Add Signals to your Layout with JMRI/PanelPro

Dick Bronson - RR-CirKits, Inc.

Further Clinics in this series:

- Create a Detailed CTC Machine Model with JMRI/PanelPro

  10:00 PM, Monday, July 6th

- Introduction to Layout Control with JMRI/PanelPro

  - This Clinic is a Repeat 4:00 PM, Friday, July 10th

SSL (Simple Signal Logic)

- SSL is the PanelPro name for ABS signaling.
  - According to Wikipedia **Automatic Block Signal**, or **ABS**, systems consist of a series of signals that govern blocks of track between the signals. The signals are automatically activated by the conditions of the block beyond the signal. Signals in ABS territory do not just denote occupancy. Signals in ABS territory denote the most restricted indication. ... Train crews that operate under ABS, often operate with track warrants or traffic control.
  - Only **CTC** systems are considered sufficient authority to run trains based strictly on signal indications. This is because CTC signals default to 'Stop' and require a dispatcher to 'Clear' them.

SSL (Simple Signal Logic)

- SSL basics
  - ABS defaults to '**Clear**' signals, and drops to '**Stop**' if the block immediately beyond the signal is occupied, or if the switch (turnout) beyond the signal is set against the direction of traffic.

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  - Therefore ABS requires input information for track occupancy and for switch position.

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  - Therefore ABS requires input information for track occupancy and for switch position.
  - ABS also shows a limited speed indication called '**Approach**' if the next signal beyond this signal is showing 'Stop'. This is a warning to the train crew to *approach* the next signal prepared to 'Stop' before they reach it.

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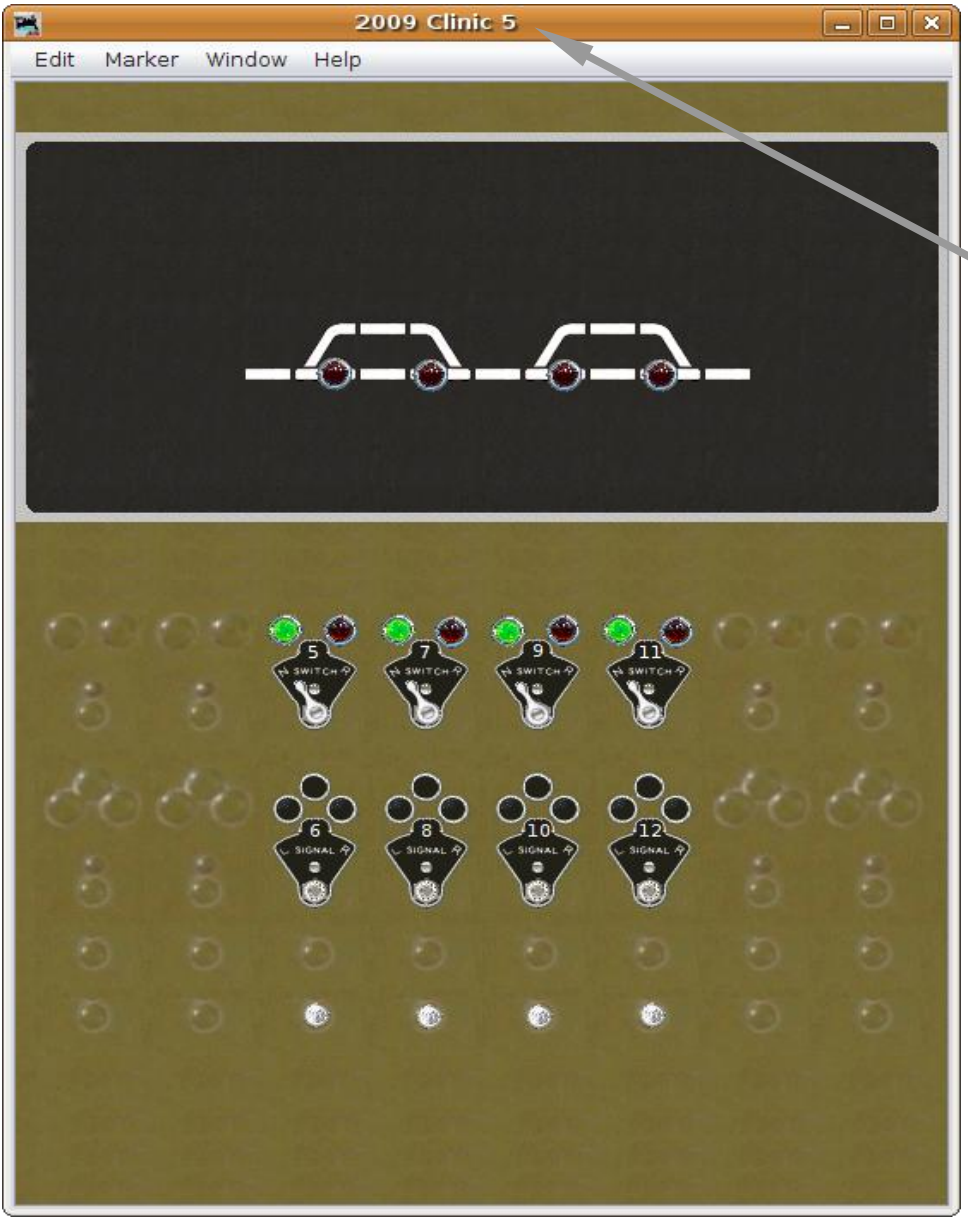
  - Therefore ABS requires input information for track occupancy and for switch position.
  - ABS also shows a limited speed indication called '**Approach**' if the next signal beyond this signal is showing 'Stop'. This is a warning to the train crew to *approach* the next signal prepared to 'Stop' before they reach it.
  - If the signals are close, or trains long, some systems would give a double warning using a flashing signal.

SSL (Simple Signal Logic)

- SSL basics
  - In some cases a signal at the block boundary may not be visible due to terrain, tunnels, buildings, etc. In that case a slave or '**Distant**' signal could be used as a 'heads up'. In SSL checking the 'Is Distant Signal' will tie a signal to the next (Protected) signal and show the most restrictive setting of either signal.
  - **Approach Lighting**. In the earlier days of signaling it was common to have signals turn out their lamps if there were no trains approaching them in order to save lamp life and battery power. Now that most signals are utility powered this is less common. Most modelers ignore this feature because a series of dark signals is not very interesting to onlookers.

SSL (Simple Signal Logic)



- SSL basics
  - Open our new 2009Clinic4.xml panel.
  - Save it as 2009Clinic5.xml

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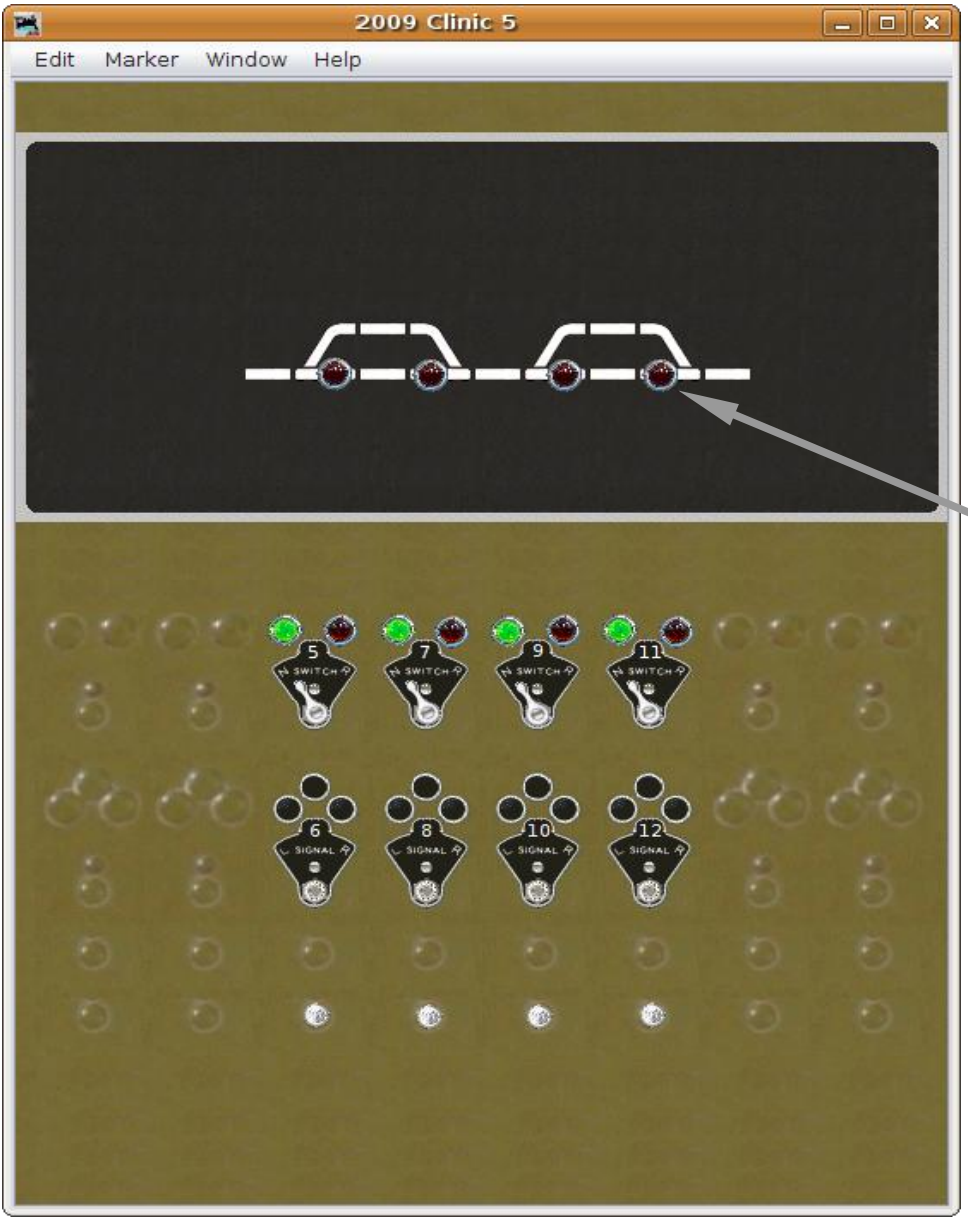

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  - We already have occupancy sensors for our OS sections.

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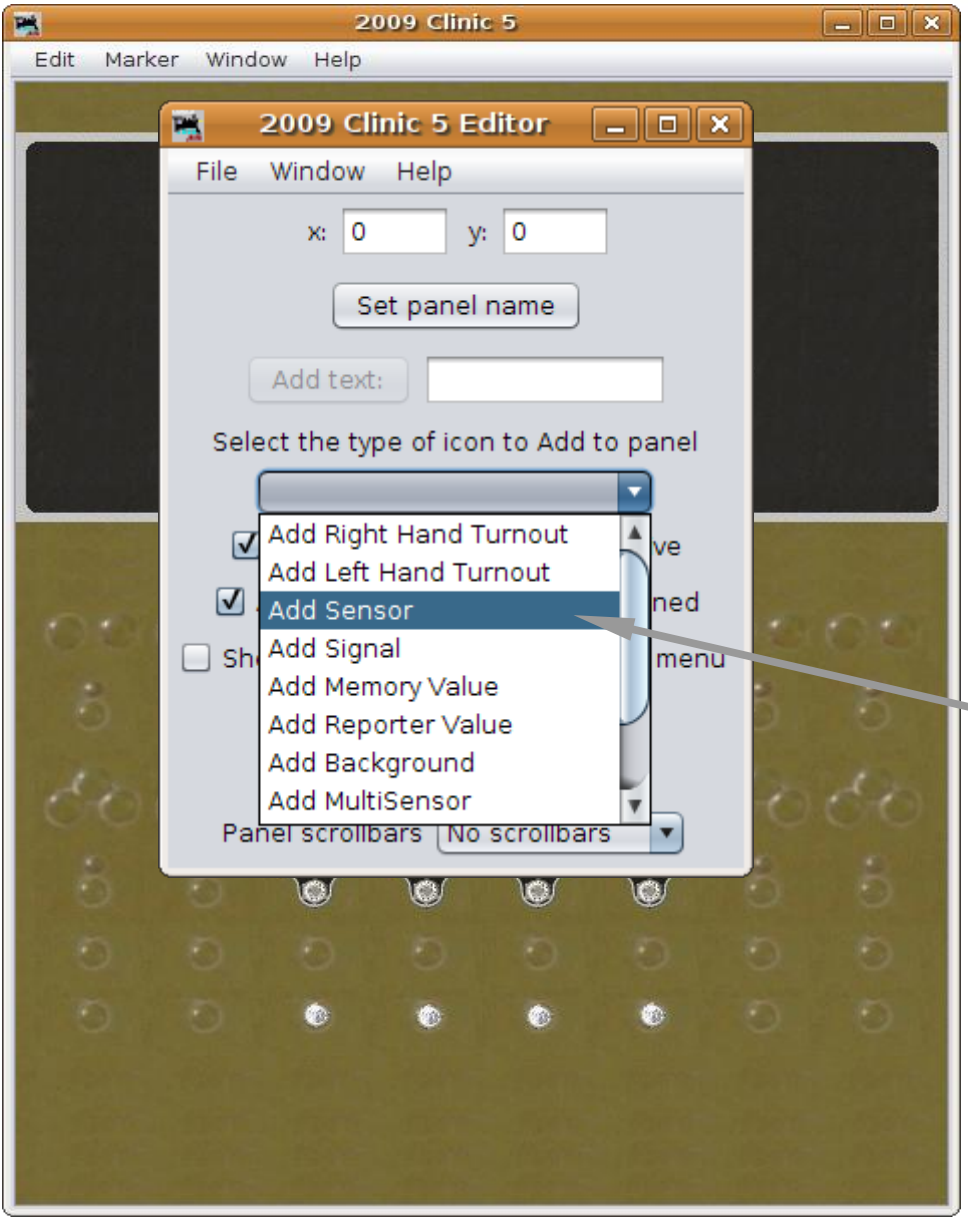

- SSL basics
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  - We already have occupancy sensors for our OS sections.
  - Add our block sensors.

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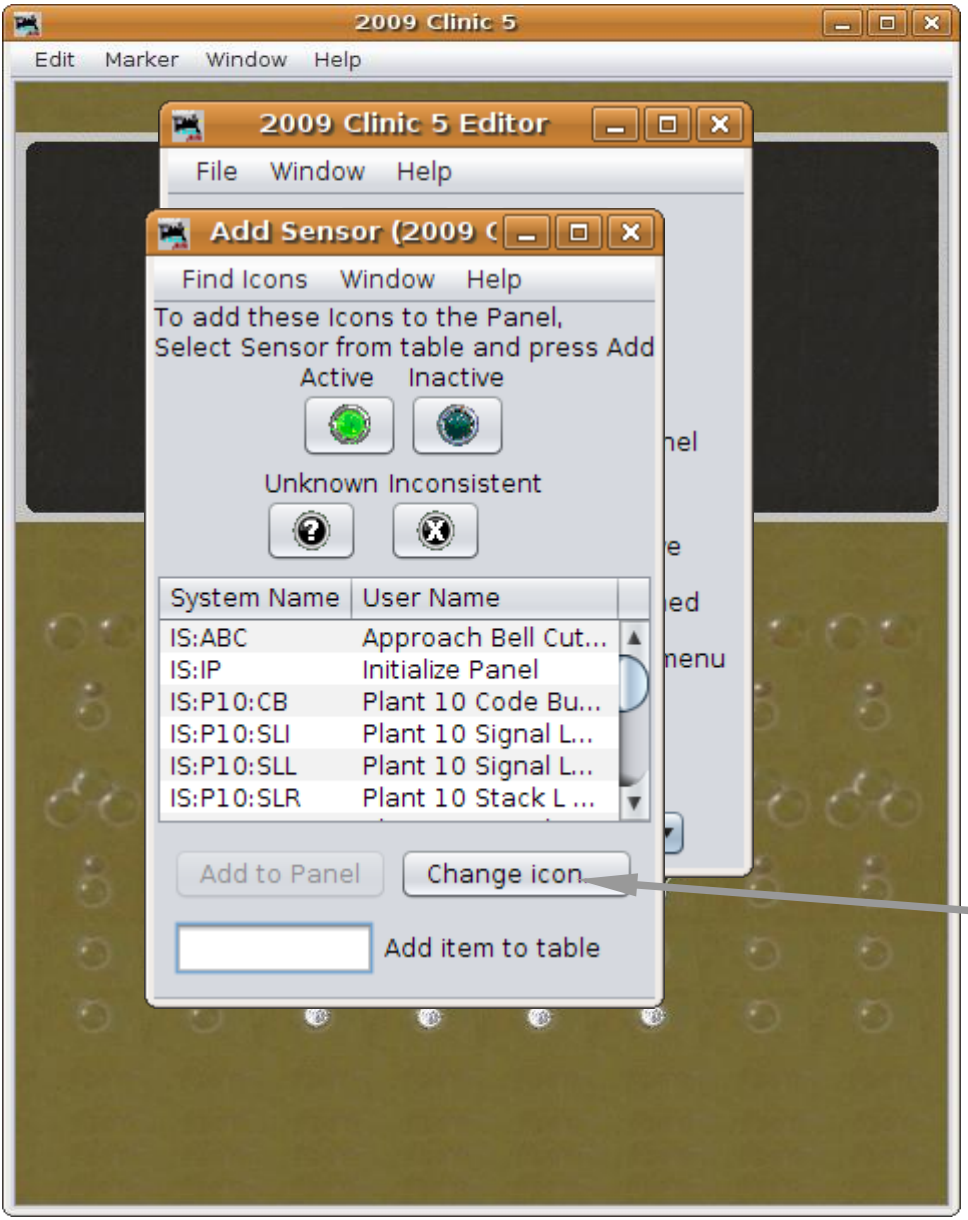

- SSL basics
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  - The US&S default was white jewels for track. We will do the same.

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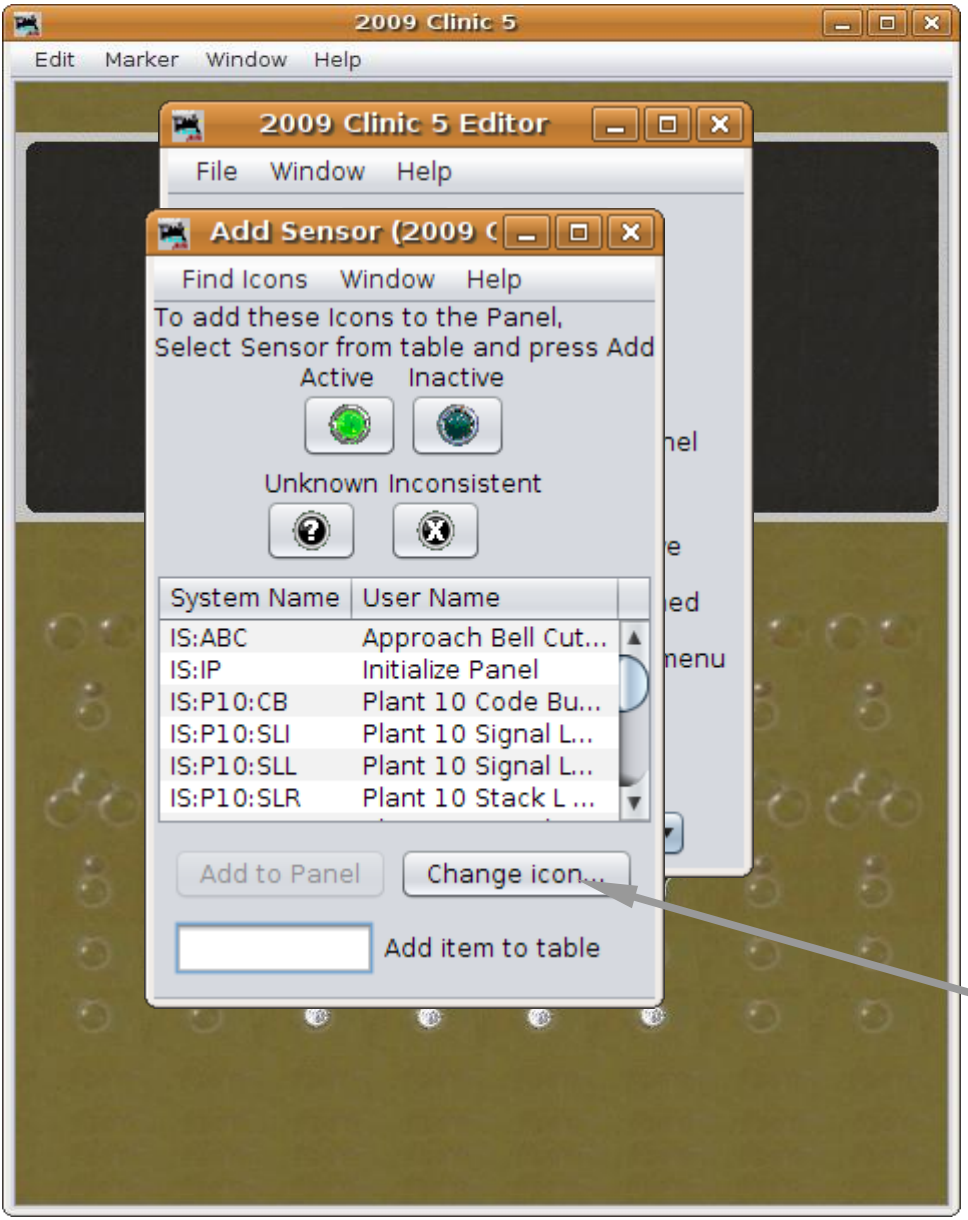

- SSL basics
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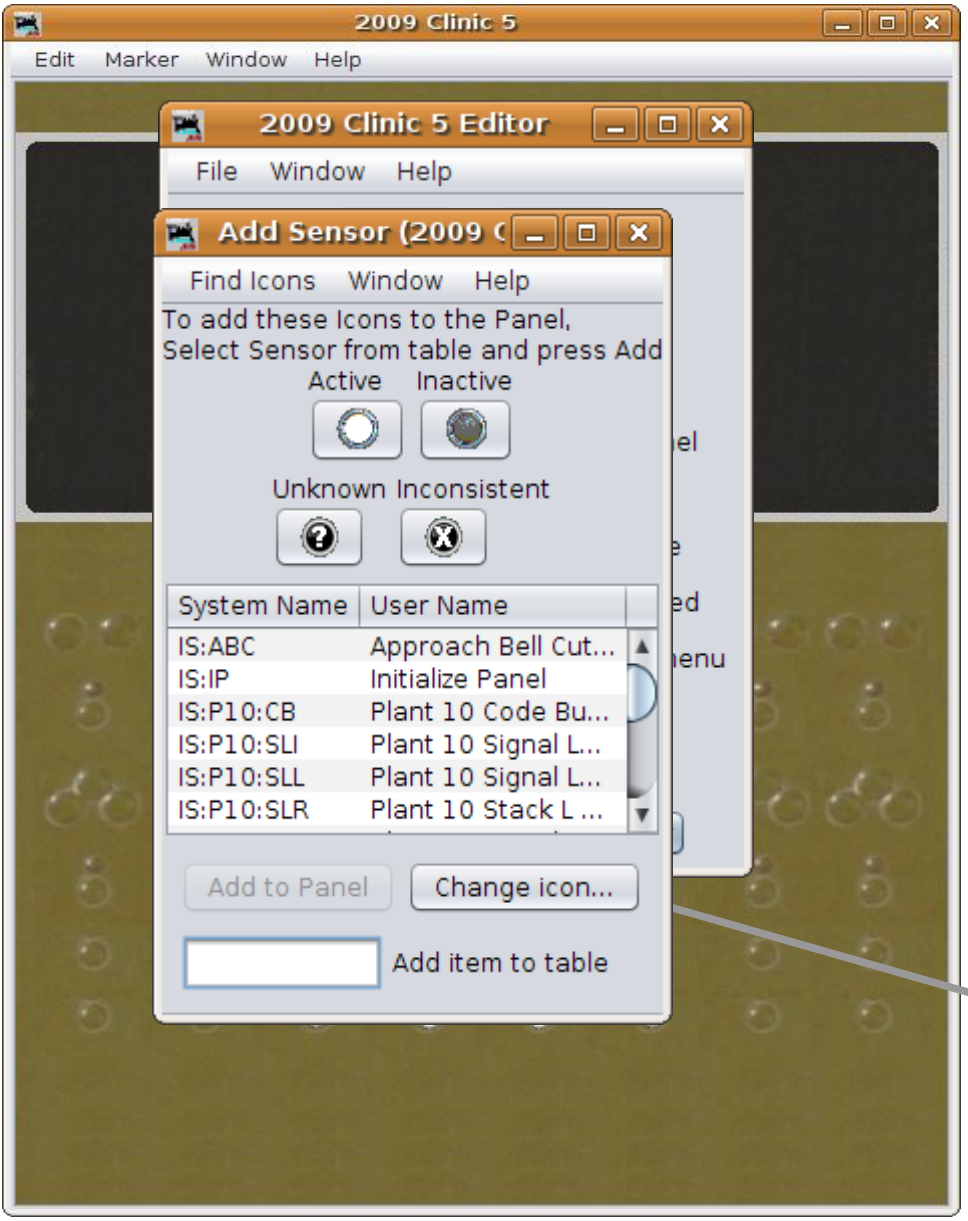
  - We already have occupancy sensors for our OS sections.
  - Add our block sensors.
  - The US&S default was white jewels for track. We will do the same. Click 'Change icon...'

SSL (Simple Signal Logic)

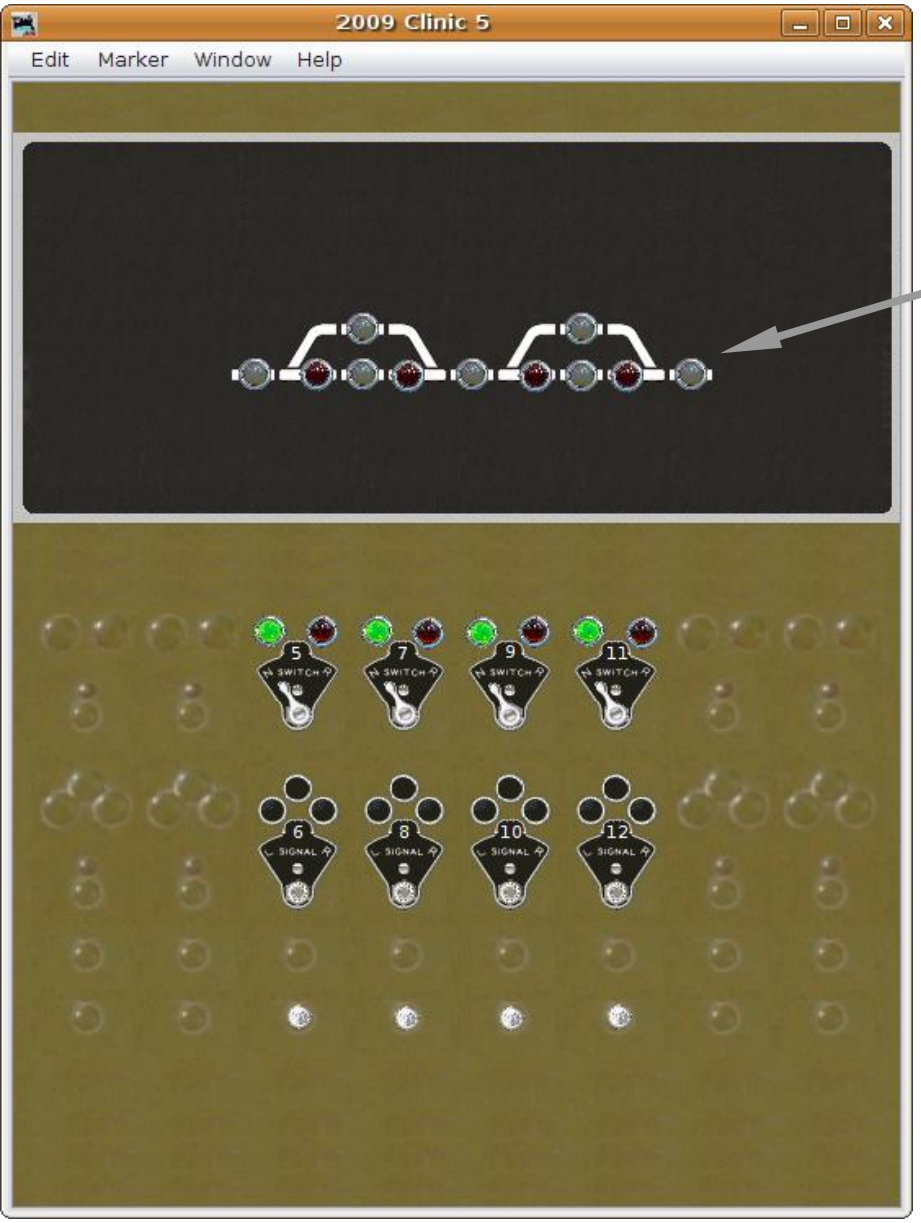


- SSL basics
  - We need to add:

IS4:TK
IS6:TBK
IS6:TAK
IS8:TK
IS10:TBK
IS10:TAK
IS12:TK

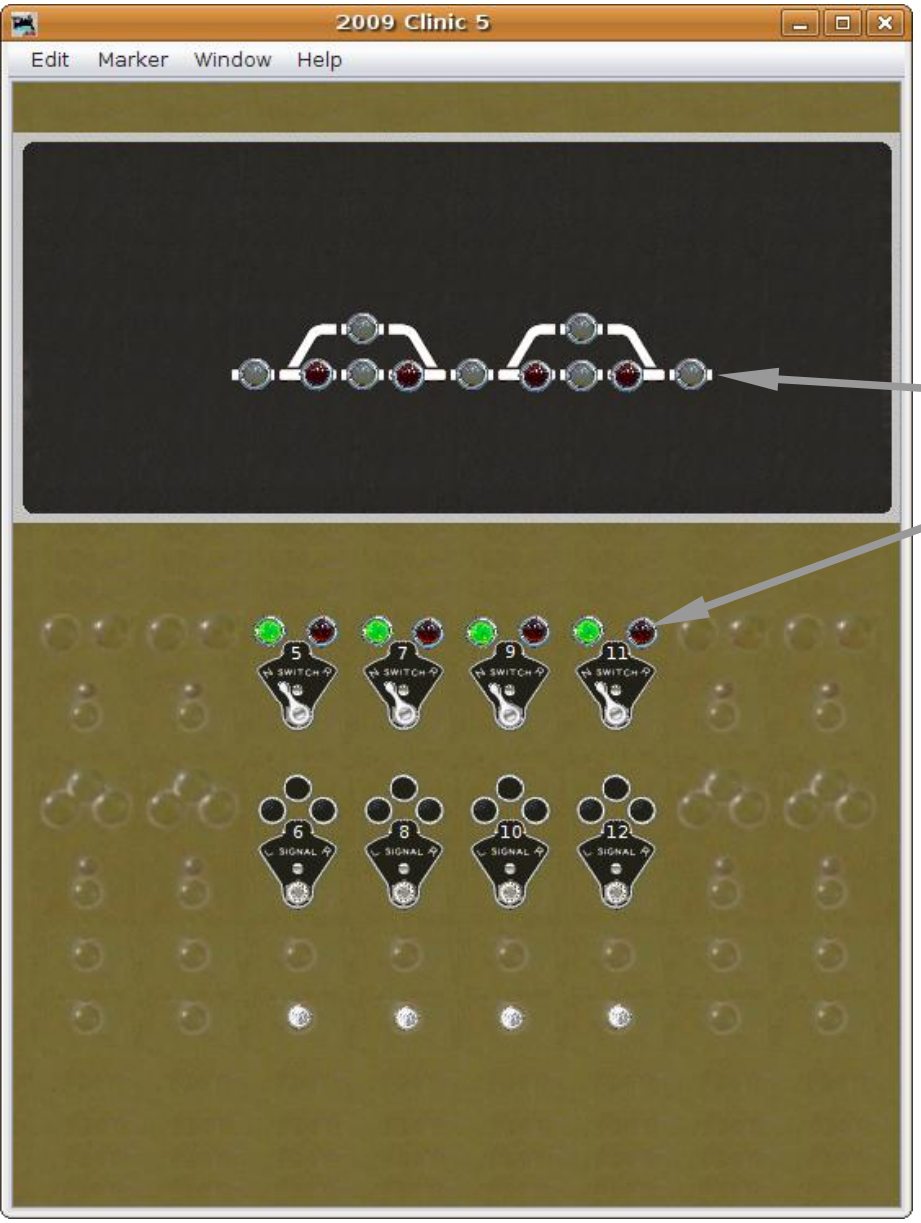
T=**T**rack
A=Track **A**
B=Track **B**
K=indi**K**tor

SSL (Simple Signal Logic)



- SSL basics
  - Position each new sensor image where appropriate.

SSL (Simple Signal Logic)



- SSL basics
  - Position each new sensor image where appropriate.
  - We now have sufficient information from the layout to add our signals. (occupancy plus switches)

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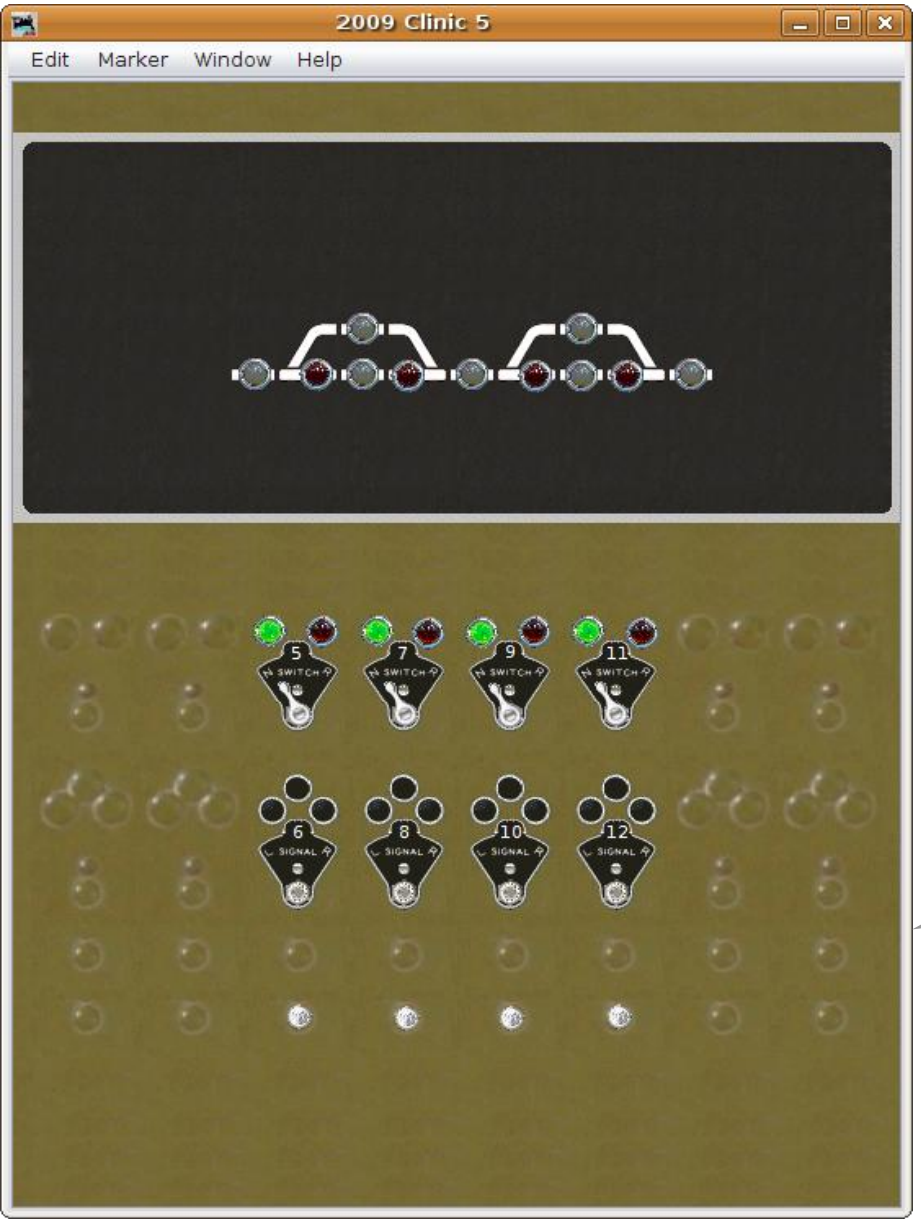
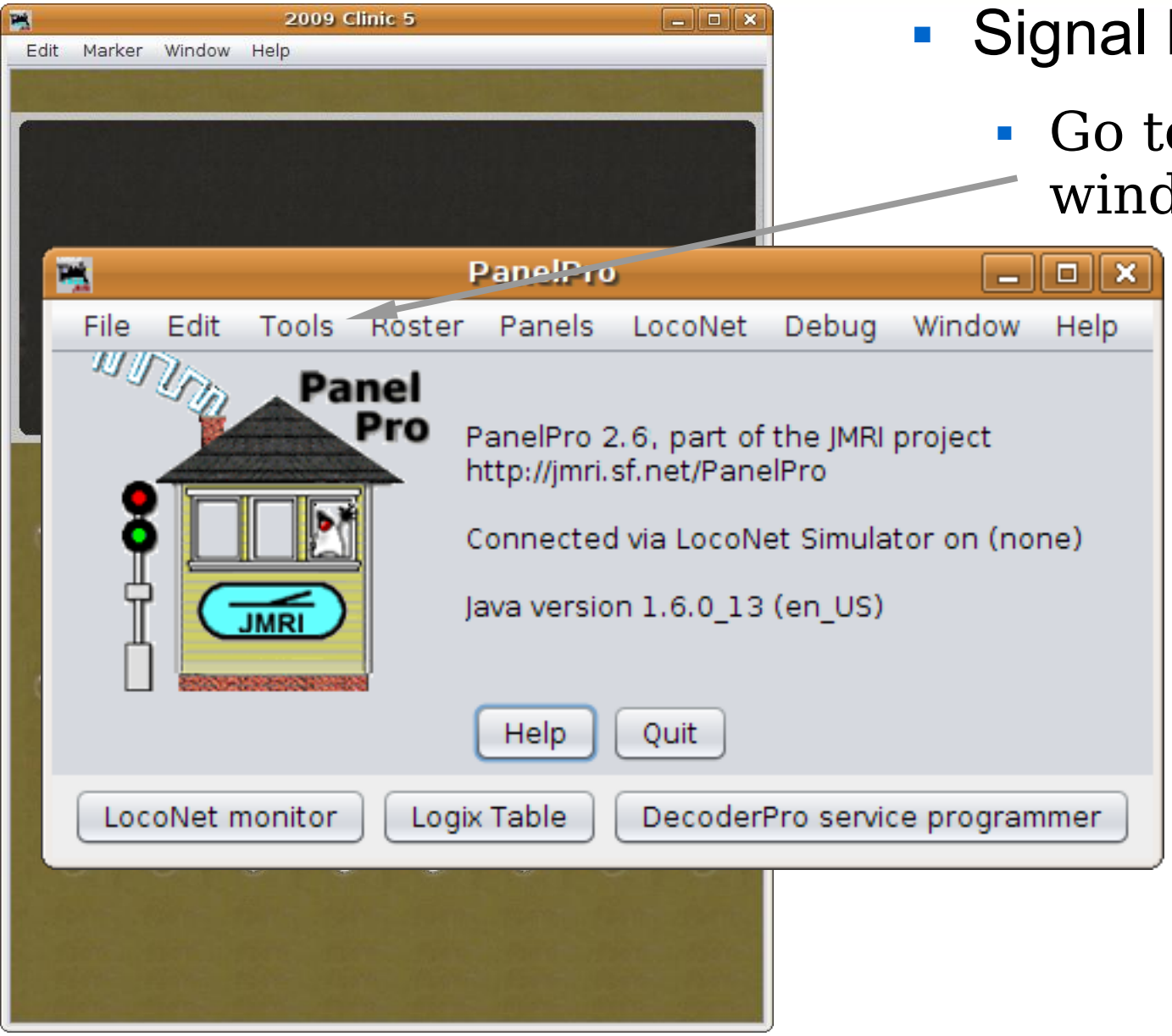


- SSL basics
  - Position each new sensor image where appropriate.
  - We now have sufficient information from the layout to add our signals. (occupancy plus switches)
  - Actually an ABS system would not have a central panel like we are creating here. We are only making the panel to more easily understand the way the JMRI system operates.

SSL (Simple Signal Logic)



- Signal head basics
  - Go to the PanelPro window and select 'tools'.

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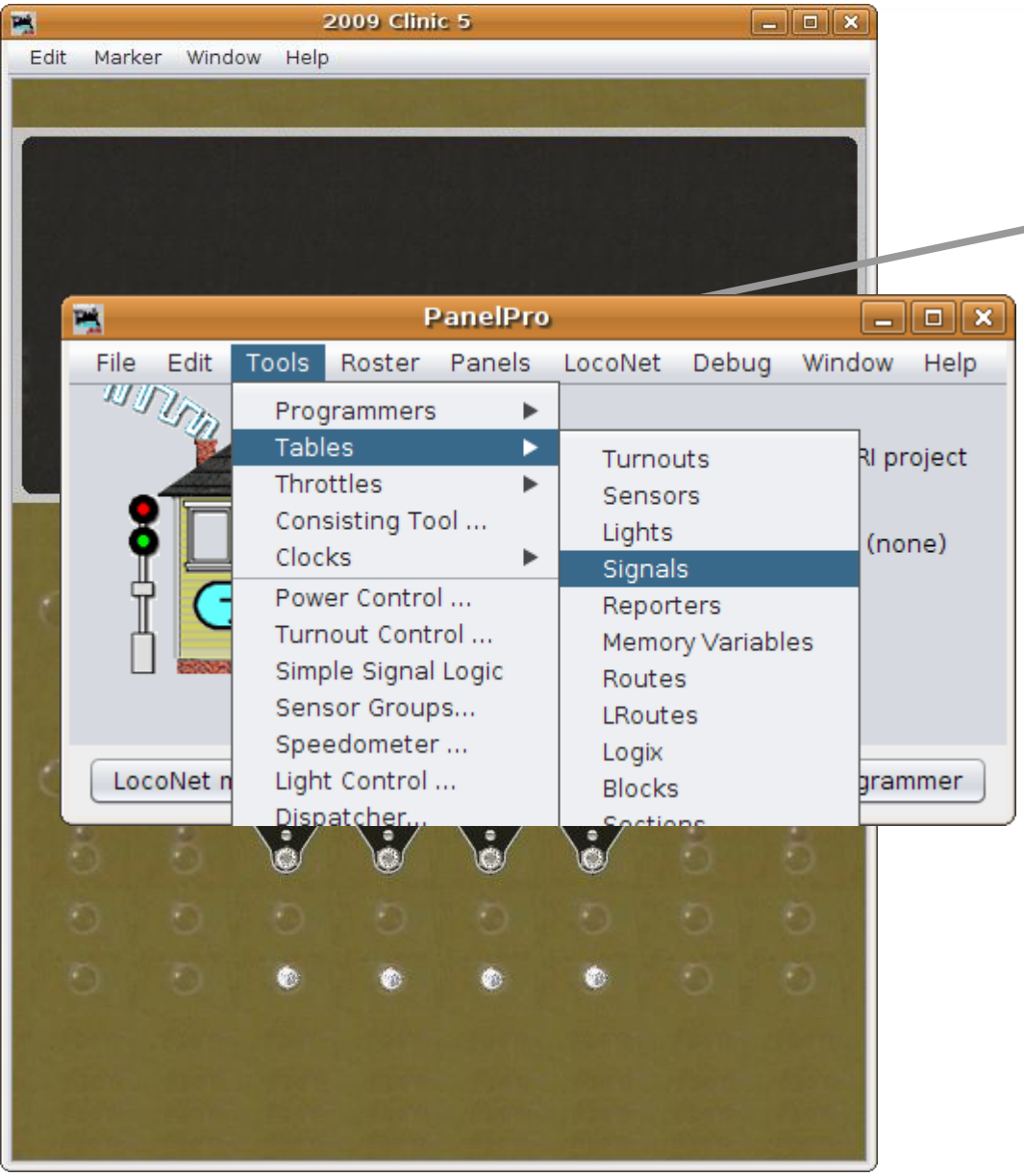

- Signal head basics
  - Go to the PanelPro window and select 'tools'.
  - Navigate to 'Tables' – 'Signals' and click to open the 'Signal Table'.

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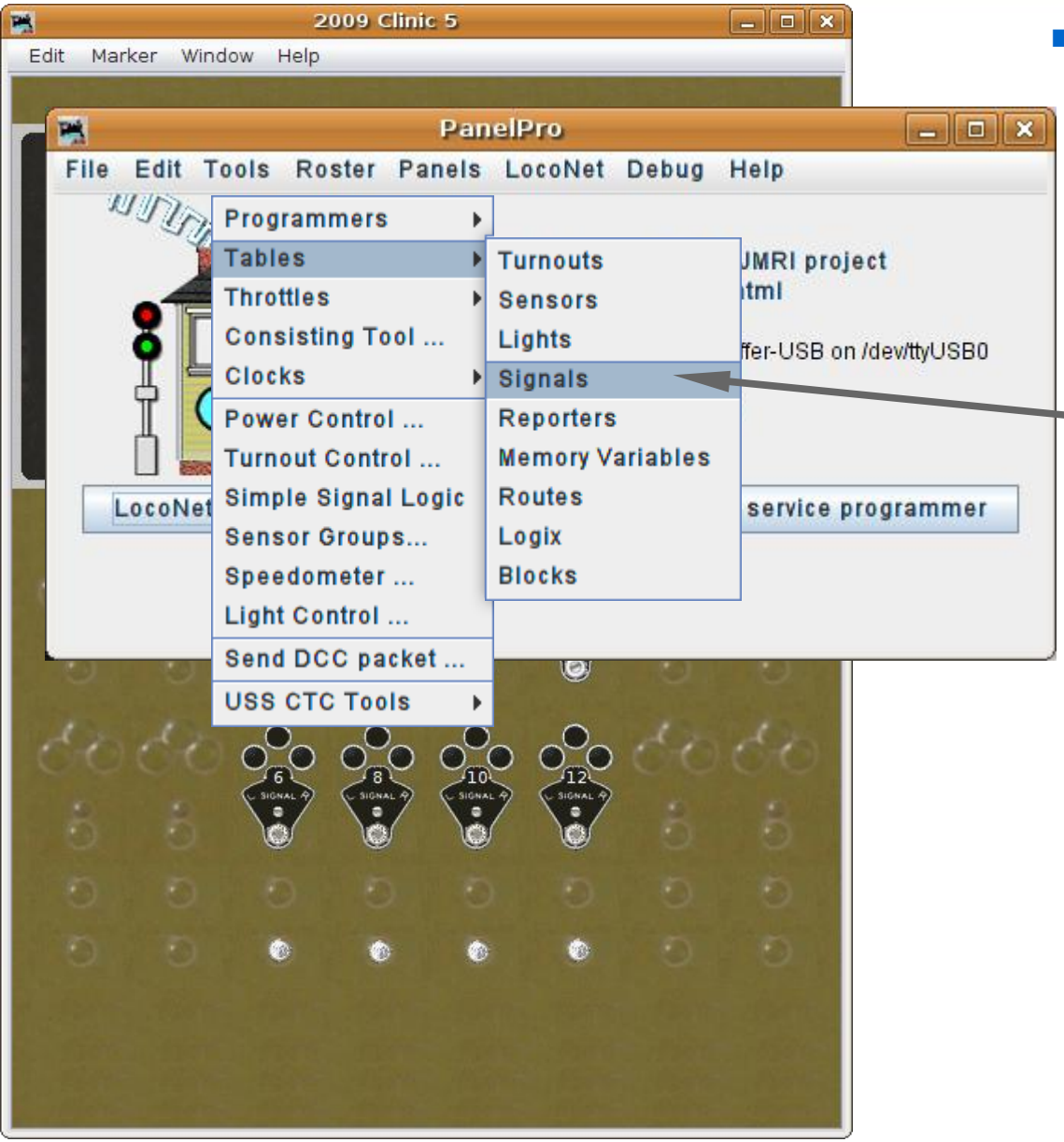

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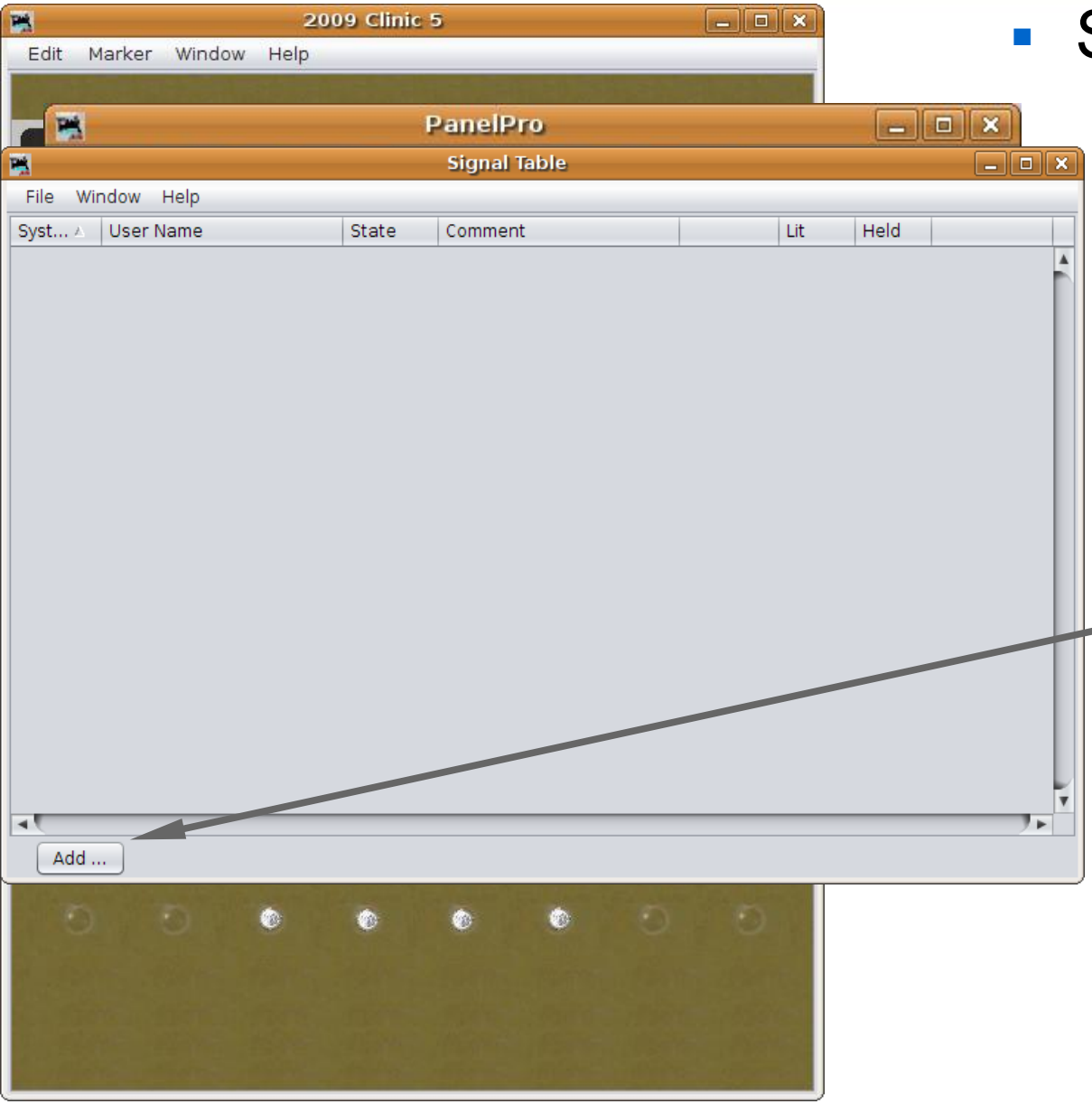

- Signal head basics
  - Go to the PanelPro window and select 'tools'.
  - Navigate to 'Tables' – 'Signals' and click to open the 'Signal Table'.
  - Click 'Add ...' to add new signal heads.

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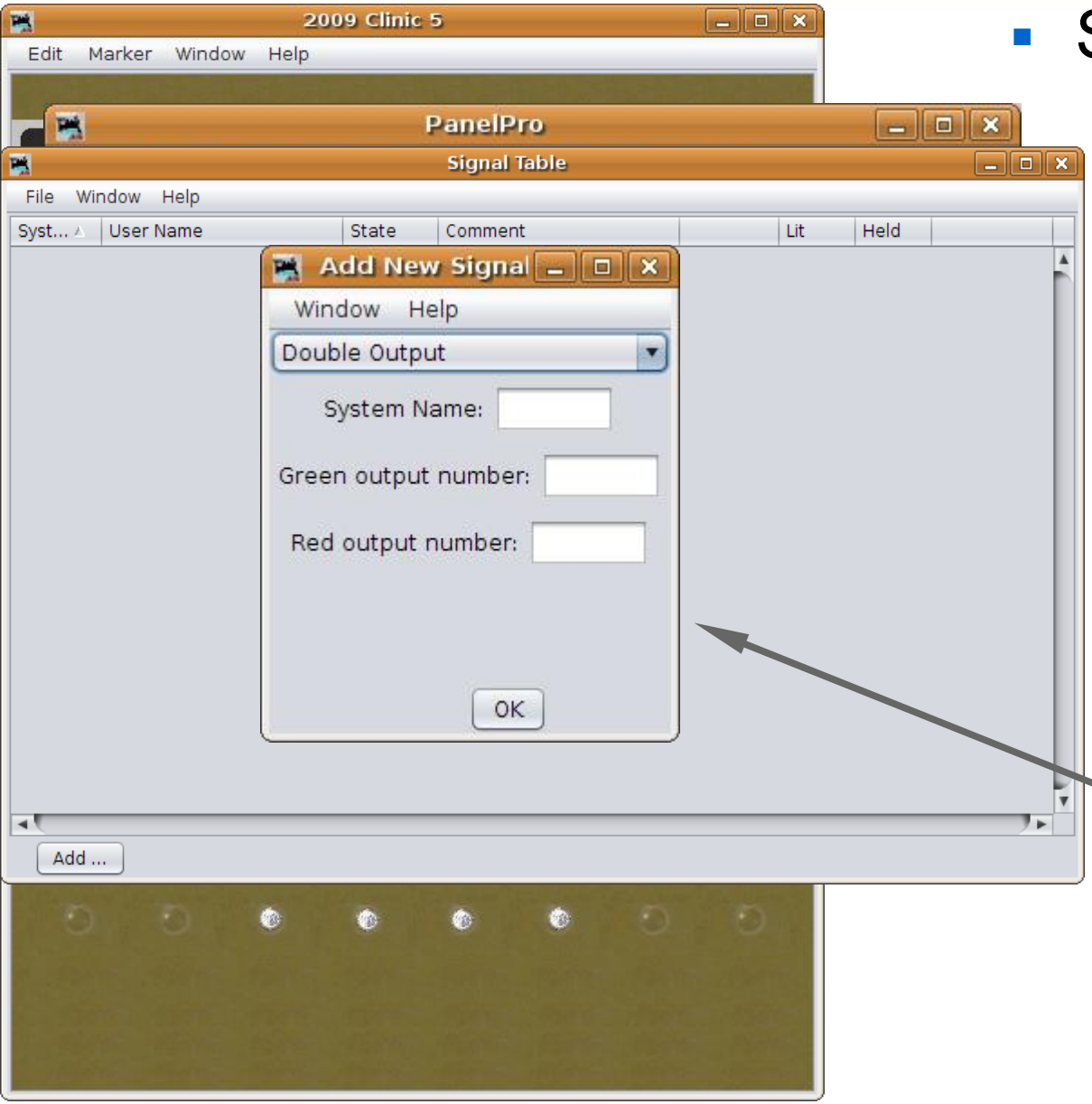
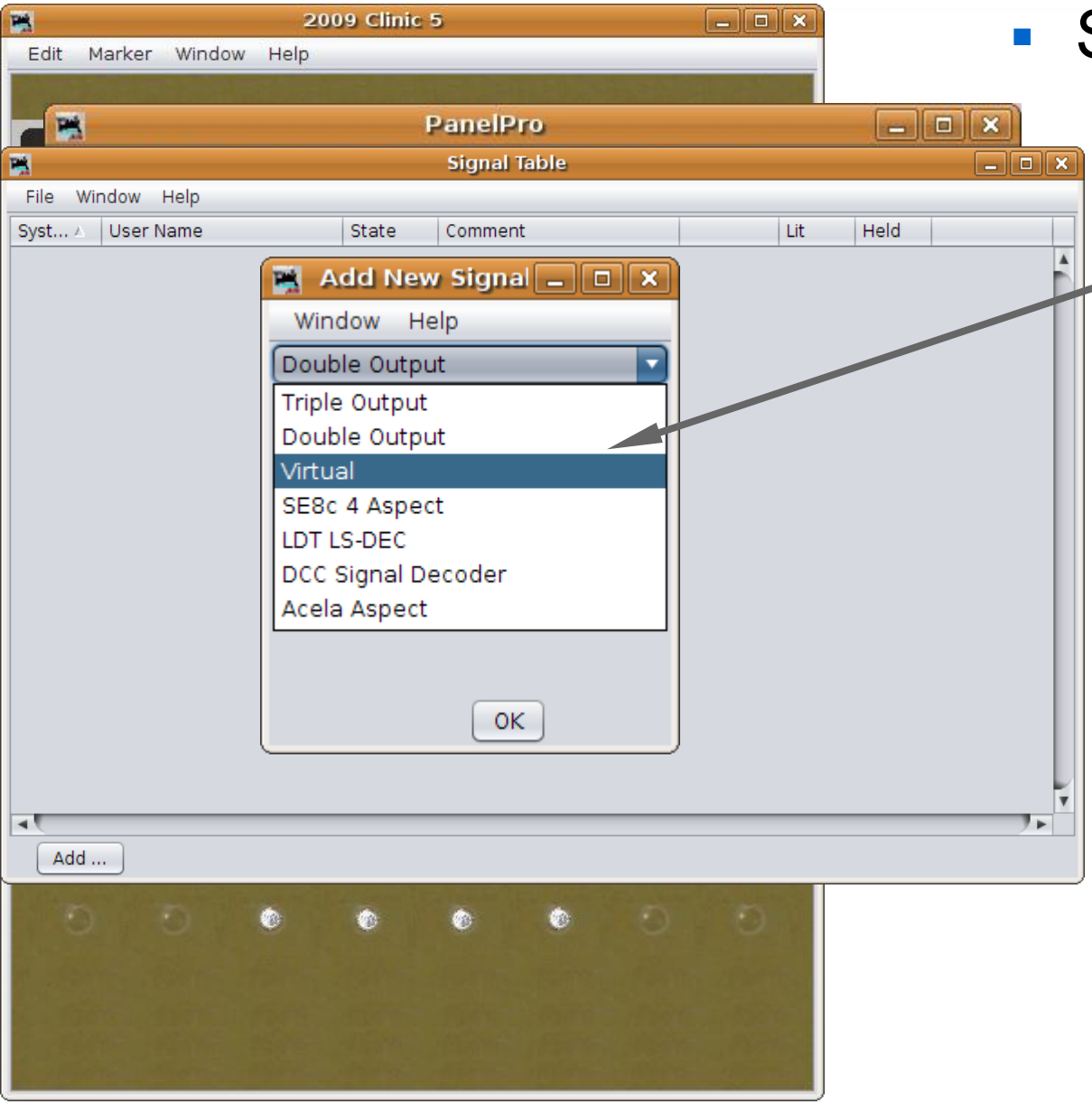


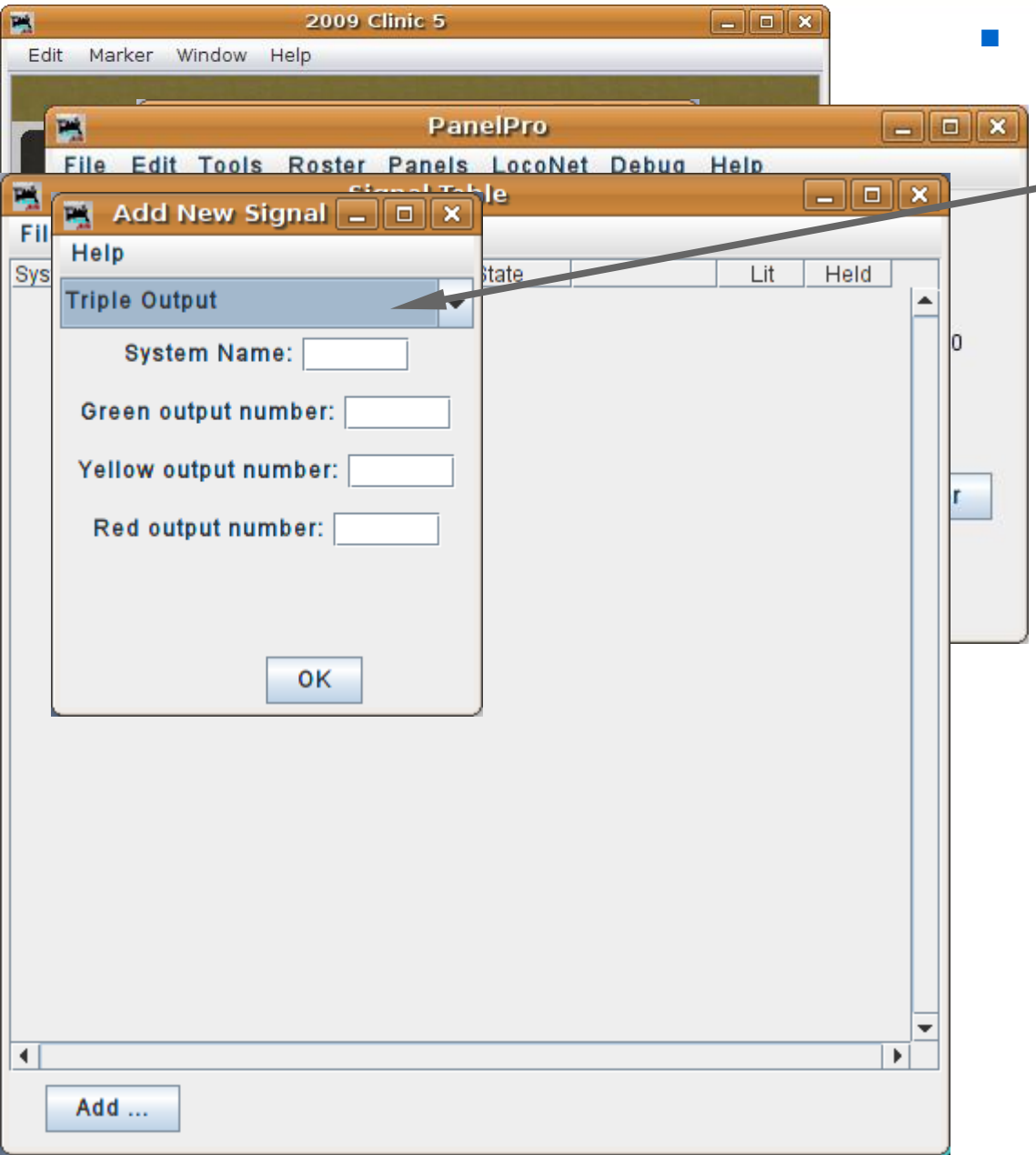
- Signal head basics
  - Go to the PanelPro window and select 'tools'.
  - Navigate to 'Tables' – 'Signals' and click to open the 'Signal Table'.
  - Click 'Add ...' to add new signal heads.
  - This brings up a new window requesting specifics on the hardware.

SSL (Simple Signal Logic)



- Signal head basics
  - There are different basic hardware choices, each with its own details.

SSL (Simple Signal Logic)



- Signal head basics
  - **Triple Output**. This refers to a signal that has individual drivers for each output. Originally this was called 'Triple Turnout' because many systems use 'turnouts' as general purpose output devices.

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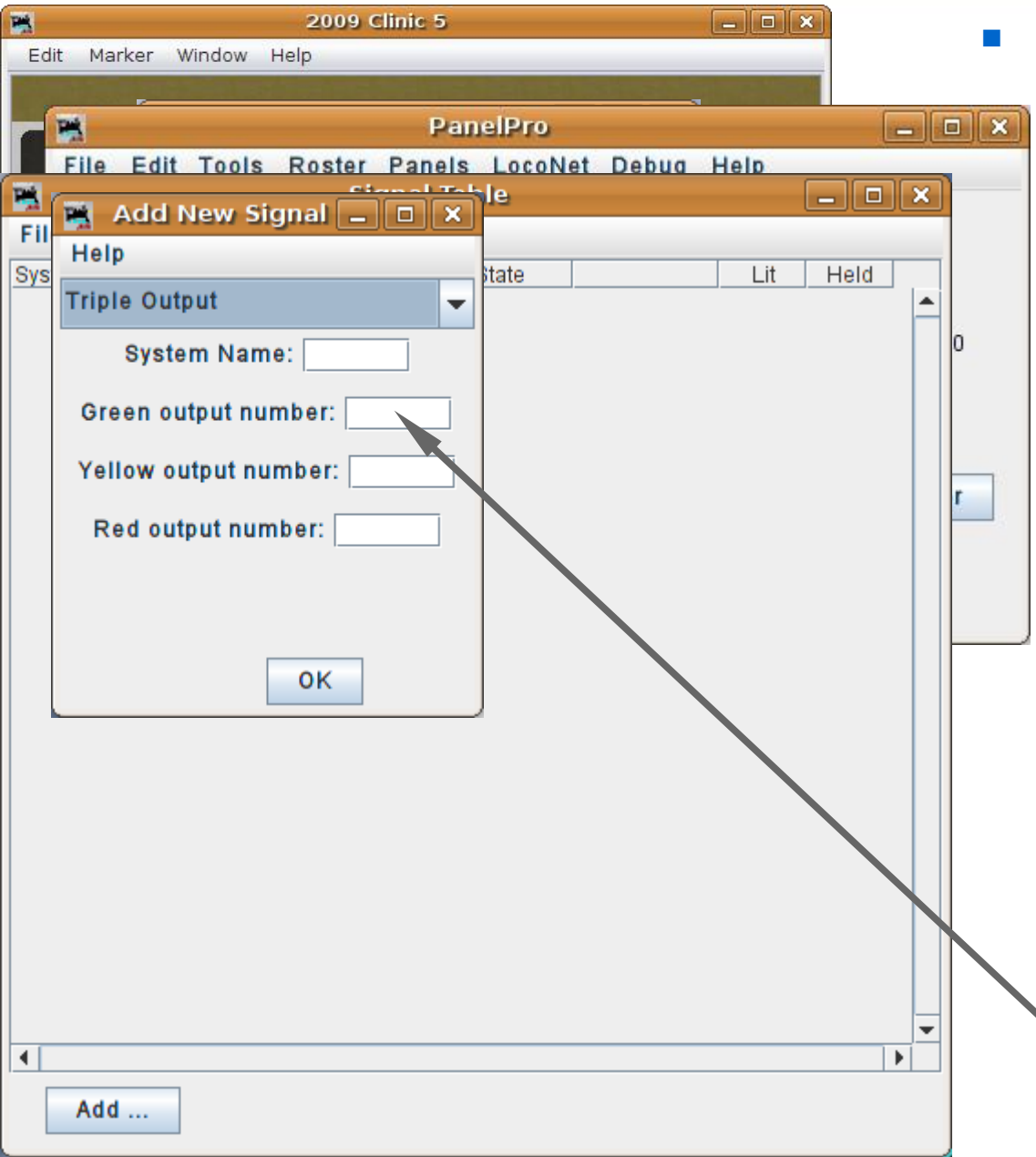
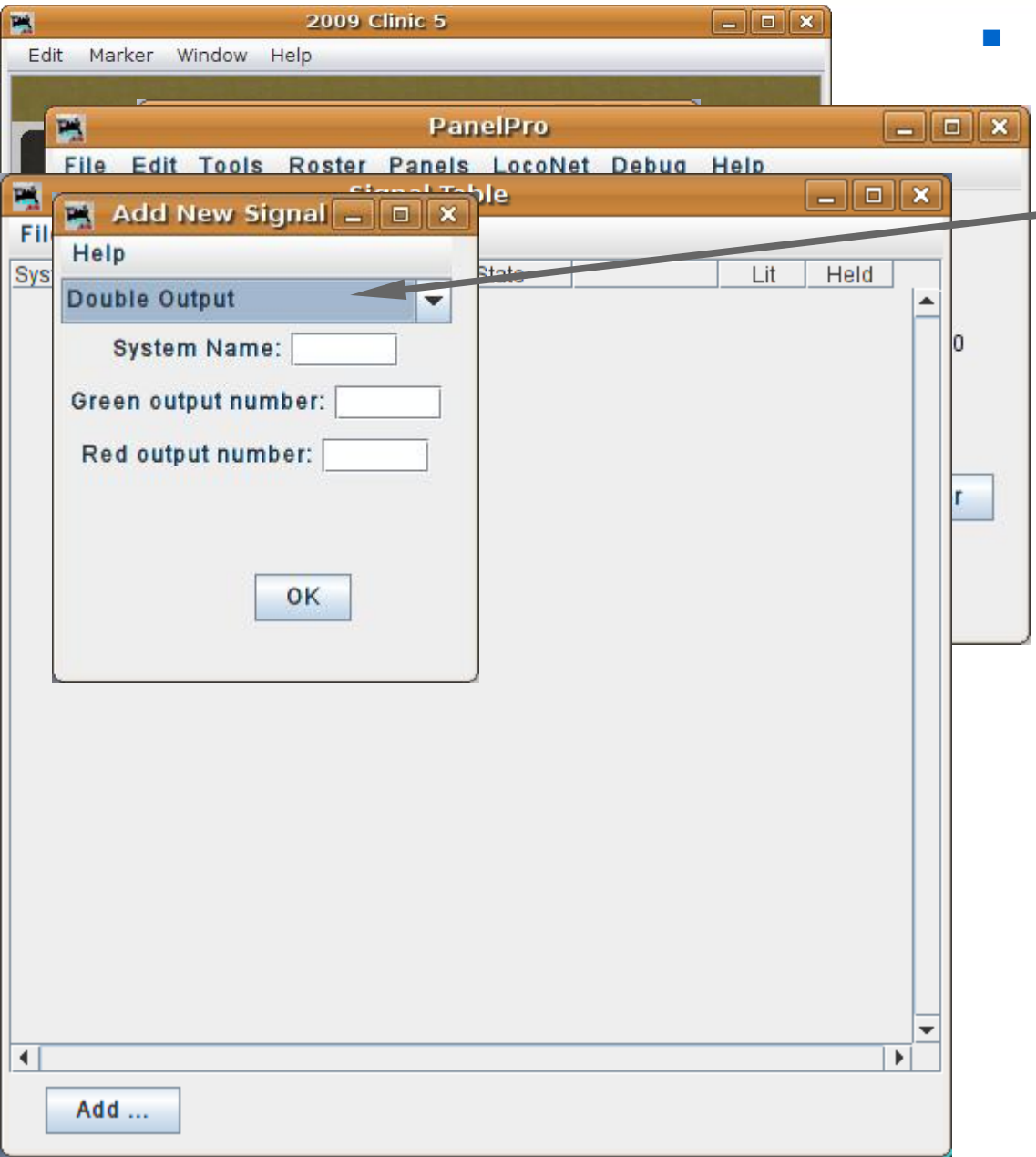


- Signal head basics
  - **Triple Output**. This refers to a signal that has individual drivers for each output. Originally this was called 'Triple Turnout' because many systems use 'turnouts' as general purpose output devices.
  - This ID is the system type plus ”H” for 'signal **H**ead'. For example 'LH' for Digitrax **L**ocoNet devices.
  - Individual output lines get entered here. (e.g. LT25)

SSL (Simple Signal Logic)



- Signal head basics
  - **Double Output**. This refers to a signal that has two drivers. This implies some sort of decoding in the hardware or visually. (for example driving a red plus a green searchlight LED at the same time will produce a yellow signal)

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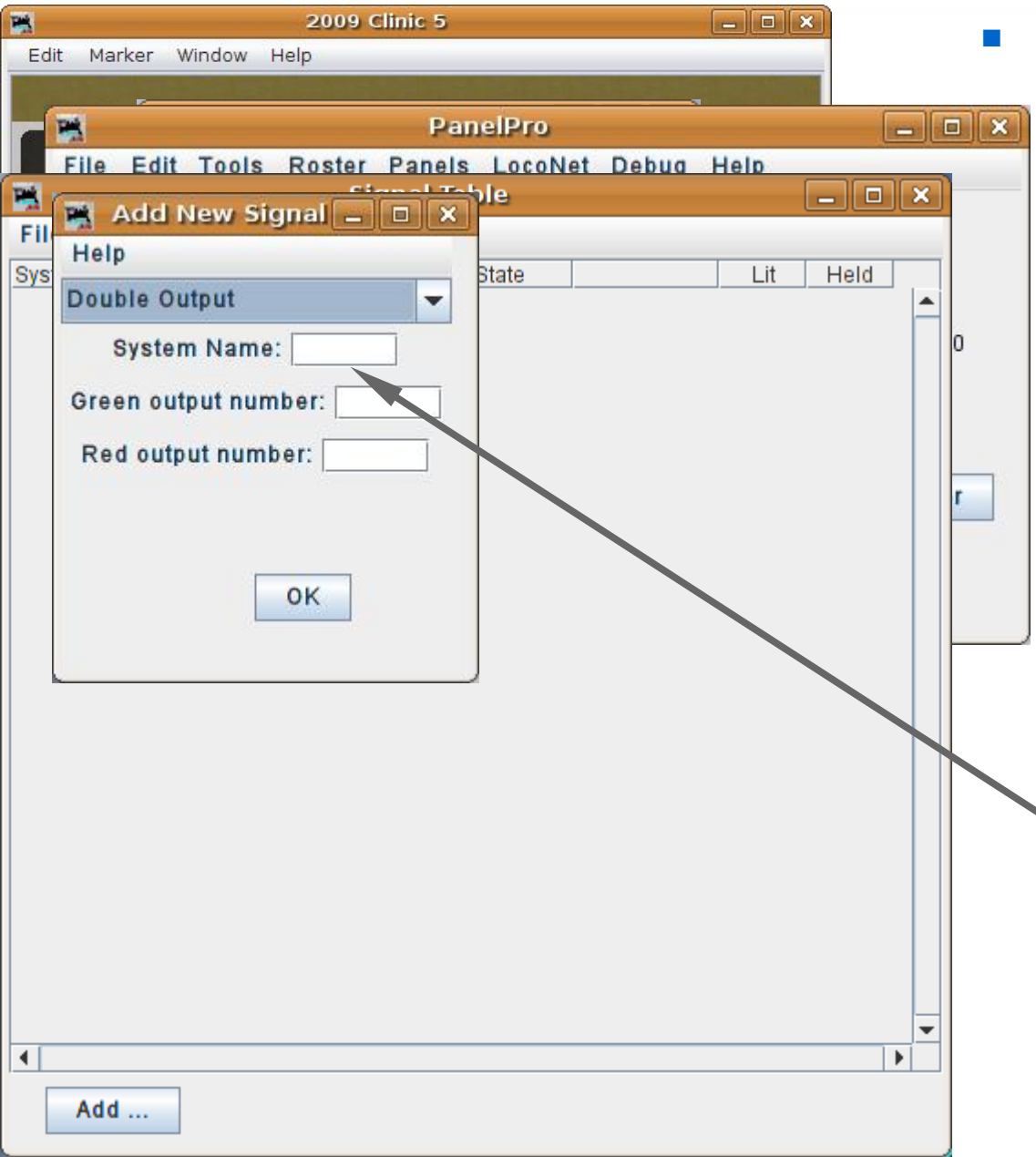

- Signal head basics
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  - The system name and hardware ID are similar to the triple output head.

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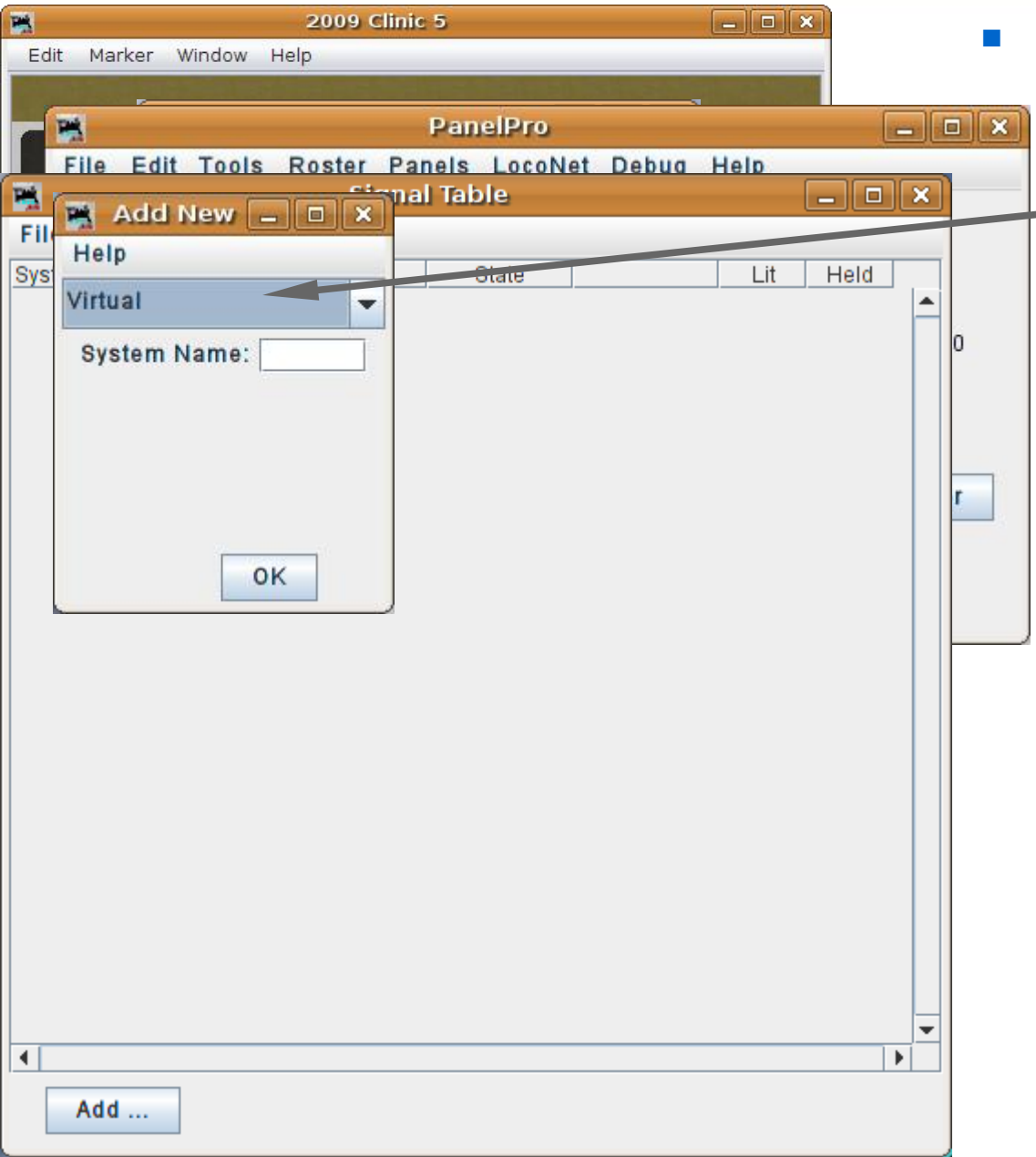

- Signal head basics
  - **Virtual**. This refers to a signal that has no actual hardware on the layout. Sometimes it is convenient to use a virtual signal to fill in the 'details', so to speak, and then use the 'Distant' option to include the 'details' into another actual signal's indication. It is not even necessary to include the virtual signal on the panel.

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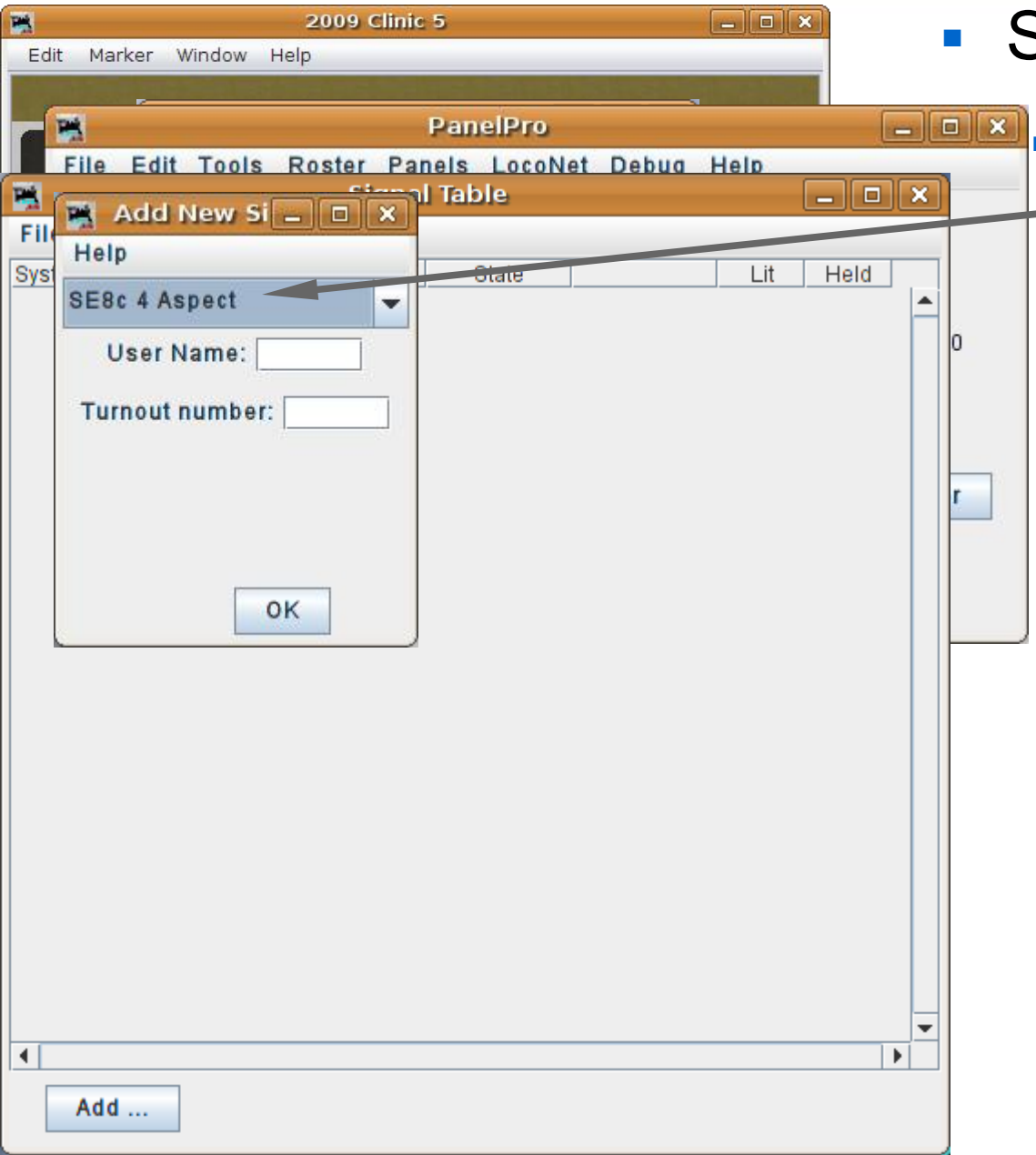

- Signal head basics
- **SE8c 4 Aspect**. The SE8c is Digitrax's signal driver board. Our TC-64 board will also operate in SE8c (signal) mode. The SE8c mode just sends out single commands for each aspect change, which saves some bandwidth on the network. (a relatively minor amount)

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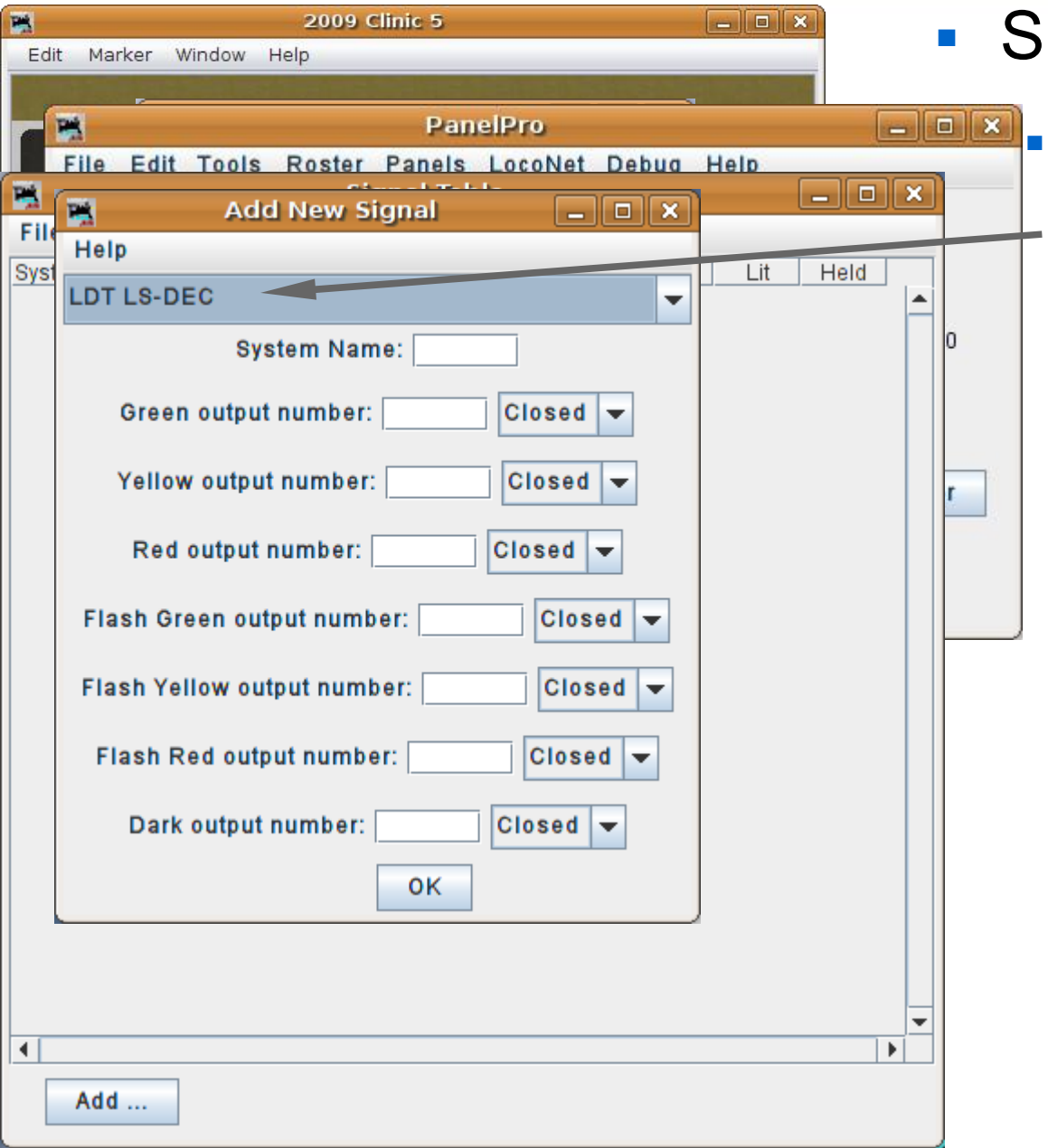
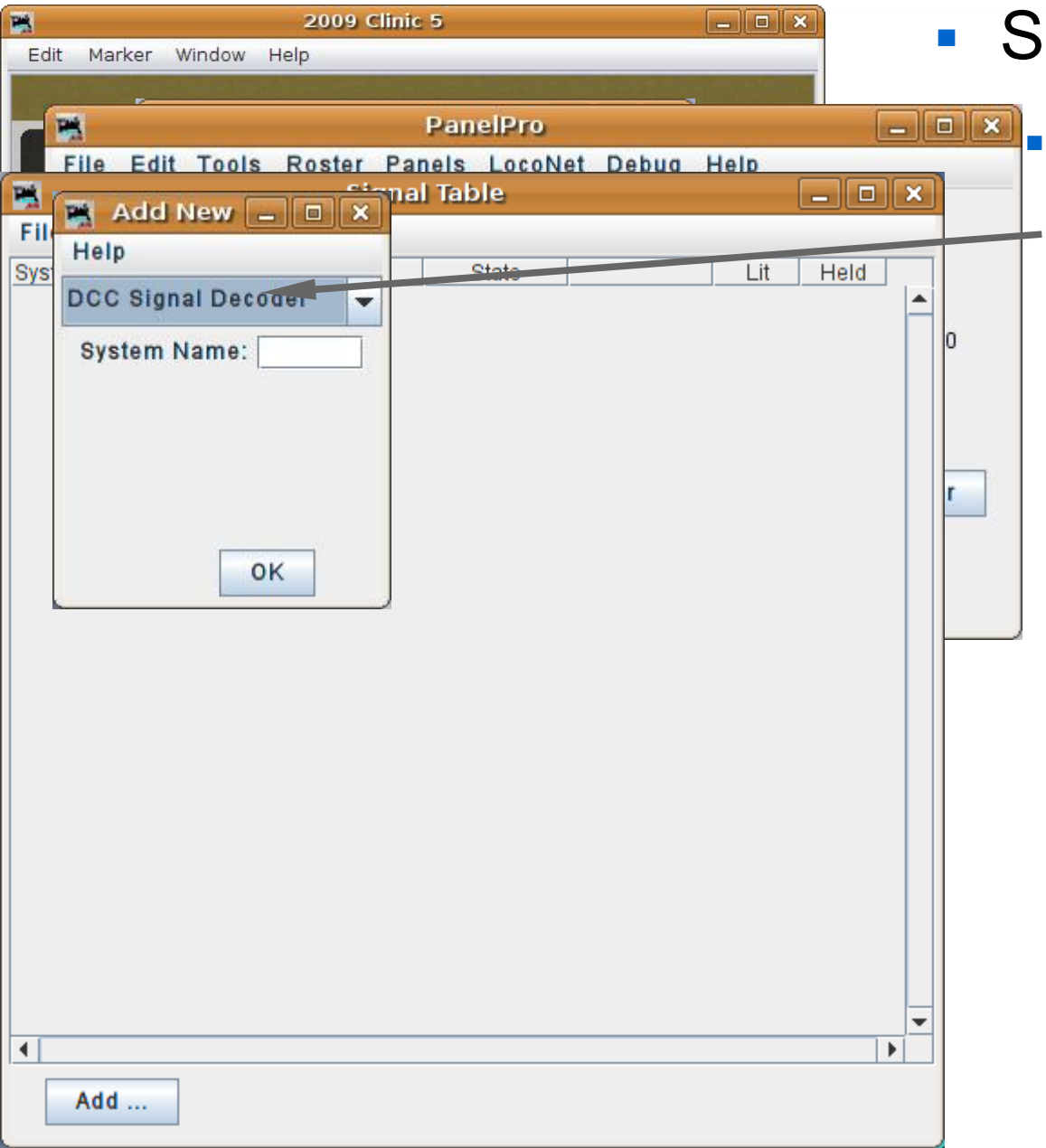


- Signal head basics
- **LDT LS-DEC**. **L**ittfinski **D**aten **T**echnik **L**ight **S**ignal **Dec**oder. This signal decoder has different versions that directly support many of the complex European multi-head signal systems.

SSL (Simple Signal Logic)



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- **DCC Signal Decoder**. This signal type controls signal heads attached to any decoder that uses the DCC signal packets as defined by the NMRA DCC Working Group.

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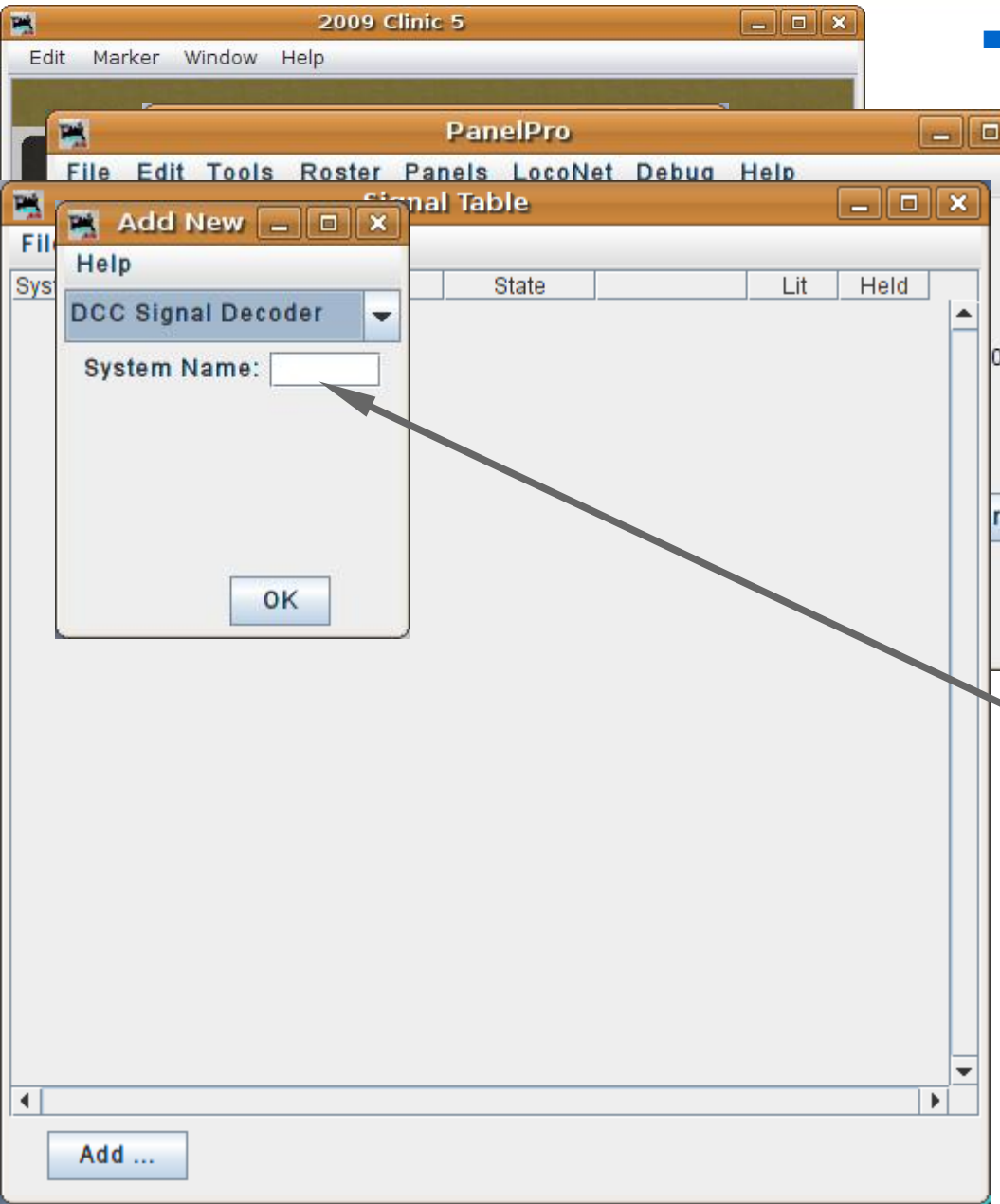

- Signal head basics
- **DCC Signal Decoder**. This signal type controls signal heads attached to any decoder that uses the DCC signal packets as defined by the NMRA DCC Working Group.
- Enter its DCC address as the system number.

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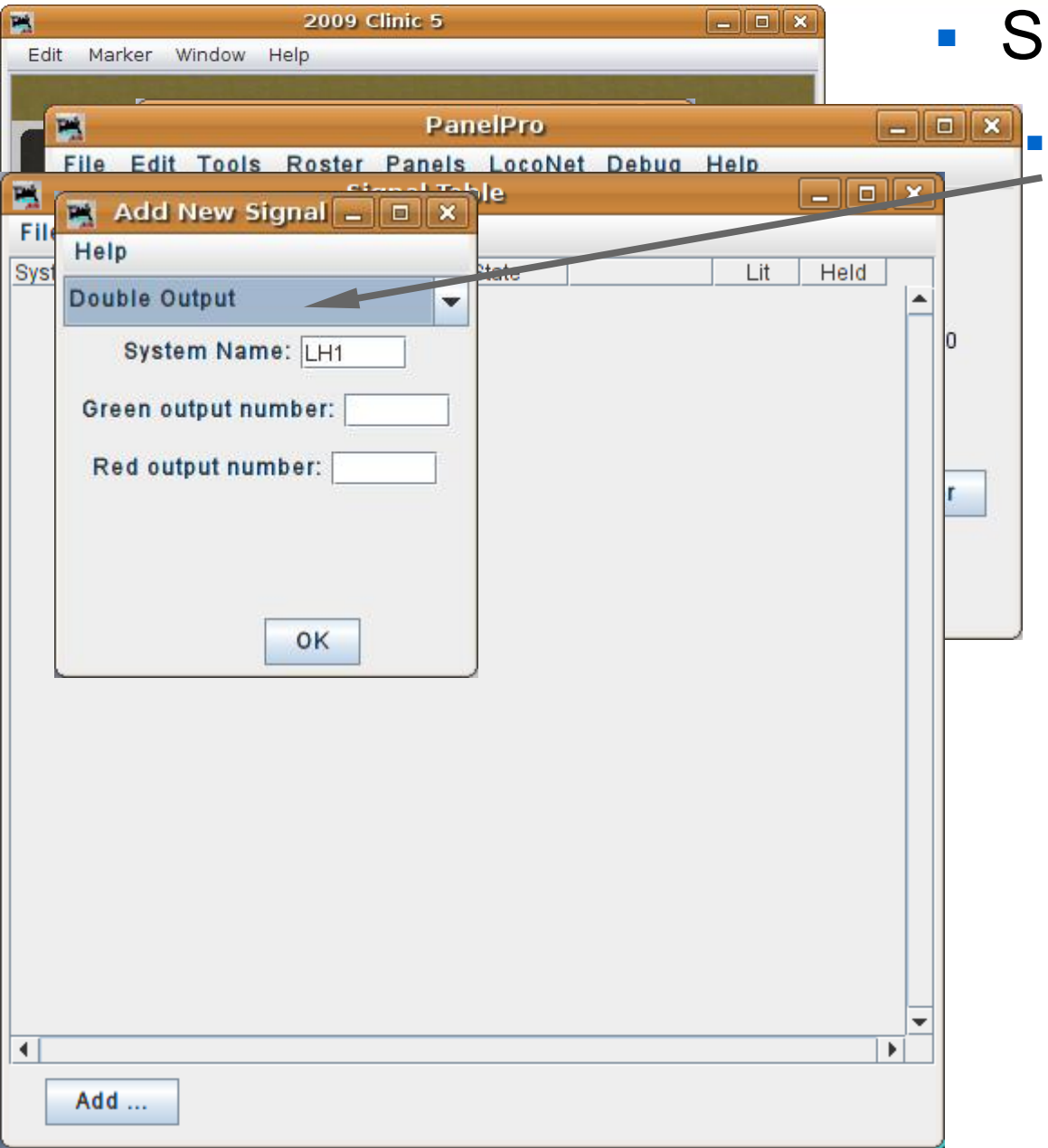

- Signal head basics
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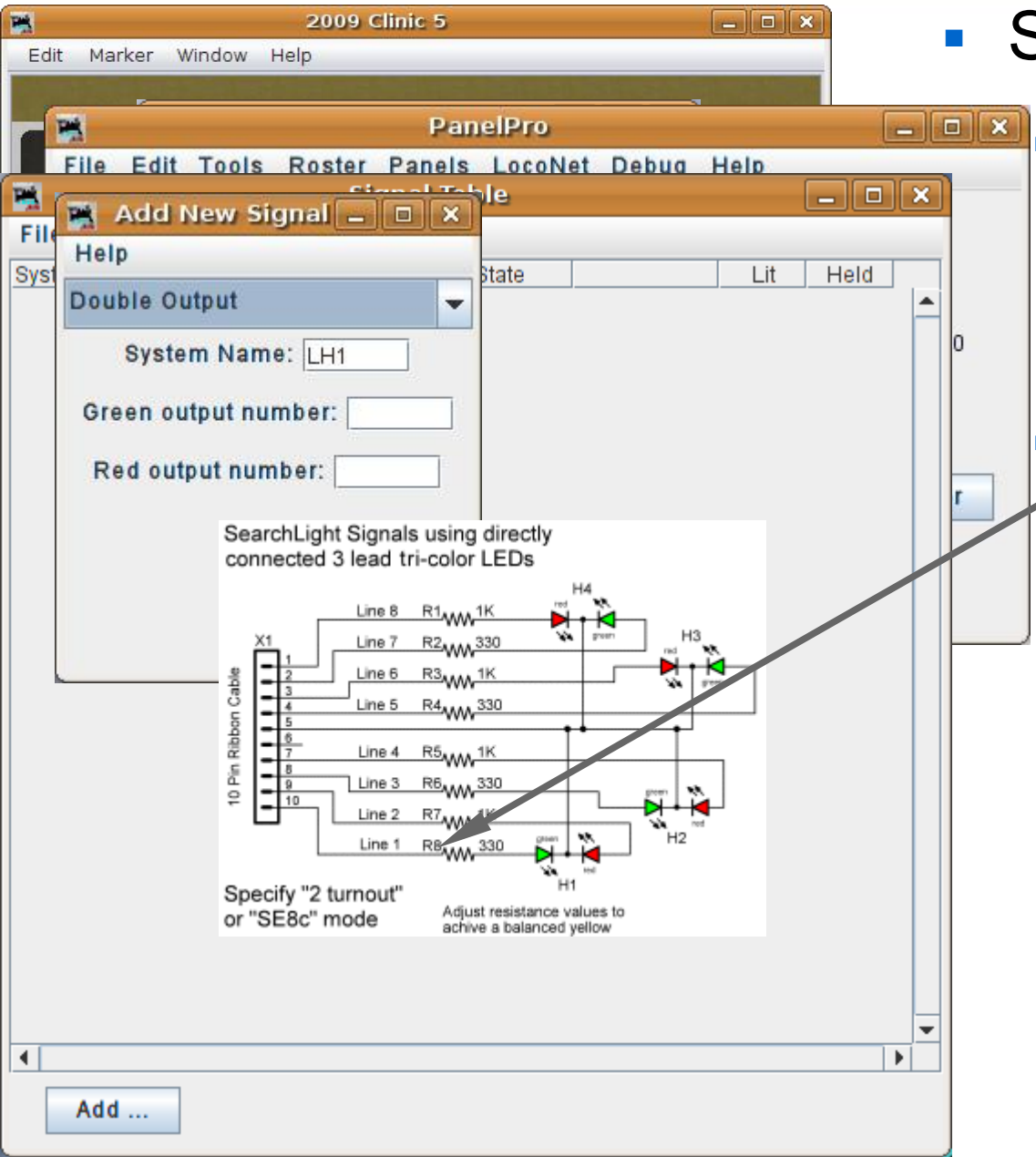

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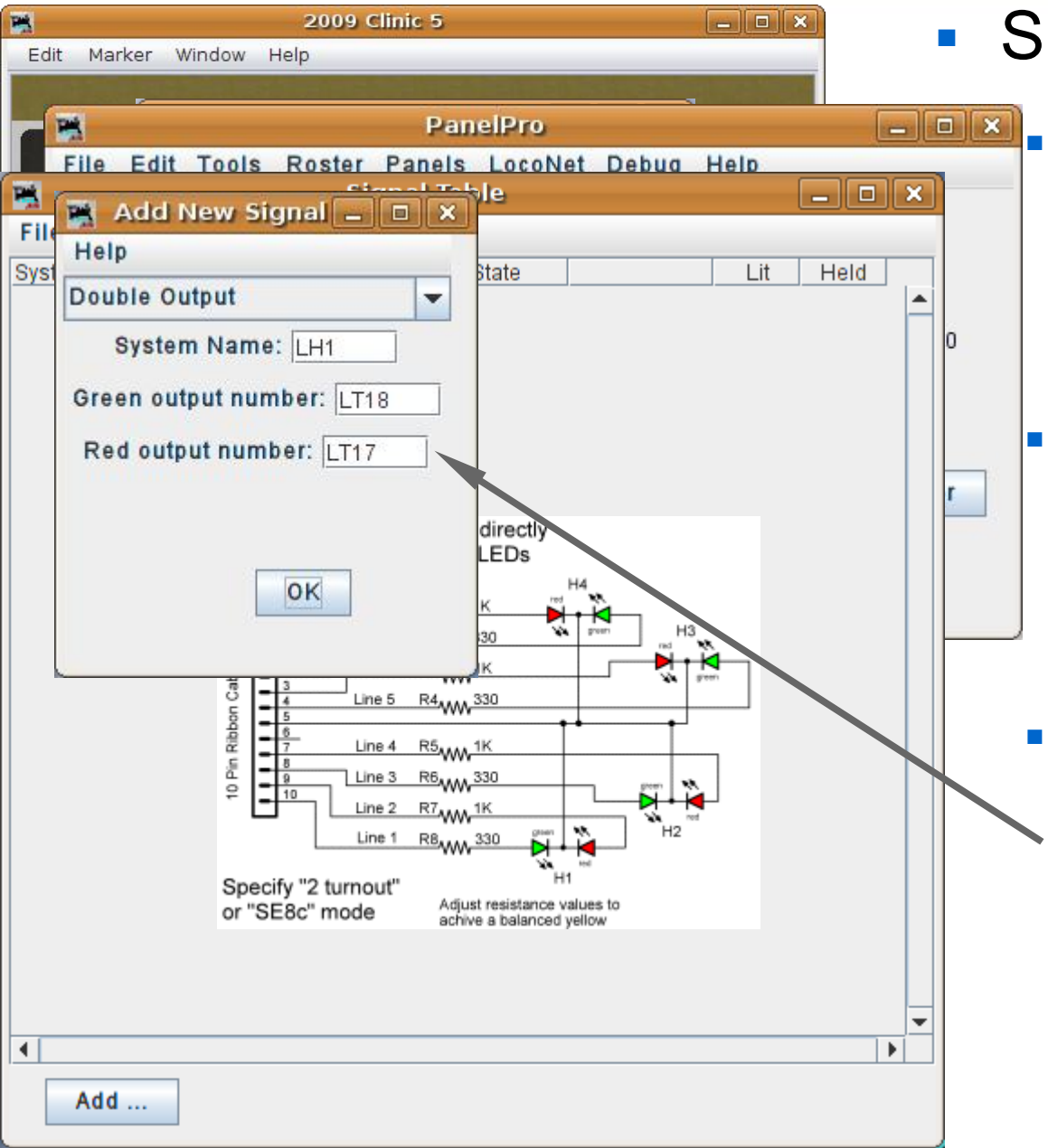

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  - The TC-64 signal port base address is 16, so the output lines start with LT17, LT18, etc. (port address plus line number)

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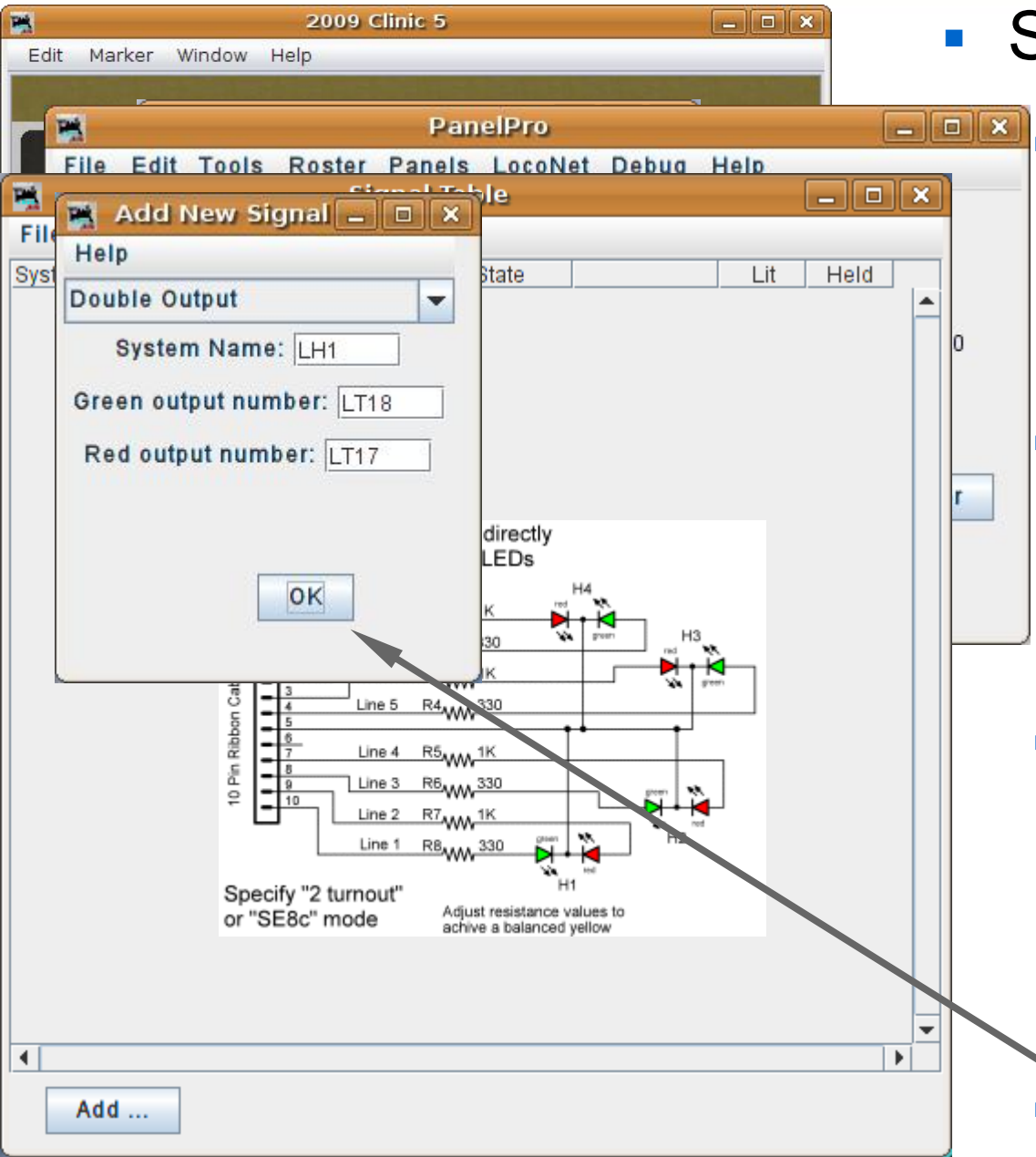

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  - Click 'OK' to add a signal.

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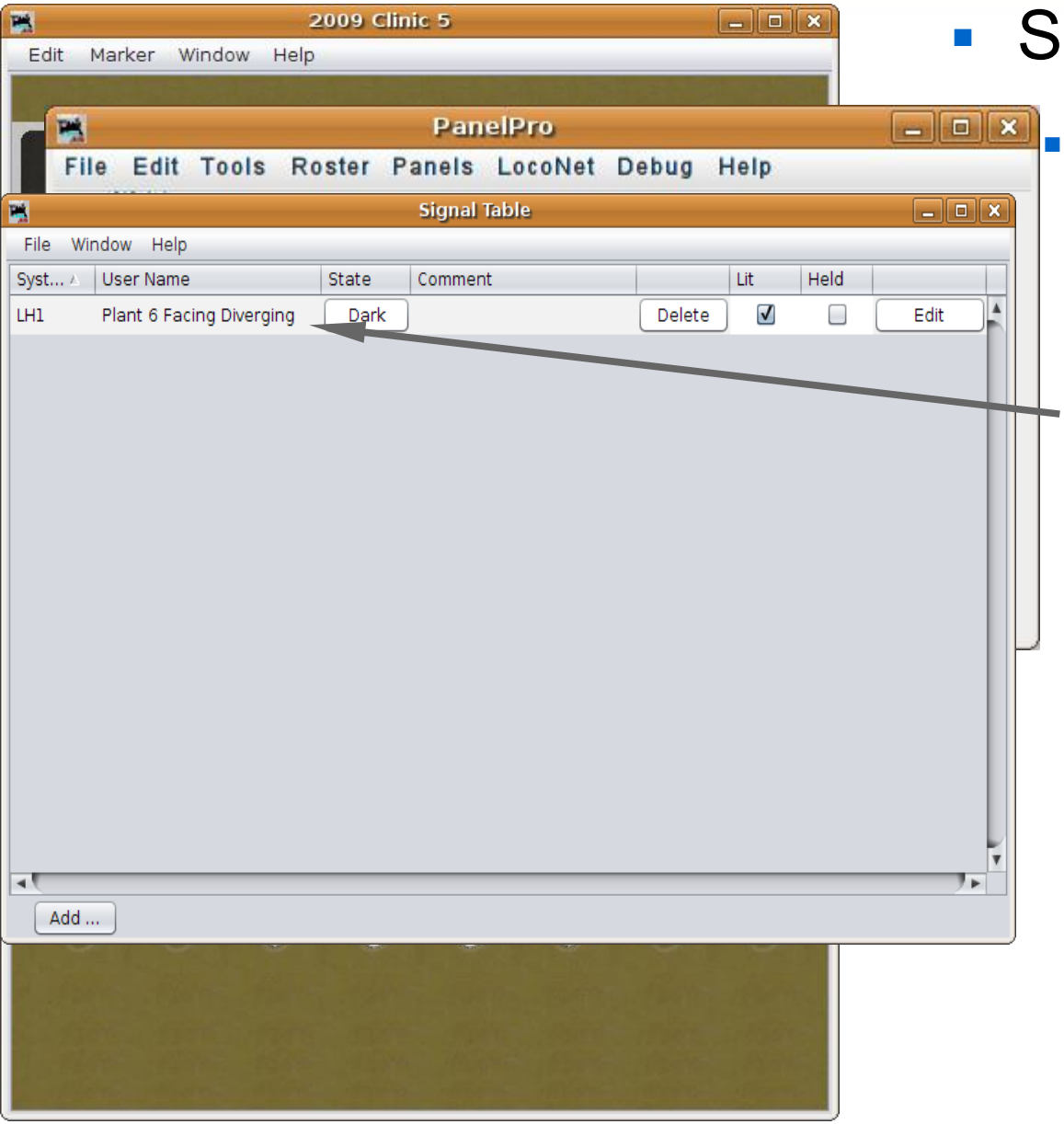

- Signal head basics
  - Once the signal head is in the Signal Table, add a description to match it. I called it 'Plant 6 Facing Diverging', but you could name it any way that seems good for your RR.

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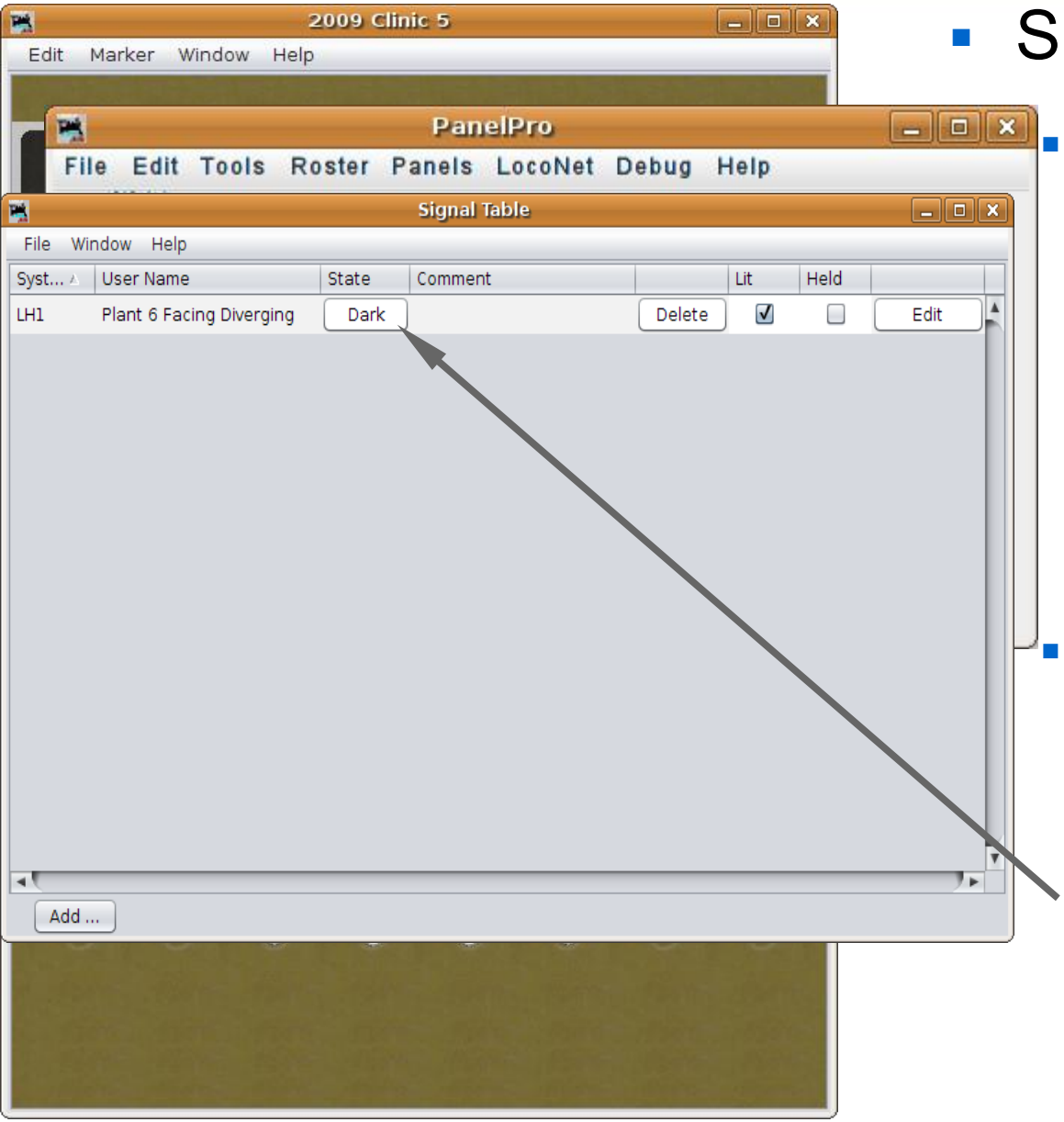

- Signal head basics
  - Once the signal head is in the Signal Table, add a description to match it. I called it 'Plant 6 Facing Diverging', but you could name it any way that seems good for your RR.
  - A good thing to do at this point is to see if your hardware responds as expected. Clicking on the 'State' button should cycle the actual signal through its various aspects.

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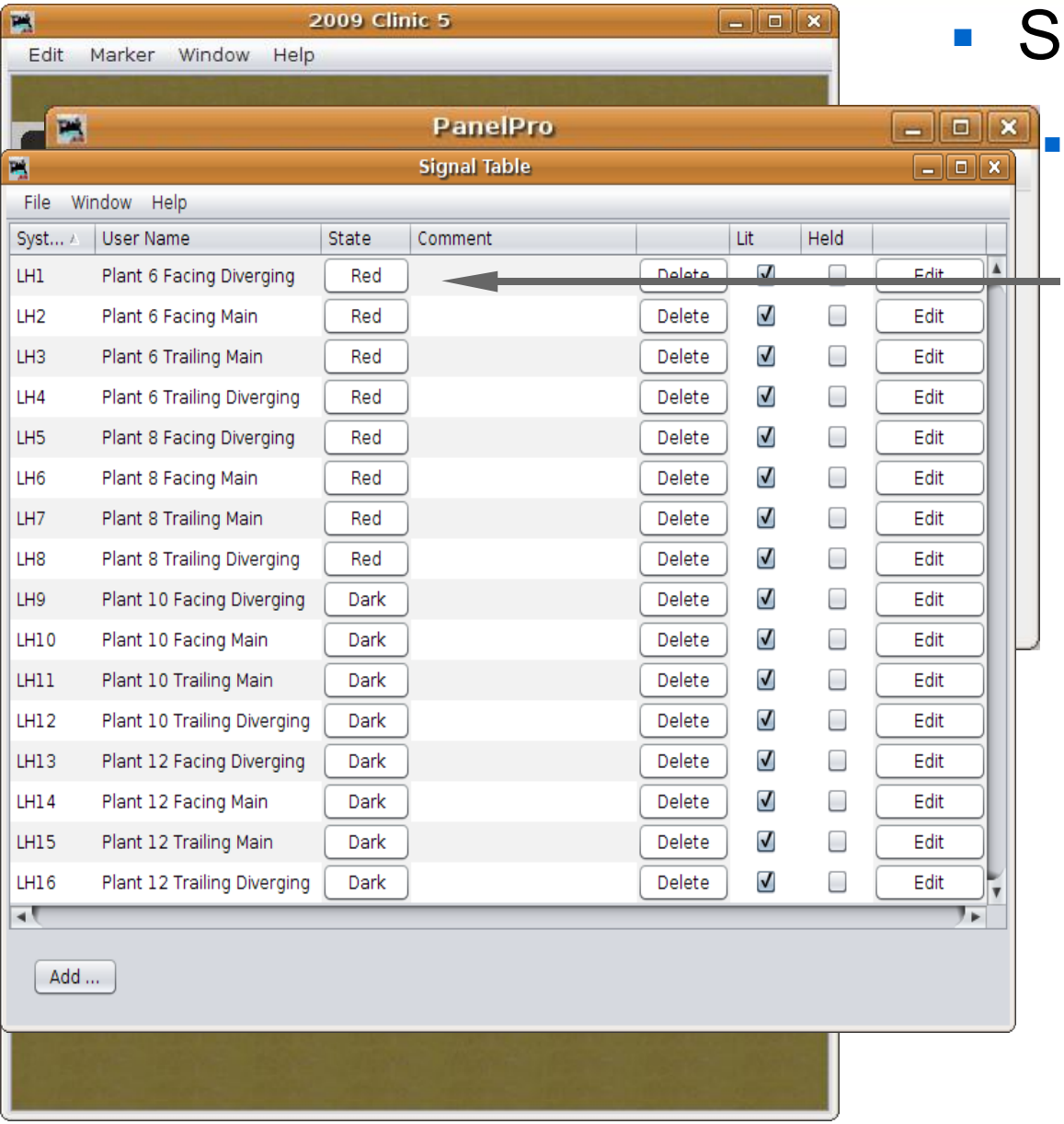

- Signal head basics
- Once the first signal head is working correctly, add in the rest of them.

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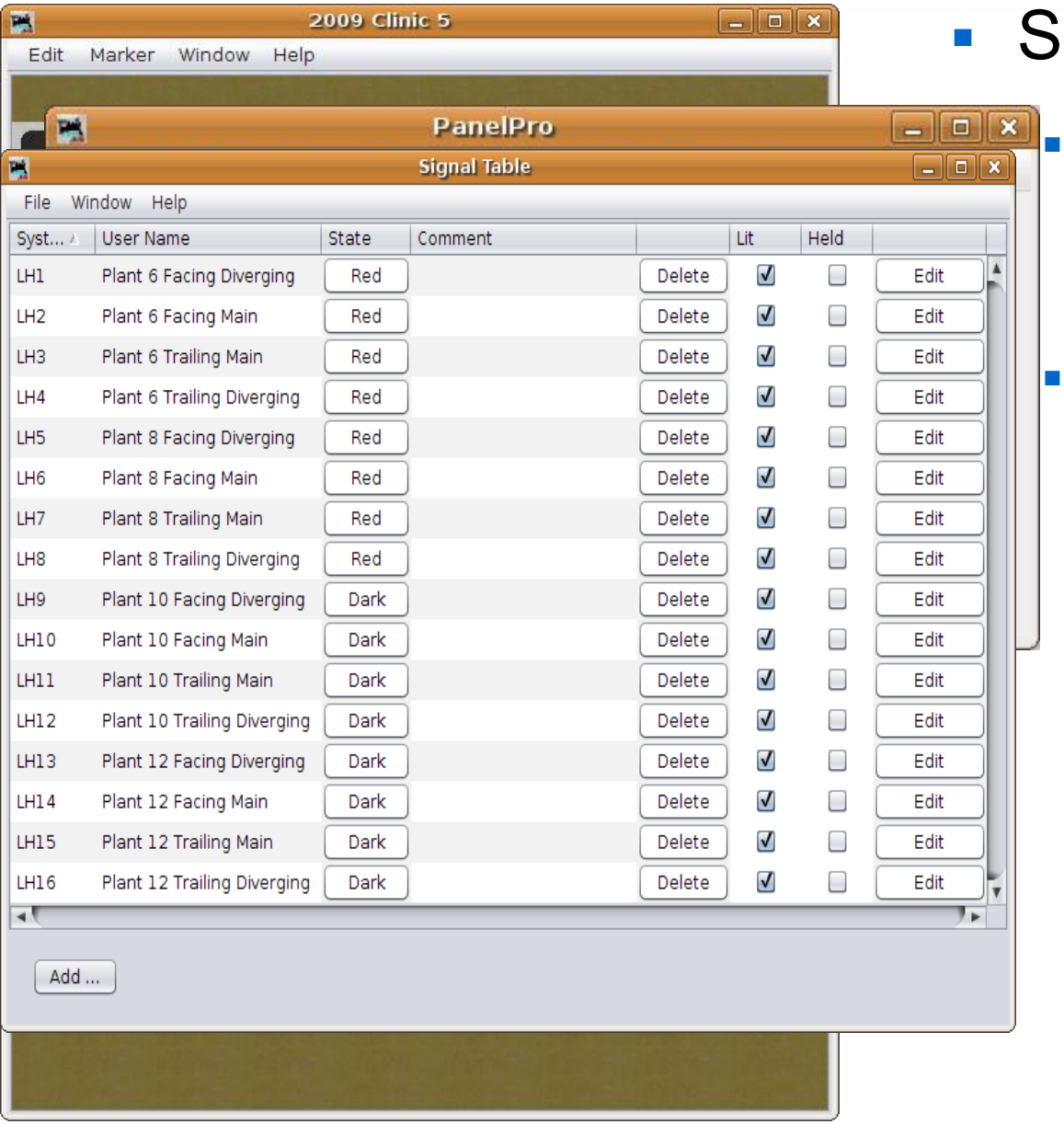

Syst...	User Name	State	Comment		Lit	Held	
LH1	Plant 6 Facing Diverging	Red		Delete	☑	☐	Edit
LH2	Plant 6 Facing Main	Red		Delete	☑	☐	Edit
LH3	Plant 6 Trailing Main	Red		Delete	☑	☐	Edit
LH4	Plant 6 Trailing Diverging	Red		Delete	☑	☐	Edit
LH5	Plant 8 Facing Diverging	Red		Delete	☑	☐	Edit
LH6	Plant 8 Facing Main	Red		Delete	☑	☐	Edit
LH7	Plant 8 Trailing Main	Red		Delete	☑	☐	Edit
LH8	Plant 8 Trailing Diverging	Red		Delete	☑	☐	Edit
LH9	Plant 10 Facing Diverging	Dark		Delete	☑	☐	Edit
LH10	Plant 10 Facing Main	Dark		Delete	☑	☐	Edit
LH11	Plant 10 Trailing Main	Dark		Delete	☑	☐	Edit
LH12	Plant 10 Trailing Diverging	Dark		Delete	☑	☐	Edit
LH13	Plant 12 Facing Diverging	Dark		Delete	☑	☐	Edit
LH14	Plant 12 Facing Main	Dark		Delete	☑	☐	Edit
LH15	Plant 12 Trailing Main	Dark		Delete	☑	☐	Edit
LH16	Plant 12 Trailing Diverging	Dark		Delete	☑	☐	Edit

- Signal head basics
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  - This would be a good time to save our work again. (2009Clinic5.xml)

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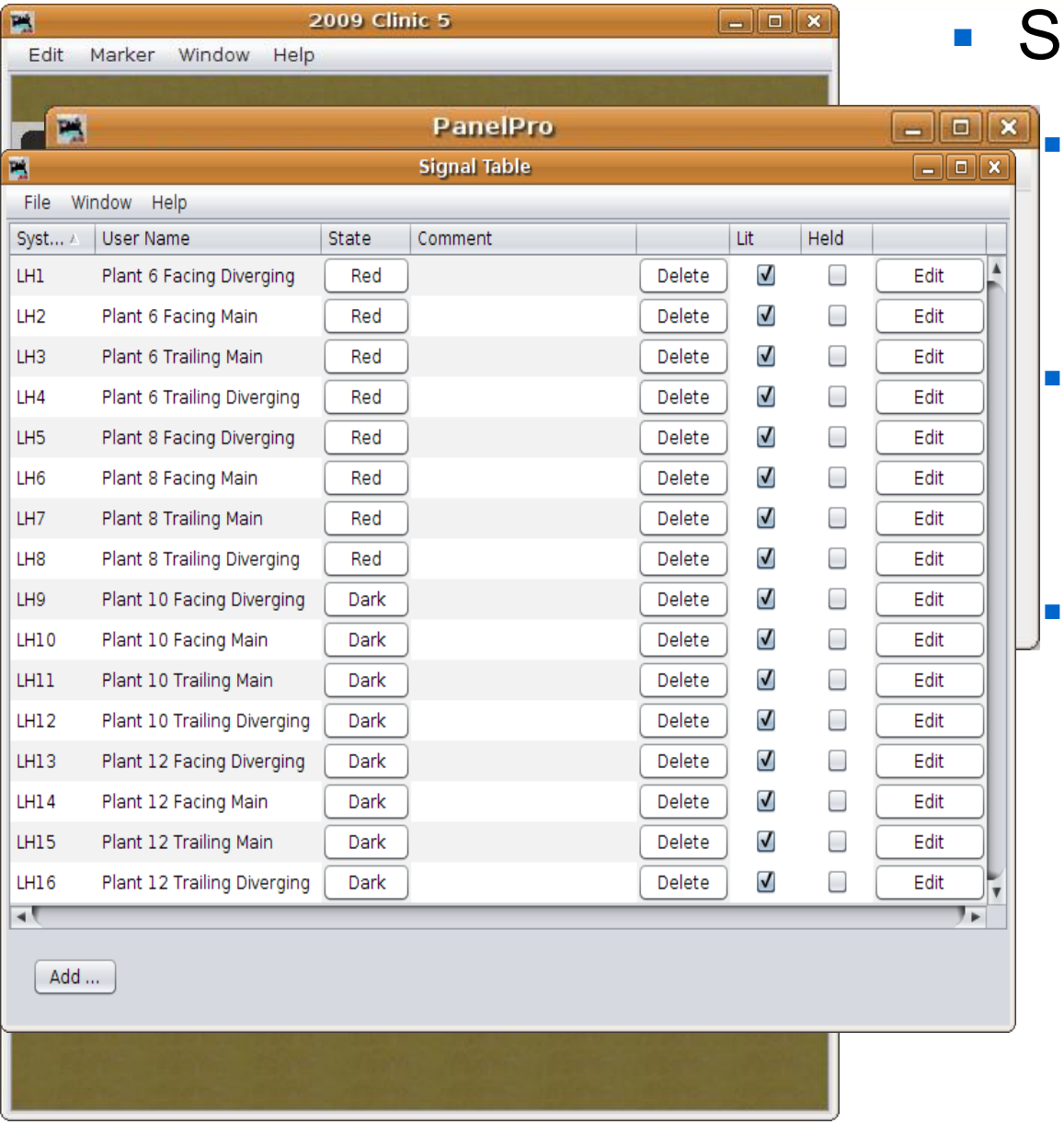

- Signal head basics
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  - This would be a good time to save our work again. (2009Clinic5.xml)
  - For this session of the clinic we will add signal images to the panel to help us visualize what is happening on the layout. For a prototypical panel we could skip this step.

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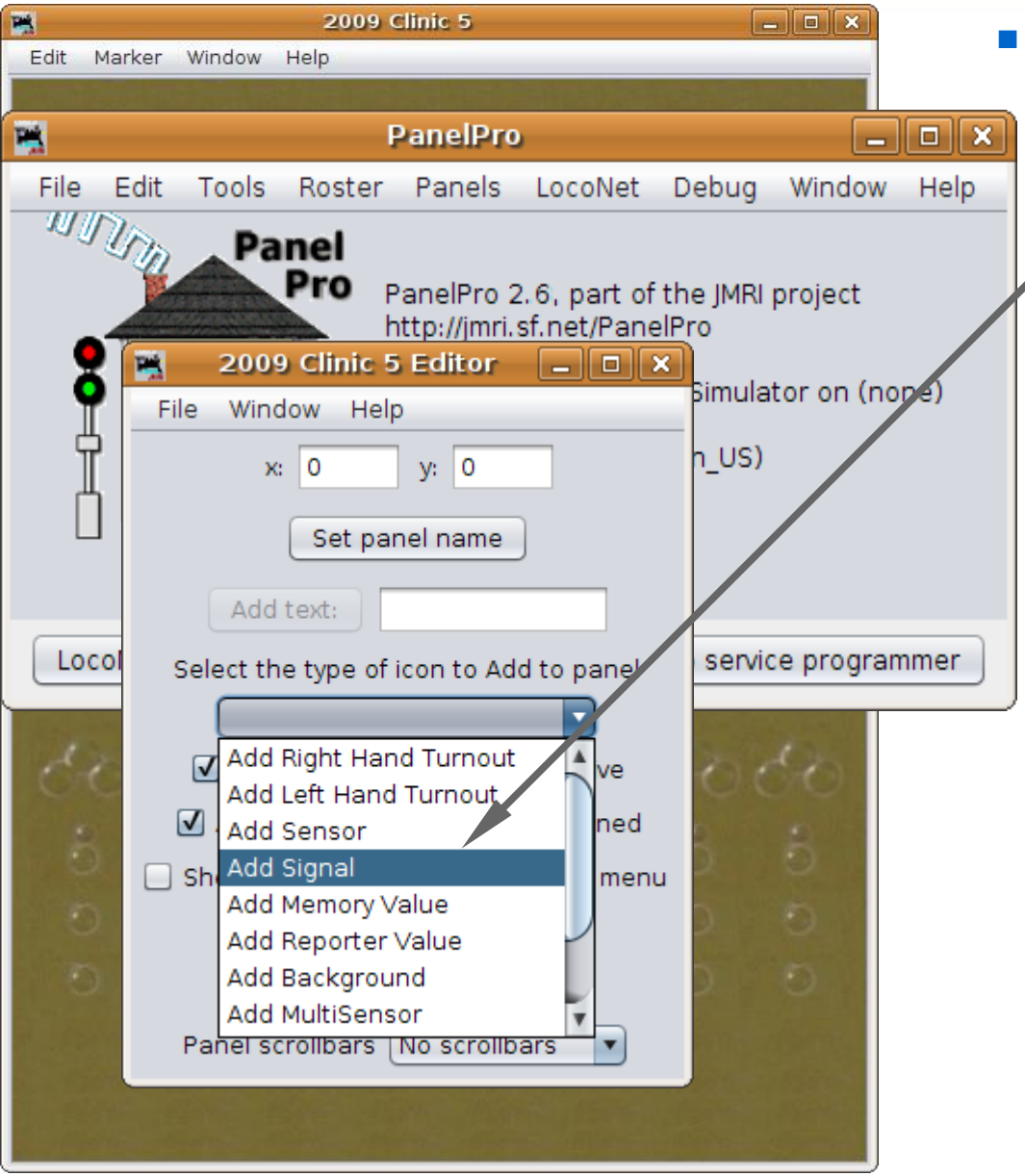

- Signal head basics
  - Select 'Add Signal' from the Panel Editor.

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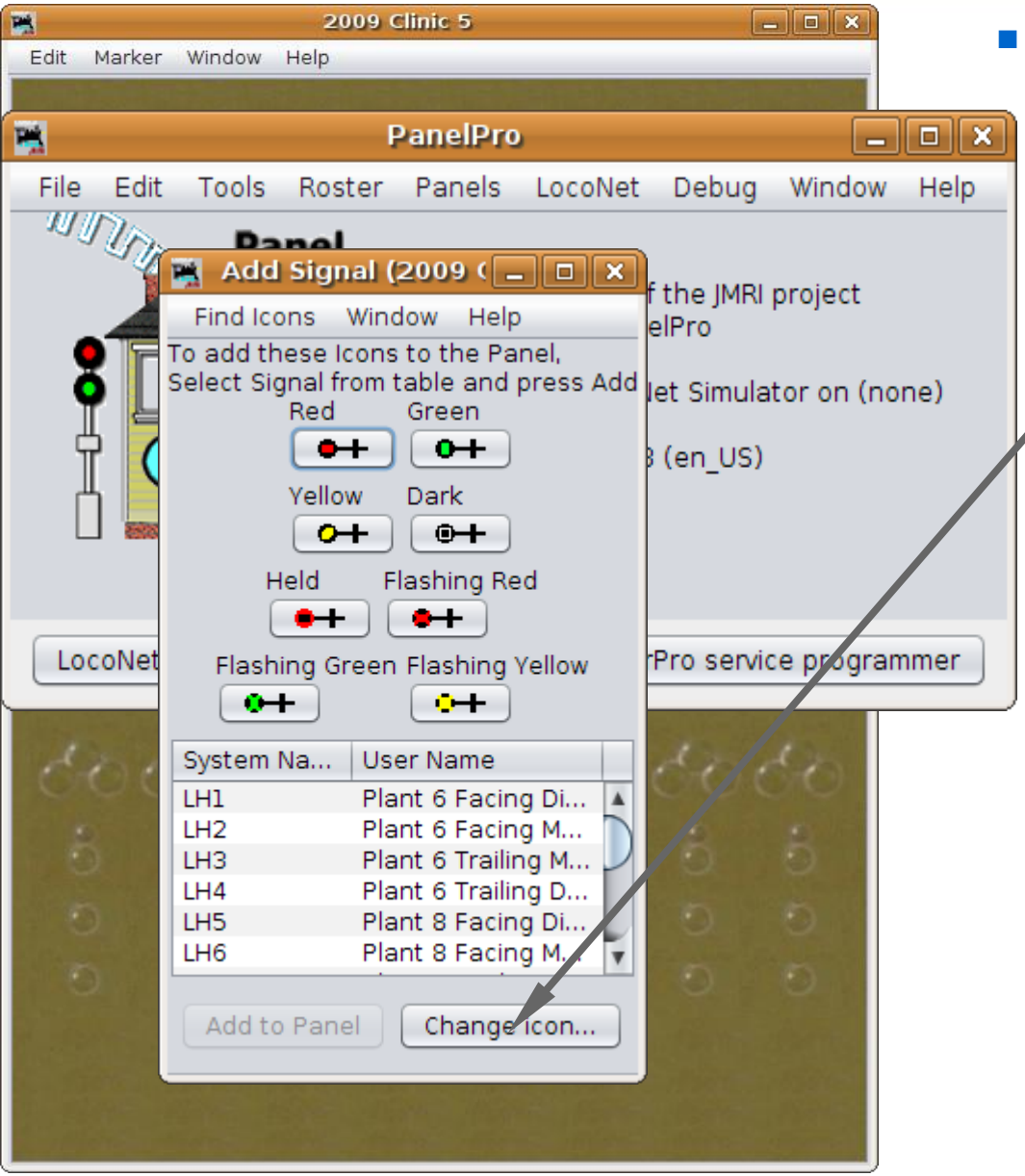

- Signal head basics
  - Select 'Add Signal' from the Panel Editor.
  - Change icon...

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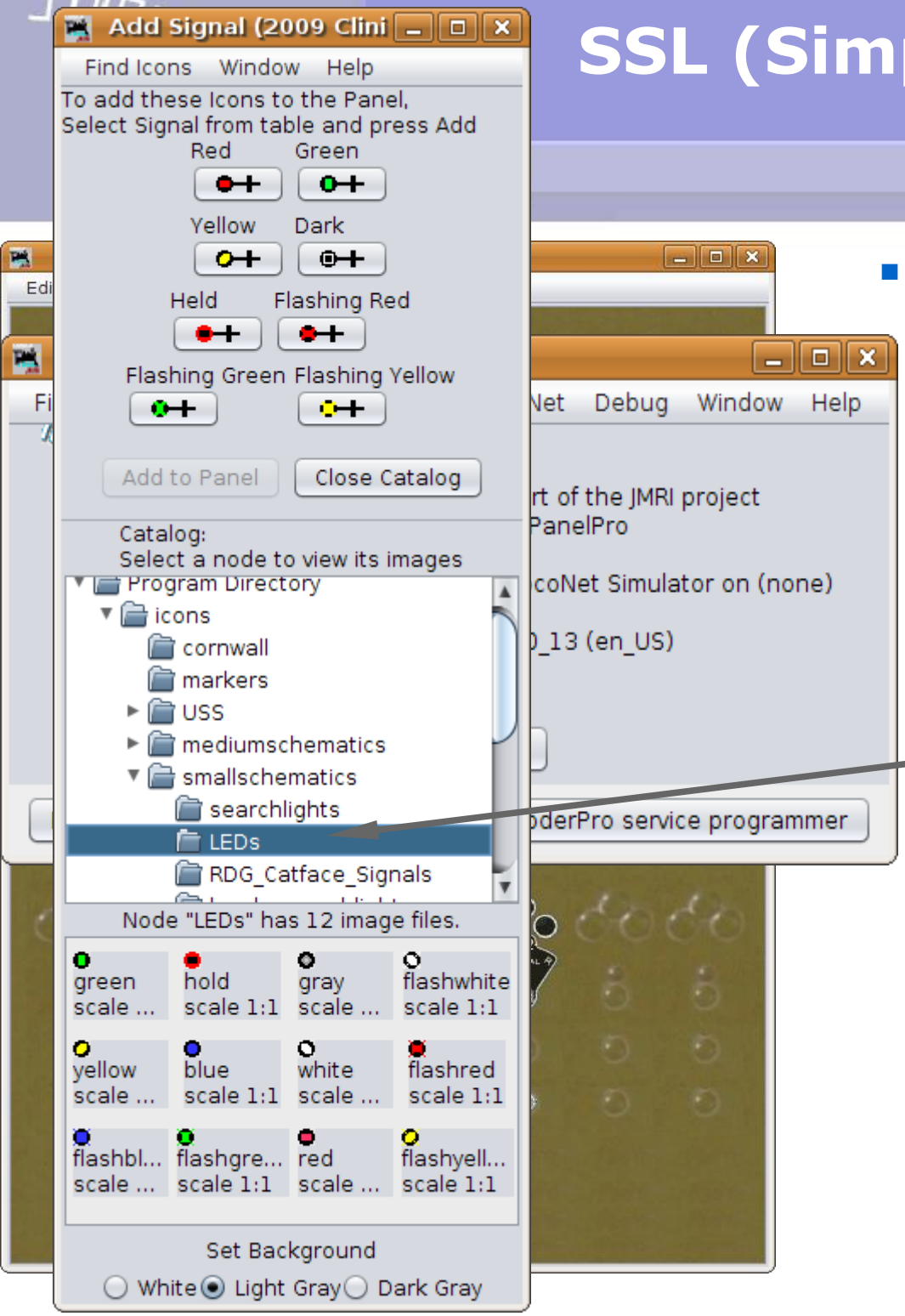

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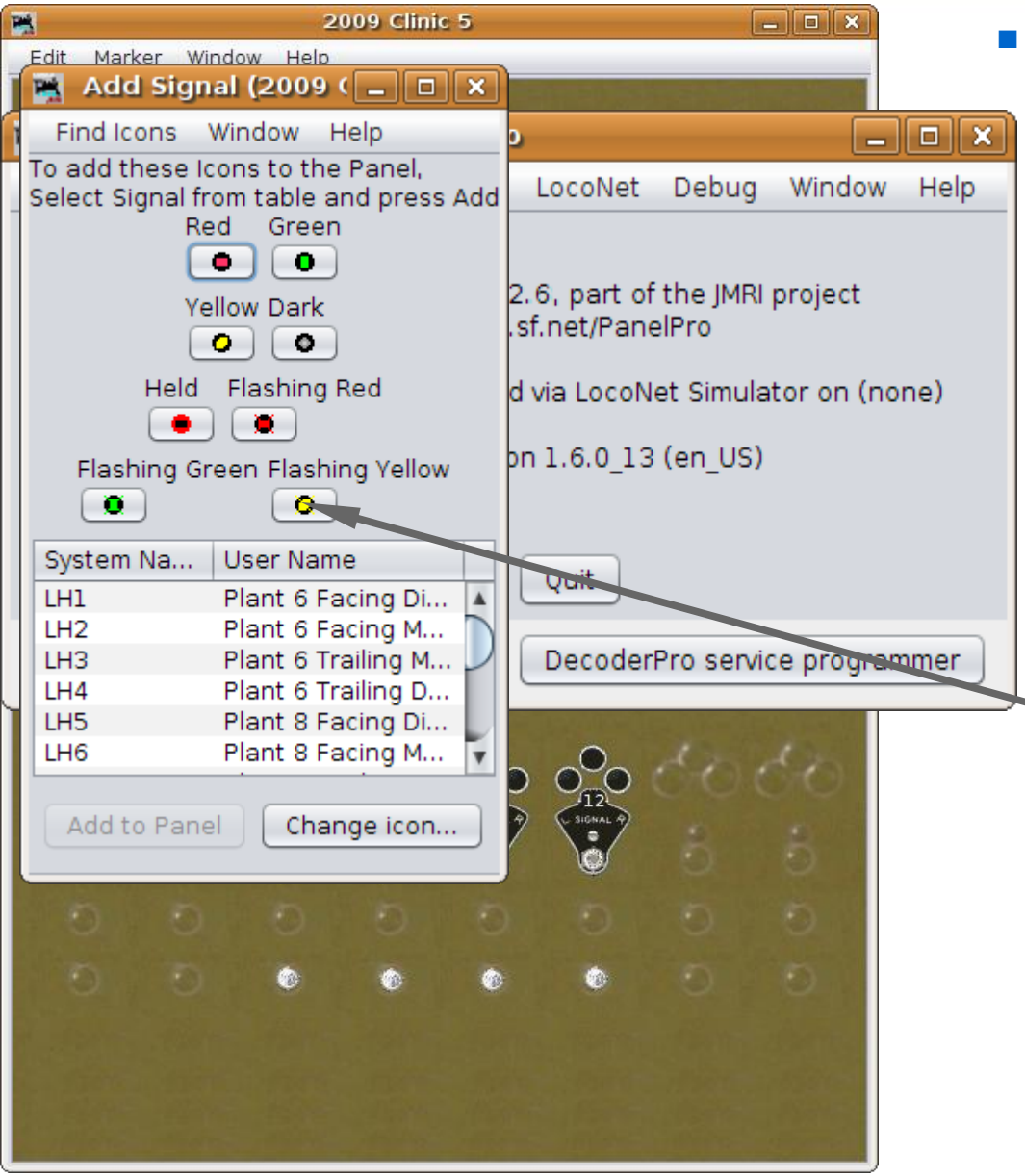
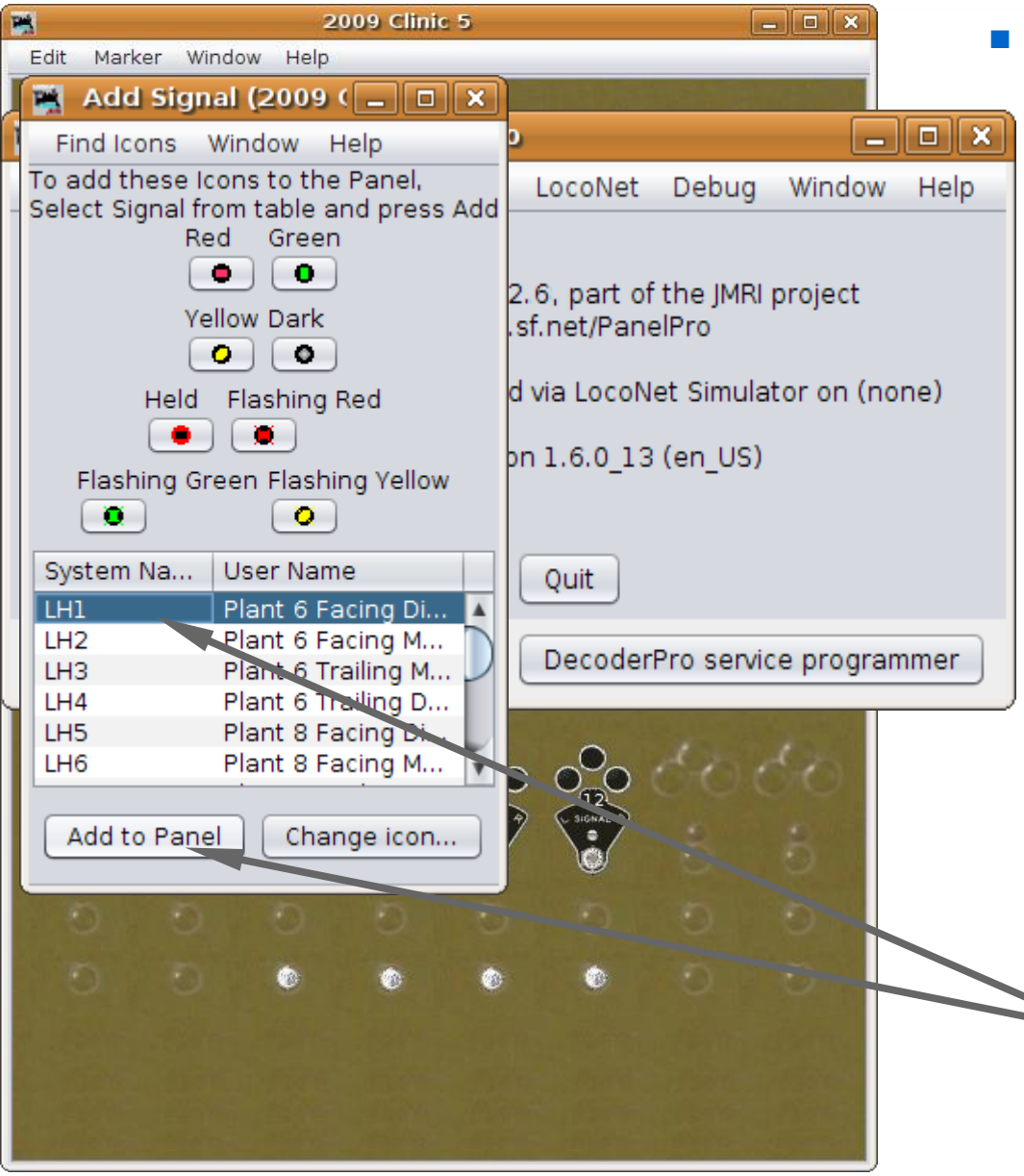
  - Select 'Add Signal' from the Panel Editor.
  - Change icon...
  - For this example panel I am going to use the simple LED images.

SSL (Simple Signal Logic)



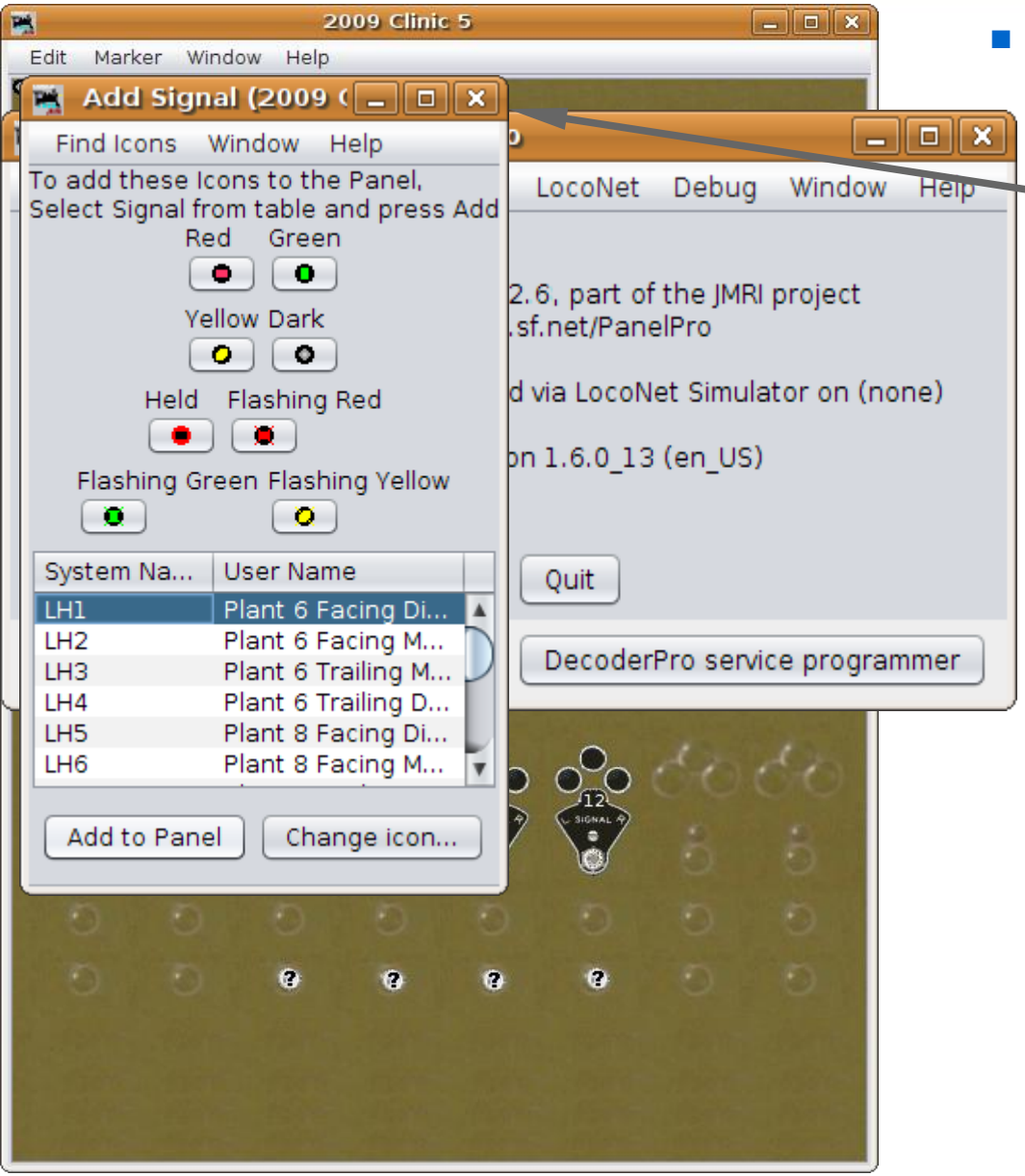
- Signal head basics
  - Select 'Add Signal' from the Panel Editor.
  - Change icon...
  - For this example panel I am going to use the simple LED images.
  - Remember that you need to drag inside of the image area to change the icon images.

SSL (Simple Signal Logic)



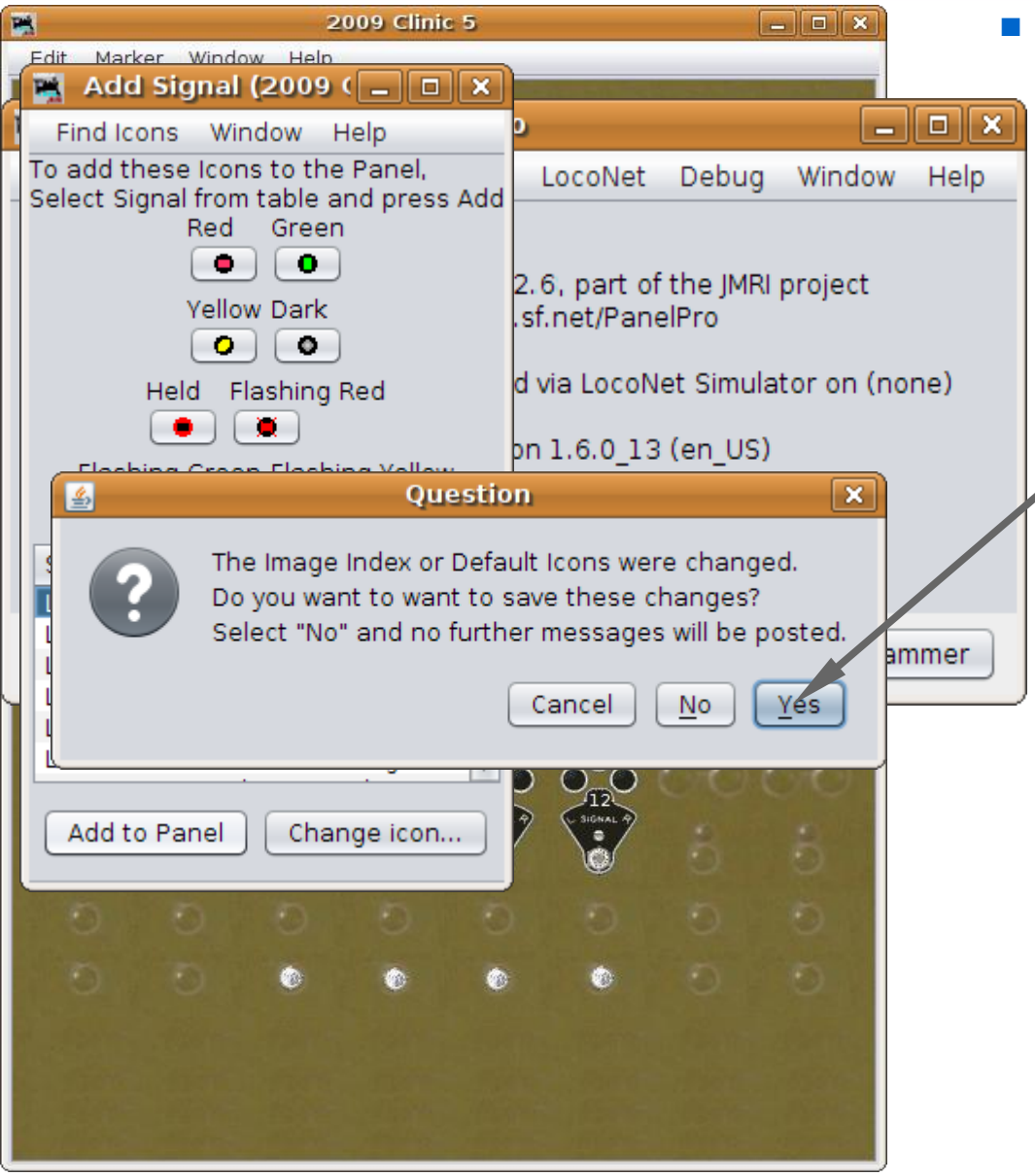
- Signal head basics
  - Select 'Add Signal' from the Panel Editor.
  - Change icon...
  - For this example panel I am going to use the simple LED images.
  - Remember that you need to drag inside of the image area to change the icon images.
  - Highlight each signal name and click 'Add to Panel' to place them all on the panel.

SSL (Simple Signal Logic)



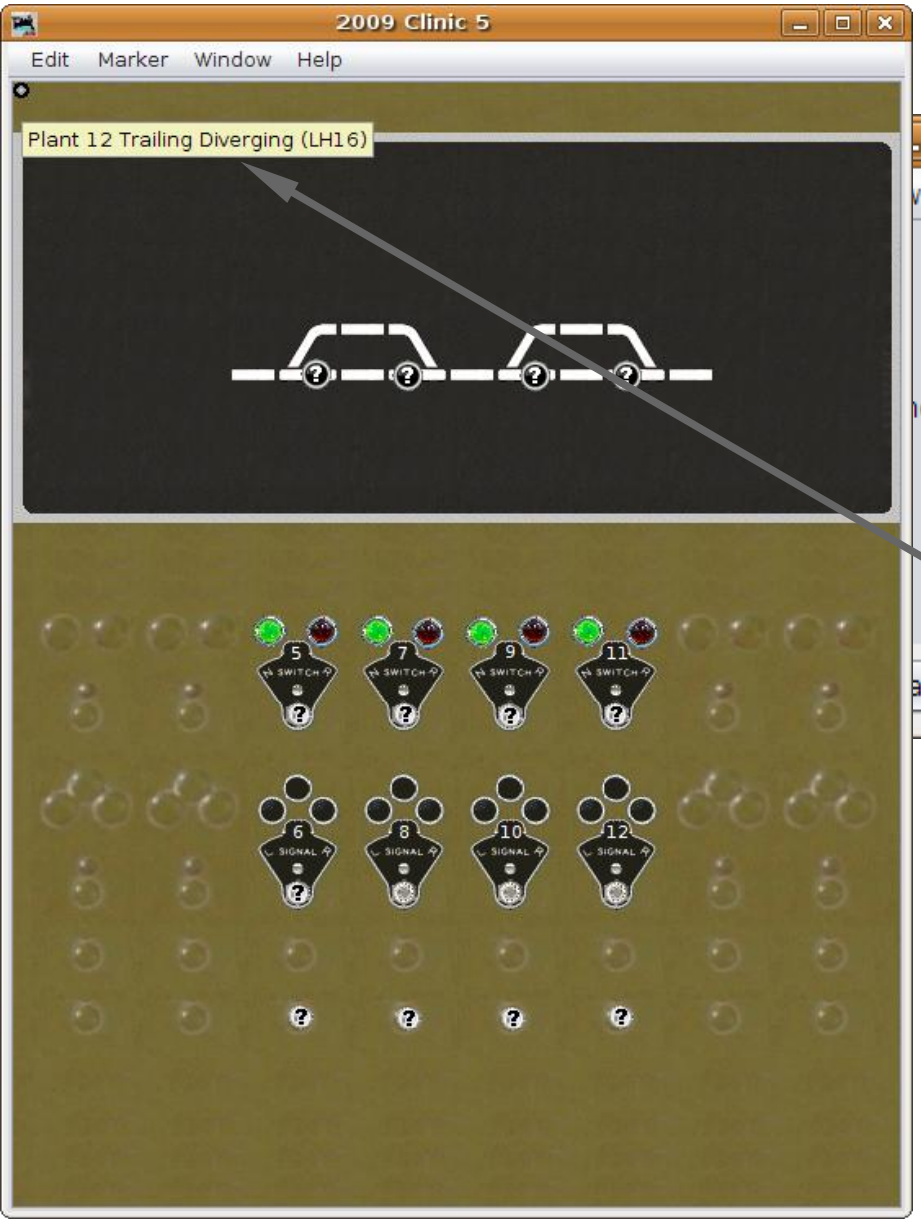
- Signal head basics
  - Close the 'Add Signal..' window.

SSL (Simple Signal Logic)



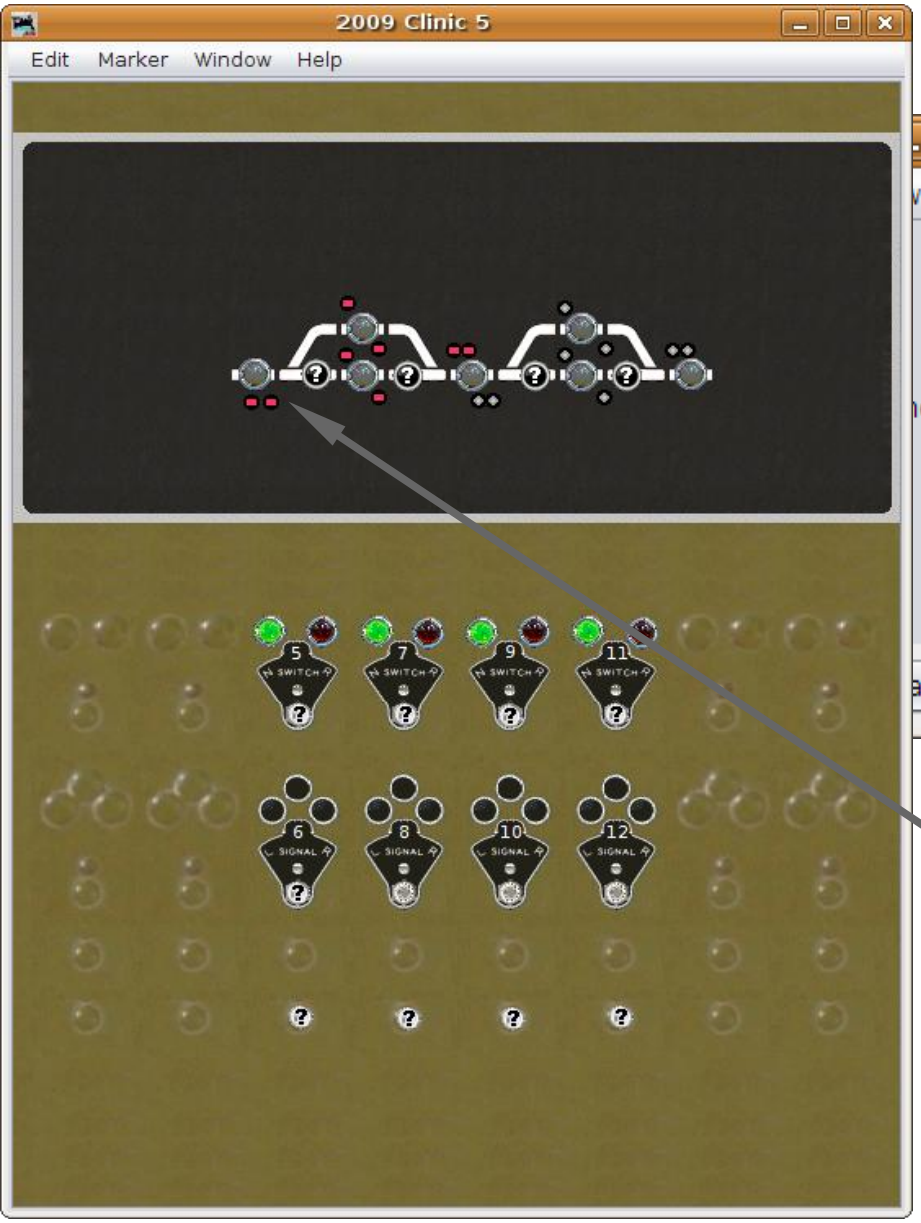
- Signal head basics
  - Close the 'Add Signal..' window.
  - You are given the opportunity to make this set of images the new default set.

SSL (Simple Signal Logic)



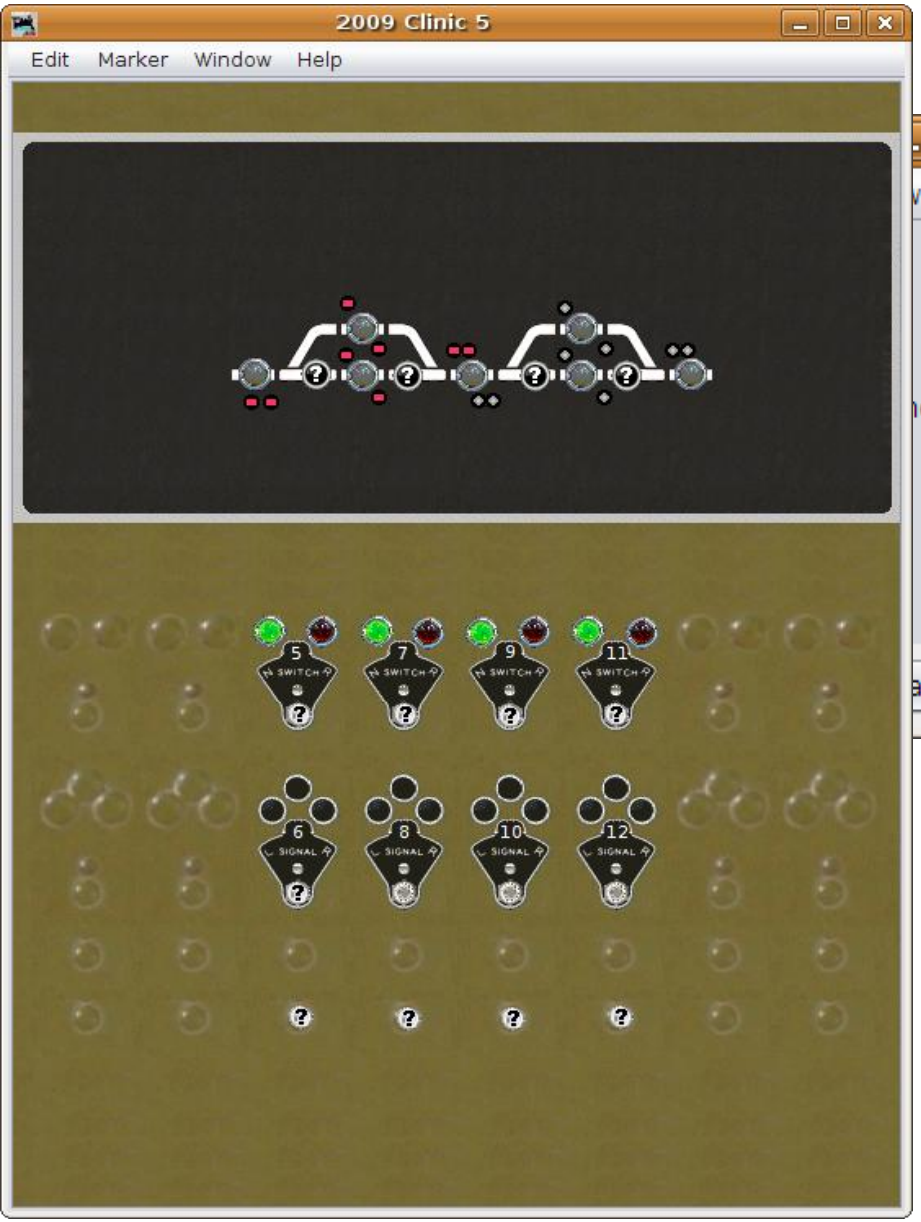
- Signal head basics
  - Close the 'Add Signal..' window.
  - You are given the opportunity to make this set of images the new default set.
  - Using the hover pop-ups, identify each new signal and place it on the panel.

SSL (Simple Signal Logic)



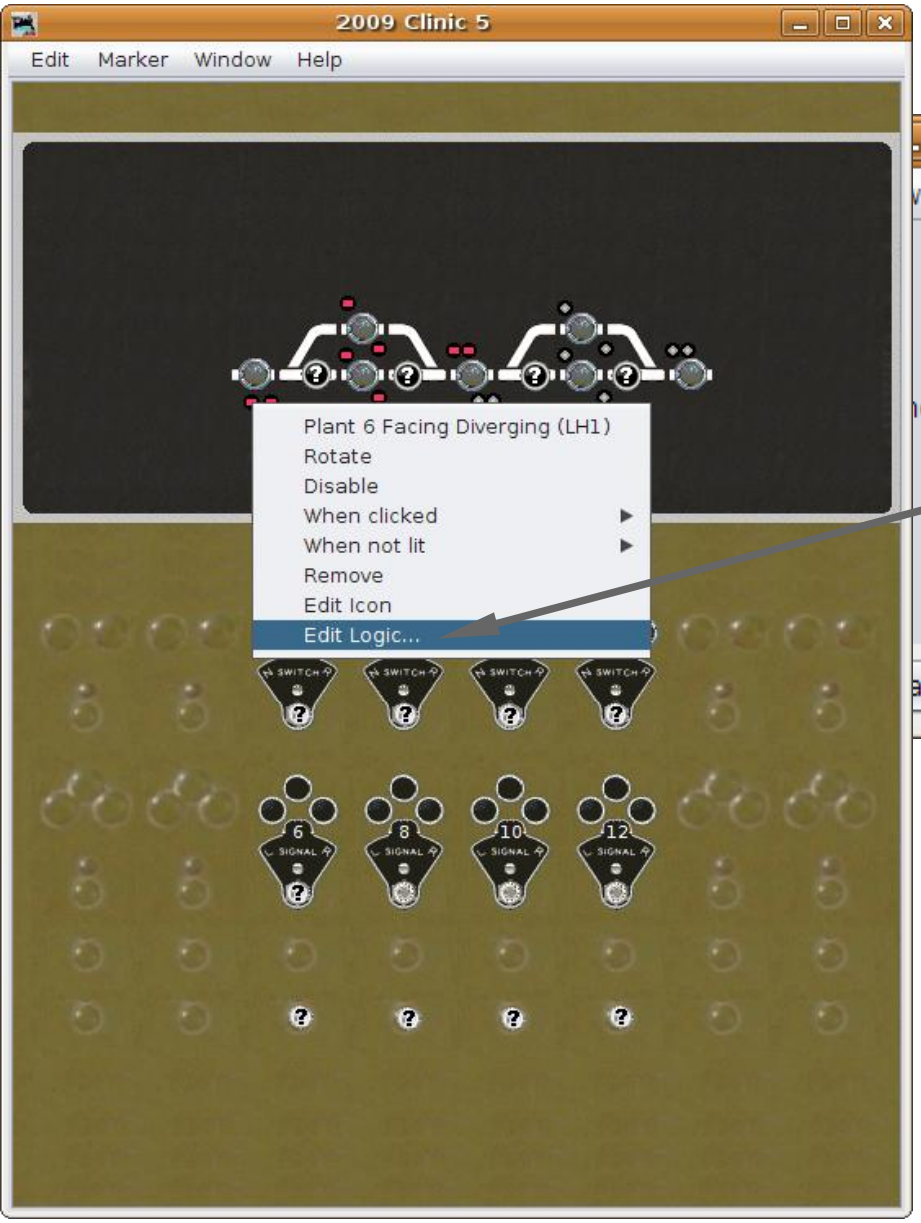
- Signal head basics
  - Close the 'Add Signal..' window.
  - You are given the opportunity to make this set of images the new default set.
  - Using the hover pop-ups, identify each new signal and place it on the panel.
  - Clicking on these signal images should change the corresponding signals on the layout.

SSL (Simple Signal Logic)



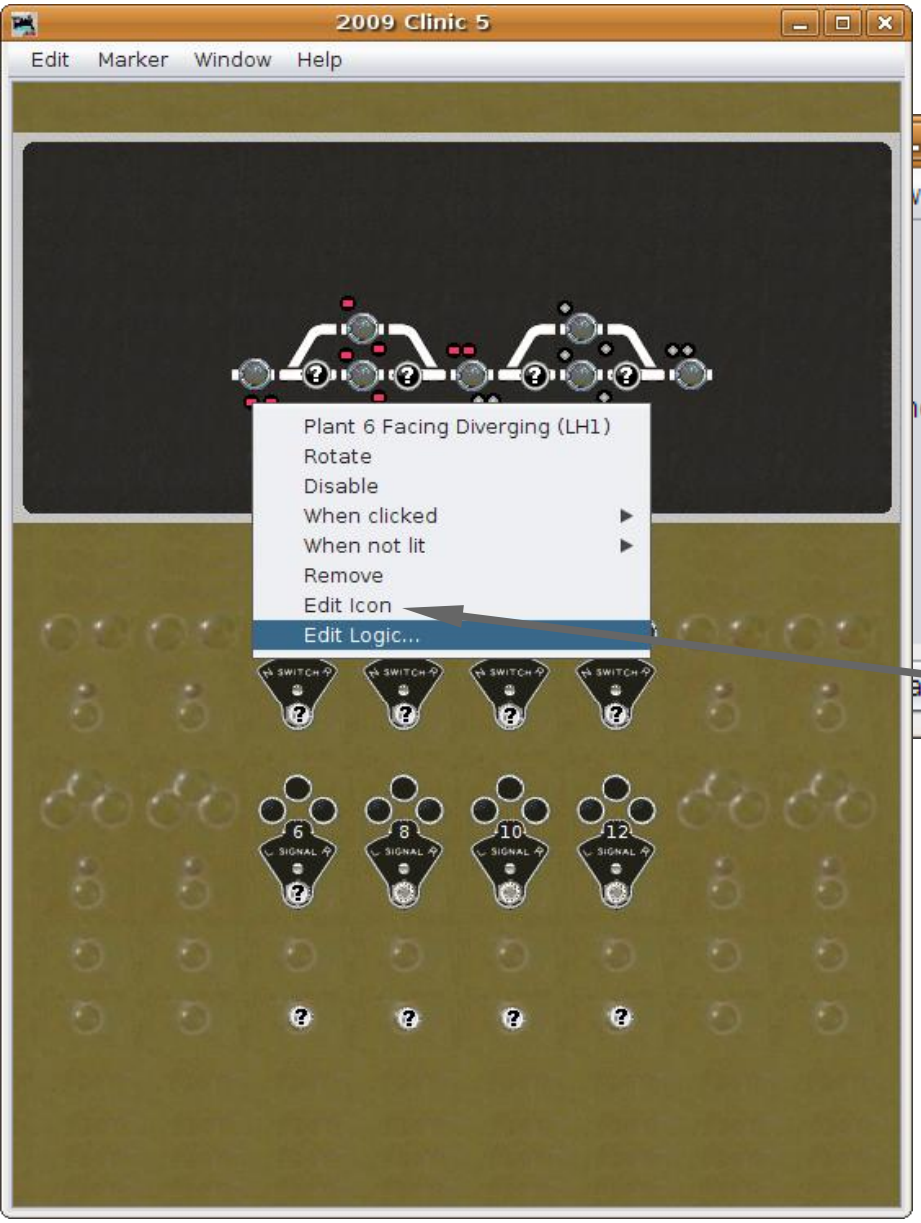
- Signal head basics
  - This is a good point to save our work again.

SSL (Simple Signal Logic)



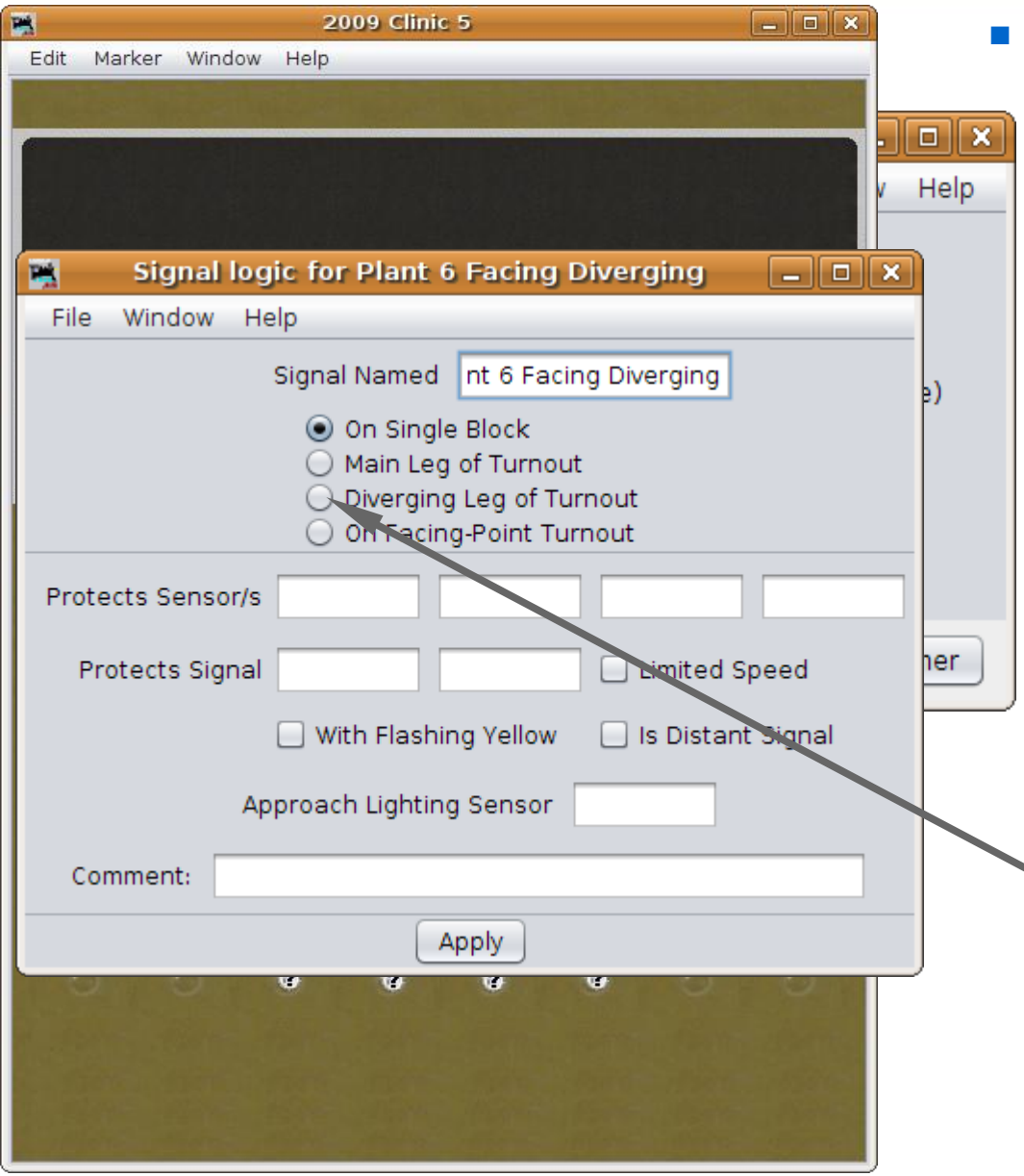
- Signal head basics
  - This is a good point to save our work again.
  - To add the signal's logic right click on each signal's icon and select 'Edit Logic'

SSL (Simple Signal Logic)



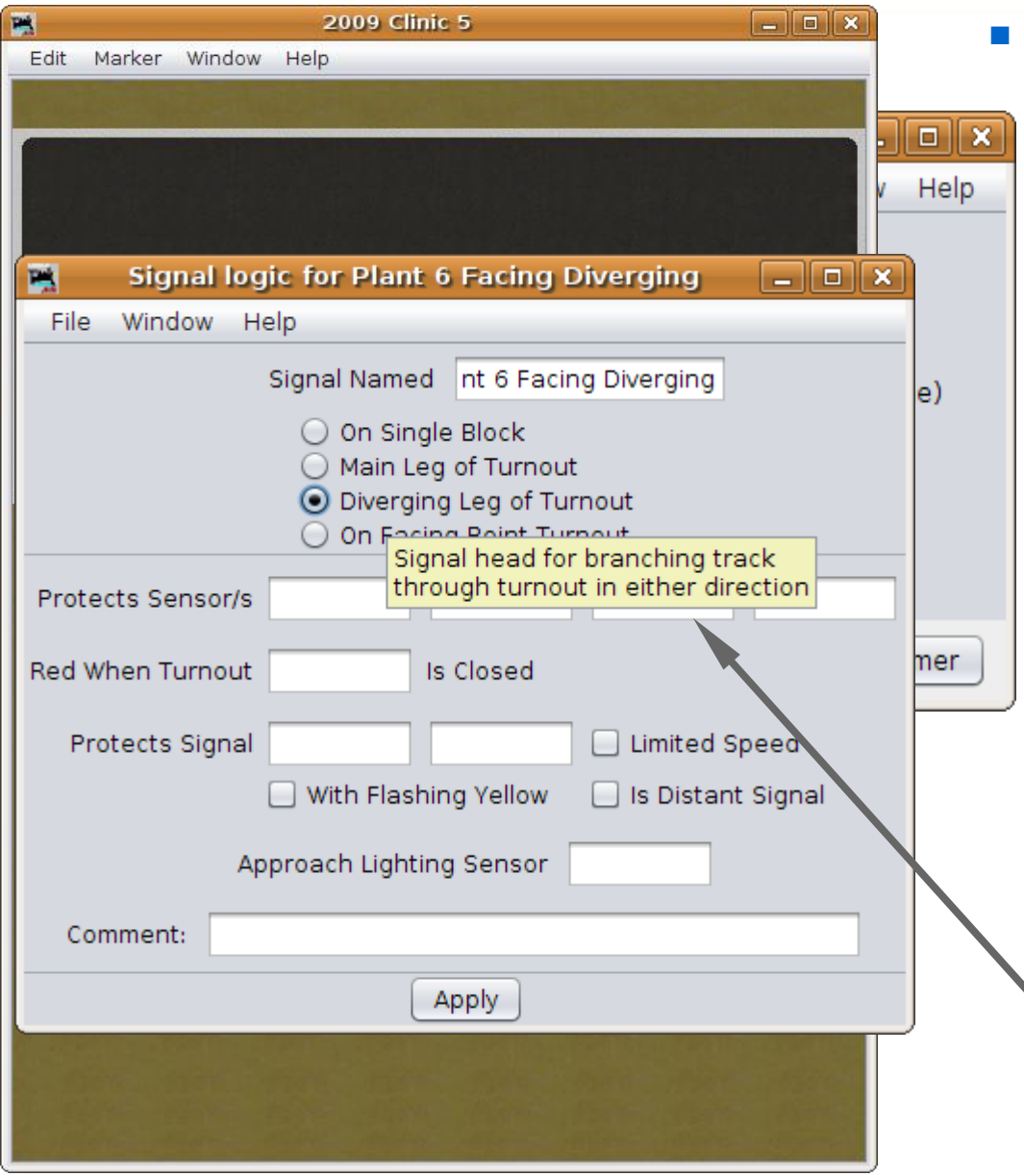
- Signal head basics
  - This is a good point to save our work again.
  - To add the signal's logic right click on each signal's icon and select 'Edit Logic'
  - Note: Use 'Edit icon' to change the appearance or signal head ID.

SSL (Simple Signal Logic)



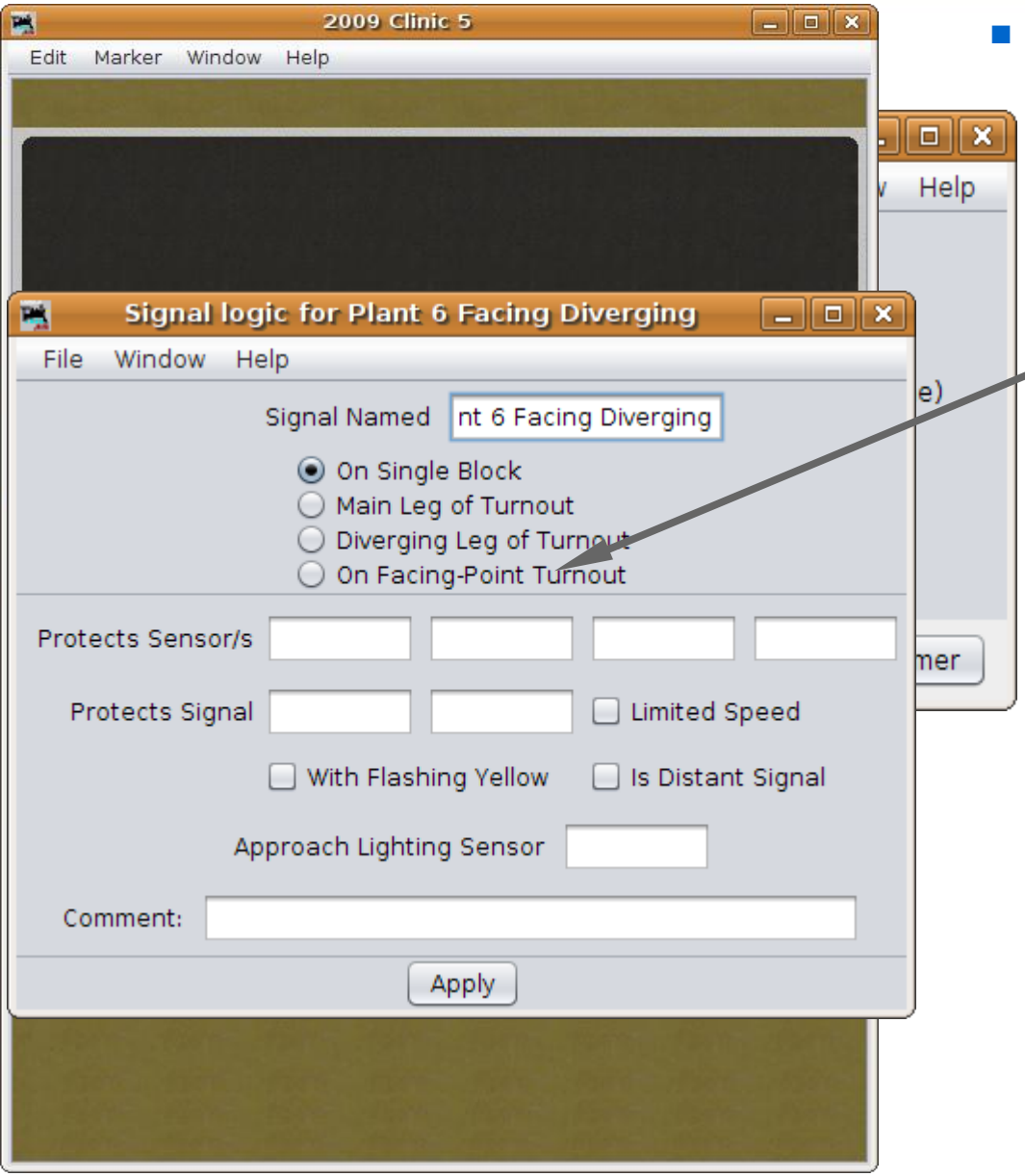
- Signal head basics
  - This is a good point to save our work again.
  - To add the signal's logic right click on each signal's icon and select 'Edit Logic'
  - Note: Use 'Edit icon' to change the appearance or signal head ID.
  - First select the purpose of this signal head. In this case its controlling the 'Diverging Leg of Turnout'.

SSL (Simple Signal Logic)



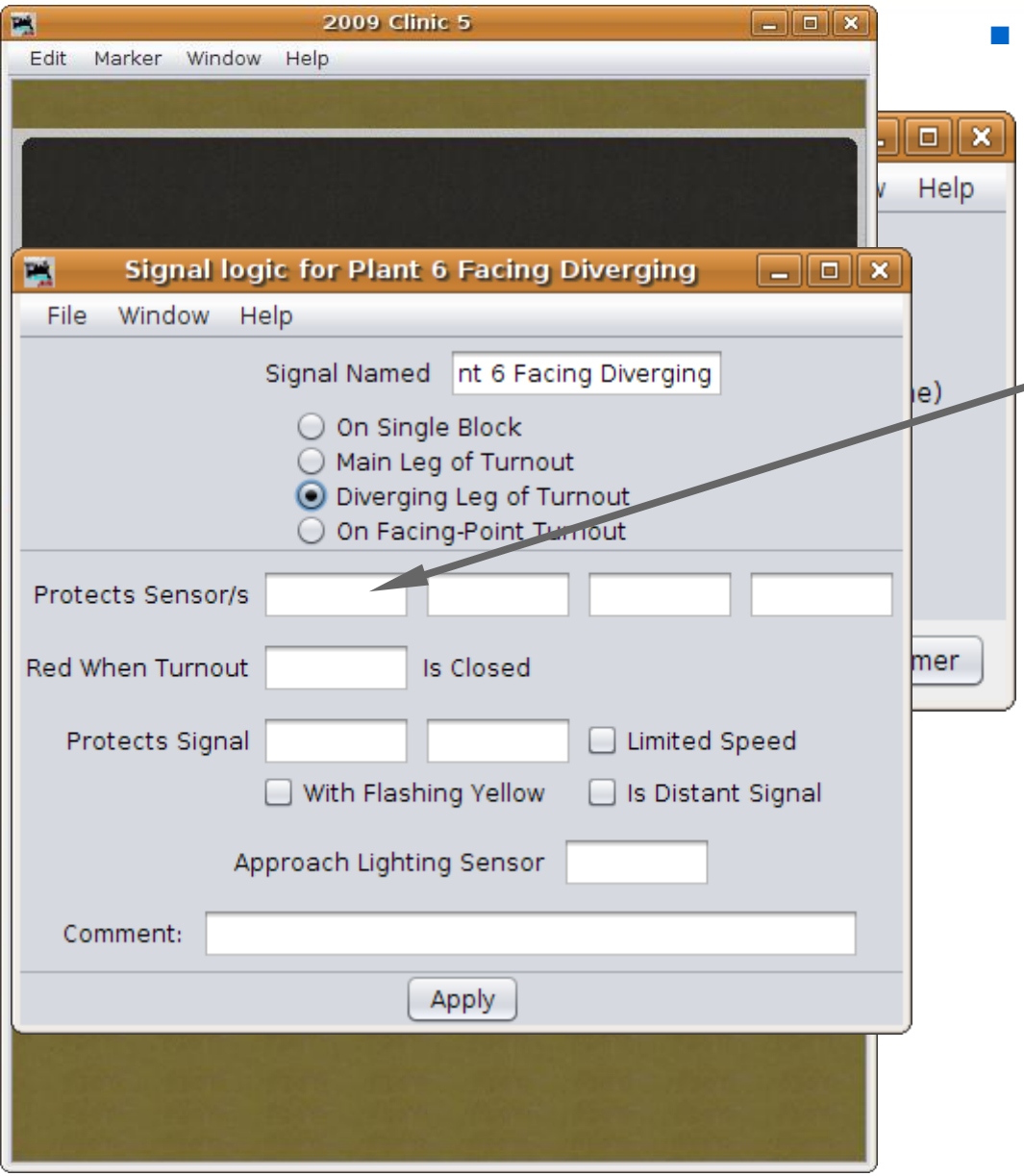
- Signal head basics
  - This is a good point to save our work again.
  - To add the signal's logic right click on each signal's icon and select 'Edit Logic'
  - Note: Use 'Edit icon' to change the appearance or signal head ID.
  - First select the purpose of this signal head. In this case its controlling the 'Diverging Leg of Turnout'.
  - Each item has pop-up help.

SSL (Simple Signal Logic)



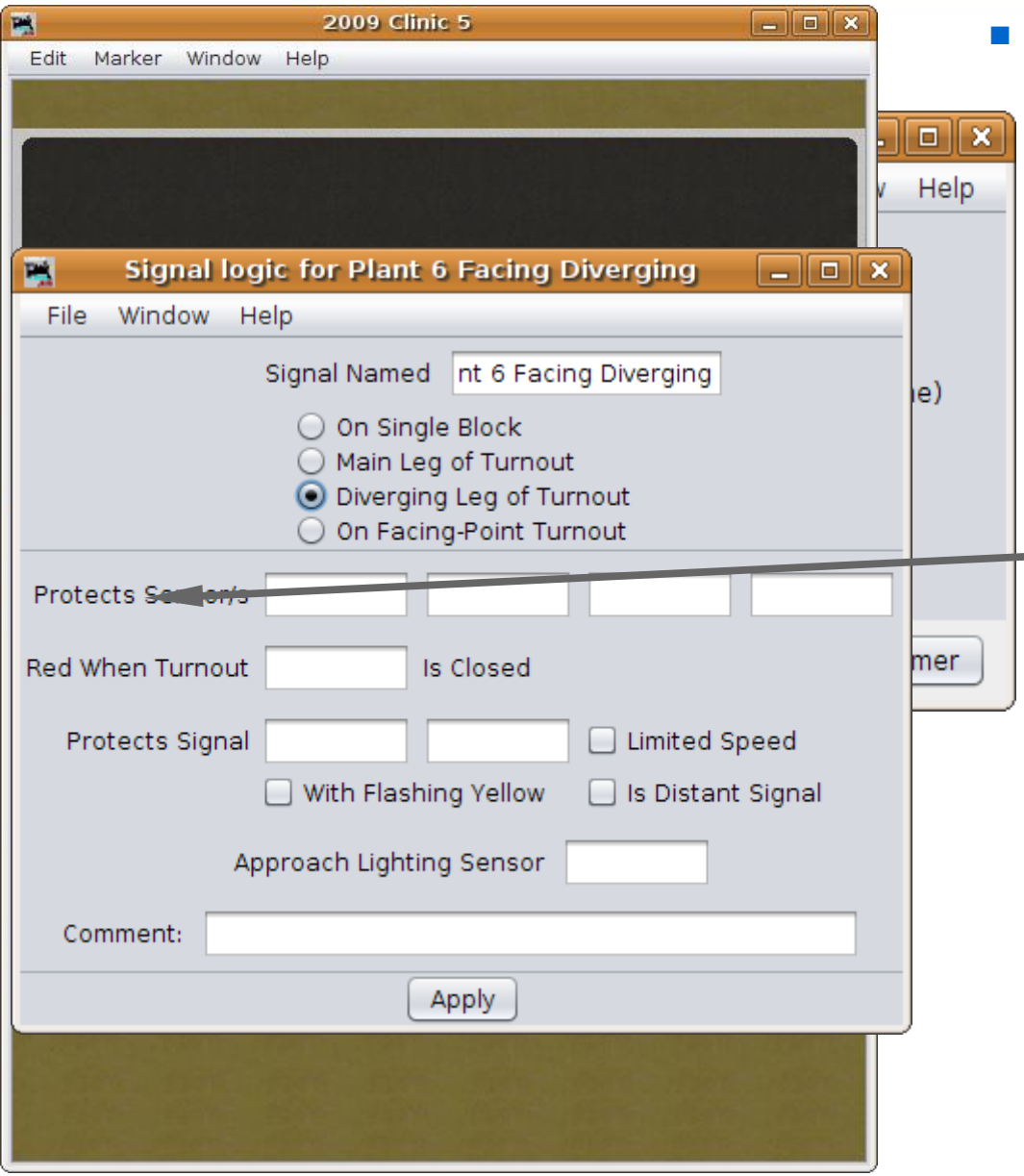
- Signal head basics
  - Note: Do NOT choose 'On Facing-Point Turnout' unless you just have a single signal head that is controlling both routes.

SSL (Simple Signal Logic)



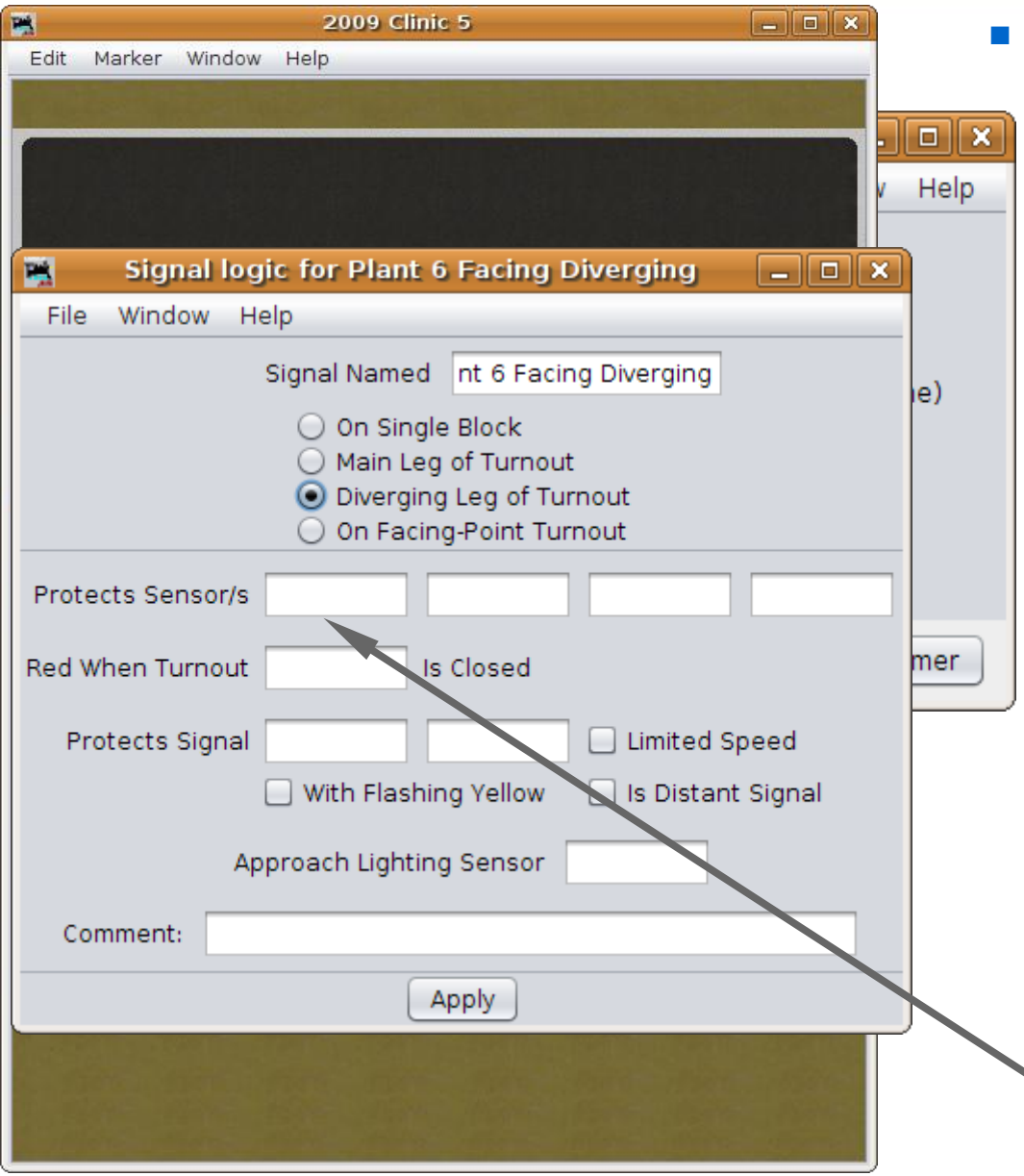
- Signal head basics
  - These sensors are the actual BOD (Block Occupancy Detector) units for the OS and Track section this signal protects.

SSL (Simple Signal Logic)



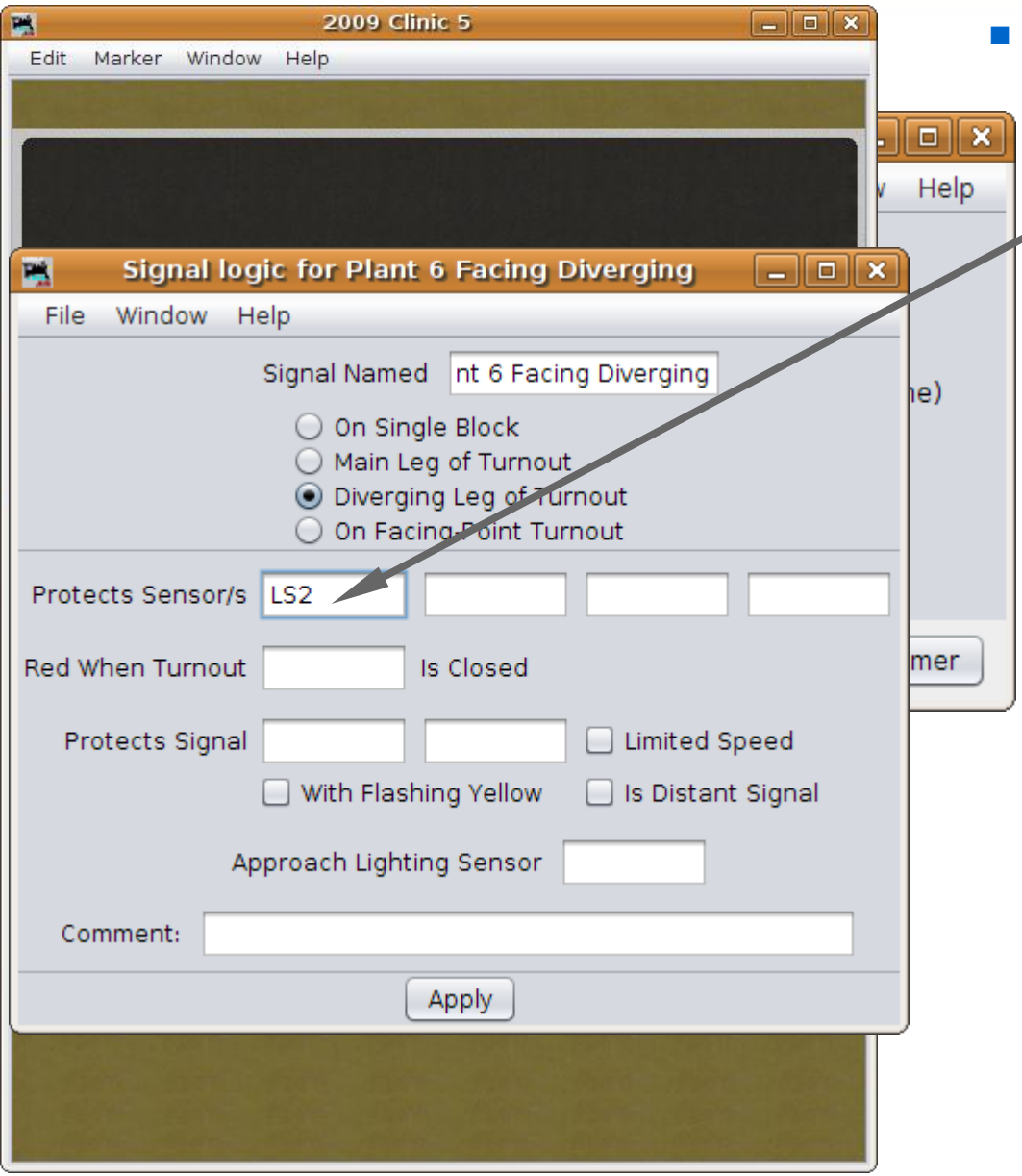
- Signal head basics
  - These sensors are the actual BOD (Block Occupancy Detector) units for the OS and Track section this signal protects.
  - 'Protects' means that a signal goes to 'stop' in front of these sensors when they are active. I.e. It is the track that is being protected from any train that might be entering it.

SSL (Simple Signal Logic)



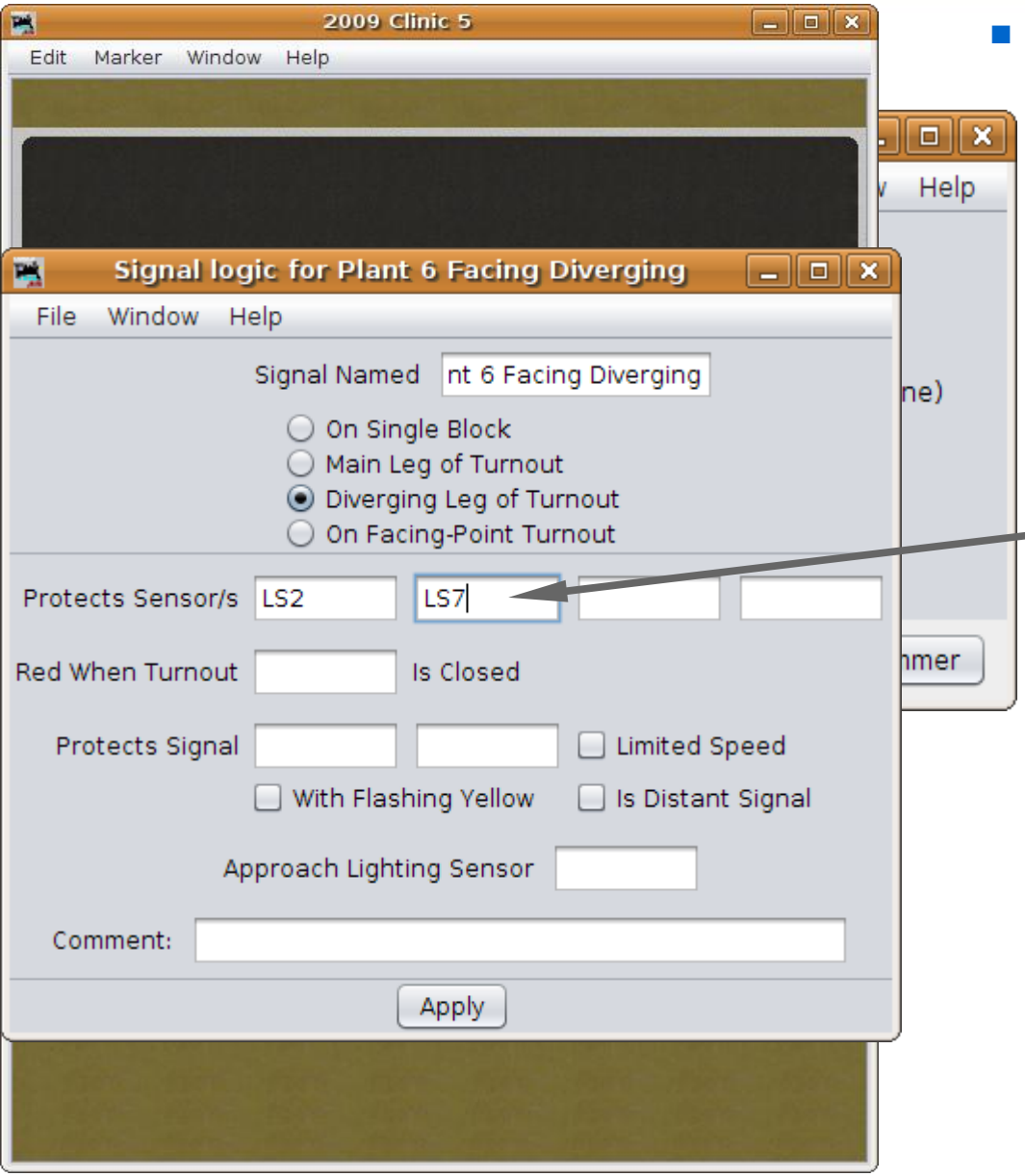
- Signal head basics
  - These sensors are the actual BOD (Block Occupancy Detector) units for the OS and Track section this signal protects.
  - 'Protects' means that a signal goes to 'stop' in front of these sensors when they are active. I.e. It is the track that is being protected from any train that might be entering it.
  - One reason is if the OS is already occupied.

SSL (Simple Signal Logic)



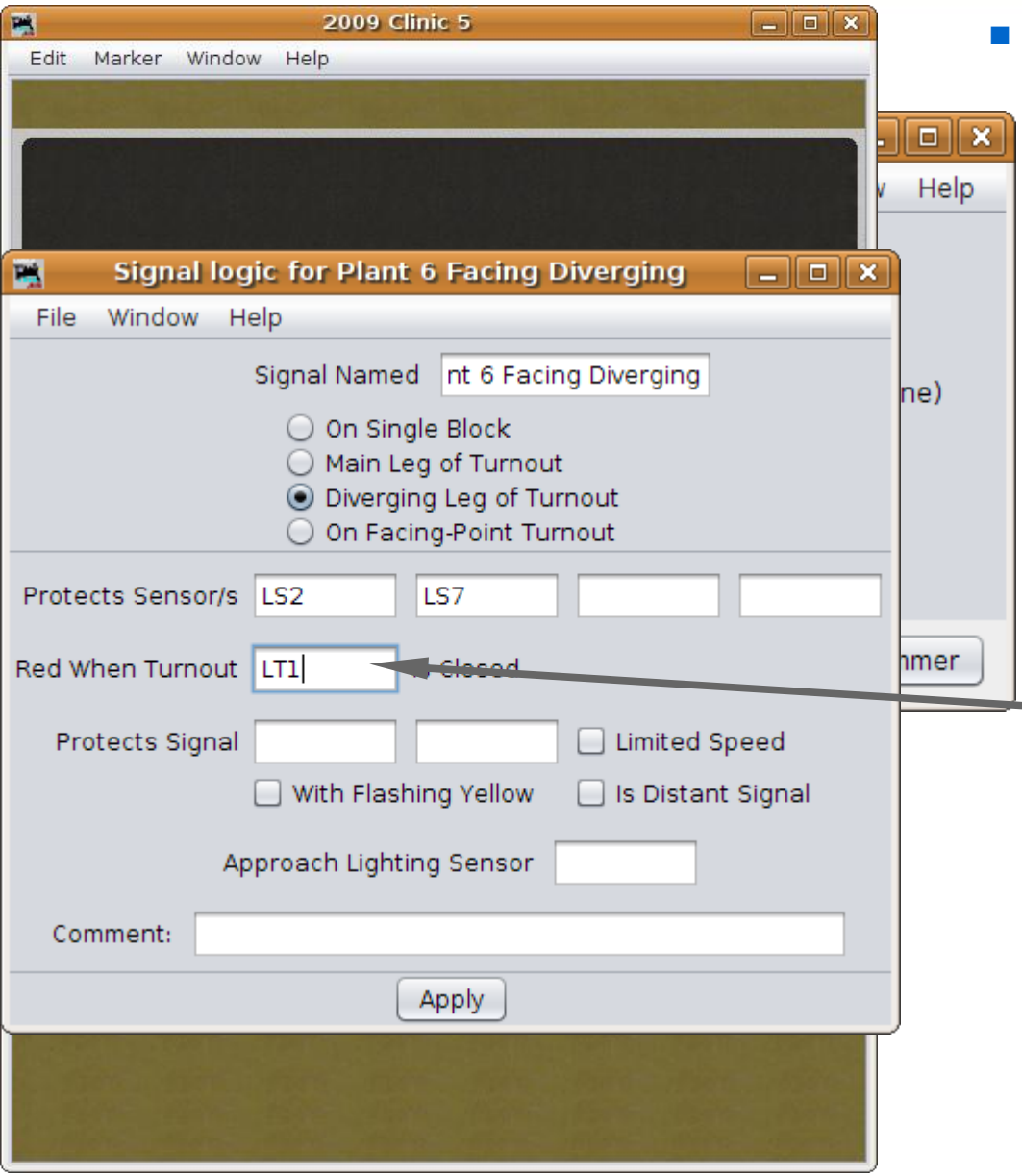
- Signal head basics
  - Enter the sensor for the OS which is LS2.

SSL (Simple Signal Logic)



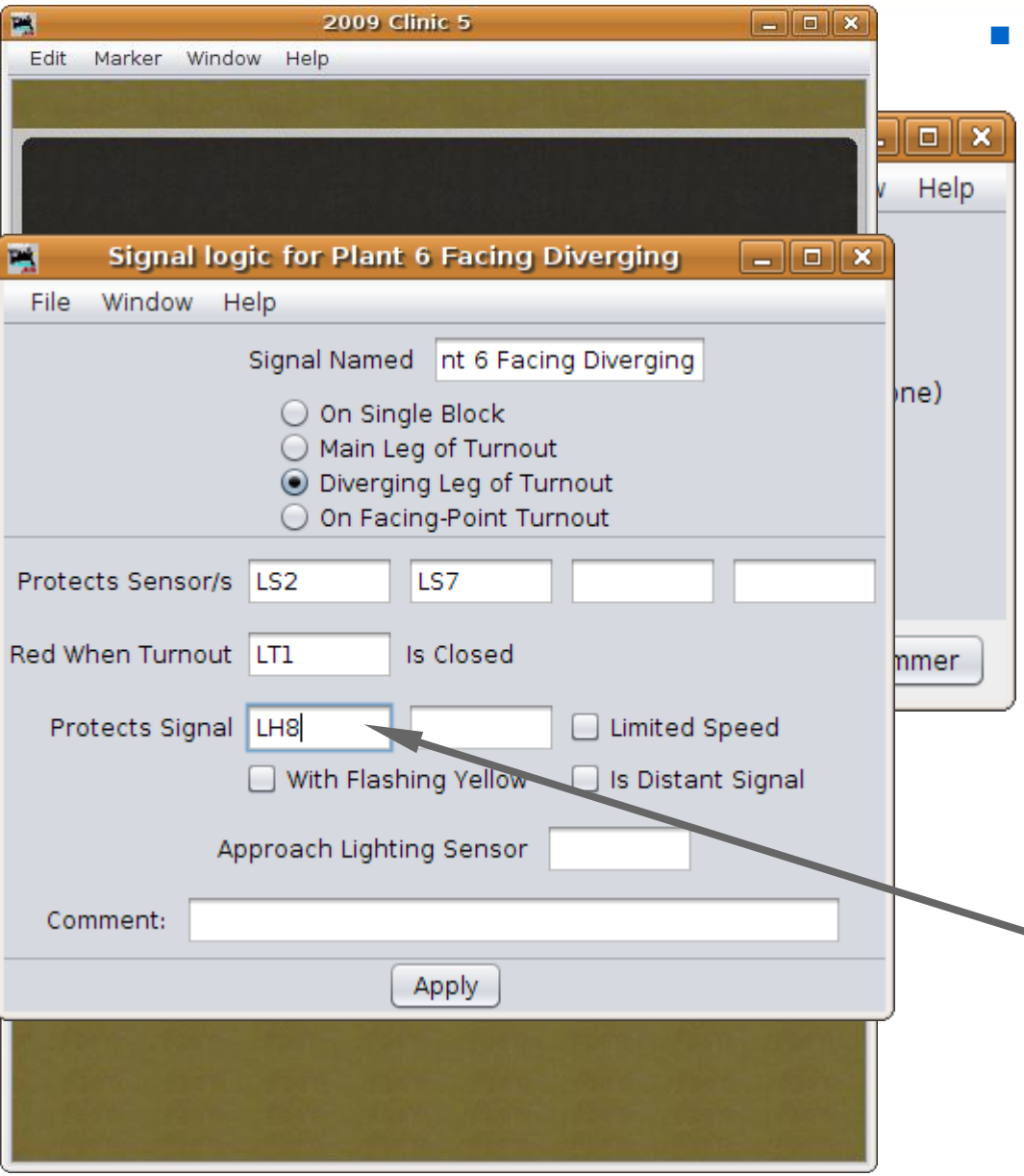
- Signal head basics
  - Enter the sensor for the OS which is LS2.
  - This signal head is for the diverging route, so it also needs to protect the siding, i.e. LS7.

SSL (Simple Signal Logic)



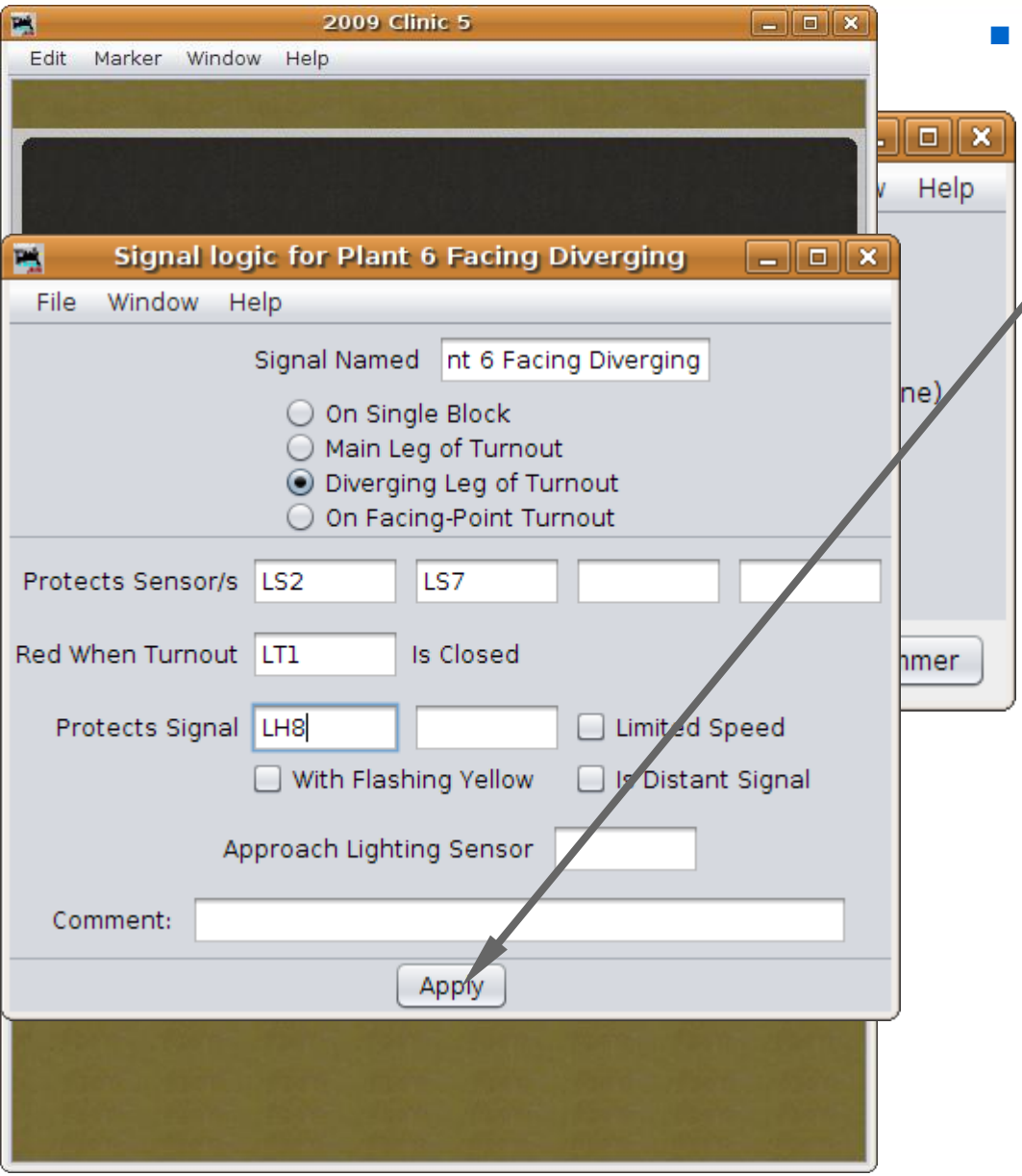
- Signal head basics
  - Enter the sensor for the OS which is LS2.
  - This signal head is for the diverging route, so it also needs to protect the siding, i.e. LS7.
  - Of course we need to know what turnout is involved, so we enter LT1.

SSL (Simple Signal Logic)



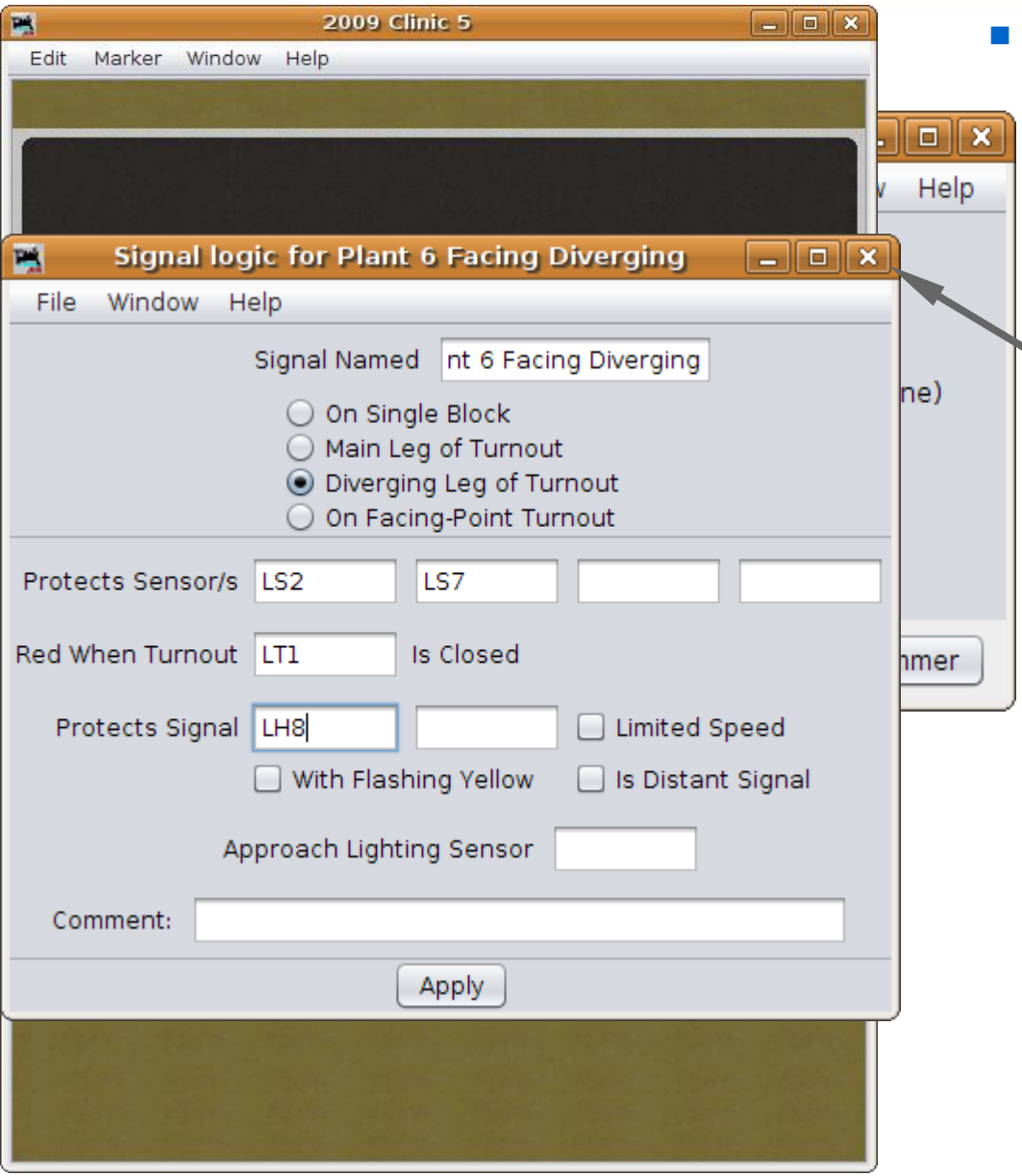
- Signal head basics
  - Enter the sensor for the OS which is LS2.
  - This signal head is for the diverging route, so it also needs to protect the siding, i.e. LS7.
  - Of course we need to know what turnout is involved, so we enter LT1.
  - Finally we need to know the next signal along *this* route. It is LH8 at the end of the diverging track.

SSL (Simple Signal Logic)



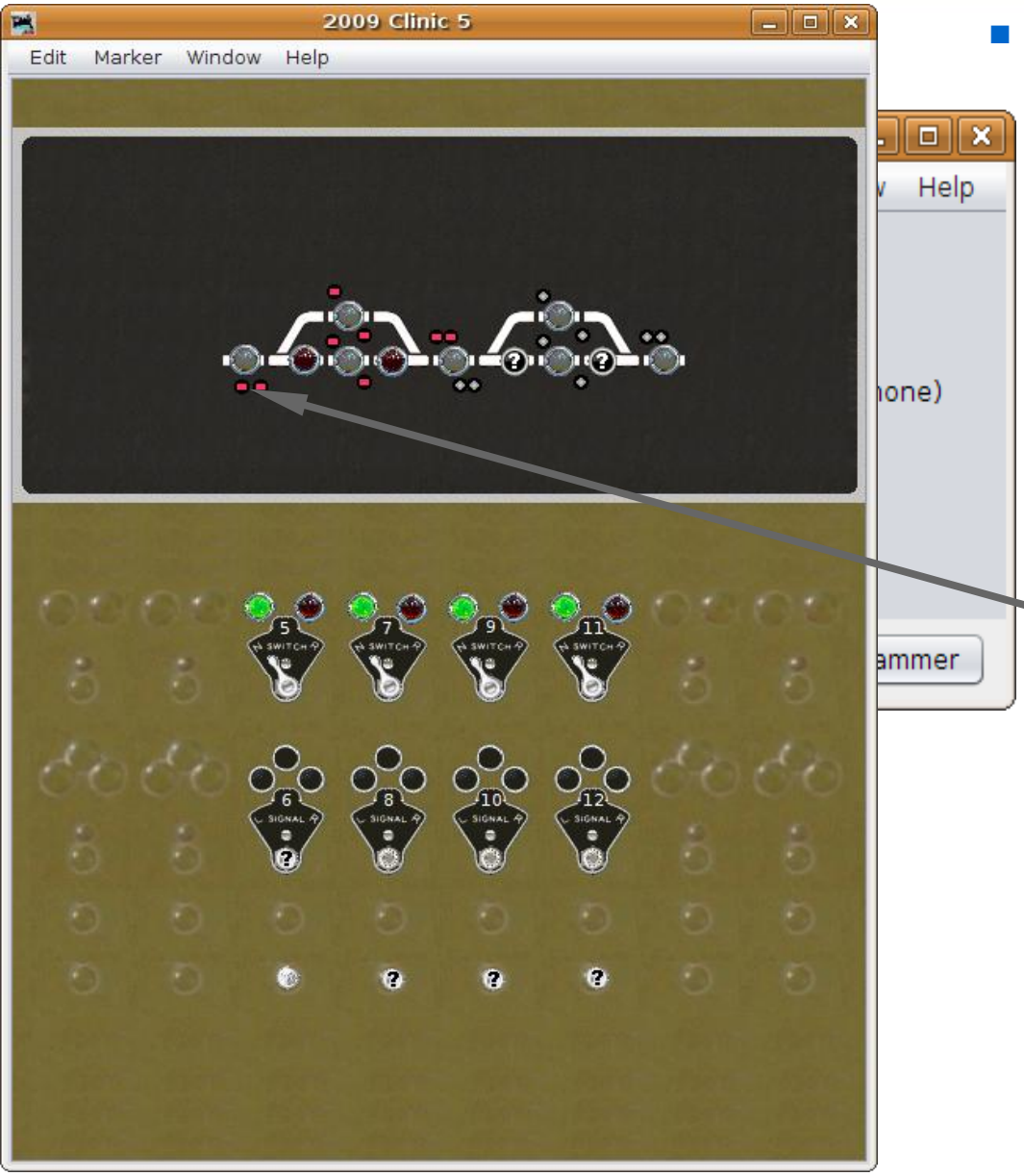
- Signal head basics
  - Click 'Apply' to update the logic for this head.

SSL (Simple Signal Logic)



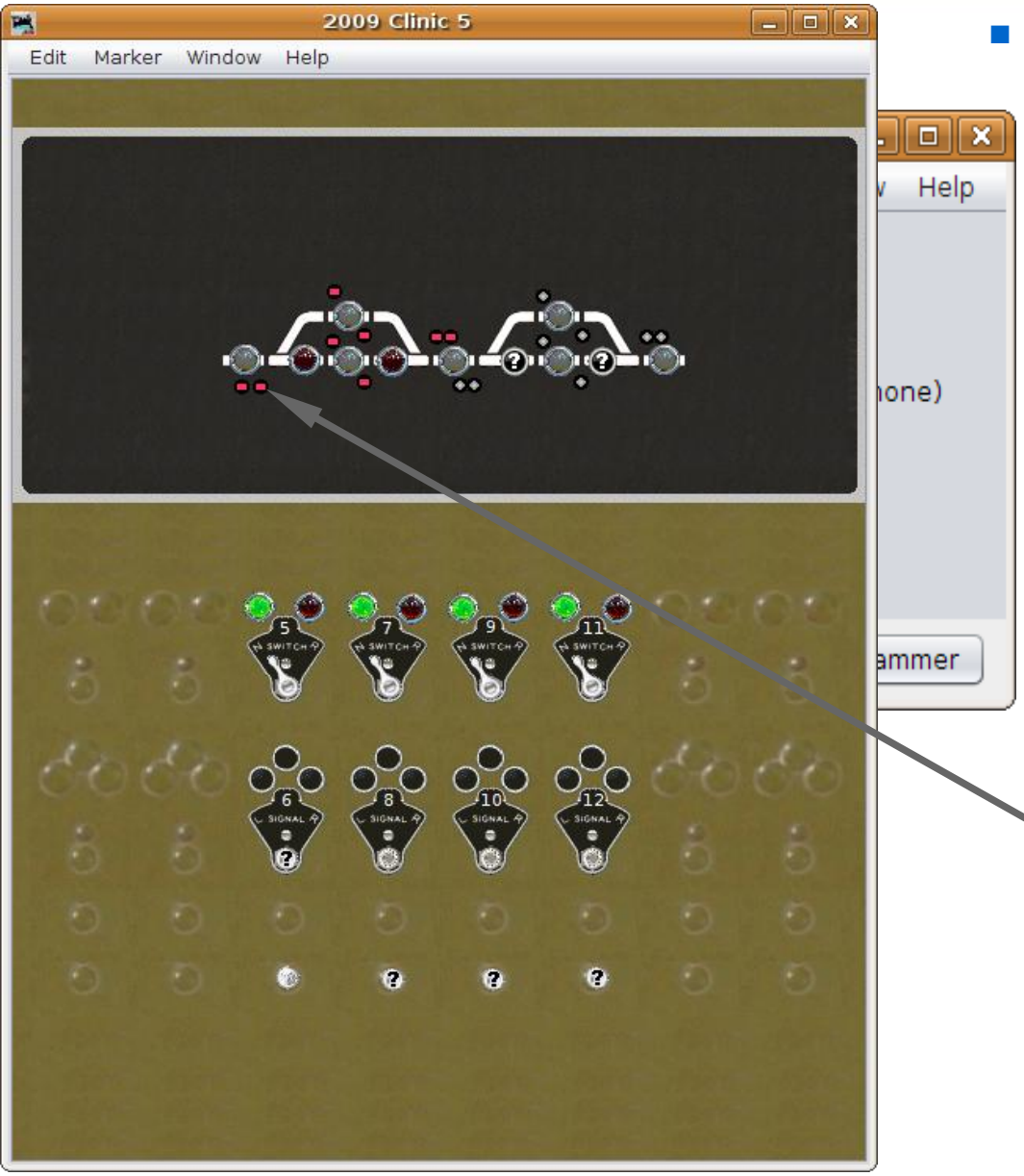
- Signal head basics
  - Click 'Apply' to update the logic for this head.
  - Close the edit window when done.

SSL (Simple Signal Logic)



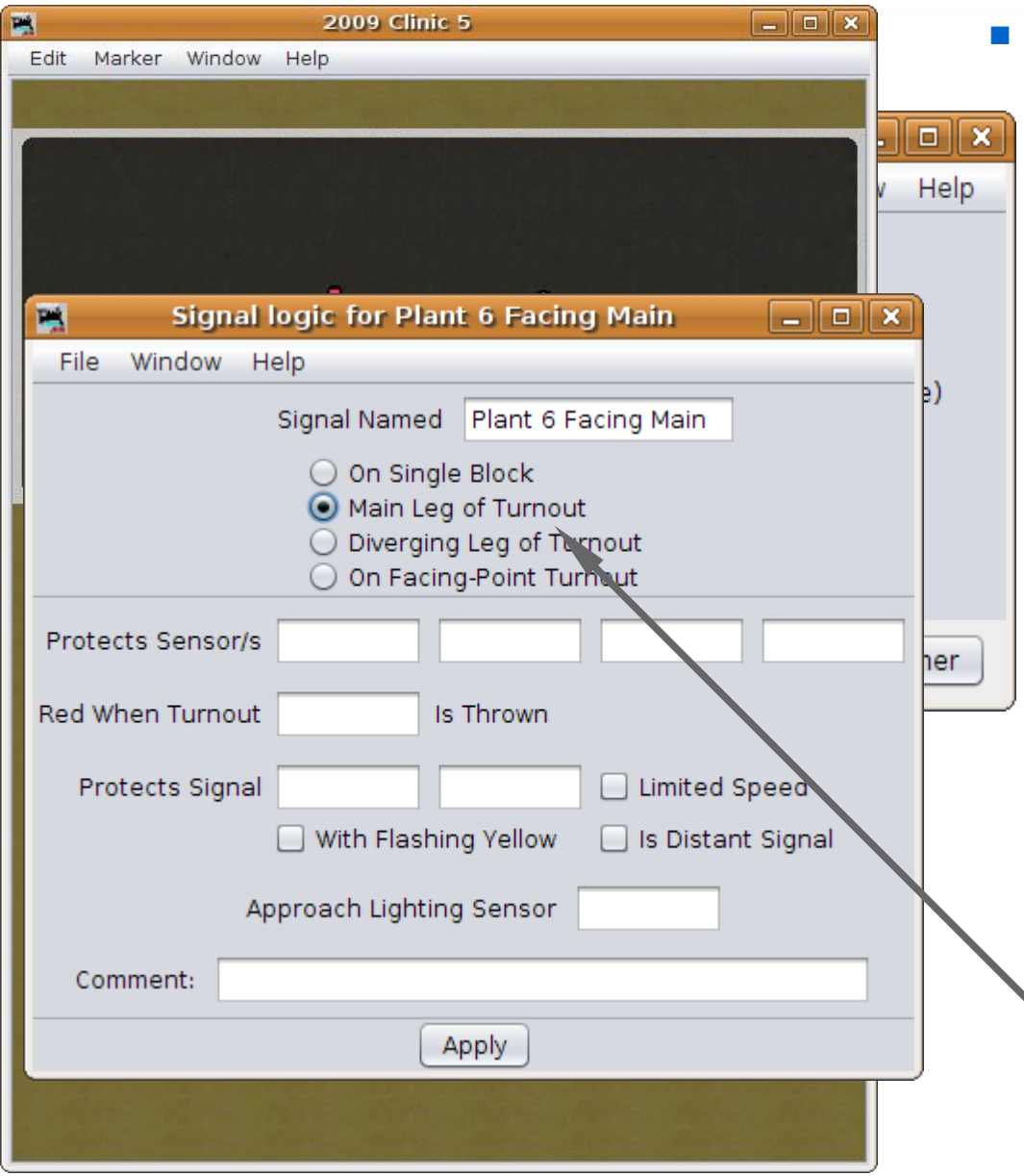
- Signal head basics
  - Click 'Apply' to update the logic for this head.
  - Close the edit window when done.
  - The signal is still red because the turnout is set against traffic onto the diverging route.

SSL (Simple Signal Logic)



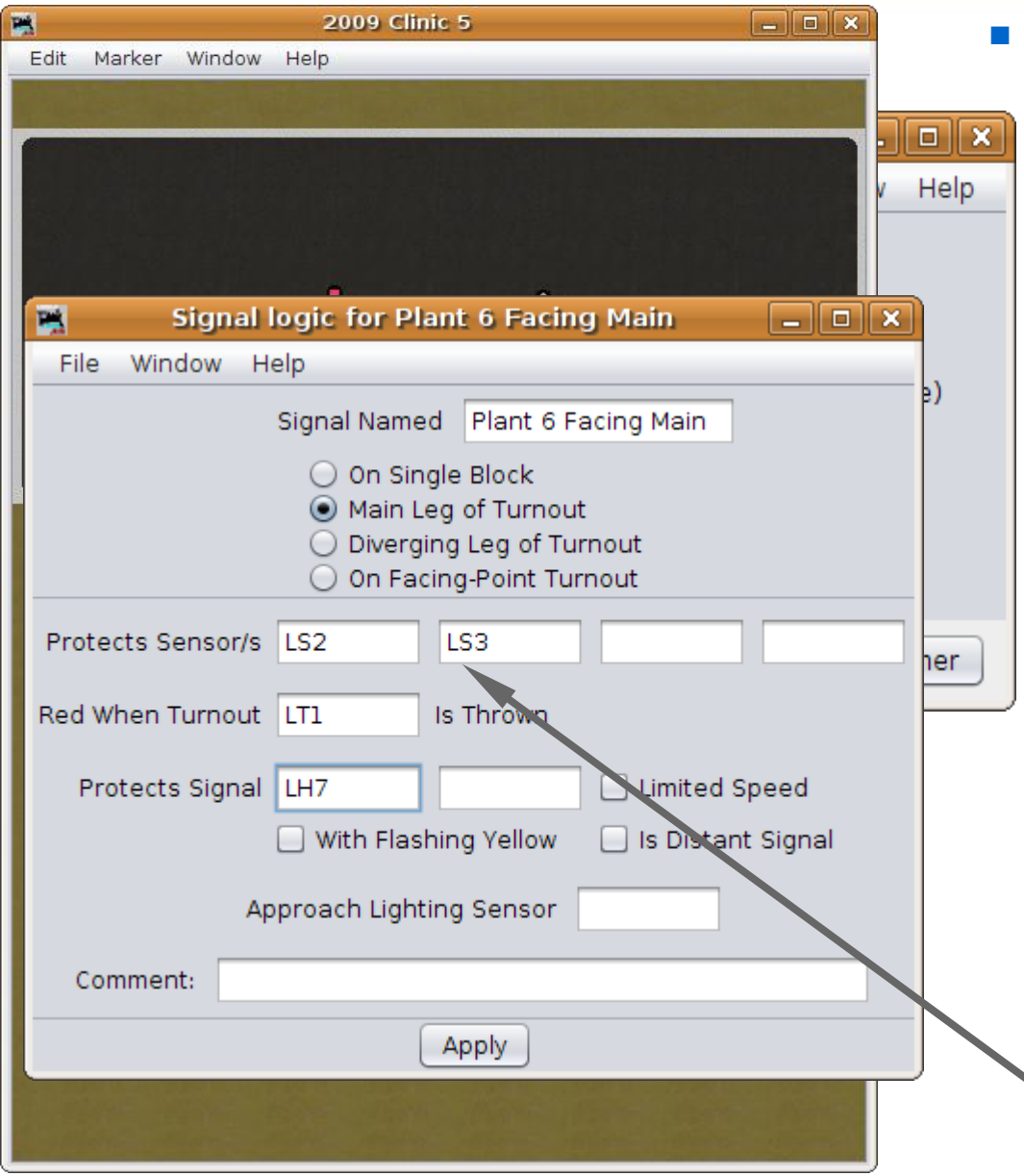
- Signal head basics
  - Click 'Apply' to update the logic for this head.
  - Close the edit window when done.
  - The signal is still red because the turnout is set against traffic onto the diverging route.
  - Right click the next head to bring up its edit window.

SSL (Simple Signal Logic)



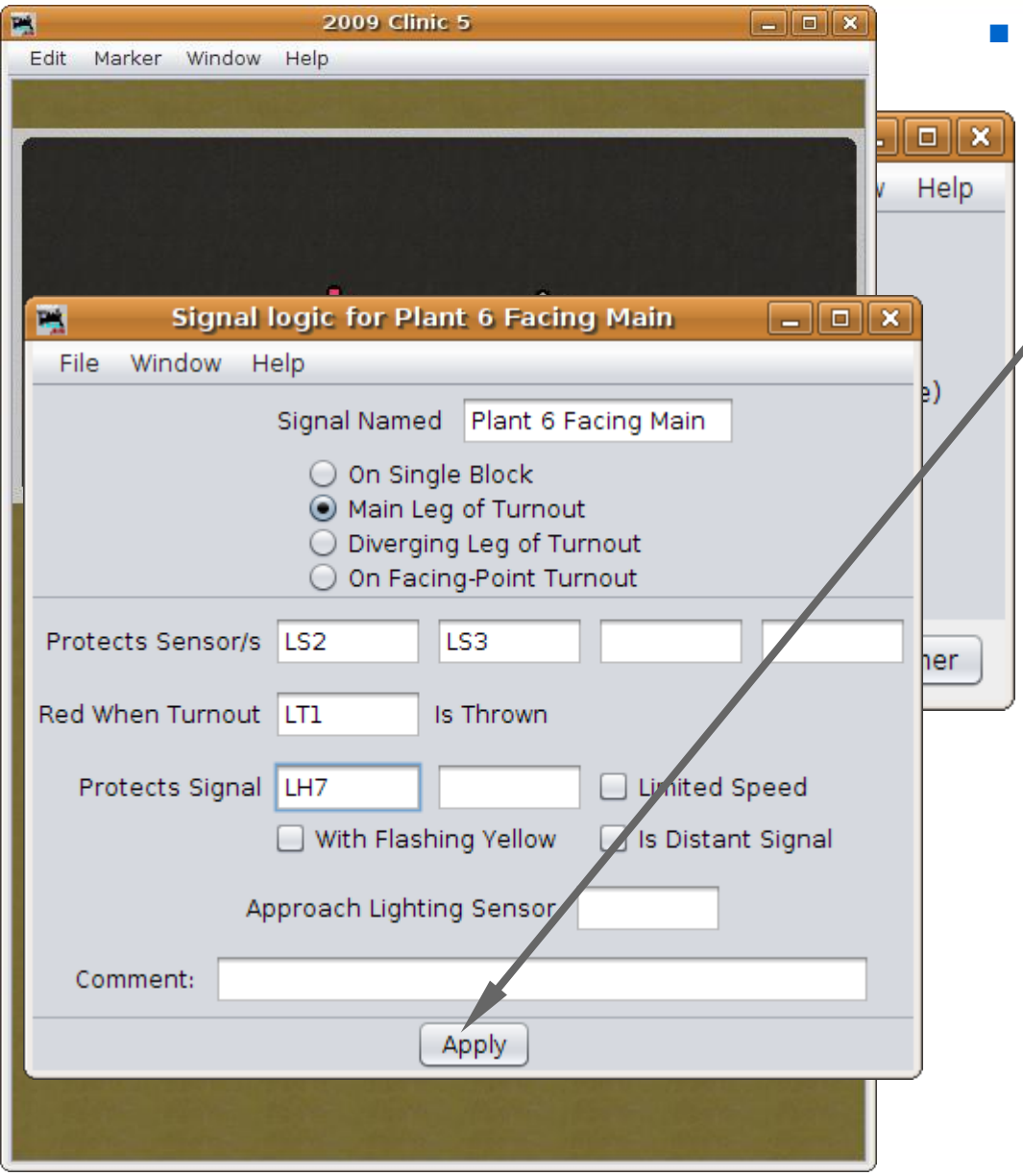
- Signal head basics
  - Click 'Apply' to update the logic for this head.
  - Close the edit window when done.
  - The signal is still red because the turnout is set against traffic onto the diverging route.
  - Right click the next head to bring up its edit window.
  - This is the 'main' leg of the turnout.

SSL (Simple Signal Logic)



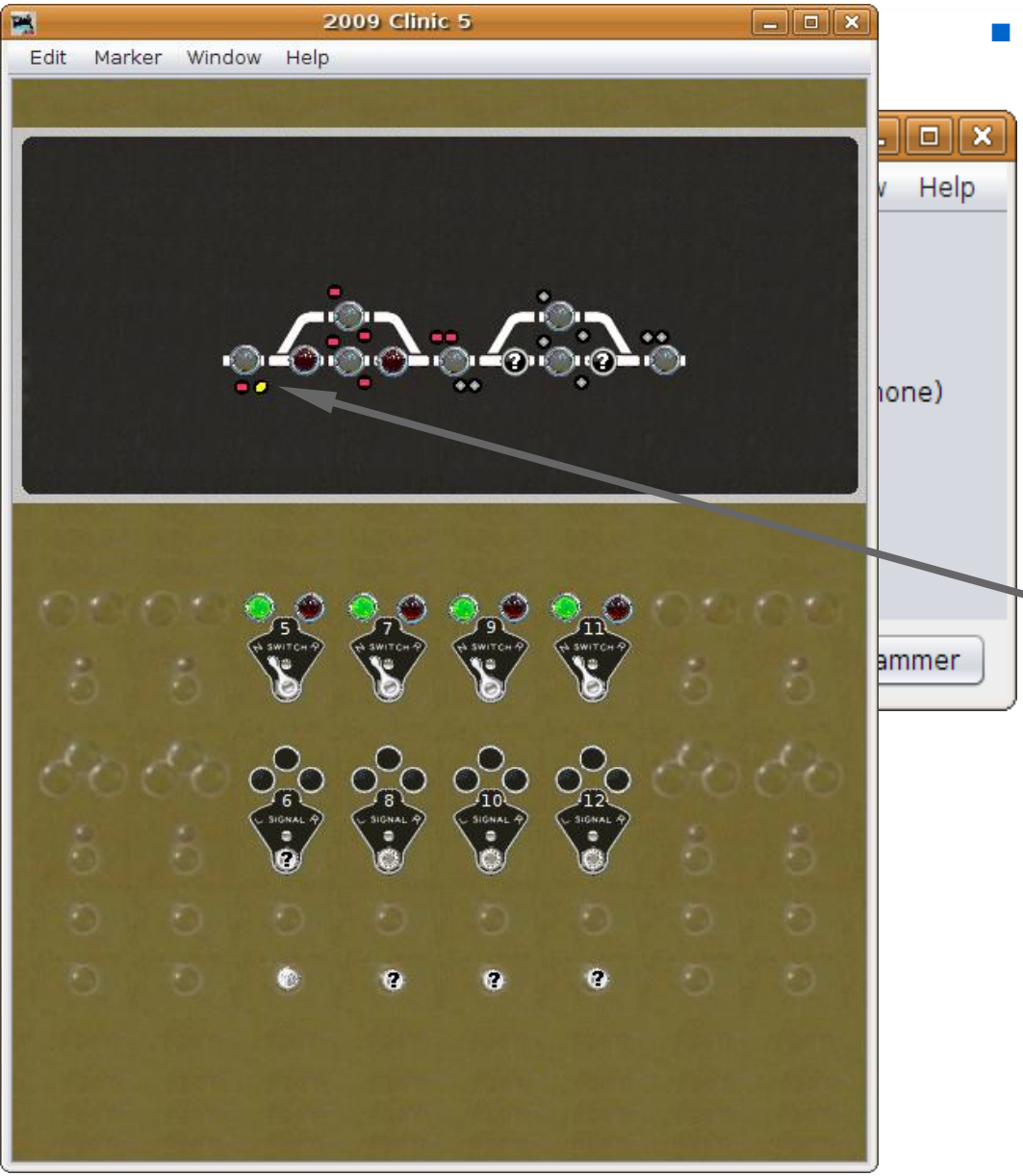
- Signal head basics
  - Click 'Apply' to update the logic for this head.
  - Close the edit window when done.
  - The signal is still red because the turnout is set against traffic onto the diverging route.
  - Right click the next head to bring up its edit window.
  - This is the 'main' leg of the turnout.
  - Add all the other info.

SSL (Simple Signal Logic)



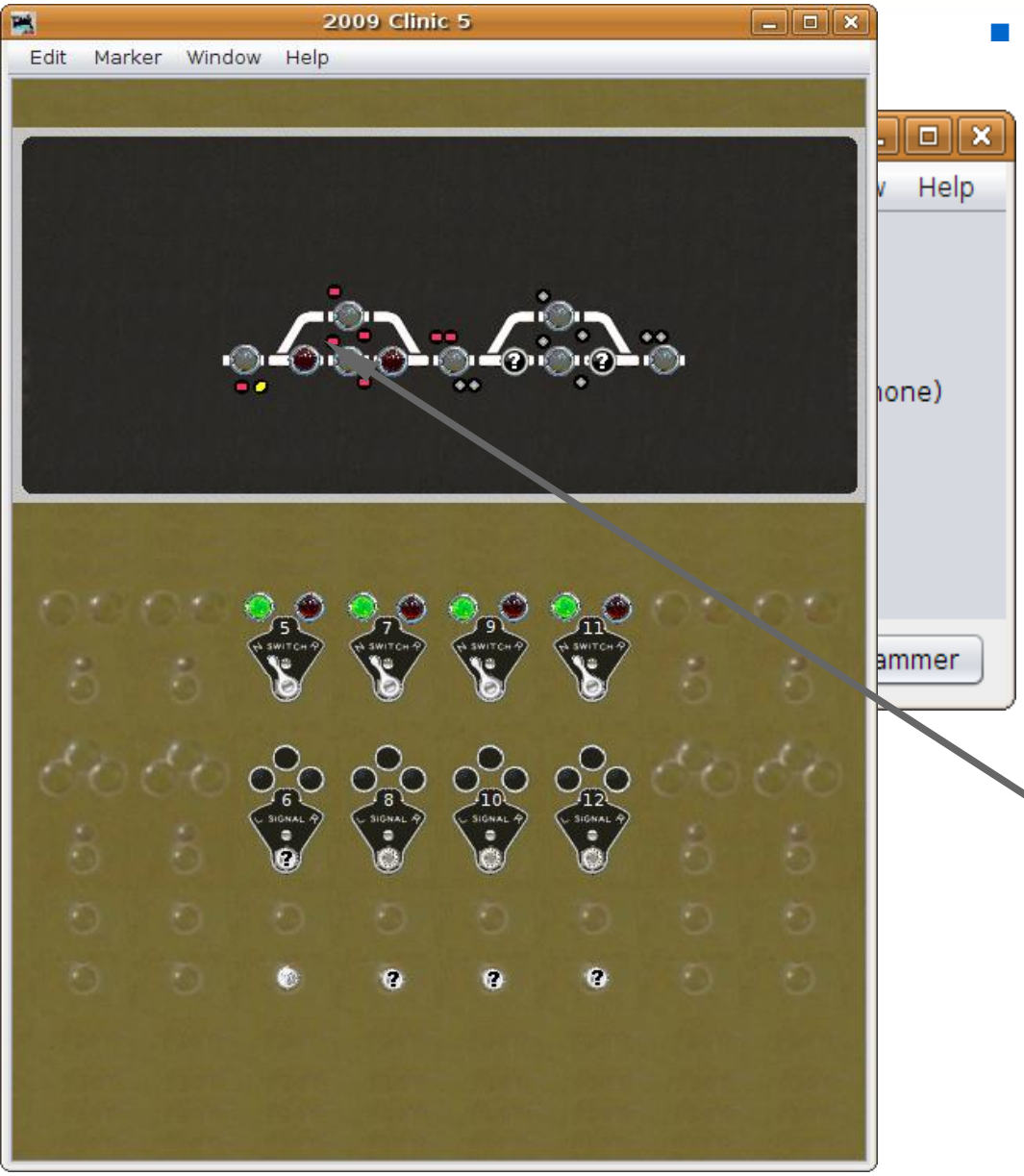
- Signal head basics
  - Click 'Apply' to update the logic for this head and then close the edit window.

SSL (Simple Signal Logic)



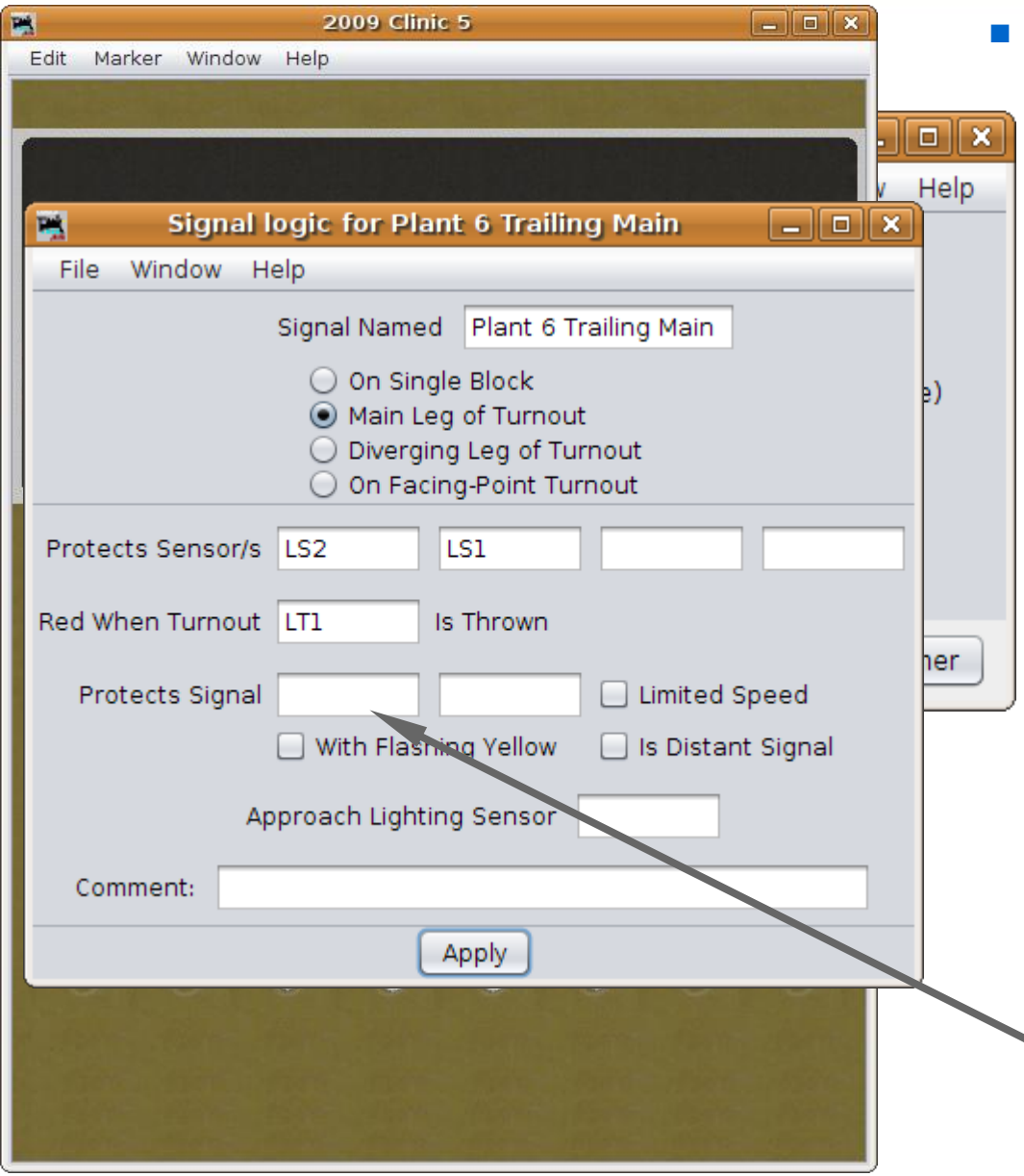
- Signal head basics
  - Click 'Apply' to update the logic for this head and then close the edit window.
  - We now see yellow over red which indicates we may proceed on the main route, prepared to stop at the next signal.

SSL (Simple Signal Logic)



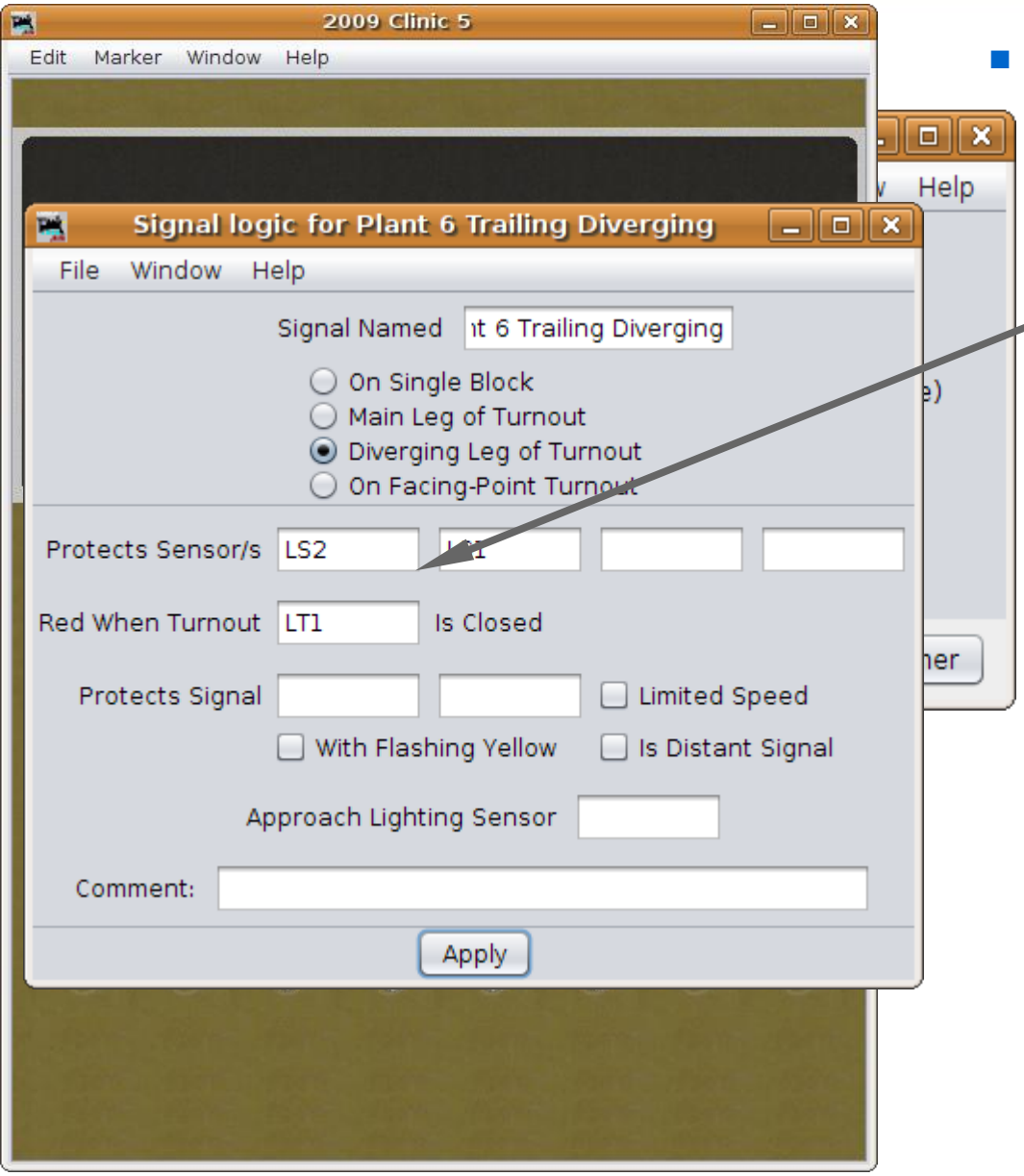
- Signal head basics
  - Click 'Apply' to update the logic for this head and then close the edit window.
  - We now see yellow over red which indicates we may proceed on the main route, prepared to stop at the next signal.
  - Next enter the info for the two remaining signals at this turnout.

SSL (Simple Signal Logic)



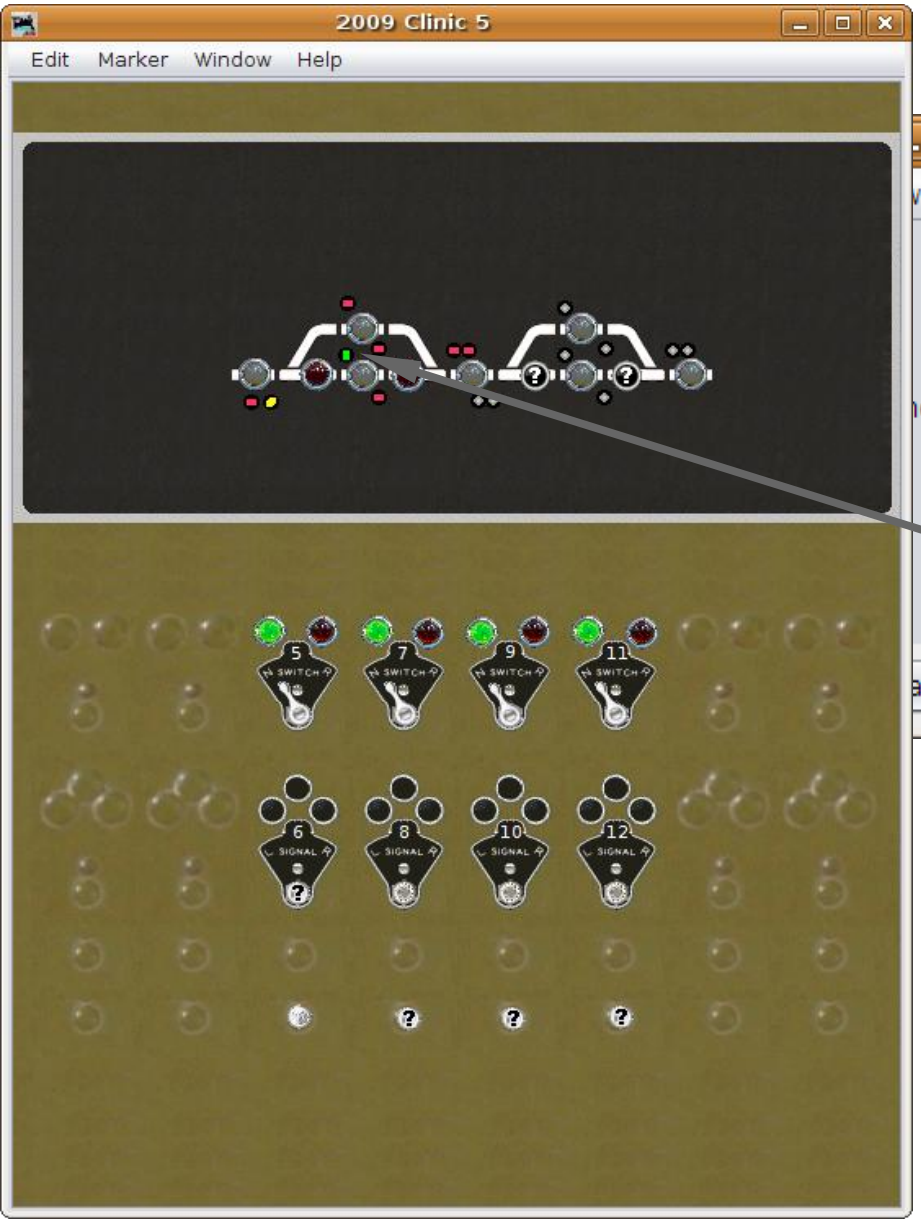
- Signal head basics
  - Click 'Apply' to update the logic for this head and then close the edit window.
  - We now see yellow over red which indicates we may proceed on the main route, prepared to stop at the next signal.
  - Next enter the info for the two remaining signals at this turnout.
  - Note: we don't have any known signal to protect in this direction.

SSL (Simple Signal Logic)



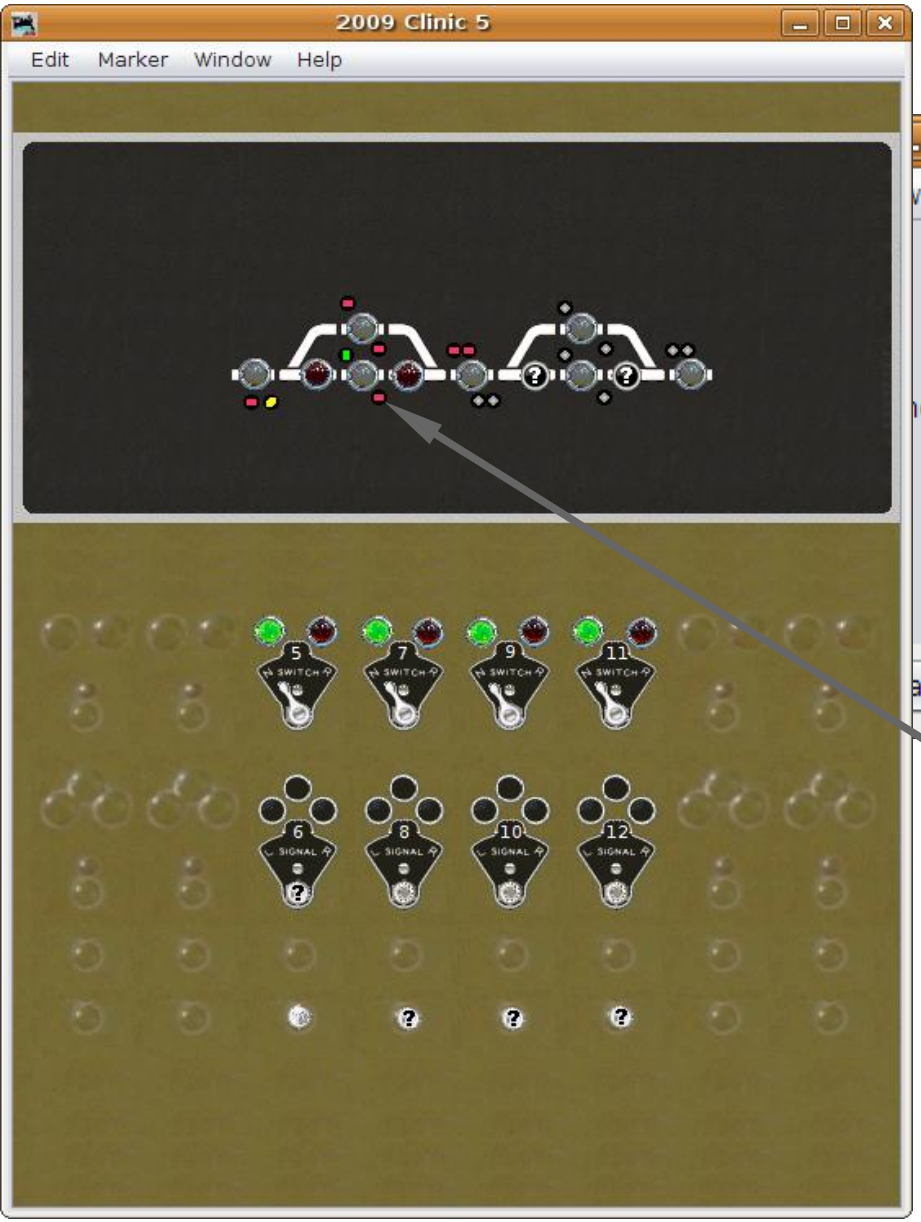
- Signal head basics
  - The information for the diverging leg is identical to the main leg in this direction.

SSL (Simple Signal Logic)



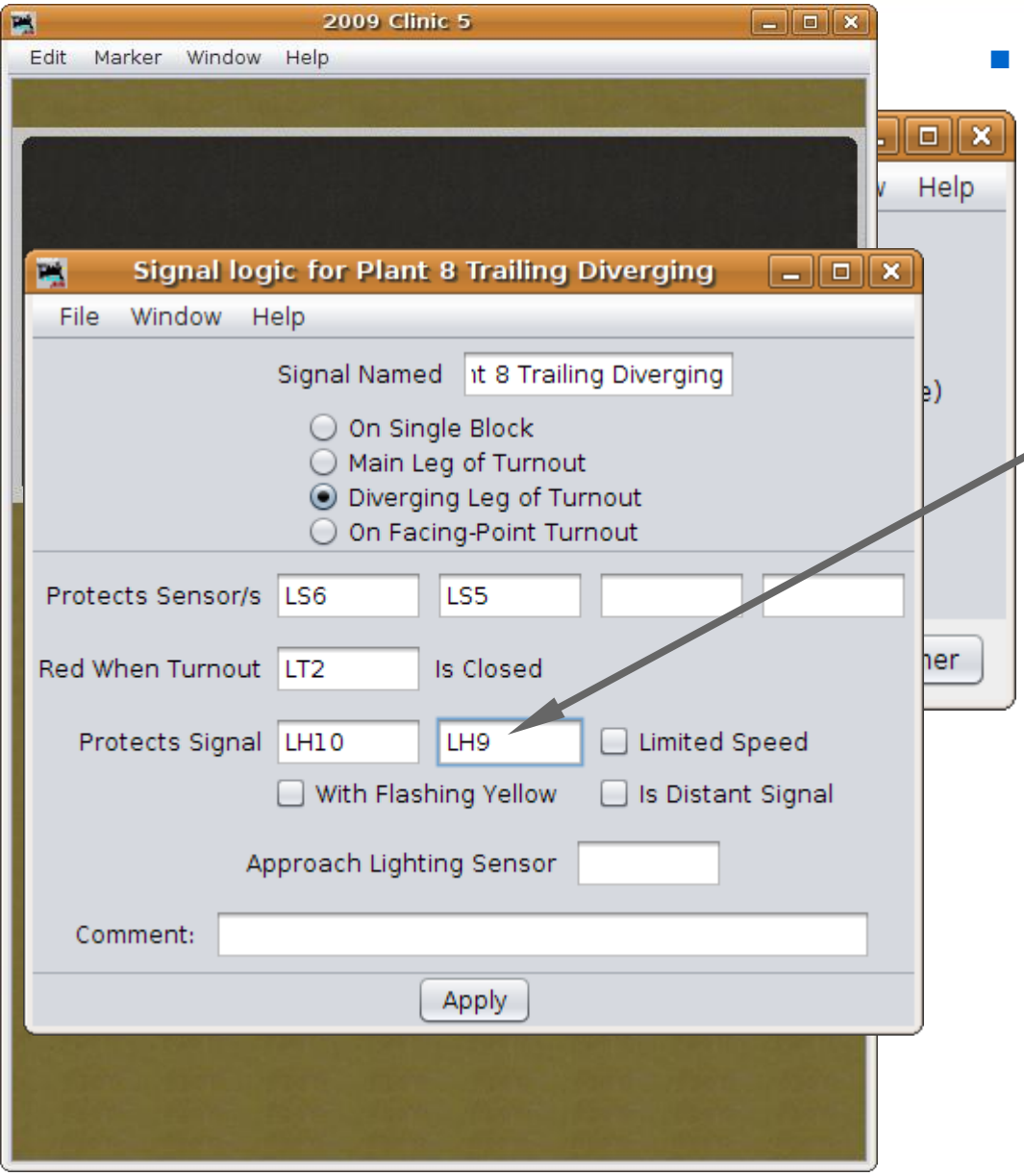
- Signal head basics
  - The information for the diverging leg is identical to the main leg in this direction.
  - A layout check shows signals working in both directions now.

SSL (Simple Signal Logic)



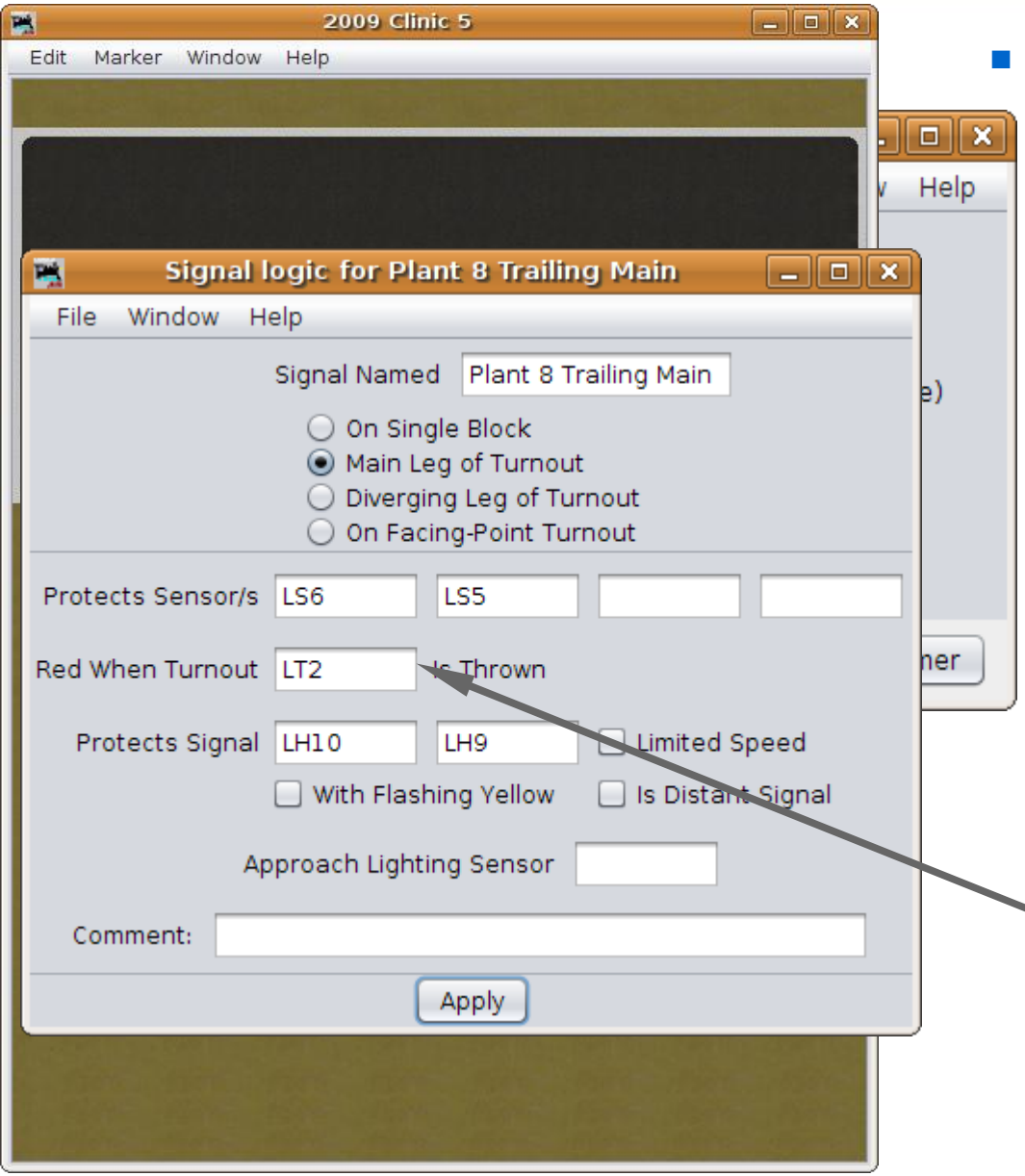
- Signal head basics
  - The information for the diverging leg is identical to the main leg in this direction.
  - A layout check shows signals working in both directions now.
  - Continue to add the logic for each signal until they are all complete.

SSL (Simple Signal Logic)



- Signal head basics
  - Note: the next protected signal is a two head mast, so list both signal heads here. If either 'next' signal head shows proceed, (G or Y) then this signal will show clear, if the protected block sensors are also clear.

SSL (Simple Signal Logic)

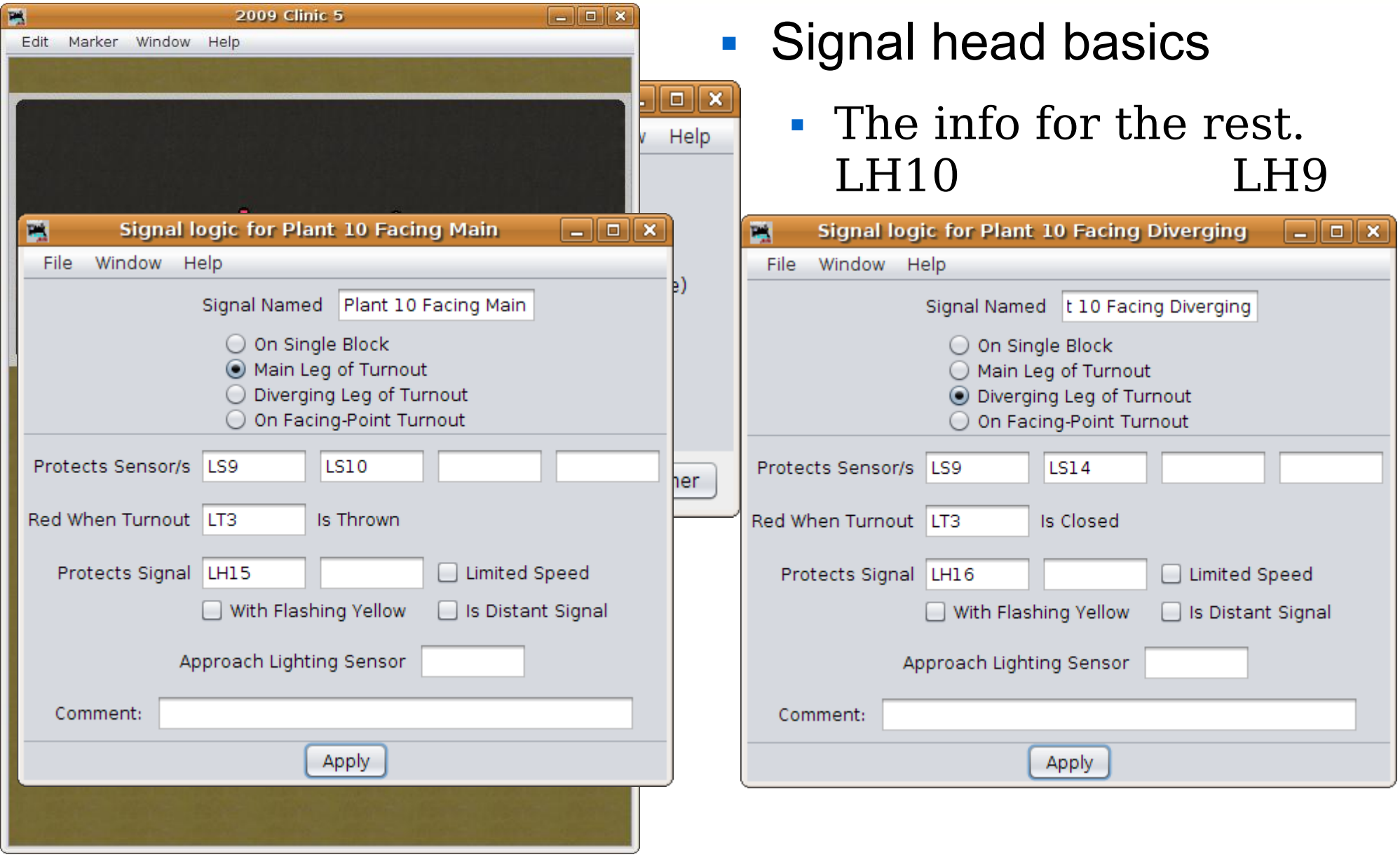


- Signal head basics
  - Note: the next protected signal is a two head mast, so list both signal heads here. If either 'next' signal head shows proceed, (G or Y) then this signal will show clear, if the protected block sensors are also clear.
  - Again, the information for the diverging leg and the main leg are the same.

SSL (Simple Signal Logic)

- Signal head basics
  - The info for the rest.

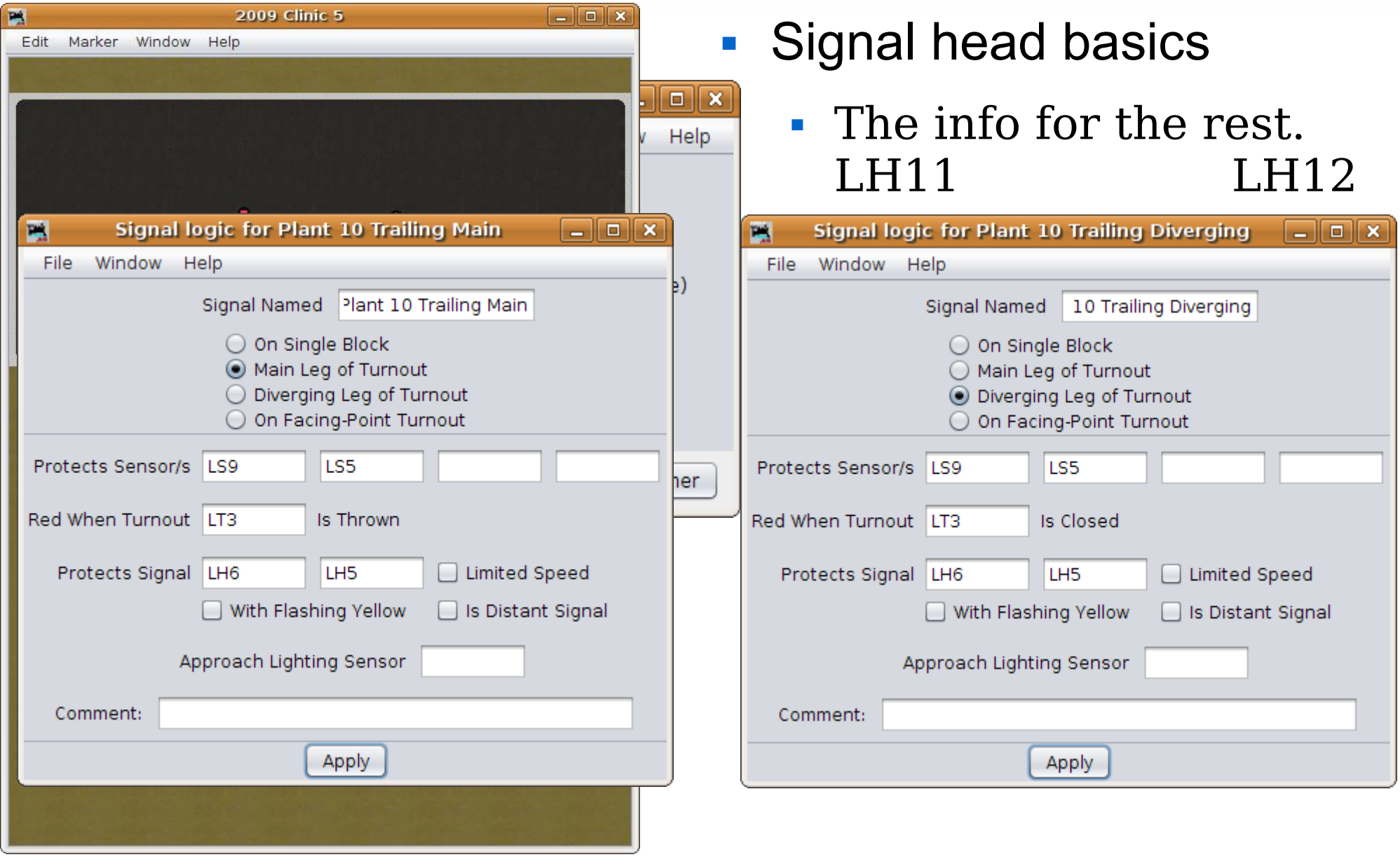
LH10 LH9



SSL (Simple Signal Logic)

- Signal head basics
  - The info for the rest.

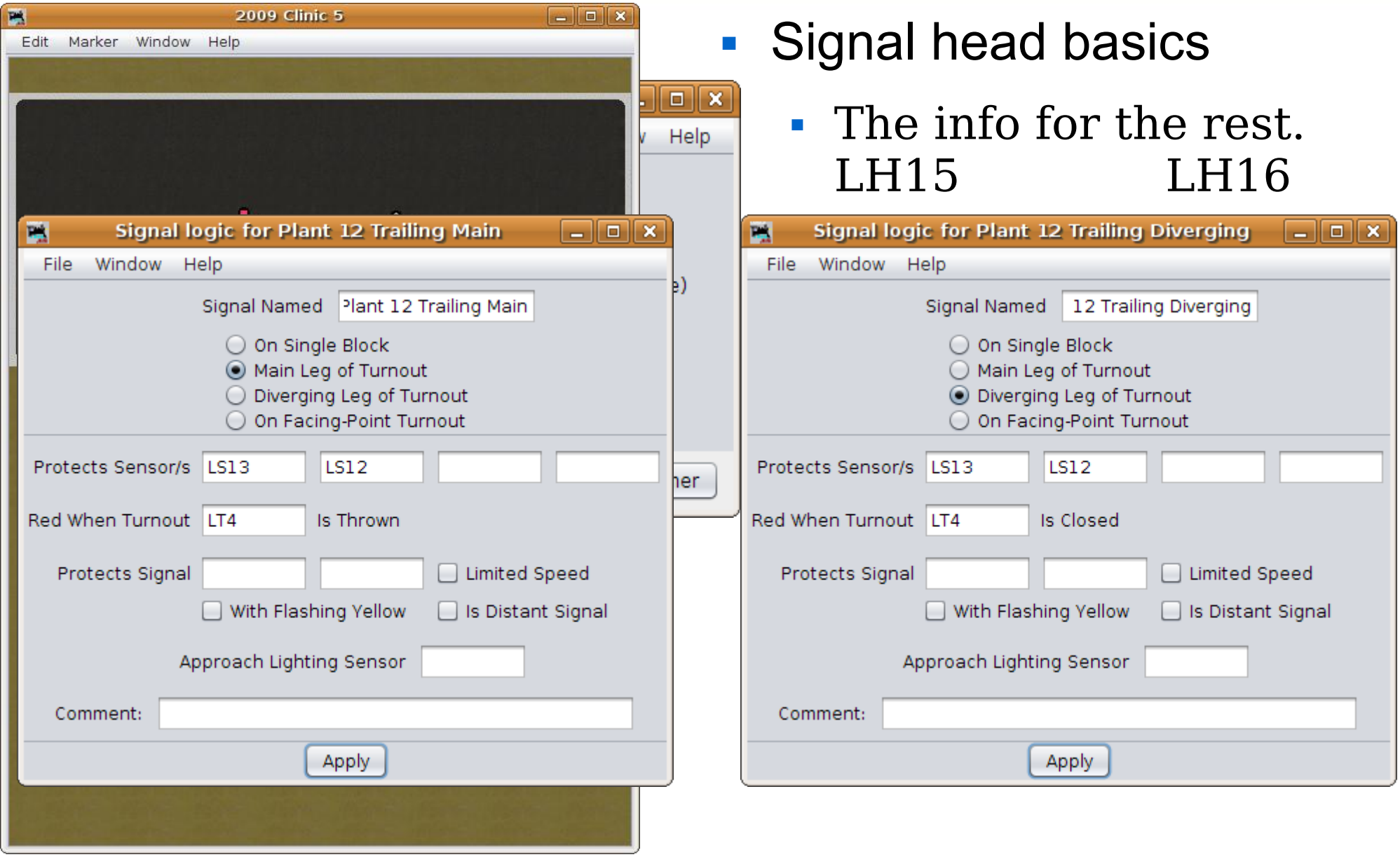
LH11 LH12



SSL (Simple Signal Logic)

- Signal head basics
  - The info for the rest.

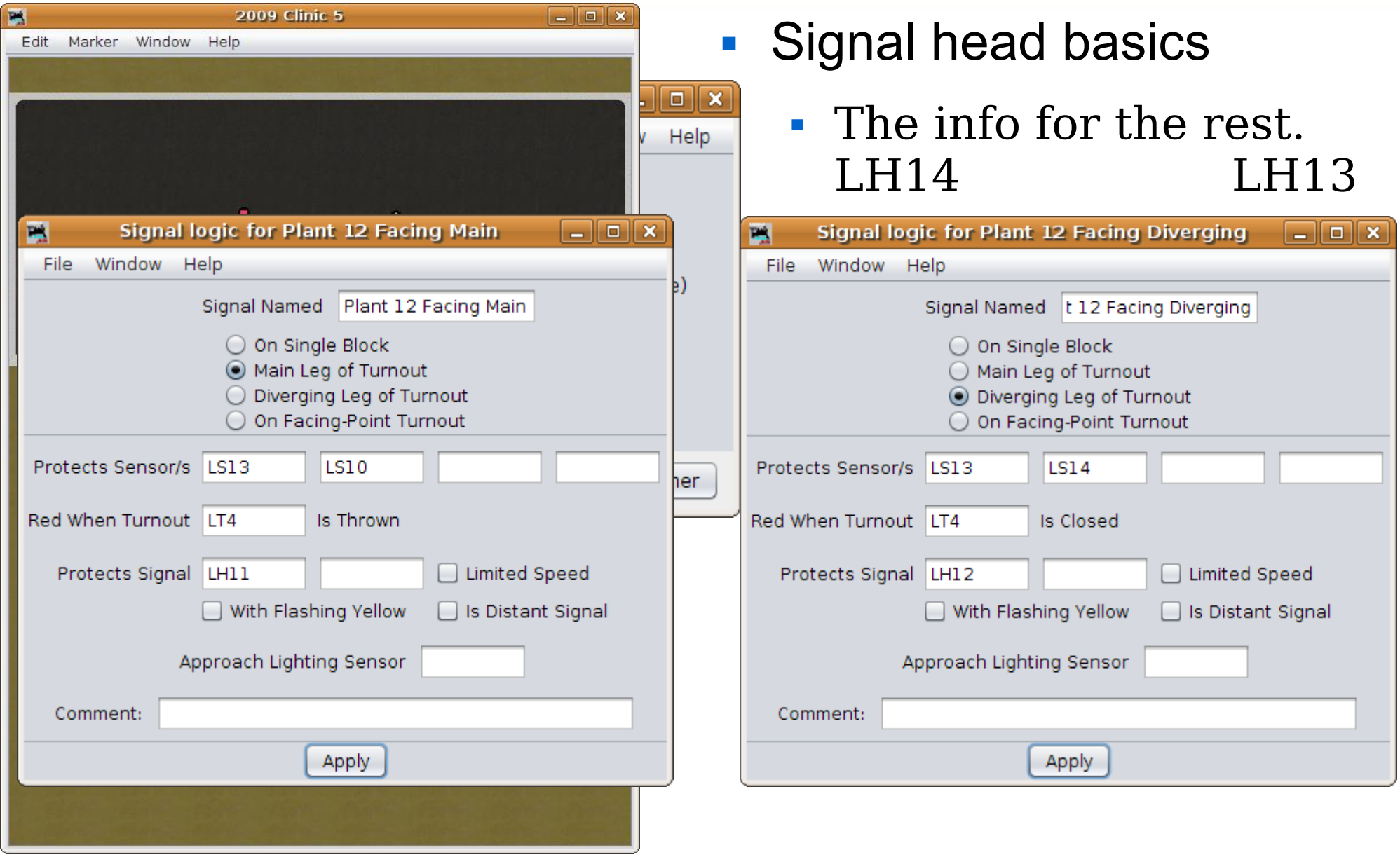
LH15 LH16



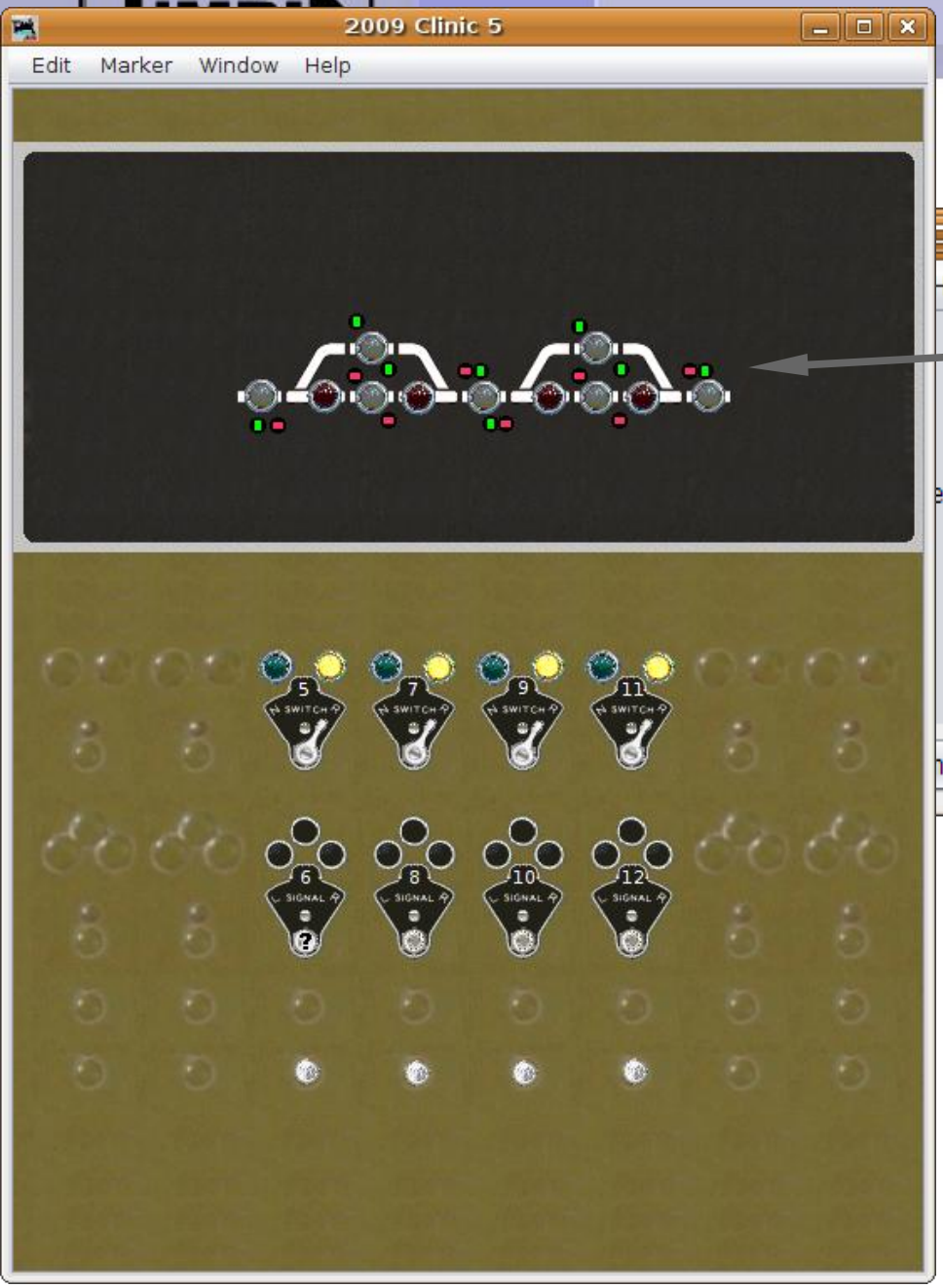
SSL (Simple Signal Logic)

- Signal head basics
  - The info for the rest.

LH14 LH13

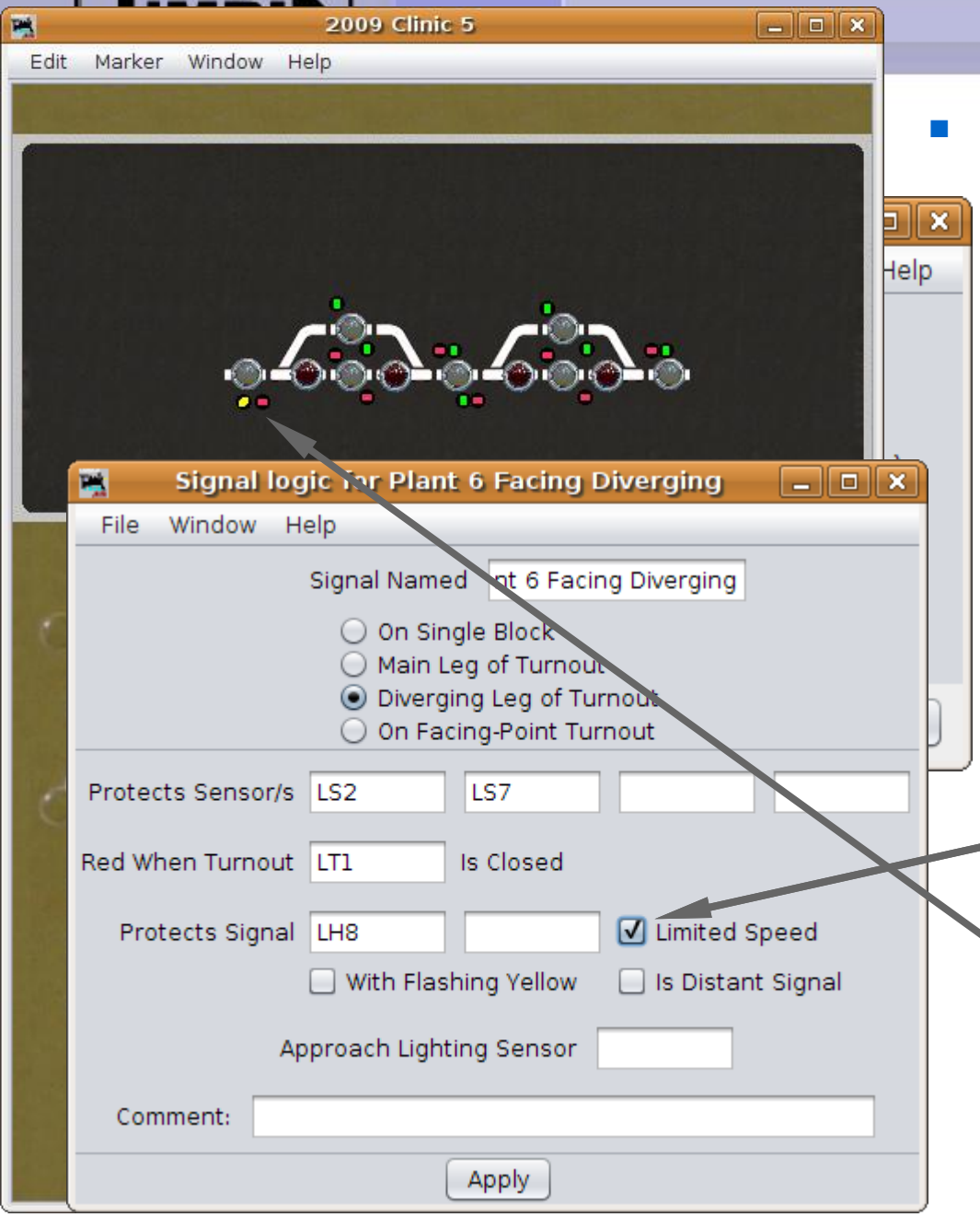


SSL (Simple Signal Logic)



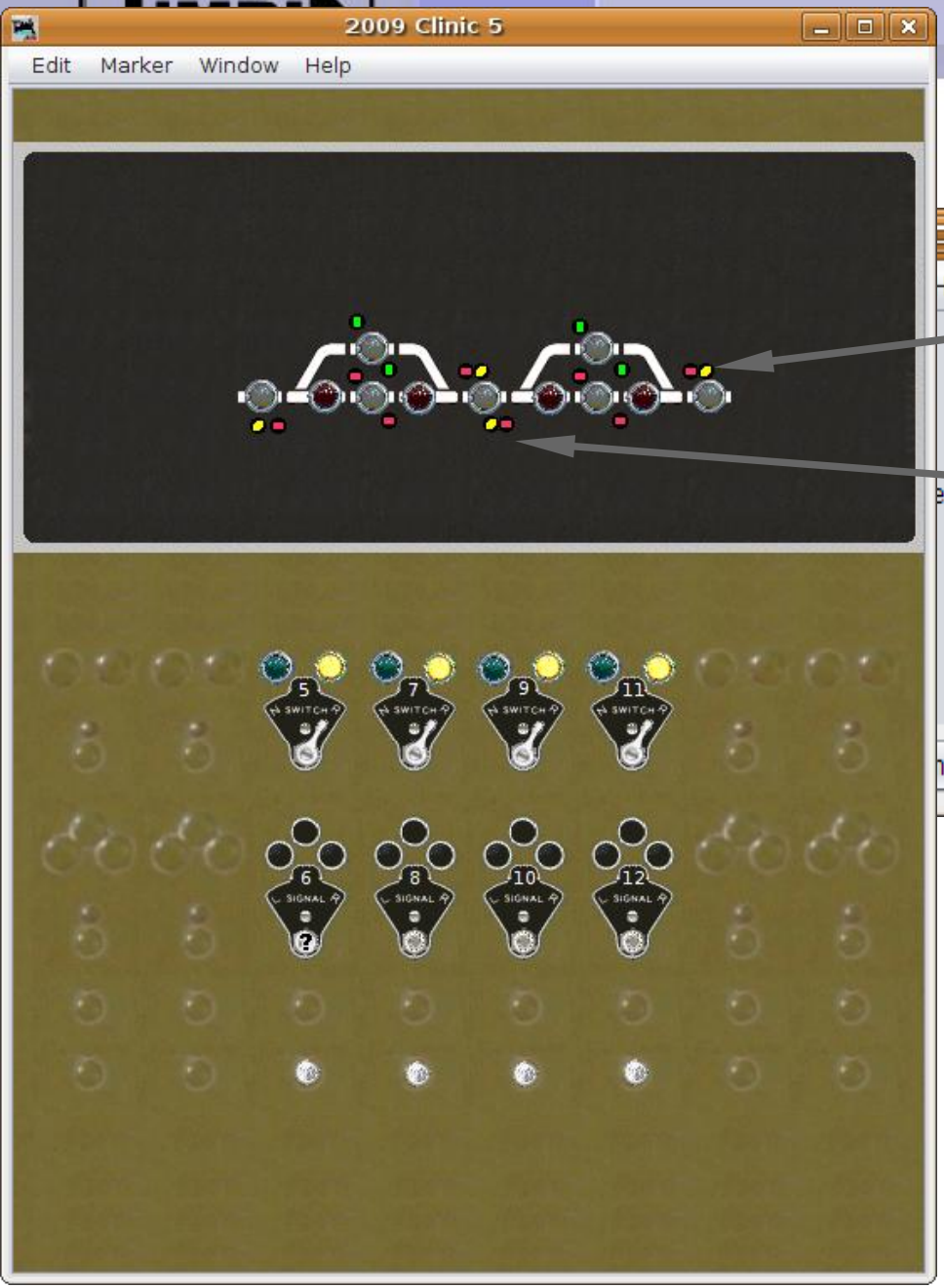
- Signal Logic
  - Notice that setting all the turnouts to reverse (diverging) gives us green signals through the passing sidings. You could limit the speed in this situation by using the 'approach' signal.

SSL (Simple Signal Logic)



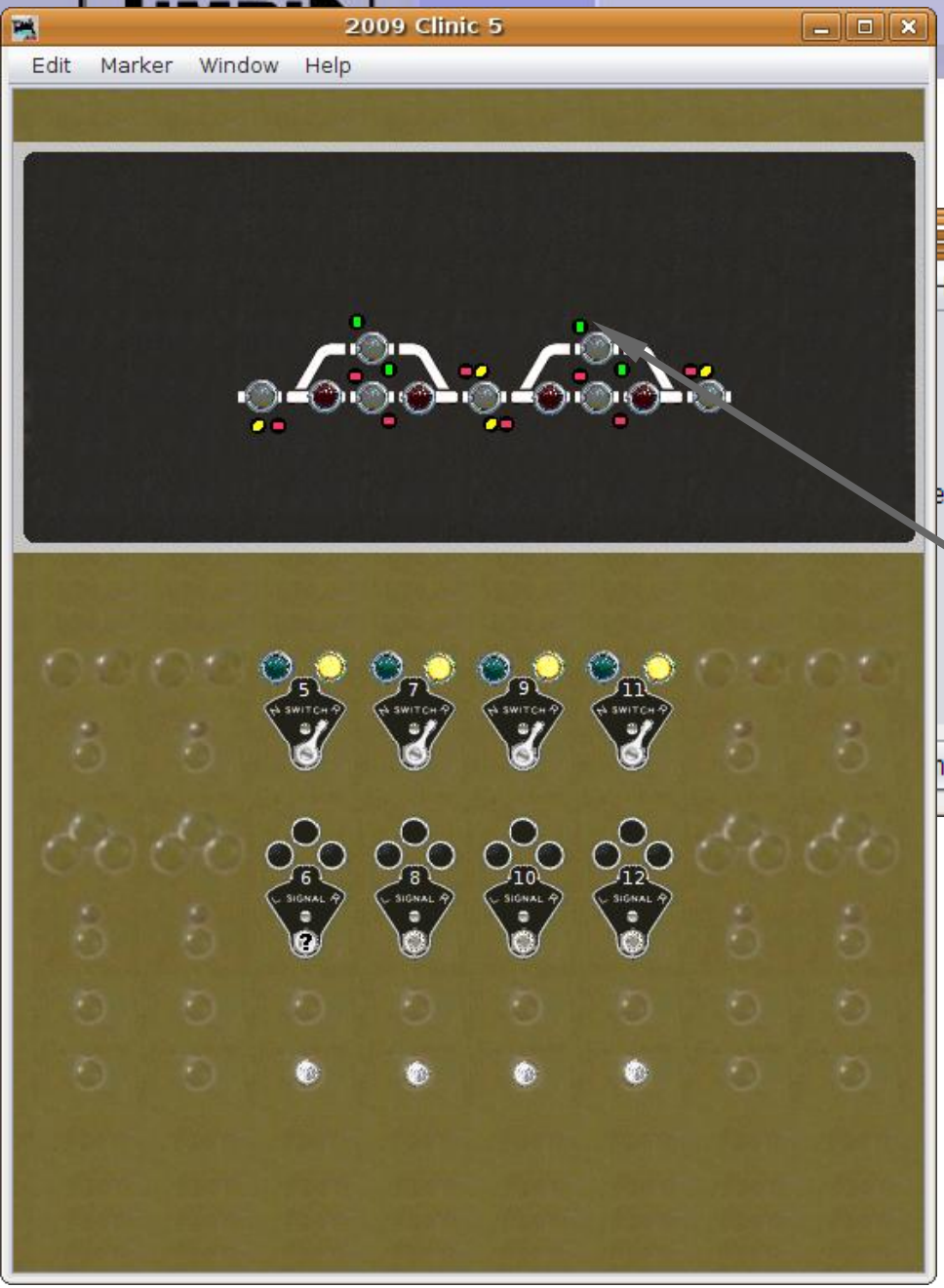
- Signal Logic
  - Notice that setting all the turnouts to reverse (diverging) gives us green signals through the passing sidings. You could limit the speed in this situation by using the 'approach' signal.
  - SSL supports this practice simply by checking the 'Limited Speed' box. As soon as you click 'Apply' the signal drops to yellow as its maximum indication.

SSL (Simple Signal Logic)



- Signal Logic
  - Make the same changes to the other diverging routes and now all our diverging routes show limited speed.

SSL (Simple Signal Logic)

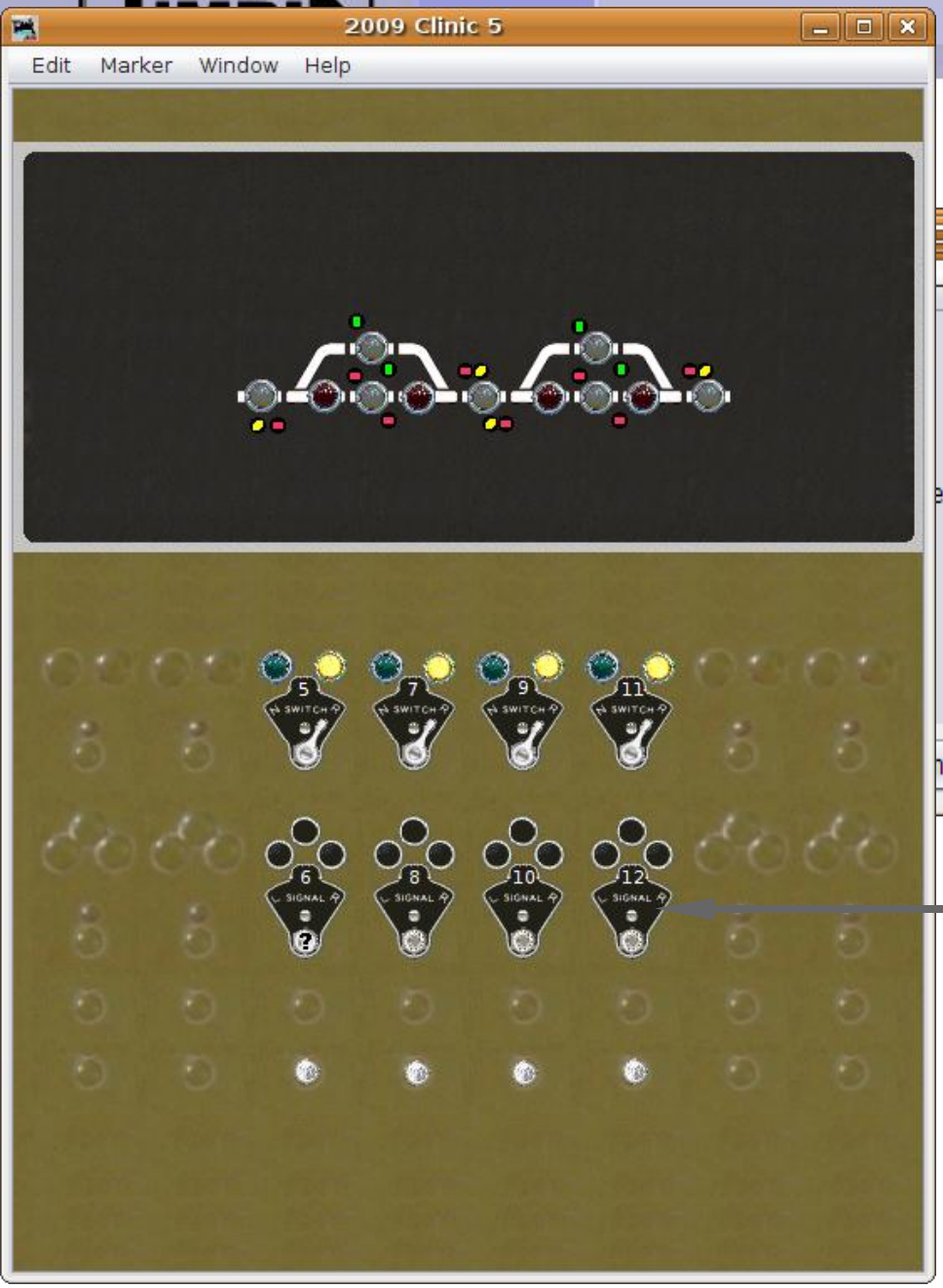


- Signal Logic
  - Make the same changes to the other diverging routes and now all our diverging routes show limited speed.
  - Rules can cover the speed while exiting a passing siding. Usually a red over green at the exit of a siding means the train may accelerate to posted speed after leaving the siding. The 'Red' may be a marker light.

SSL (Simple Signal Logic)

- Signal Logic
  - As I previously mentioned, a prototype ABS system would not have a remote panel, so in reality this panel is the foundation for a CTC system.

SSL (Simple Signal Logic)



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  - Actually this is how CTC works. The CTC system over rides an underlying ABS system with permissive inputs from the dispatcher.

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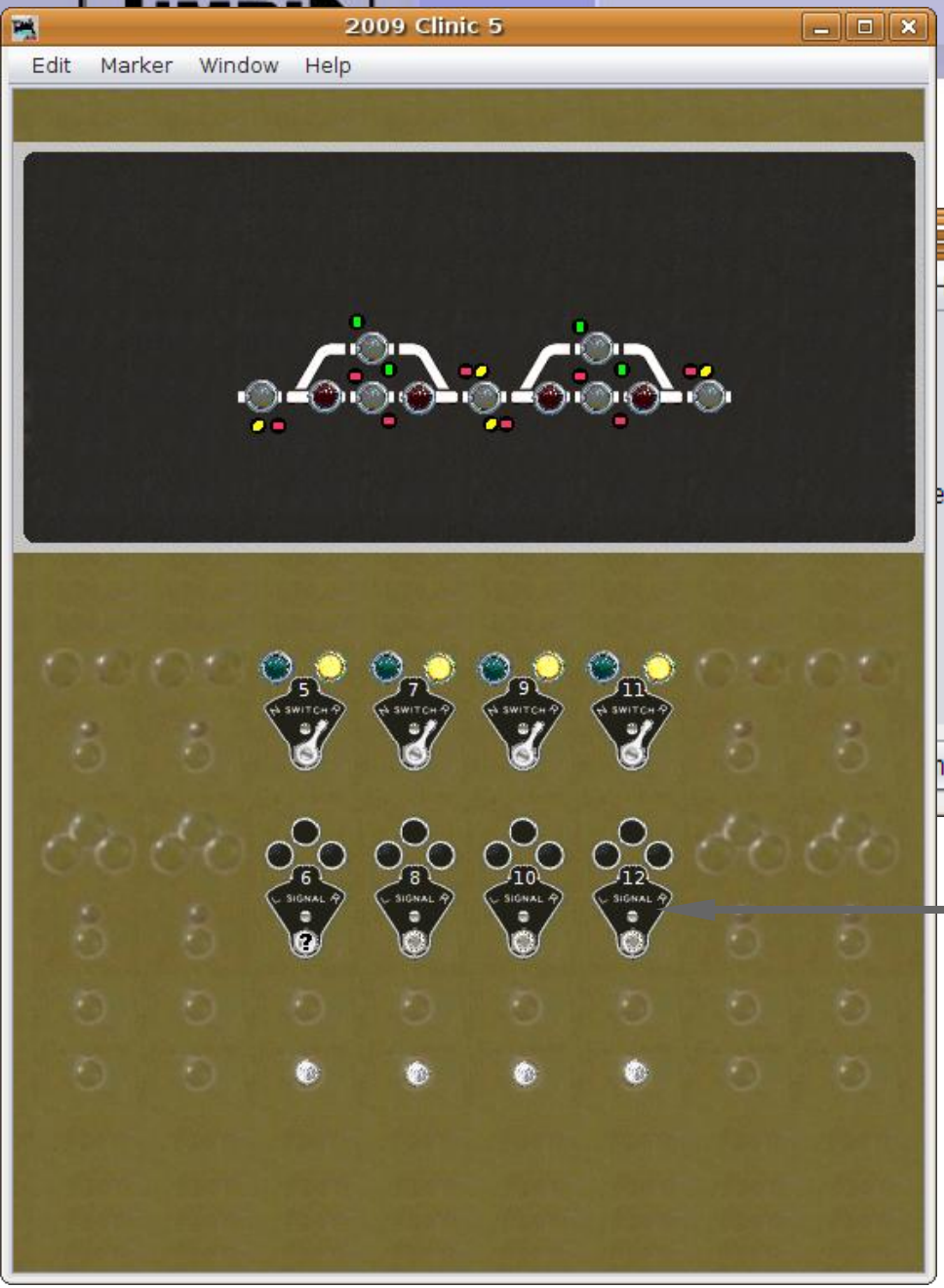
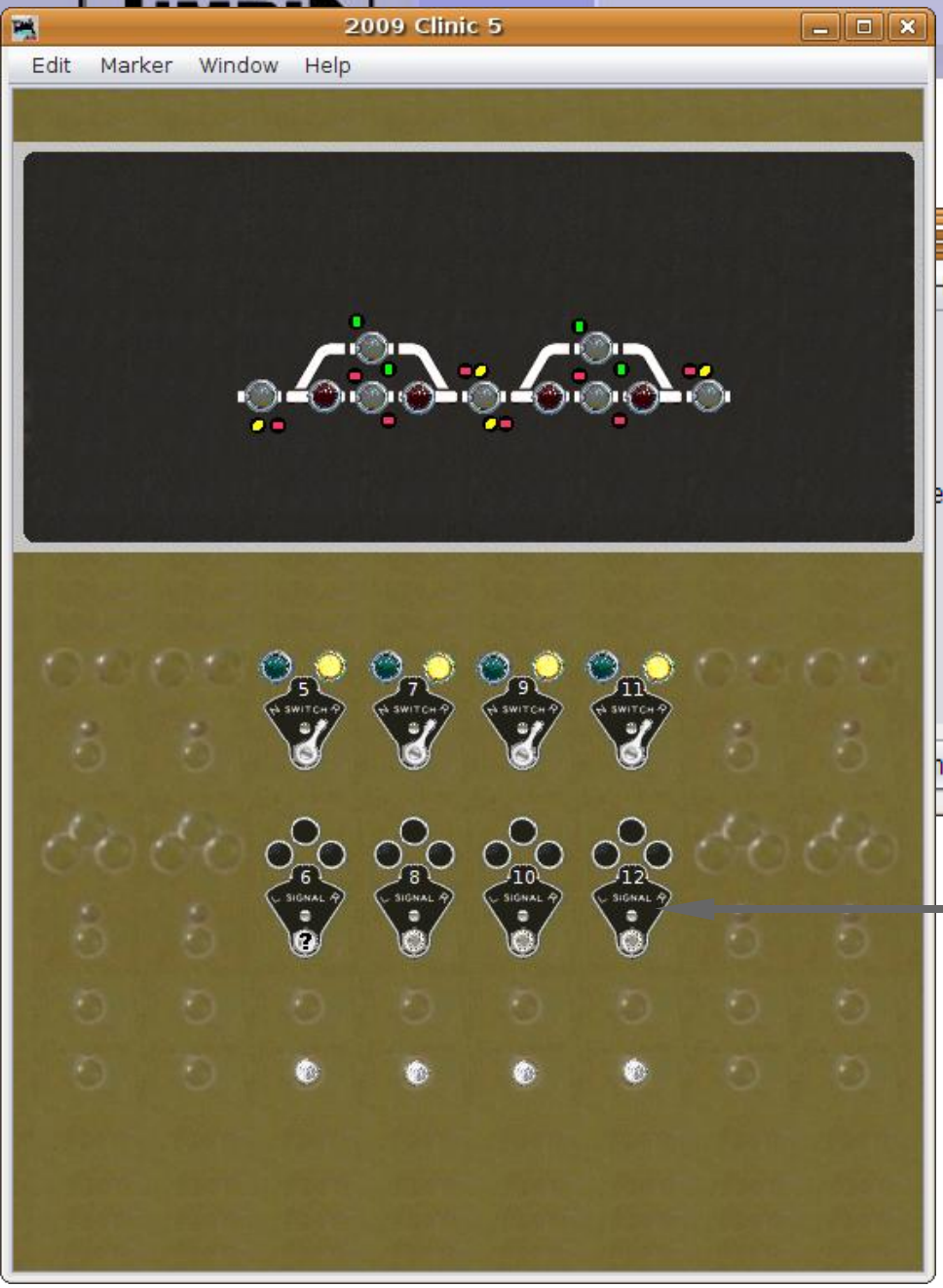


- Signal Logic
  - As I previously mentioned, a prototype ABS system would not have a remote panel, so in reality this panel is the foundation for a CTC system.
  - Actually this is how CTC works. The CTC system over rides an underlying ABS system with permissive inputs from the dispatcher.
  - The 'Signals Normal' lever position holds them all at Stop.

SSL (Simple Signal Logic)



- Signal Logic
  - We can add some Logix to link the actual block sensors to the panel displays and also some toggle switches to simulate train detection when running in simulator mode. I will save these Logix additions as 2009Clinic6.xml

SSL (Simple Signal Logic)

- What we have covered so far:
  - Placing signals on a panel.
  - Simple Signal Logic.
- Where we are going next:
  - CTC Panel Logix