Manion West Main 1		Manion West Main 1	Paths	Delete	0.00	in	
OBMA-W2	Manion West Main 2		Manion West Main 2	Paths	Delete	0.00	in	
OBWH-E1	Whithead East Main 1		Whithead East Main 1	Paths	Delete	0.00	in	
OBWH-E2	Whithead East Main 2		Whithead East Main 2	Paths	Delete	0.00	in	
OBWH-OS-M1	Whithead OS Main 1		Whithead OS Main 1	Paths	Delete	0.00	in	

- Now consider 'Manion OS Main 1'. Because it includes a turnout there can be more than one path through it.

Paths

Occupancy Block Table							
Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block							
System Name	User Name	Comment	Sensor			Length	
OBMA-E1	Manion East Main 1		Manion East Main 1	Paths	Delete	0.00	in
OBMA-E2	Manion East Main 2		Manion East Main 2	Paths	Delete	0.00	in
OBMA-OS-M1	Manion OS Main 1		Manion OS Main 1	Paths	Delete	0.00	in
OBMA-OS-M2	Manion OS Main 2		Manion OS Main 2	Paths	Delete	0.00	in
OBMA-W1	Manion West Main 1		Manion West Main 1	Paths	Delete	0.00	in
OBMA-W2	Manion West Main 2		Manion West Main 2	Paths	Delete	0.00	in
OBWH-E1	Whithead East Main 1		Whithead East Main 1	Paths	Delete	0.00	in
OBWH-E2	Whithead East Main 2		Whithead East Main 2	Paths	Delete	0.00	in
OBWH-OS-M1	Whithead OS Main 1		Whithead OS Main 1	Paths	Delete	0.00	in

Block-Portal Cross Reference	
Block Name	Portal Name
Manion East Main 1	Manion E1
Manion East Main 2	Manion E2
Manion OS Main 1	Manion W1
	Manion E1
	Manion Crossover
Manion OS Main 2	Manion Crossover
	Manion E2
	Manion W2
Manion West Main 1	Manion W1
	Crossman M1

- Now consider 'Manion OS Main 1'. Because it includes a turnout there can be more than one path through it.
- The first path is formed when the turnout is 'Closed' or normal for the main line. It goes from the Portal 'Manion W1' to the Portal 'Manion E1'. It includes a turnout so the 'Turnouts' button is used.

Paths

The image shows three overlapping software windows. The top window is titled "Occupancy Block Table" and contains a table with columns: System Name, User Name, Comment, Sensor, Paths, Delete, Length, and in. The bottom window is titled "Path Table for Block 'Manion OS Main 1'" and contains a table with columns: From Portal, Path Name, To Portal, Turnouts, and Delete. The bottom-most window is titled "Turnout Table for Path 'Manion Main 1C' in Blo..." and contains a table with columns: System or User Name, Turnout Setting, Delete, and Clear.

System Name	User Name	Comment	Sensor	Paths	Delete	Length	in
OBMA-E1	Manion East Main 1		Manion East Main 1	Paths	Delete	0.00	in
OBMA-E2	Manion East Main 2		Manion East Main 2	Paths	Delete	0.00	in
OBMA-OS-M1	Manion OS Main 1		Manion OS Main 1	Paths	Delete	0.00	in
OBMA-OS-M2	Manion OS Main 2		Manion OS Main 2	Paths	Delete	0.00	in
OBMA-W1							
OBMA-W2							
OBWH-E1							
OBWH-E2							
OBWH-OS-M1							

From Portal	Path Name	To Portal	Turnouts	Delete
Manion W1	Manion Main 1C	Manion E1	Turnouts	Delete
				Clear

System or User Name	Turnout Setting	Delete	Clear
Manion Main 1	Closed	Delete	Clear

- Enter the turnout System or User Name and the setting that is required for this Path. I used 'Manion Main 1', but it could have been 'LT201'. Generally it is better to use user names where possible. That allows the system (hardware) names to be changed with fewer problems. For a complex Path through an interlocking multiple turnouts may be involved.
- Enter the other path and its turnout position or positions for a complex Path.

Paths

Occupancy Block Table
Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block

System Name	User Name	Comment	Sensor	Paths	Delete	Length	
OBMA-E1	Manion East Main 1		Manion East Main 1	Paths	Delete	0.00	in
OBMA-E2	Manion East Main 2		Manion East Main 2	Paths	Delete	0.00	in
OBMA-OS-M1	Manion OS Main 1		Manion OS Main 1	Paths	Delete	0.00	in
OBMA-OS-M2	Manion OS Main 2		Manion OS Main 2	Paths	Delete	0.00	in
OBMA-W1							
OBMA-W2							
OBWH-E1							
OBWH-E2							
OBWH-OS-M1							

Path Table for Block "Manion OS Main 1"
Enter a Path Name into the blank (last) row of the table to add a Path

From Portal	Path Name	To Portal	Turnouts	Delete
Manion W1	Manion Main 1C	Manion E1	Turnouts	Delete
Manion W1	Manion Crossover	Manion Crossover	Turnouts	Delete
				Clear

Turnout Table for Path "Manion Crossover" in B...
Enter a Turnout Name into the last row

System or User Name	Turnout Setting	Delete
Manion Main 1	Thrown	Delete
Manion Main 2	Thrown	Delete
		Clear

- We have entered the crossover and its turnout position.
- On this demo layout the two turnouts of the crossover have separate switch machines, so I have included them both in this path.
- Note: To drag and drop from the 'Item Palette' turnout tab into the 'Turnout Table for Path' System or User Name list, the destination box must be highlighted first.

Paths

Occupancy Block Table
Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block

System Name	User Name	Comment	Sensor	Paths	Delete	Length	
OBMA-E1	Manion East Main 1		Manion East Main 1	Paths	Delete	0.00	in
OBMA-E2	Manion East Main 2		Manion East Main 2	Paths	Delete	0.00	in
OBMA-OS-M1	Manion OS Main 1		Manion OS Main 1	Paths	Delete	0.00	in
OBMA-OS-M2	Manion OS Main 2		Manion OS Main 2	Paths	Delete	0.00	in
OBMA-W1							
OBMA-W2							
OBWH-E1							
OBWH-E2							
OBWH-OS-M1							

Path Table for Block "Manion OS Main 1"
Enter a Path Name into the blank (last) row of the table to add a Path

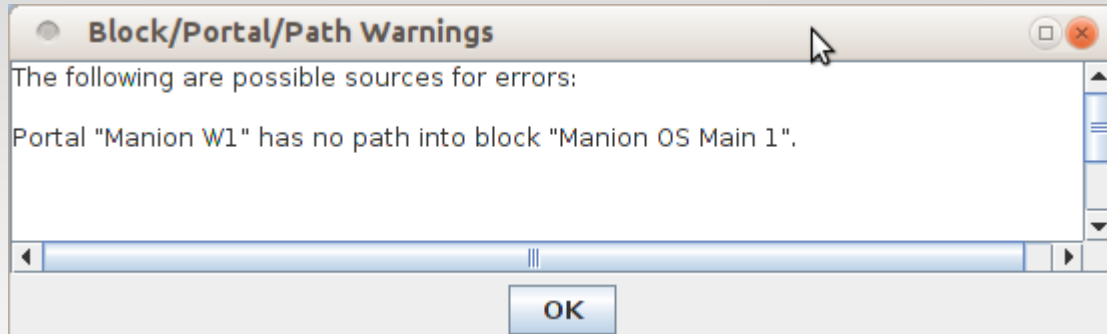
From Portal	Path Name	To Portal	Turnouts	Delete
Manion W1	Manion Main 1C	Manion E1	Turnouts	Delete
Manion W1	Manion Crossover	Manion Crossover	Turnouts	Delete
				Clear

Turnout Table for Path "Manion Crossover" in B...
Enter a Turnout Name into the last row

System or User Name	Turnout Setting	Delete
Manion Main 1	Thrown	Delete
Manion Main 2	Thrown	Delete
		Clear

- We have entered the crossover and its turnout position.
- Enter the other Path and its required turnout position.

Path Warnings



- When you exit each step in the process, the Control Panel Editor evaluates what you have just done and notifies you of any possible errors or omissions that it finds.
- In this case it is just warning us that we have not yet added the path into the OS. As you proceed you can use these warning messages as a guide to show you what path to configure next.
- Early in your entering of data many 'Warning' windows will pop up. As long as I am still entering data I pretty much ignore them. However as you get close to completing the data entry you will need to start paying close attention because they are notifying you of connections that the Editor sees as possible, but are as yet undefined.
- The next few slides will show a different portion of the actual (not demo) layout with a bit more complexity to the interlocking.

Paths

Occupancy Block Table

Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block

System Name	User Name	Comment	Sensor	Length	Curvat...		
OB					None	Paths	Delete
OB					None	Paths	Delete
OB					None	Paths	Delete
OB					None	Paths	Delete

Portal Table

Enter a Portal Name into the blank (last) row of the table to add a Portal

Block Name	Portal Name	Comment	Sensor	Length	Curvat...		
OB					None	Paths	Delete
OB					None	Paths	Delete
OB					None	Paths	Delete
OB					None	Paths	Delete

Path Table for Block "CP Moorman Main 2"

Enter a Path Name into the blank (last) row of the table to add a Path

From Portal	Path Name	To Portal		
CP Moorman W2	Moorman M2 to M1	CP Moorman W Crossover	Turnouts	Delete
CP Moorman W2	Moorman M2	Moorman E2	Turnouts	Delete
				Clear

Turnout Table for Path "Moorman M2" in Block "CP ..."

Enter a Turnout Name into the last row

System or User Name	Turnout Setting		
LT21	Closed	Delete	
LT22	Closed	Delete	
LT23	Closed	Delete	

CP Moorman

11 Main 1 21 23

12 Main 2 21 22 22 24

13 23 25

171 Territory Siding

- CP Moorman Main 2 (lower track) has 3 turnouts in its path between the east and west ends. This section of track is divided into two OBlocks, the upper section and the lower section with gaps in the two crossovers. (OBlock 21 & OBlock 22)
- We will also need to add a third Path Table entry for the path from 'CP Moorman W2' to the siding at OBlock 25. It will also include the same 3 turnouts, but LT23 will be 'Thrown'.

Paths

Occupancy Block Table

Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block

System Name	User Name	Comment	Sensor	Length	Curvat...		
OB					None	Paths	Delete
OB					None	Paths	Delete
OB					None	Paths	Delete
OB					None	Paths	Delete

Portal Table

Enter a Portal Name into the blank (last) row of the table to add a Portal

Block Name				
CP Seale				
CP Seale				
Block 2				
CP Moorman Main 1				
CP Moorman Main 2				
CP Moorman Main 2				

Path Table for Block "CP Moorman Main 2"

Enter a Path Name into the blank (last) row of the table to add a Path

From Portal	Path Name	To Portal		
CP Moorman W2	Moorman M2 to M1	CP Moorman W Crossover	Turnouts	Delete
CP Moorman W2	Moorman M2	Moorman E2	Turnouts	Delete
				Clear

Turnout Table for Path "Moorman M2" in Block "CP ..."

Enter a Turnout Name into the last row

System or User Name	Turnout Setting	
LT21	Closed	Delete
LT22	Closed	Delete
LT23	Closed	Delete

CP Moorman

11 Main 1 21 23

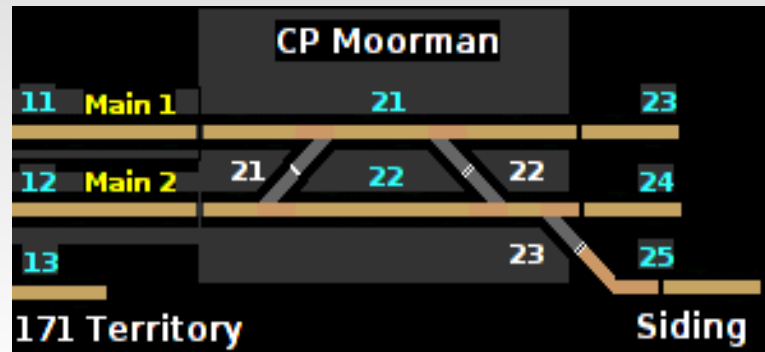
12 Main 2 21 22 22 24

13 23 25

171 Territory Siding

- CP Moorman Main 2 (lower track) has 3 turnouts in its path between the east and west ends. This section of track is divided into two OBlocks, the upper section and the lower section with gaps in the two crossovers. (OBlock 21 & OBlock 22)
- We will also need to add a third Path Table entry for the path from 'CP Moorman W2' to the siding at OBlock 25. It will also include the same 3 turnouts, but LT23 will be 'Thrown'.
- The fourth path is from the East crossover to the siding.

Paths



- When we are done we should have 6 paths through CP Moorman. (theoretically 8 paths)
 - OBlock 11 to OBlock 23 Main 1
 - OBlock 11 to OBlock 24 Main 1 to Main 2
 - OBlock 11 to OBlock 25 Main 1 to Siding
 - OBlock 12 to OBlock 23 Main 2 to Main 1
 - OBlock 12 to OBlock 24 Main 2
 - OBlock 12 to OBlock 25 Main 2 to Siding
- We do not count the two paths that crossover then immediately back while going from OBlock 12 to OBlock 24 or OBlock 12 to OBlock 25.

OBlock Lengths

Occupancy Block Table								
Enter a Block System or User Name into the blank (last) row of the table to add an Occupancy Block								
System Name	User Name	Comment	Sensor			Length		Reporter
OBBU-M1	Butler Main 1		Butler Main 1	Paths	Delete	14.00	in	
OBBU-M2	Butler Main 2		Butler Main 2	Paths	Delete	14.00	in	
OBMA-E1	Manion East Main 1		Manion East Main 1	Paths	Delete	16.00	in	
OBMA-E2	Manion East Main 2		Manion East Main 2	Paths	Delete	16.00	in	
OBMA-OS-M1	Manion OS Main 1		Manion OS Main 1	Paths	Delete	15.00	in	
OBMA-OS-M2	Manion OS Main 2		Manion OS Main 2	Paths	Delete	15.00	in	
OBMA-W1	Manion West Main 1		Manion West Main 1	Paths	Delete	20.00	in	
OBMA-W2	Manion West Main 2		Manion West Main 2	Paths	Delete	20.00	in	
OBSQ-M1	Squires Main 1		Squires Main 1	Paths	Delete	14.00	in	

- Fill in all the OBlock lengths in actual inches or centimeters. This is included for compatibility with JMRI Blocks. It also helps with automated train running to let the automated engineer know how far it is to the next signal.
- You can also enter the maximum speed and curvature information for each OBlock.

Signals

- Signals are used by Warrants to tell if a train is allowed to pass through a portal or must wait.
- For each Signal on your layout, make an entry in the Signal Table. These Signals will control the actions of any warranted train - changing its speed according to the Signal's indication when the train reaches the Portal where each Signal is located. That is, each Signal 'protects' the OBlock beyond the Portal. The Signal may be either a SignalMast or a SignalHead.
- It should be obvious that these Signals do not actually need to physically exist on the layout, but they do need to exist and be operational in JMRI.
- The warrant detects the signal aspect when it enters the approach OBlock and, if needed, prepares to change the speed before it reaches the protected block. Any speed change is ramped down to the speed required by the signal. The 'delay time' is the time the warranted train will wait before beginning the speed change.
- Likewise, when the Signal indicates a clear or improved speed from a stopped or reduced speed condition, the speed will be ramped up to the allowed or recorded speed.

Signals

- The demo layout uses the new RR-CirKits SignalMan boards configured as Signal Masts to control the signals. We will configure them as NS-2008 signals controlled by NMRA DCC Signal Aspect commands.
- Signal Masts may be created in JMRI by combining together individual signal heads. However for masts that use heads with flashing lamps this can create a lot of traffic on the layout control bus and on the DCC bus, because the flashing is done by turning on and off individual lamps.

- Some basic signal terms:



- Signal Arm or Signal Head - Each individual signal unit. Shows colors, patterns.
- Rule – The number of each rule as shown in the rule book. E.g. **245A, 281**.



- Aspect - What it looks like to the observer. E.g. green over red.
- Name – The rule book title for the aspect. E.g. **CLEAR, STOP, APPROACH SLOW**.
- Indication – The description of what the train is supposed to do at the signal. E.g. **Proceed, approaching next signal not exceeding Slow Speed**.



- Marker - A signal head or arm that does not change color or position.
- Mast - Used to refer to an entire signal made up of one or more signal heads.

Signals

- SignalMan Programming – Set up the Mast #, Names and Aspect for each one.

Program SignalMan 13001 in Operations Mode (Main Track)

File Window Help

SignalMan Brightness **Masts A** Masts B Masts C Masts D Logic A Logic B Logic C Logic D

Roster Entry Function Labels Roster Media Basic CVs

Select either 'Output mode' (a Serial command - Closed/Thrown plus a Mast #) OR 'DCC mode' (a Mast Address plus its Signal Aspect). All commands are entered as their actual Address numbers. For example to respond to LT9 Closed enter Command as 9 C.

To use Bi-polar LEDs check the box between any paired color entry. Pairs must use adjacent output lines, either Lunar/Red, or Yellow/Green. To set the Bi-polar hue, adjust the individual brightnesses of the paired LEDs. Either Bi-polar color used by itself does not require a check.

Aspect#	Mode	Command	Lamp A Phase/Flash	Bi-Polar	Lamp B Phase/Flash	Lamp C Phase/Flash	Bi-Polar	Lamp D Phase/Flash	Lighting Effects
1:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-R Steady	BP <input type="checkbox"/>	H2-R Steady	H1-R	<input type="checkbox"/>	H1-R None	Effect Fade
		1 0-Stop			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message
2:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-R Steady	BP <input type="checkbox"/>	H2-Y Steady	H1-Y	<input type="checkbox"/>	H1-Y None	Effect Fade
		1 4-Restricting			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message
3:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-R Steady	BP <input type="checkbox"/>	H2-Y A Medium	H1-G	<input type="checkbox"/>	H1-G None	Effect Fade
		1 11-Medium-Appr			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message
4:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-Y Steady	BP <input type="checkbox"/>	H2-R Steady	H1-L	<input type="checkbox"/>	H1-L None	Effect Fade
		1 21-Approach			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message
5:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-Y Steady	BP <input type="checkbox"/>	H2-Y Steady	H1-R	<input type="checkbox"/>	H1-R None	Effect Fade
		1 23-Appr-Slow			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message
6:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-R Steady	BP <input type="checkbox"/>	H2-G Steady	H1-Y	<input type="checkbox"/>	H1-Y None	Effect Fade
		1 15-Medium-Clr			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message
7:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-Y A Medium	BP <input type="checkbox"/>	H2-R Steady	H1-G	<input type="checkbox"/>	H1-G None	Effect Fade
		1 22-Advance-Appr			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message
8:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-Y Steady	BP <input type="checkbox"/>	H2-G Steady	H1-L	<input type="checkbox"/>	H1-L None	Effect Fade
		1 25-Appr-Medium			2nd Event 1	Polarity send normal		Reserved (0x4X) message	No Second Message

Type



Read changes on sheet Write changes on sheet Read full sheet Write full sheet

Read changes on all sheets Write changes on all sheets Read all sheets Write all sheets

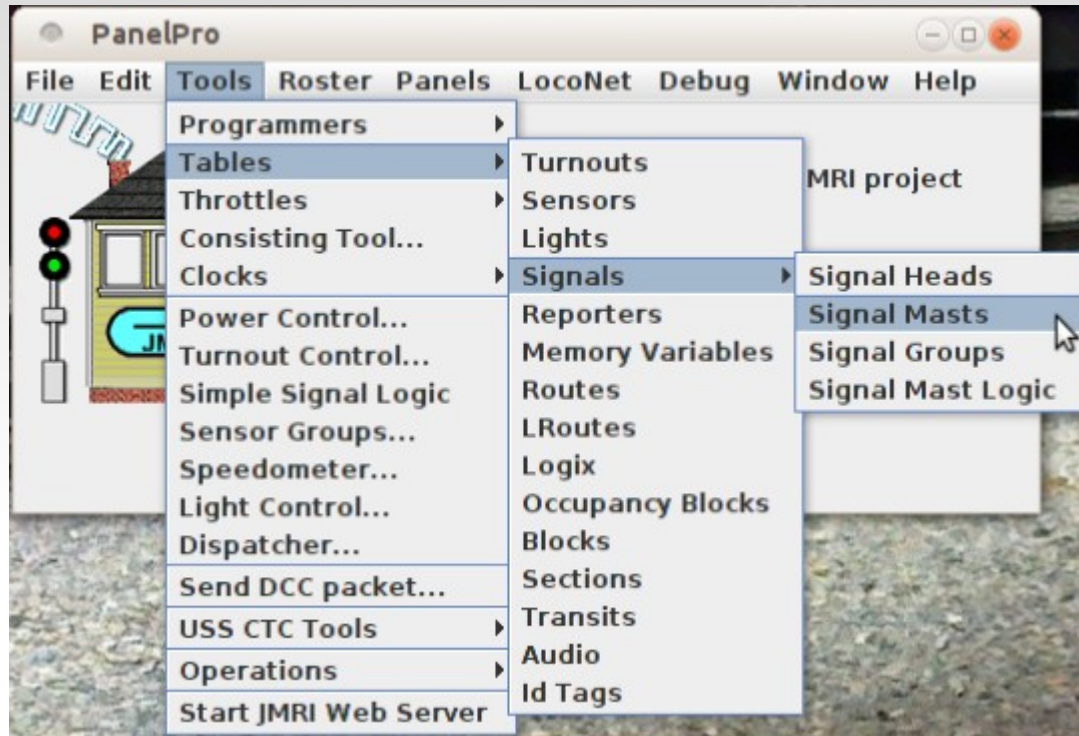
OK

Signals

Aspect#	Mode	Command	Lamp A Phase/Flash	Bi-Polar	Lamp B Phase/Flash	Lamp C Phase/Flash	Bi-Polar	Lamp D Phase/Flash	Lighting Effects					
1:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-R	Steady	BP <input type="checkbox"/>	H2-R	Steady	H1-R	None	BP <input type="checkbox"/>	H1-R	None	Effect	Fade
		1	0-Stop		2nd Event 1	Polarity	send normal	Reserved (0x4X)	message	No Second Message				
2:	<input type="radio"/> Turnout	<input checked="" type="radio"/> DCC	H1-R	Steady	BP <input type="checkbox"/>	H2-Y	Steady	H1-Y	None	BP <input type="checkbox"/>	H1-Y	None	Effect	Fade
		1	4-Restricting		2nd Event 1	Polarity	send normal	Reserved (0x4X)	message	No Second Message				

- A quick look at the first two entries shows how it works with the SignalMan.
 - Mode – set to read NMRA DCC mast aspect commands, not turnout commands.
 - Mast Number – set to mast #1 for all entries on this mast.
 - Aspect #1 Name – Stop (aspect #0)
 - Lamps – Lamp A is H1-R steadily lit. Lamp B is H2-R steadily lit. 
 - Effect – Fade from one appearance to the next.
 - Aspect #2 Name – Restricting (aspect #4)
 - Lamps – Lamp A is H1-R steadily lit. Lamp B is H2-Y steadily lit. 
 - Effect – Fade from one appearance to the next.
 - These signals only use two lamps at a time, so Lamp C and Lamp D entries are set to 'None', so any lamp selections or settings are ignored.

Signals



- Once we have the hardware setup then we add the signal masts into JMRI.
 - Select 'Tools – Tables – Signals – Signal Masts' which will open the 'Signal Masts' table.
 - Click on 'Add...' to enter the first new mast.

Signals

Add Signal Mast

Window Help

User Name: Whithead W1

Signal system: NS-2008

Mast type: Double head 3-3 color light high signal

Select Mast Driver: DCC Signal Mast Decoder

System: LocoNet

DCC Accessory Address: 1

Approach

Set Aspect Id 21 Disable Aspect

Advance Approach

Set Aspect Id 22 Disable Aspect

Limited Clear

Set Aspect Id 20 Disable Aspect

Restricting

Set Aspect Id 4 Disable Aspect

Approach Medium

Set Aspect Id 25 Disable Aspect

Medium Approach

Set Aspect Id 11 Disable Aspect

Approach Slow

Set Aspect Id 23 Disable Aspect

Medium Clear

Set Aspect Id 15 Disable Aspect

Clear

Set Aspect Id 29 Disable Aspect

Stop Signal

Set Aspect Id 0 Disable Aspect

Approach Limited

Set Aspect Id 27 Disable Aspect

Copy Aspect IDs From Mast

OK

- Enter the User Name.
- Select the Signal System. (NS-2008)
- Choose a mast type. (in our case 2 head)
- Set the driver hardware. In this case NMRA DCC Signal Mast Decoder.
- This system is LocoNet, but in a multiple interface system you would choose the interface being used to drive the signal.
- Enter the DCC address of the mast. (in this example it is #1)
- Fill in the aspect numbers for each name. In the latest release of JMRI this will be automatic for standardized hardware.
- Once a mast has been entered you can copy its aspect numbers to others.

Signals

- Another quick way to enter multiple similar heads is to simply change the User Name and DCC Accessory address number, then click on OK for each new change.

- Once you have made entries for each head be sure to test them out by opening the signal mast table and clicking on the entries in 'Aspect' and selecting different aspect names

User Name ▾	Aspect
Whithead W2	Approach ▾
Whithead W1	Stop Signal ▾
Whithead E2	Approach ▾
Whithead E1	Clear ▾

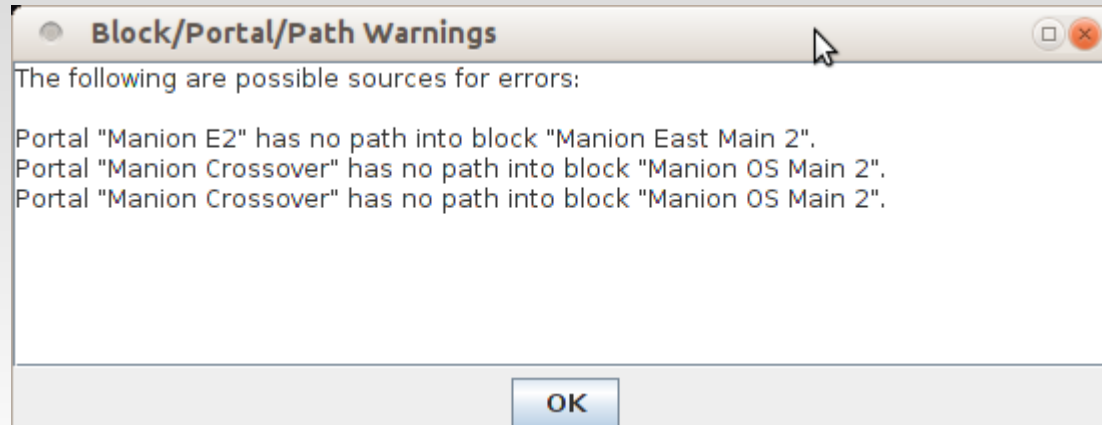
- There is no access to the signal mast table rather than the signal mast table. This is the end.

Signals

- Once we have operating signals, actual hardware, or virtual signals, it is time to add them to the portals.
- Open the 'Signal Table' portion of 'Occupancy Blocks, their Portals and Paths'. Hopefully your signal names are clear enough to make the job of drag and drop from the item palette easy.
- Note: The 'Signal Name' entry box must be selected before you can drop an item into it.
- Our completed signal table.

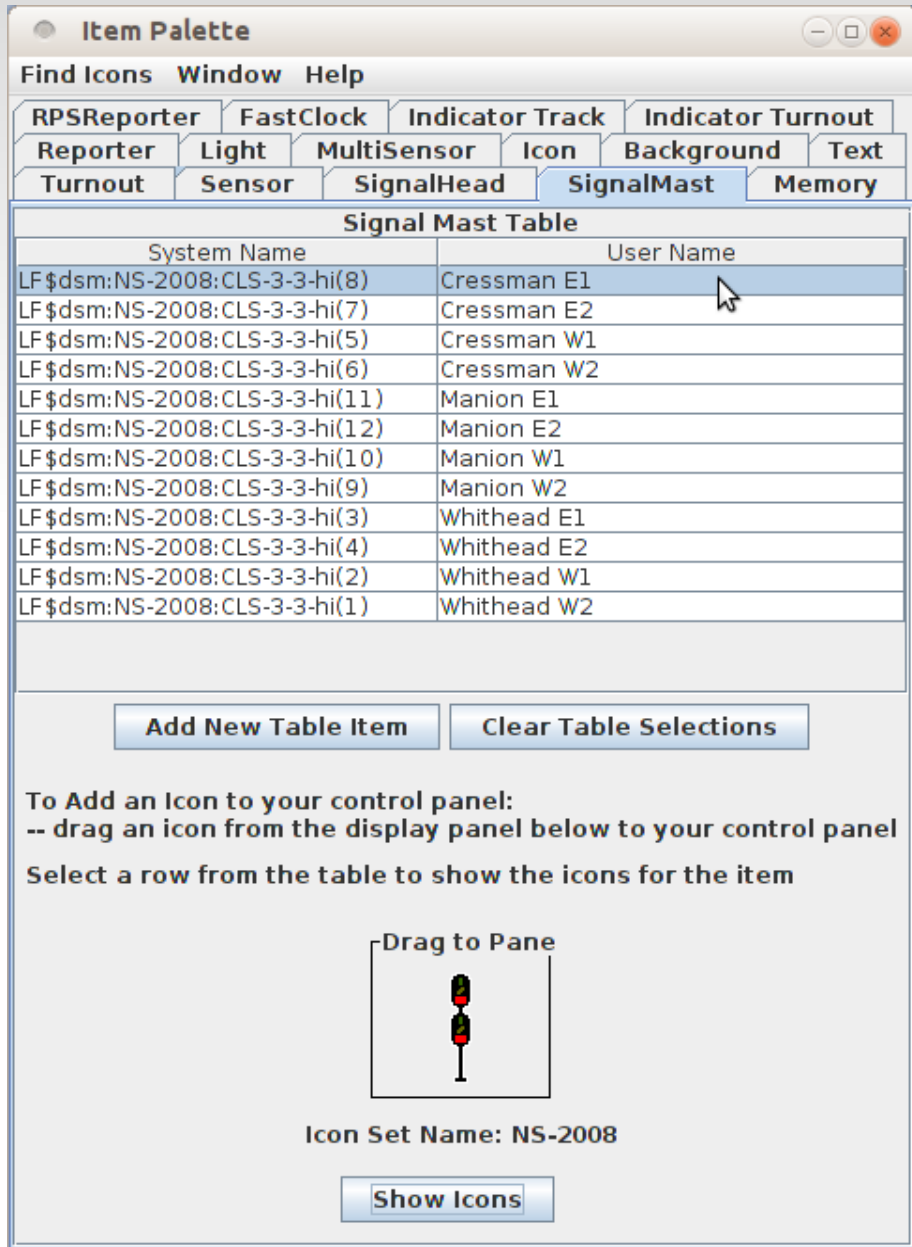
Signal Name	From (Approach) Block	(Through) Portal	To (Protected) Block	Offset(sec)	
Whithead W1	Whithead West Main 1	Whithead W1	Whithead OS Main 1	0	Delete
Whithead W2	Whithead West Main 2	Whithead W2	Whithead OS Main 2	0	Delete
Whithead E1	Whithead East Main 1	Whithead E1	Whithead OS Main 1	0	Delete
Whithead E2	Whithead East Main 2	Whithead E2	Whithead OS Main 2	0	Delete
Manion W1	Manion West Main 1	Manion W1	Manion OS Main 1	0	Delete
Manion W2	Manion West Main 2	Manion W2	Manion OS Main 2	0	Delete
Manion E1	Manion East Main 1	Manion E1	Manion OS Main 1	0	Delete
Manion E2	Manion East Main 2	Manion E2	Manion OS Main 2	0	Delete
Cressman W1	Whithead East Main 1	Cressman M1	Manion West Main 1	0	Delete
Cressman W2	Whithead East Main 2	Cressman M2	Manion West Main 2	0	Delete
Cressman E1	Manion West Main 1	Cressman M1	Whithead East Main 1	0	Delete
Cressman E2	Manion West Main 2	Cressman M2	Whithead East Main 2	0	Delete
				0	Clear

Error Warnings



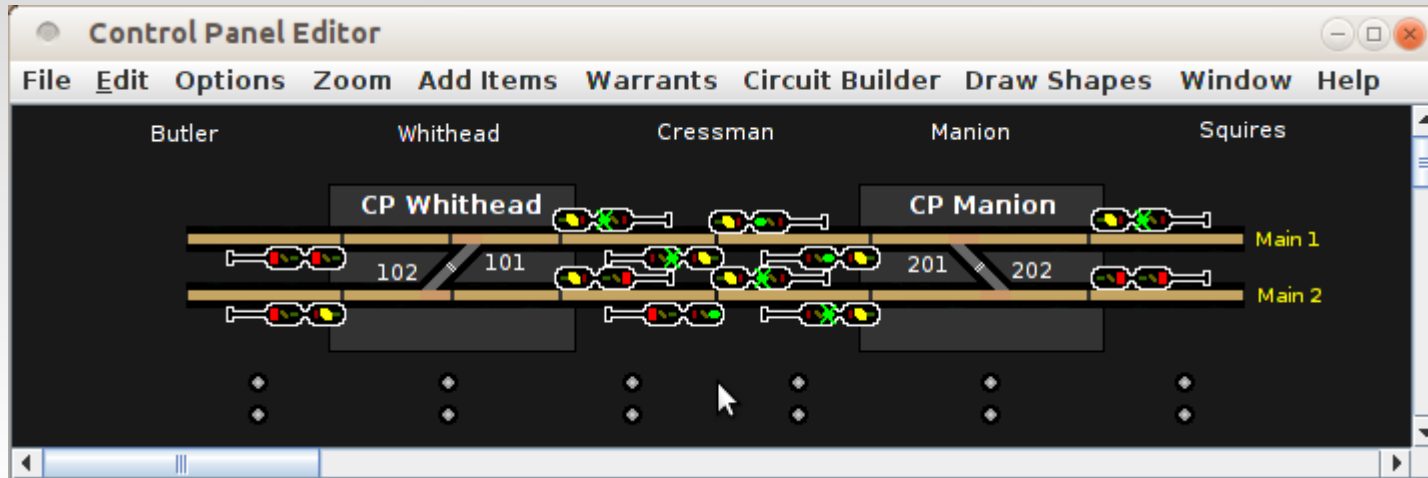
- When we open or close the 'Occupancy Blocks' window it prompts us with what it detects as possible errors.
- After locating and correcting the missing entries you can close the window and open it again to see if the errors are gone.

Add Signals to our Panel

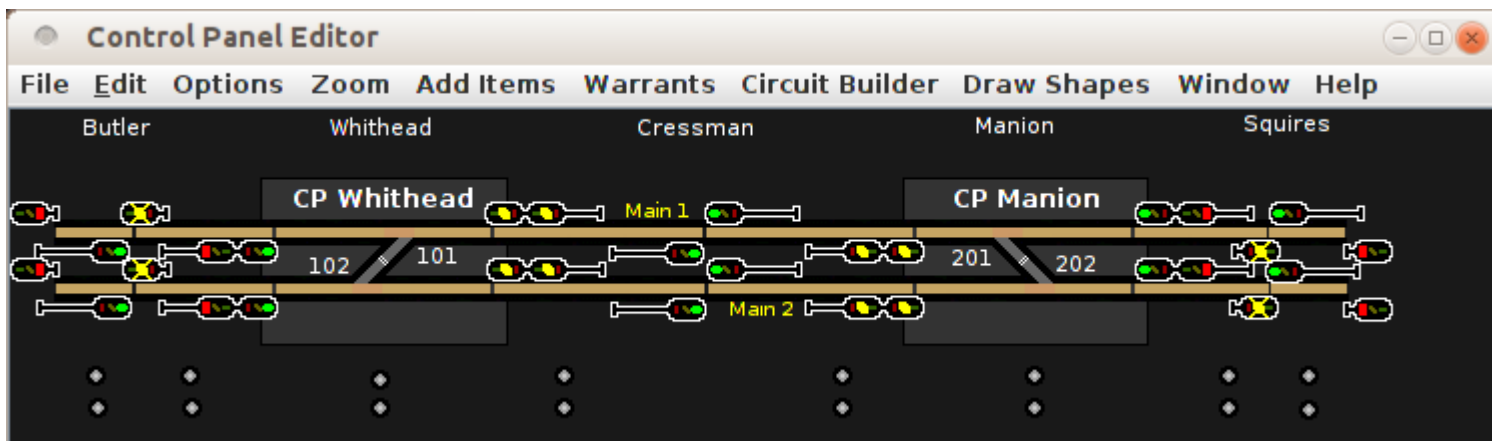


- When we created the NS-2008 signal masts we actually created, not only the signal control information, but also active images that we can place on a panel if we so desire.
- Strictly speaking this is not prototypical, but we modelers do like to see them both on the layout and on our panels.
- To place signals open the Item Palette, highlight the signal, then drag the image to your panel. It may appear as a red 'X'. If so click on it to make the signal appear.
- Likely the signal will not be facing the way you need it to. Right click to open the menu, then choose 'Rotate'. 90 and 270 degrees are helpful.

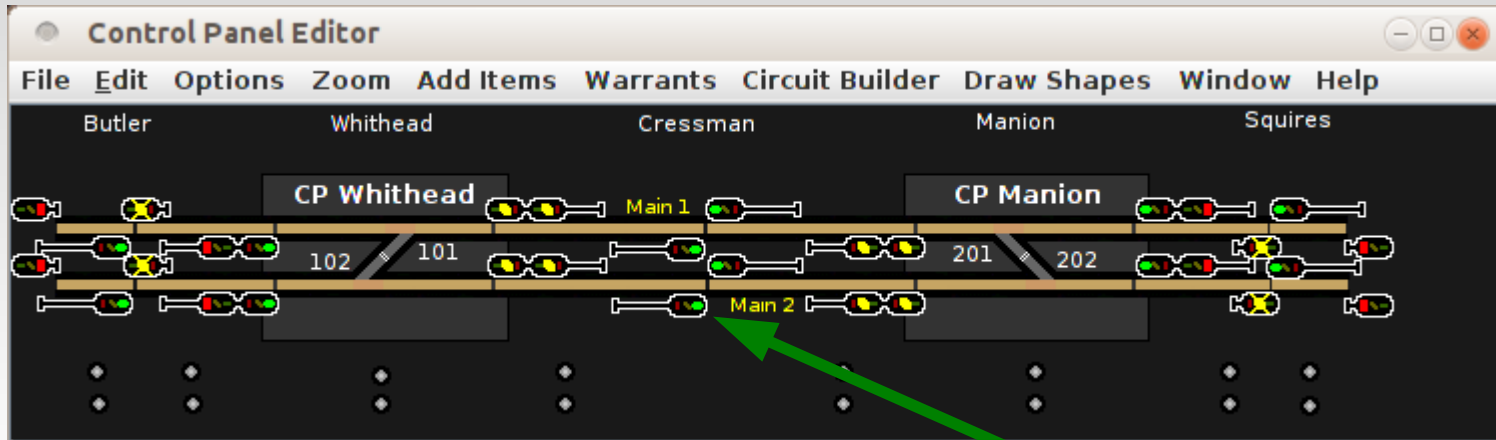
Add Signals to our Panel



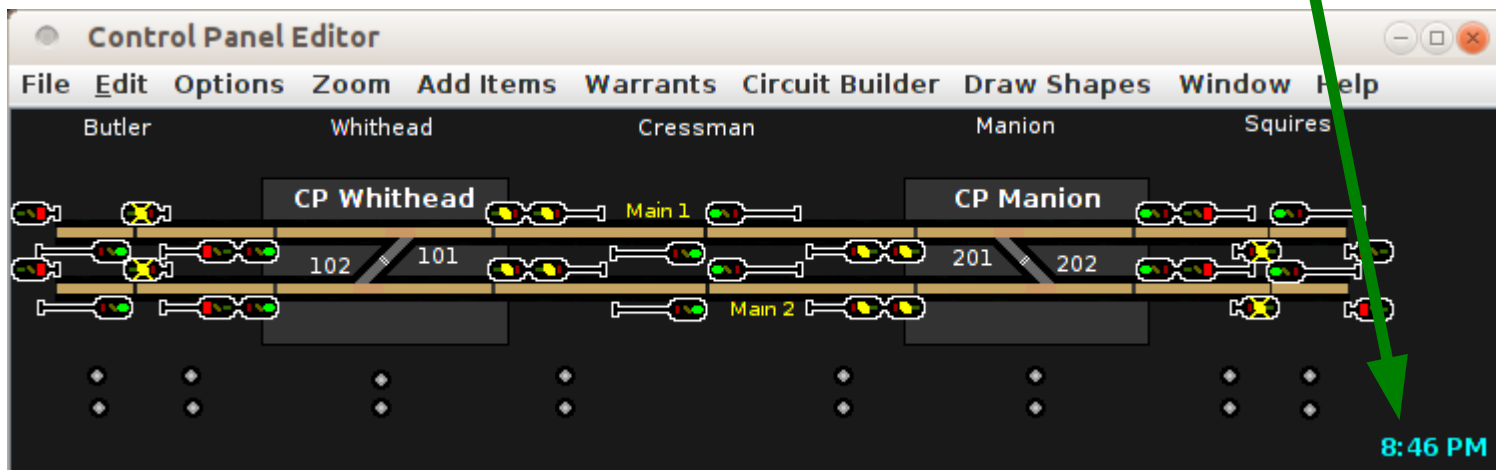
- Here is what our panel looks like with signal masts applied. Things are pretty crowded around Cressman.
- 5 minutes later, by using the Control Panel Editor group move plus duplicating some track images, we now have this diagram.



Add Signals to our Panel



- Actually I changed the intermediate signals to be 3 high to drive semaphores.
- Go to the Add Items → Memory and select 'IMCURRENTTIME' and give it a color of cyan. That will give us a neat little time of day clock that we can drag to our panel.

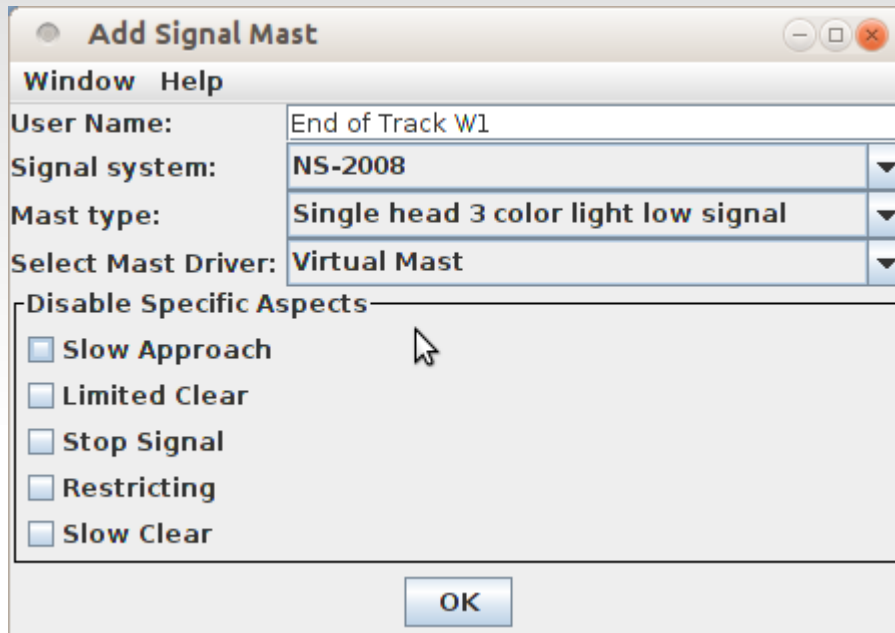


Tying it all together

- We now have a panel that controls our signals, indicates occupancy, indicates short circuits if you have that option, and throws turnouts. However something is still missing, the connection of the signal logic.
- Using Logix or scripting to control these signal masts would be a daunting task. It is possible, and many JMRI users have accomplished it. However when you specified NS-2008 rules, that is what you have. The signal set already knows the rules for controlling them prototypically. All we need to do is connect the signals to the layout, and to each other.
- The portals and paths are for train control. Those tables tell the train controller what signal to watch for at each portal.
- The signal mast logic informs each mast about what it watches. This will include OBlocks, turnouts, interfering signals like at a diamond crossing, and of course other signal masts further down the line.
- For this demo layout we will also need to place some dummy end of track signals to keep our trains from hitting the bumpers.

Tying it all together

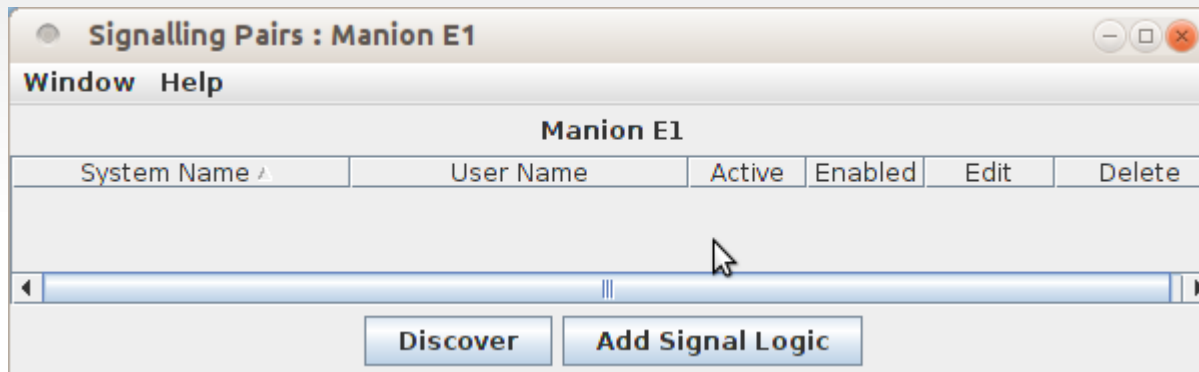
- I had trouble with the end of track signals. I finally used a 3 light dwarf.



- We use a 'Virtual Mast' because there is no actual signal at this point.
- We need four of them and will just duplicate it for all four places where the track dead ends. Just change the name each time.
- The issue was how to make sure it was always set to 'Stop Signal'. I solved that by adding signal mast logic that watches the ISCLOCKRUNNING sensor. It probably would be better to make another sensor to watch in case someone stops the clock.

Tying it all together

- To add the connections to our signal logic we can either right click on the signal's image, then select 'Signal Mast Logic:' or else you can open the 'Signal Masts' table and click on the 'Edit Logic' button for each mast.
- In either case a 'Signaling Pairs:' window will open.



- The Control Panel Editor does not currently do Automatic Block Routing, so the 'Discover' button is not useful to us. Click on the 'Add Signal Logic' button and we will add each signal pair manually.
- We will create a signal pair for each possible route from this signal to another signal further down the track. The 'next' signal in any pair is determined by the turnout positions (if any) along the Path from this signal to the next.

Tying it all together

- First select the destination (next along the route) mast for this pair. In this case even though we pass a turnout, there is just a single option, Cressman E1.

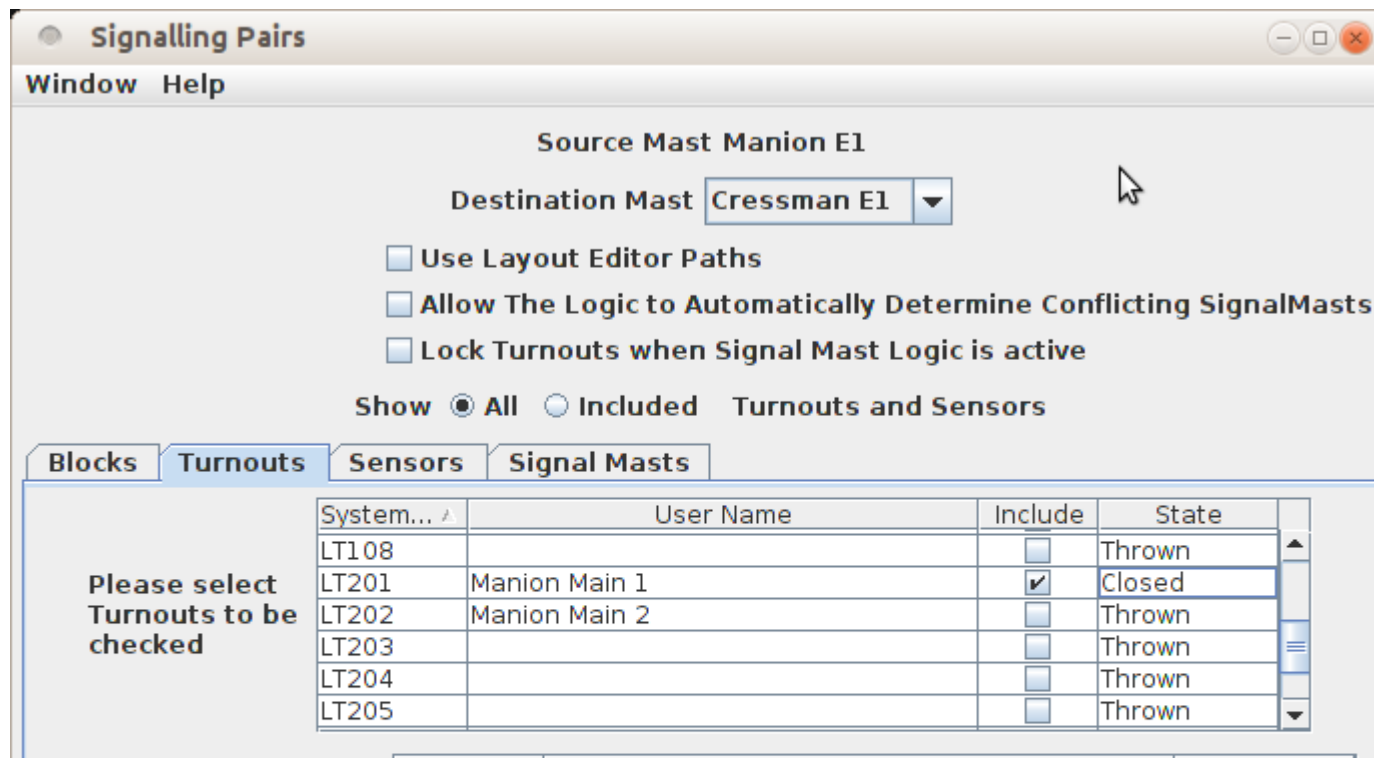
The screenshot shows a window titled "Signalling Pairs" with a menu bar containing "Window" and "Help". The main content area is titled "Source Mast Manion E1". Below this, there is a "Destination Mast" dropdown menu currently set to "Cressman E1". There are three unchecked checkboxes: "Use Layout Editor Paths", "Allow The Logic to Automatically Determine Conflicting SignalMasts", and "Lock Turnouts when Signal Mast Logic is active". Below these is a "Show" section with radio buttons for "All" (selected), "Included", and "Turnouts and Sensors".

At the bottom, there are four tabs: "Blocks", "Turnouts", "Sensors", and "Signal Masts". The "Blocks" tab is active, showing two tables. The top table is titled "Please select Blocks to be checked" and has columns: "System...", "User Name", "Include", "State", "Speed", and "Permissive". The bottom table is titled "These Blocks are auto generated and can not be changed" and has columns: "System...", "User Name", "State", "Speed", and "Permissive".

At the very bottom of the window is a button labeled "Update Signal Logic".

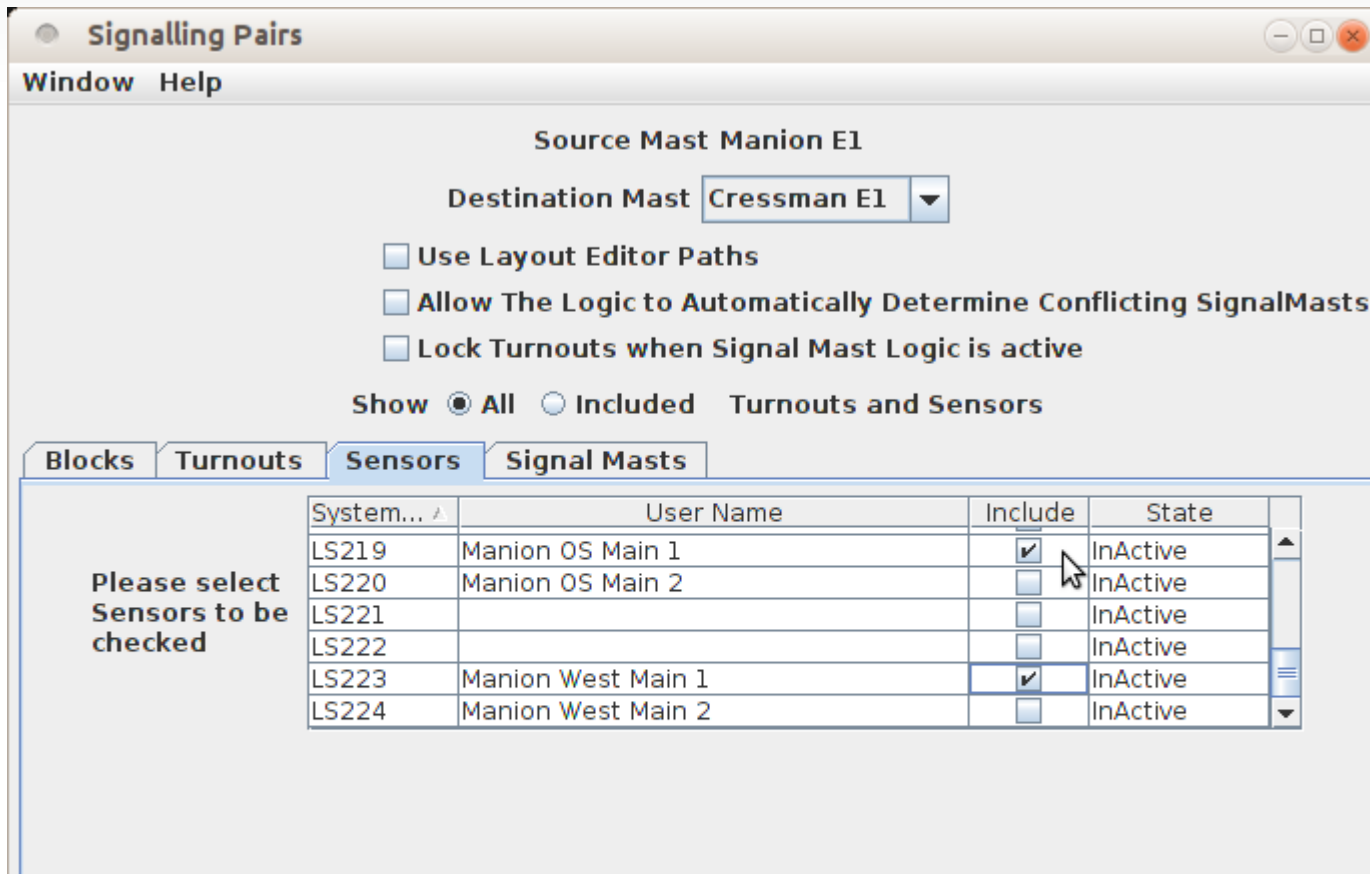
Tying it all together

- Open the 'Turnouts' tab. That will give you a list to select from. In this example the only turnout along the route is 'Manion Main 1'. Check the 'Include' box and set the state to the position that allows the train to follow the route to the next signal in the pair. In this case 'Closed' or straight through.
- The 'Included' radio button is useful once the selections have been made and you are trouble shooting, because it hides all the clutter and shows just the items of interest. (or not if it is missing)



Tying it all together

- In like manner include all the sensors and their required states that the train passes between the source mast and the destination mast. Click 'Update Signal Logic' to complete the entry.
- The 'Signal Masts' tab is only used for possible conflicting signals that are not a part of this pair. One example might be at a level crossing with another line. Its signals would need to be set to 'Stop' before this route could be cleared.

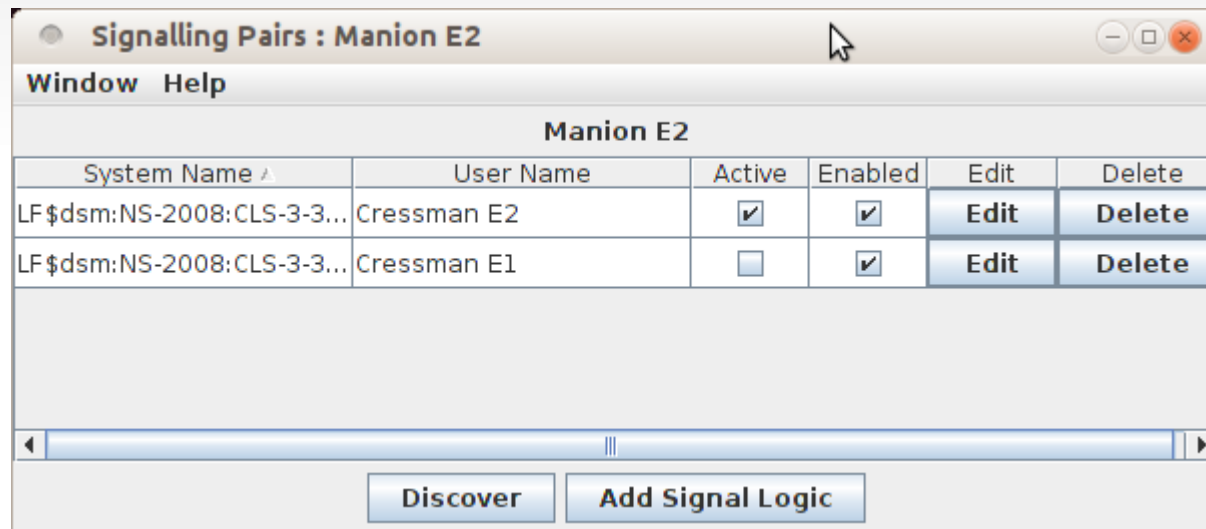


The screenshot shows the 'Signalling Pairs' software window. The 'Source Mast' is set to 'Manion E1' and the 'Destination Mast' is set to 'Cressman E1'. There are three unchecked checkboxes: 'Use Layout Editor Paths', 'Allow The Logic to Automatically Determine Conflicting SignalMasts', and 'Lock Turnouts when Signal Mast Logic is active'. The 'Show' options are 'All' (selected), 'Included', and 'Turnouts and Sensors'. The 'Sensors' tab is active, displaying a table with columns for 'System...', 'User Name', 'Include', and 'State'. A message on the left says 'Please select Sensors to be checked'. The table contains the following data:

System...	User Name	Include	State
LS219	Manion OS Main 1	<input checked="" type="checkbox"/>	InActive
LS220	Manion OS Main 2	<input type="checkbox"/>	InActive
LS221		<input type="checkbox"/>	InActive
LS222		<input type="checkbox"/>	InActive
LS223	Manion West Main 1	<input checked="" type="checkbox"/>	InActive
LS224	Manion West Main 2	<input type="checkbox"/>	InActive

Tying it all together

- The 'Manion E2' signal mast protects two possible routes, one straight through to the 'Cressman E2' signal, and the second via the crossover to the 'Cressman E1' signal.
- For this signal we will create two different signal pairs, one for each possible route. The 'Active' box contains a check mark for the currently active route.



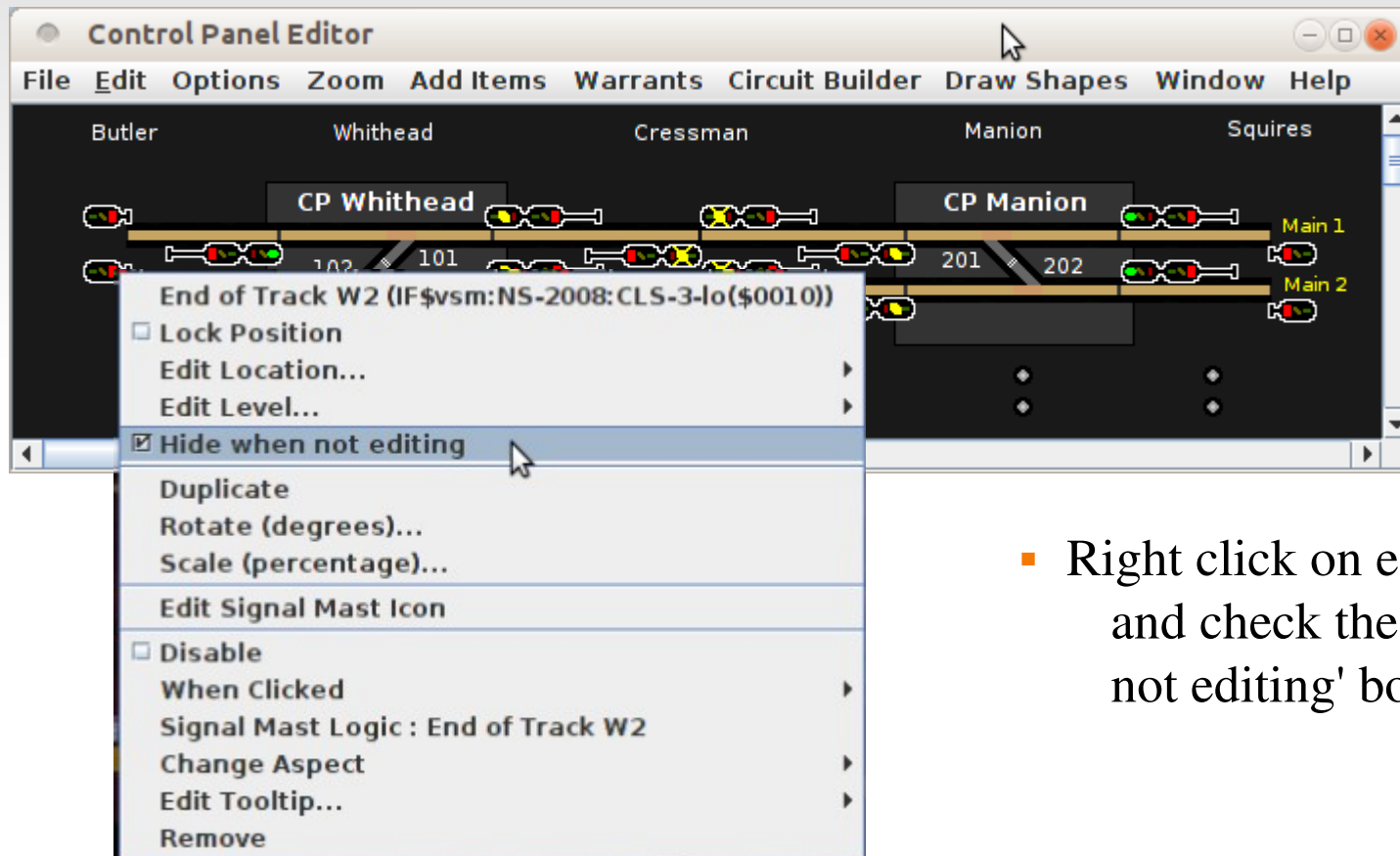
- We include both turnouts.
- We include all three sensors.

System...	User Name	Include	State
LT201	Manion Main 1	<input checked="" type="checkbox"/>	Thrown
LT202	Manion Main 2	<input checked="" type="checkbox"/>	Thrown

System...	User Name	Include	State
LS219	Manion OS Main 1	<input checked="" type="checkbox"/>	InActive
LS220	Manion OS Main 2	<input checked="" type="checkbox"/>	InActive
LS223	Manion West Main 1	<input checked="" type="checkbox"/>	InActive

Tying it all together

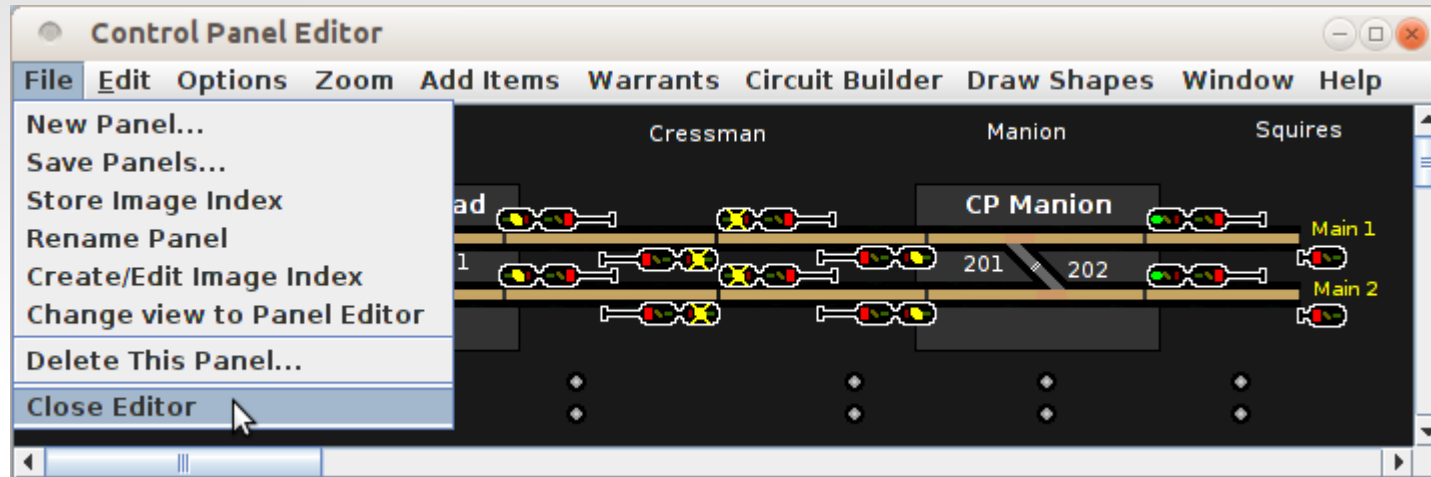
- Here we see the latest version of our panel. We can do one cosmetic trick by setting the end of track signals to not show when we are not in edit mode.



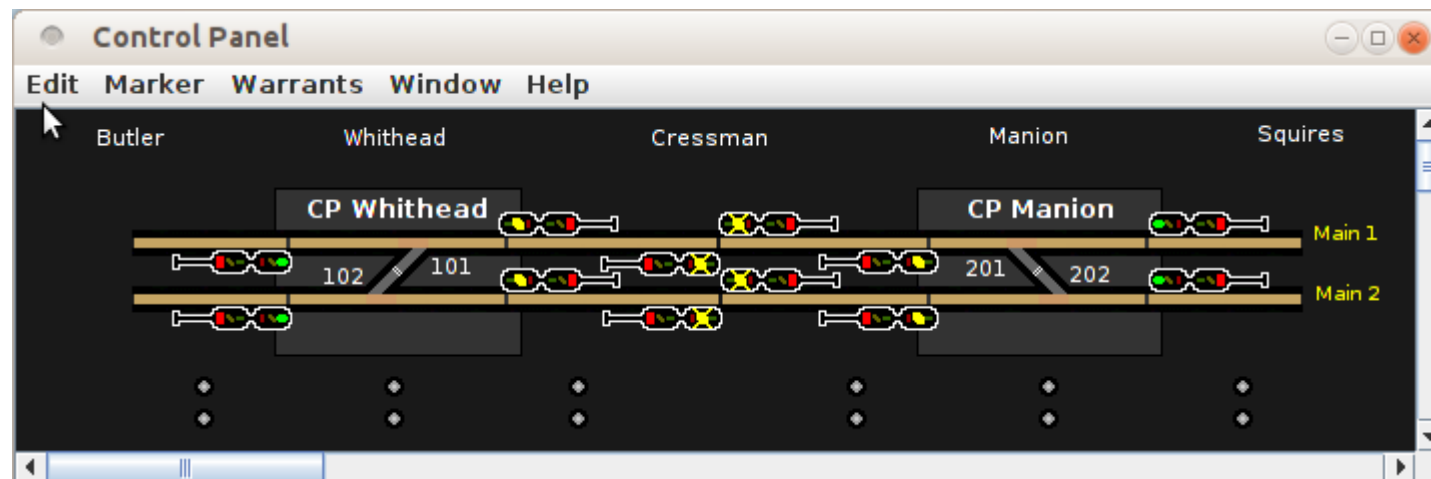
- Right click on each signal and check the 'Hide when not editing' box.

Tying it all together

- To close the editor click on the 'File' drop down list and choose 'Close Editor'.



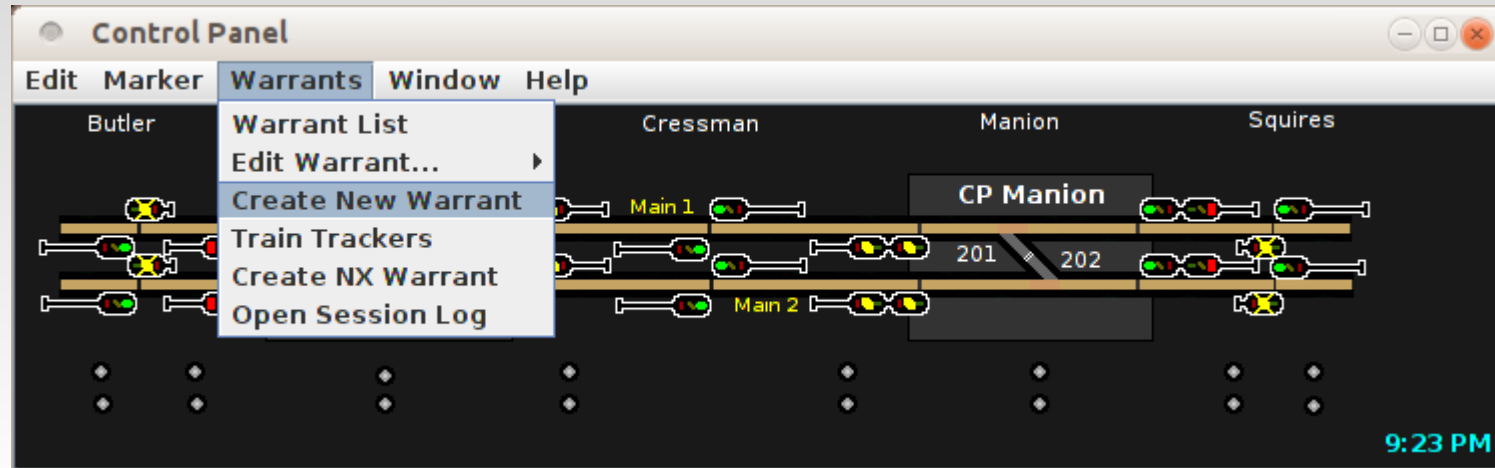
- Obviously we could do the same for all signals to make them invisible when not needed. You could copy and create a signal free panel for the purist visiting dispatcher.



Warrants

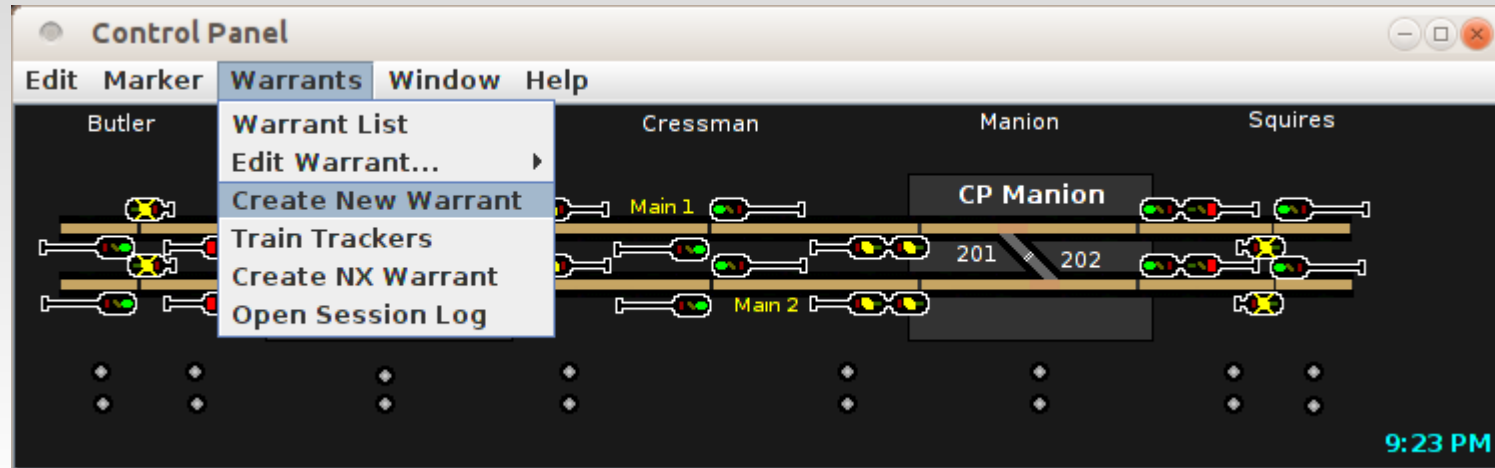
- A Warrant contains the information needed to run a train. This includes the DCC address of the locomotive(s), the route train will take, the settings of the turnouts needed to traverse the route and the throttle commands to use at various points along the route - e.g. speed, when to show lights, sound horns, ring bells, or other sound effects.
- NOTE: Warrants can only be created if the PanelPro configuration has at least two OBlocks defined.
- There are three steps in creating a warrant,
 - 1. Define the route.
 - 2. Select a train.
 - 3. Record the throttle commands.

Warrants

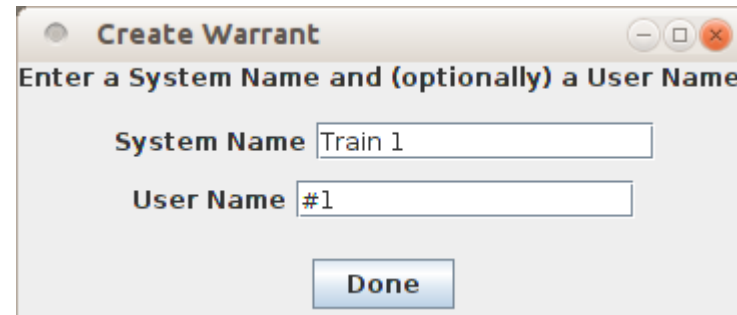


- To create a new Warrant Select 'Warrants' then click on 'Create New Warrant'.

Warrants



- To create a new Warrant Select 'Warrants' then click on 'Create New Warrant'.
- This opens a window where you enter the new Warrant's name. When finished click on the 'Done' button.



Warrants

#1

File Window Help

System Name IWTRAIN 1 User Name #1

Define Route Record/Playback Script

Originating Location

Block Name	Path Name	Exit Portal Name
Manion East Main 1	MA-SQ M1	Manion E1

Destination Location

Block Name	Entry Portal Name	Path Name
Whithead West Main 1	Whithead W1	BU-WH M1

Via Location

Block Name	Path Name

Avoid Location

Block Name	Path Name

Calculate Route

Calculate

Max Number of Blocks in Route: 20

Searching for Route

Stop

System Name	User Name
OBBU-M1	Butler Main 1
OBBU-M2	Butler Main 2
OBMA-E1	Manion East Main 1
OBMA-E2	Manion East Main 2
OBMA-OS-M1	Manion OS Main 1
OBMA-OS-M2	Manion OS Main 2
OBMA-W1	Manion West Main 1
OBMA-W2	Manion West Main 2
OBSQ-M1	Squires Main 1
OBSQ-M2	Squires Main 2
OBWH-E1	Whithead East Main 1
OBWH-E2	Whithead East Main 2
OBWH-OS-M1	Whithead OS Main 1
OBWH-OS-M2	Whithead OS Main 2
OBWH-W1	Whithead West Main 1
OBWH-W2	Whithead West Main 2

Save Copy Cancel Delete

- Start by dragging the Originating and Destination OBlocks from the selection list into their proper locations.

Warrants

#1

File Window Help

System Name IWTRAIN 1 User Name #1

Define Route Record/Playback Script

Originating Location

Block Name Path Name Exit Portal Name

Manion East Main 1 MA-SQ M1 Manion E1

Destination Location

Block Name Entry Portal Name Path Name

Whithead West Main 1 Whithead W1 BU-WH M1

Via Location

Block Name Path Name

Avoid Location

Block Name Path Name

Calculate Route

Calculate

Max Number of Blocks in Route

20

Searching for Route

Stop

System Name	User Name
OBBU-M1	Butler Main 1
OBBU-M2	Butler Main 2
OBMA-E1	Manion East Main 1
OBMA-E2	Manion East Main 2
OBMA-OS-M1	Manion OS Main 1
OBMA-OS-M2	Manion OS Main 2
OBMA-W1	Manion West Main 1
OBMA-W2	Manion West Main 2
OBSQ-M1	Squires Main 1
OBSQ-M2	Squires Main 2
OBWH-E1	Whithead East Main 1
OBWH-E2	Whithead East Main 2
OBWH-OS-M1	Whithead OS Main 1
OBWH-OS-M2	Whithead OS Main 2
OBWH-W1	Whithead West Main 1
OBWH-W2	Whithead West Main 2

Save Copy Cancel Delete

- Next click on 'Calculate'. There is only one way for the train to get there, so there are no reasons to use 'Via' or 'Avoid' locations.

Warrants

#1

File Window Help

System Name IWTRAIN 1 User Name #1

Define Route Record/Playback Script

Show Route Table Show Throttle Commands

Train Route

Block or Sensor Name	Entry Portal	Path	Exit Portal
Manion East Main 1		MA-SQ M1	Manion E1
Manion OS Main 1	Manion E1	MA M1	Manion W1
Manion West Main 1	Manion W1	CR-MA M1	Cressman M1
Whithead East Main 1	Cressman M1	WH-CR M1	Whithead E1
Whithead OS Main 1	Whithead E1	WH M1	Whithead W1
Whithead West Main 1	Whithead W1	BU-WH M1	

Choose Engine Consist

Train Name #1

Engine Roster 522

Address 522(L)

Learn Mode

Start

Stop

Run Train

Use block protection Run with blocks dark

AutoRun

Throttle Adjustment 1.0

Halt Resume Abort

Status: Idle

Save Copy Cancel Delete

- The program almost instantly calculates the route required.
- Select an engine from the roster. Edit the train name if desired.

Warrants

#1

File Window Help

System Name TRAIN 1 User Name #1

Define Route Record/Playback Script

Train Route

Block or Sensor Name	Entry Portal	Path	Exit Portal
Manion East Main 1		MA-SQ M1	Manion E1
Manion OS Main 1	Manion E1	MA M1	Manion W1
Manion West Main 1	Manion W1	CR-MA M1	Cressman M1
Whithead East Main 1	Cressman M1	WH-CR M1	Whithead E1
Whithead OS Main 1	Whithead E1	WH M1	Whithead W1
Whithead West Main 1	Whithead W1	BU-WH M1	

Show Route Table Show Throttle Commands

Choose Engine Consist

Train Name #1

Engine Roster 522

Address 522(L)

Learn Mode

Start

Stop

Run Train

Use block protection Run with blocks dark

AutoRun

Throttle Adjustment 1.0

Halt Resume Abort

Status: Idle

Save Copy Cancel Delete

- I used my loco 522 and called the train #1
- To generate a train script you can click on 'Start' then run your train manually on the selected route. The playback will include any throttle commands you include. (horn, bell, etc.)

Warrants

- Once you have saved a train script you can edit it to change timing etc. The train will follow restricting signals that it encounters along the way, even if they were not present during the initial recording session.
- Next go to the 'Warrants' drop down list and select 'Warrant List'.
- You can use this window to play back any existing Warrant recordings.

The screenshot shows a software window titled "Warrant Table" with a menu bar (File, Window, Help) and a "Warrant List" table. Below the table are several control buttons and input fields.

Warrant	Route	Train Name	Address	Allocate	Dealloc	Set	AutoR...	ManR...	Control/Status		
#1	Origin: Manion East Main 1	#1	522(L)	⊗	⊙	⊗	⊗	⊗	Warrant "#1" has no throttle commands.	Edit	Delete
#2	Origin: Whithead West Main 1	#2	522(L)	⊗	⊙	⊗	⊗	⊗	Idle	Edit	Delete

status

Create eNtry/eXit Warrant Halt All Trains Join Destination of Warrant A to Origin of Warrant B

 A: B:

Warrants

- A new addition to Warrants is the most amazing in my opinion. Simply click on the track diagram at the starting point, then again at the destination point. (and optionally at Via and Avoid)

Create eNtRy/eXit Warrant

Originating Location

Block Name: Path Name: Exit Portal Name:

Destination Location

Block Name: Entry Portal Name: Path Name:

Via Location

Block Name: Path Name:

Avoid Location

Block Name: Path Name:

Run Auto Run Manual

Max Speed: Address:

Min Speed: Train Name:

Forward Reverse

EStop at Destination Block Time(sec) between ramp speed changes:

Halt start at Origin Block Number of speed changes in ramp:

Max Number of Blocks in Route:

Warrants

- A new addition to Warrants is the most amazing in my opinion. Simply click on the track diagram at the starting point, then again at the destination point. (and optionally at Via and Avoid)
- Enter the engine number (Address) of the train. This is important for both auto or manual running.

The screenshot shows a window titled "Create eNtry/eXit Warrant" with the following sections:

- Originating Location:** Block Name: Whithead West Main 1; Path Name: BU-WH M1; Exit Portal Name: Whithead W1.
- Destination Location:** Block Name: Manion East Main 2; Entry Portal Name: Squires 2; Path Name: MA-SQ M2.
- Via Location:** Block Name: (empty); Path Name: (empty).
- Avoid Location:** Block Name: (empty); Path Name: (empty).
- Run Mode:** Run Auto, Run Manual.
- Speeds:** Max Speed: 0.5; Min Speed: 0.075.
- Address:** 522.
- Train Name:** (empty).
- Direction:** Forward, Reverse.
- Options:** EStop at Destination Block: ; Halt start at Origin Block: .
- Time(sec) between ramp spe** and **Number of speed changes in** (partially visible).
- Max Number of Blocks in Route:** 15.

Warrants

- A new addition to Warrants is the most amazing in my opinion. Simply click on the track diagram at the starting point, then again at the destination point. (and optionally at Via and Avoid)
- Enter the engine number (Address) of the train. This is important for both auto or manual running.
- Click on 'Run NX Warrant'.

Create eNtry/eXit Warrant

Originating Location

Block Name: Whithead West Main 1 | Path Name: BU-WH M1 | Exit Portal Name: Whithead W1

Destination Location

Block Name: Manion East Main 2 | Entry Portal Name: Squires 2 | Path Name: MA-SQ M2

Via Location

Block Name: | Path Name: |

Avoid Location

Block Name: | Path Name: |

Run Auto Run Manual

Max Speed: 0.5 | Address: 522
Min Speed: 0.075 | Train Name: |

Forward Reverse

EStop at Destination Block | Time(sec) between ramp speed changes: 4.0
Halt start at Origin Block | Number of speed changes in ramp: 8

Max Number of Blocks in Route: 15

Run NX Warrant | Cancel

Warrants

- We get the following error message.
- At first this puzzled me, but then I read it slowly and carefully. The first box says it starts at Whithead West Main 1 and exits to Whithead W1. That is correct.
- The second box says it is destined for Manion East Main 2 and comes from Squires 2. Oops, it is coming in from the wrong direction. I guess automation only gets you so far. <g>

The screenshot shows a software interface for creating a warrant. The main window is titled "Create eNtry/eXit Warrant" and contains two sections: "Originating Location" and "Destination Location".

Originating Location:

Block Name	Path Name	Exit Portal Name
Whithead West Main 1	BU-WH M1	Whithead W1

Destination Location:

Block Name	Entry Portal Name	Path Name
Manion East Main 2	Squires 2	MA-SQ M2

A "Warning" dialog box is overlaid on the main window. It contains the following text:

Warning

No Route found from "Whithead West Main 1" on path "BU-WH M1" exiting at "Whithead W1" and entering "Manion East Main 2" at "Squires 2" on path "MA-SQ M2" within 15 blocks.

Check that the Portals and Paths for exit and entry are correctly defined.

Show the search tree?

Yes No

Max Speed 0.5 Address 522
Min Speed 0.075 Train Name

Forward Reverse

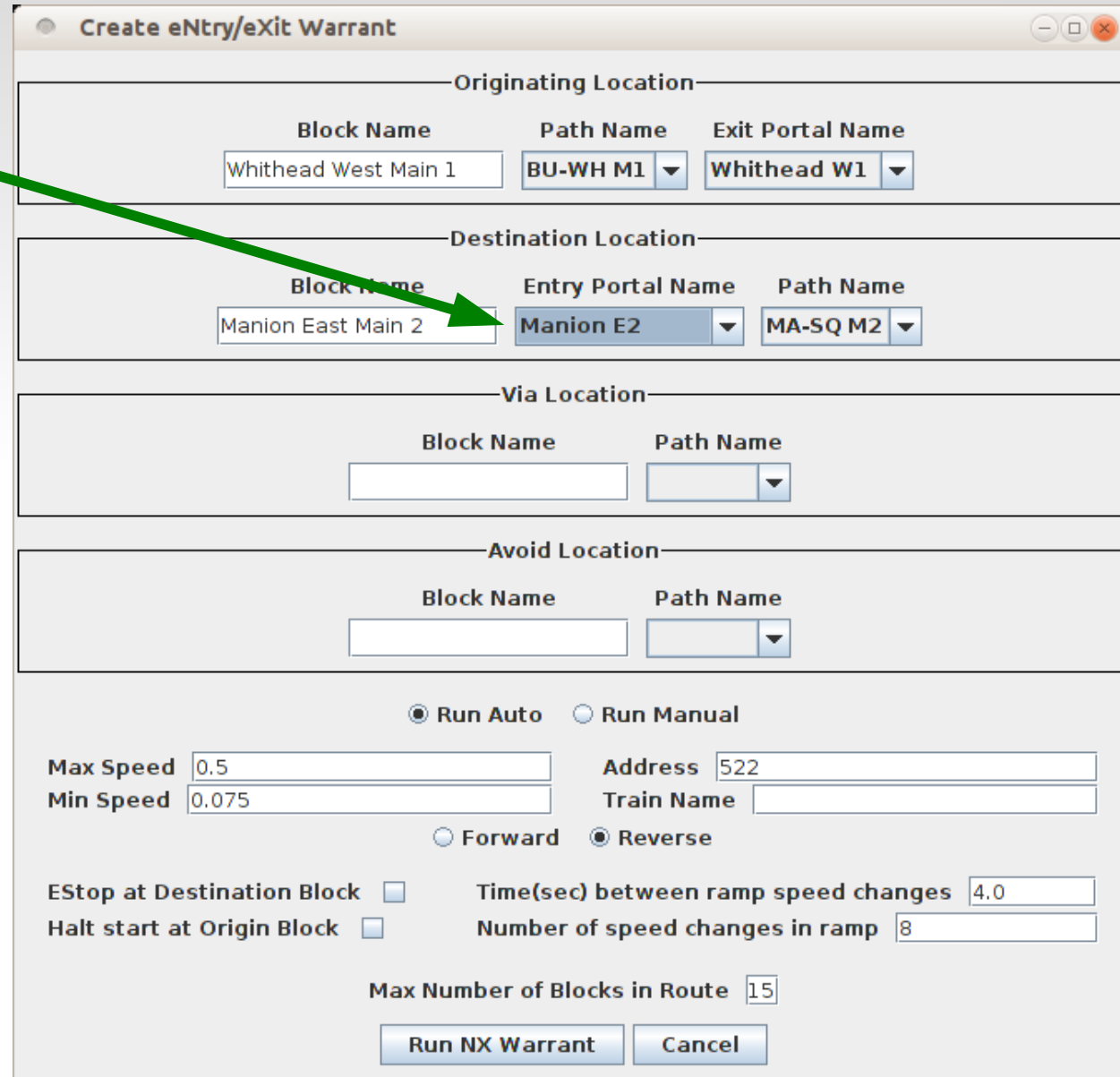
EStop at Destination Block Time(sec) between ramp speed changes 4.0
Halt start at Origin Block Number of speed changes in ramp 8

Max Number of Blocks in Route 15

Run NX Warrant Cancel

Warrants

- Correct the 'Entry Portal Name' and try again.



Create eNtry/eXit Warrant

Originating Location

Block Name	Path Name	Exit Portal Name
Whithead West Main 1	BU-WH M1	Whithead W1

Destination Location

Block Name	Entry Portal Name	Path Name
Manion East Main 2	Manion E2	MA-SQ M2

Via Location

Block Name	Path Name

Avoid Location

Block Name	Path Name

Run Auto Run Manual

Max Speed Address
Min Speed Train Name

Forward Reverse

EStop at Destination Block Time(sec) between ramp speed changes
Halt start at Origin Block Number of speed changes in ramp

Max Number of Blocks in Route

Warrants

- Correct the 'Entry Portal Name' and try again.
- Much better. The Warrant is assigned and the blocks are high lighted showing the route.

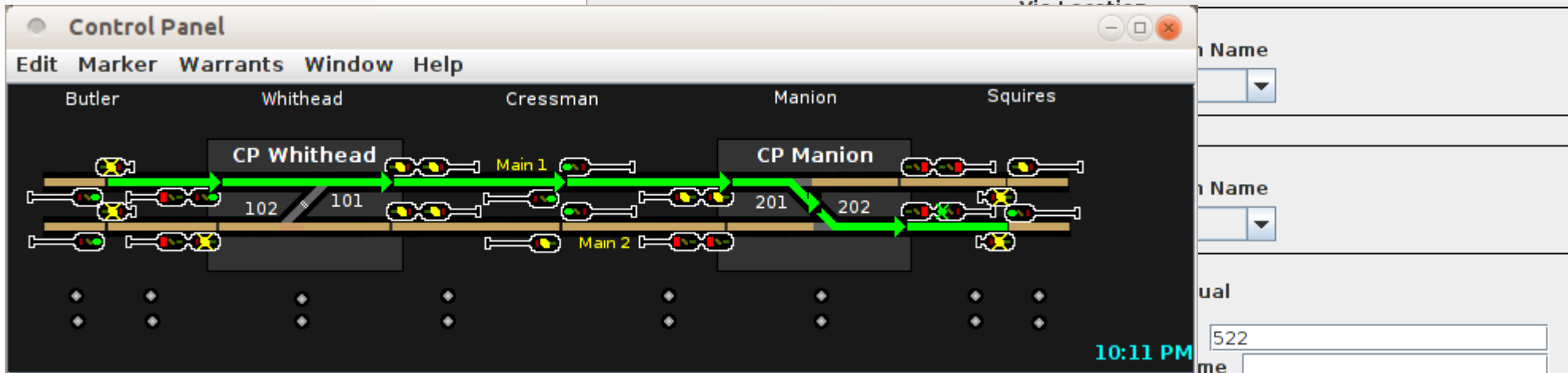
Create eNtry/eXit Warrant

Originating Location

Block Name	Path Name	Exit Portal Name
Whithead West Main 1	BU-WH M1	Whithead W1

Destination Location

Block Name	Entry Portal Name	Path Name
Manion East Main 2	Manion E2	MA-SQ M2



- The train can be run automatically or manually depending on the selections you made previously.

Forward Reverse

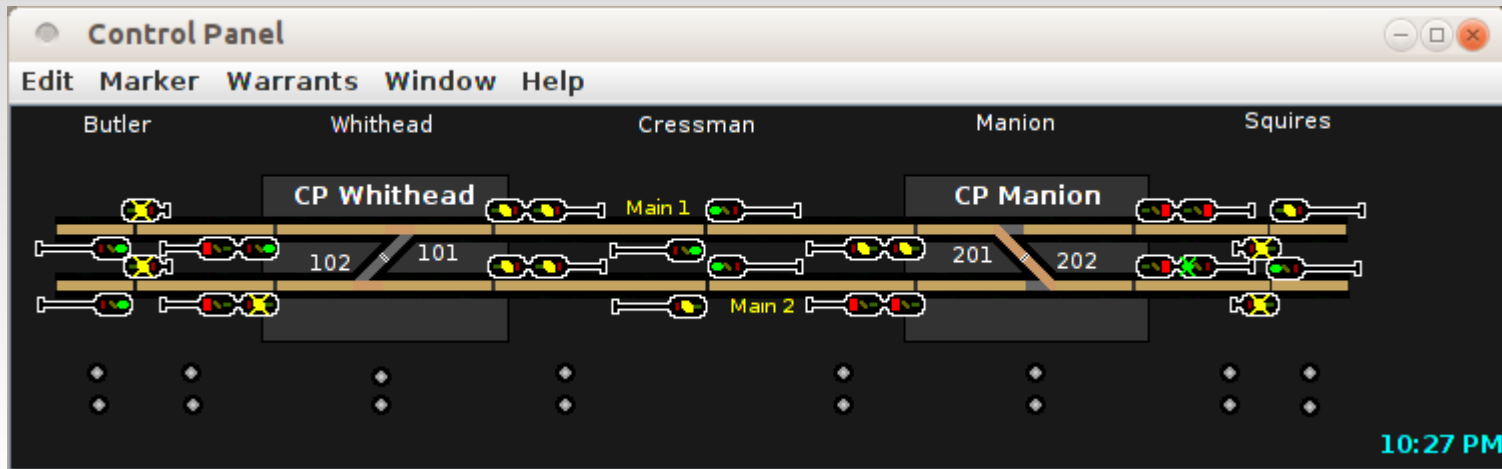
EStop at Destination Block Time(sec) between ramp speed changes 4.0

Halt start at Origin Block Number of speed changes in ramp 8

Max Number of Blocks in Route 15

Run NX Warrant Cancel

Warrants



- I added small clickable icons under each block section to let us play with the panel even without any layout attached.
- The turnouts are also 'clickable' to change them.

Warrants

Warrant Table

File Window Help

Warrant List

Warrant #	Route	Train Name	Address	Allocate	Dealloc	Set	AutoR...	ManRun	Control/Status	Edit	D...
#1	Origin: Manion East Main 1	#1	522(L)						Warrant "#1" has no throttle commands.	Edit	D...
#2	Origin: Whithead West Main 1	#2	522(L)						Idle	Edit	D...

status **Warrant "#2" not set for running.**

Create eNtry/eXit Warrant Halt All Trains Join Destination of Warrant A to Origin of Warrant B

 A: B:

- The Warrant List shows each train with a previously saved Warrant.
- Columns in the Warrant Table
 - Warrant: - The name of the warrant.
 - Route: - The route of the warrant is listed in a drop down combo box. (click to show route)
 - Train Name: - The Train Id, as stated in the Roster.
 - DCC Address: - The DCC Address of the locomotive or consist.
 - Allocate: - A button that reserves the route for the warrant.
 - Deallocate: - A button that removes the reservation for the warrant.
 - Set: - A button the sets the turnouts for the warrant route.

Warrants

Warrant #	Route	Train Name	Address	Allocate	Dealloc	Set	AutoR...	ManRun	Control/Status	Edit	D...
#1	Origin: Manion East Main 1	#1	522(L)						Warrant "#1" has no throttle commands.	Edit	D...
#2	Origin: Whithead West Main 1	#2	522(L)						Idle	Edit	D...

status **Warrant "#2" not set for running.**

Create eNtry/eXit Warrant Halt All Trains Join Destination of Warrant A to Origin of Warrant B

 A: B:

- Columns in the Warrant Table Continued.

- AutoRun: - A button that runs the train over the route according to the automated throttle commands. The recorded speed of the train will be modified according to the occupancy and signal aspects encountered on the route. Be sure the train is in its origin block!
- ManRun: - A button to assign the train to an engineer for manual operation.
- Control/Status: - The status of the warrant is shown. It also has a drop down combo box that can send the following commands to a running train. Note: This column has two functions - Status messages and control buttons.
 - Halt, Resume, Retry and Abort commands to an automated running train.
- Edit: - A button that opens an editing window for the warrant,
- Delete: - A button that deletes the warrant.

Warrants

Warrant Table

File Window Help

Warrant List

Warrant ^	Route	Train Name	Address	Allocate	Dealloc	Set	AutoR...	ManRun	Control/Status		
#1	Origin: Manion East Main 1	#1	522(L)						Warrant "#1" has no throttle commands.	Edit	D...
#2	Origin: Whithead West Main 1	#2	522(L)						Idle	Edit	D...

status **Warrant "#2" not set for running.**

Create eNtry/eXit Warrant Halt All Trains Join Destination of Warrant A to Origin of Warrant B

 A: B:

- Join – This box allows you to create a new Warrant by concatenating two existing Warrants. Of course you must be sure that the second one continues from where the first one left off running.

Warrants

- A new addition to Warrants is welcome in my opinion. Click on the 'Generate NX Warrant' button.
- Click on an originating and destination block into the 'Create Quick Warrant' list. (or type them in)
- Add a locomotive address and choose a speed and direction for it to run. (important point)
- Click on 'Run NX Warrant'

Create eNtry/eXit Warrant

Originating Location

Block Name	Path Name	Exit Portal Name
Whithead West Main 1	BU-WH M1	Whithead W1

Destination Location

Block Name	Entry Portal Name	Path Name
Manion East Main 2	Manion E2	MA-SQ M2

Via Location

Block Name	Path Name

Avoid Location

Block Name	Path Name

Run Auto Run Manual

Max Speed Address
Min Speed Train Name

Forward Reverse

EStop at Destination Block Time(sec) between ramp speed changes
Halt start at Origin Block Number of speed changes in ramp

Max Number of Blocks in Route

Warrants

- A new addition to Warrants is welcome in my opinion. Click on the 'Generate NX Warrant' button.
- Click on an originating and destination block into the 'Create Quick
- A
- C
- If the calculated path includes optional routes, then you will be asked to choose one.
- You can click the 'Review' to see the details of your choice before you select it.

Create eNtry/eXit Warrant

Originating Location

Block Name Whithead West Main 1	Path Name BU-WH M1 ▼	Exit Portal Name Whithead W1 ▼
------------------------------------	-------------------------	-----------------------------------

Destination Location

Possible Routes

Block or Sensor Name	Entry Portal	Path	Exit Portal
Manion East Main 2		MA-SQ M2	Manion E2
Manion OS Main 2	Manion E2	MA M2	Manion W2
Manion West Main 2	Manion W2	CR-MA M2	Cressman M2
Whithead East Main 2	Cressman M2	WH-CR M2	Whithead E2
Whithead OS Main 2	Whithead E2	WH M2	Whithead W2
Whithead West Main 2	Whithead W2	BU-WH M2	

2 routes found. Review and Select the one you want to use.

Route 1 traverses 5 blocks.

Route 2 traverses 7 blocks.

Run Auto Run Manual

Max Speed <input style="width: 50px;" type="text" value="0.5"/>	Address <input style="width: 50px;" type="text" value="522"/>
Min Speed <input style="width: 50px;" type="text" value="0.075"/>	Train Name <input style="width: 50px;" type="text" value="#3"/>

Forward Reverse

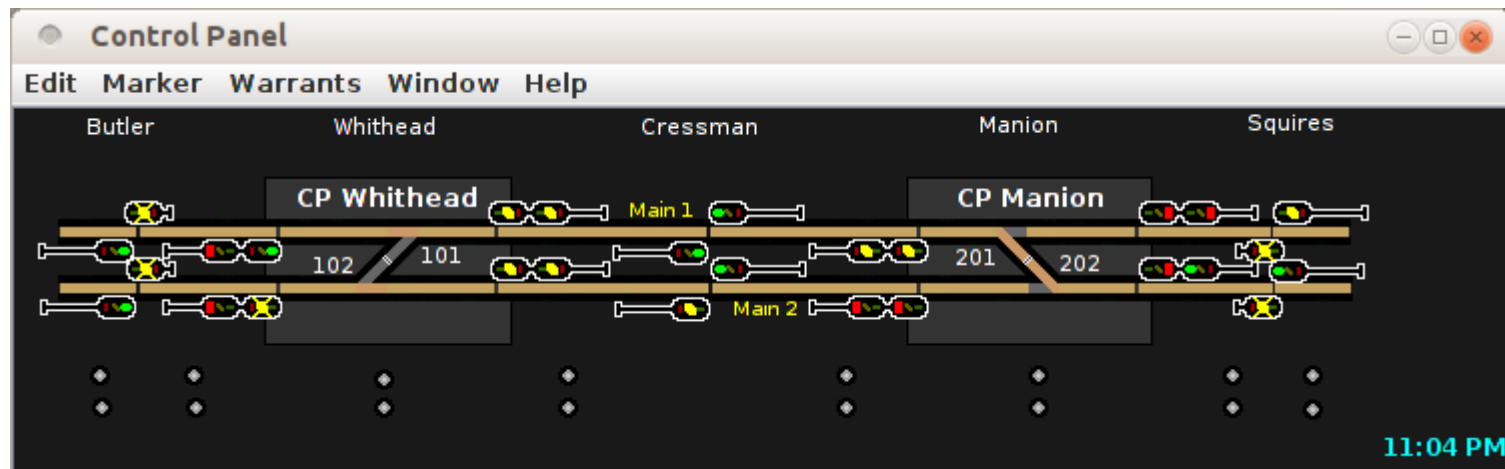
EStop at Destination Block Time(sec) between ramp speed changes

Halt start at Origin Block Number of speed changes in ramp

Max Number of Blocks in Route

Warrants

- The demo layout is not setup well for running warrants because it has no stopping blocks other than the block adjacent to the interlocking. When the Warrant enters a block with an 'Approach' signal it slows down and stops.
- On the original demo layout the 'Approach' signal was displayed before the crossover section. This causes the train to slow and stop before it even clears the opposing signals, so it will not start in the reverse direction.
- We have added an additional block in either direction to solve this. When preparing a layout for automatic running be sure to allow for these additional stopping sections. (e.g. At the end of your automated staging tracks.)



Questions

- ?