Create a Detailed CTC Machine Model with JMRI/PanelPro

Dick Bronson - RR-CirKits, Inc.

Other Clinics in this series:

- Introduction to Layout Control with JMRI/PanelPro

  Repeated 4:00 PM, Friday, July 10th

CTC

- CTC Centralized Traffic Control
  - According to Wikipedia **Centralized Traffic Control** (CTC) is a signalling system used by railroads. The system consists of a centralized train dispatcher's office that controls railroad switches in the CTC territory and the signals that railroad engineers must obey in order to keep the traffic moving safely and smoothly across the railroad.
  - 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 human dispatcher to 'Clear' them.
  - The CTC panel depicted in this clinic is a Classic era US&S panel.

CTC

- CTC 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.

CTC

- CTC 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.
  - CTC is a layer superimposed over the basic ABS system to hold all signals in the 'Stop' aspect unless cleared by the dispatcher to their ABS value. This means that the local ABS logic will always (normally) supercede in the lower speed aspect. I.e. The dispatcher does NOT actually set the signals to green. He just permits them to go green.

CTC

- CTC 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.
  - CTC is a layer superimposed over the basic ABS system to hold all signals in the 'Stop' aspect unless cleared by the dispatcher to their ABS value. This means that the local ABS logic will always (normally) supercede in the lower speed aspect. I.e. The dispatcher does NOT actually set the signals to green. He just permits them to go green.
  - 'Clear' to the dispatcher means *proceed,* one way only. 'Normal' to the dispatcher is all signals at stop.

CTC

- CTC basics
  - This clinic assumes that you understand the ABS signal system previously covered because that is the basis for the CTC operation.

CTC

- CTC basics
  - This clinic assumes that you understand the ABS signal system previously covered because that is the basis for the CTC operation.
  - We will attempt to cover the basic steps required for the CTC panel, continuing from where we left off with the SSL.

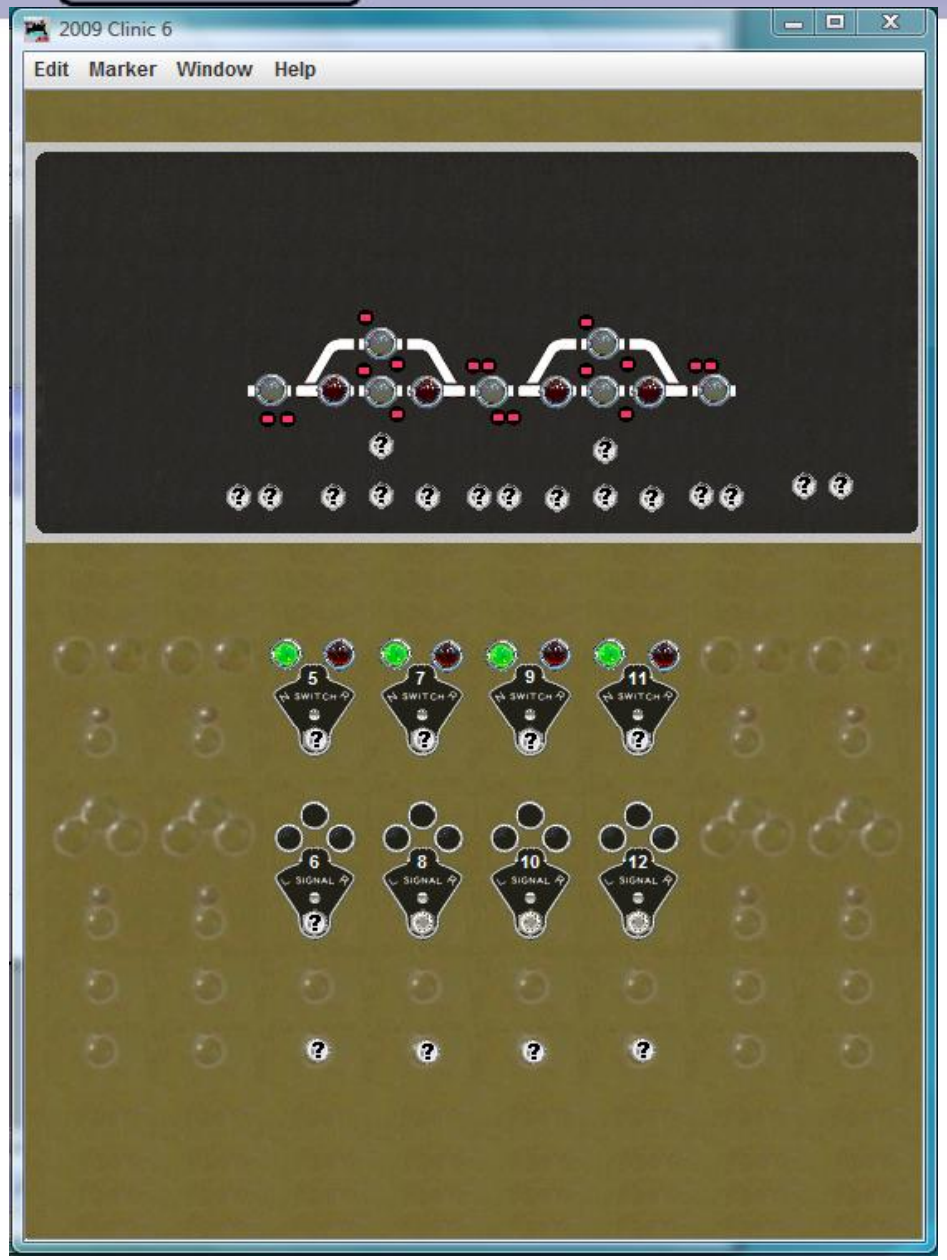
CTC

- CTC basics
  - This clinic assumes that you understand the ABS signal system previously covered because that is the basis for the CTC operation.
  - We will attempt to cover the basic steps required for the CTC panel, continuing from where we left off with the SSL.
  - The completed 2009Clinic7.xml panel has indicators for all the required logic.

CTC

- CTC basics
  - This clinic assumes that you understand the ABS signal system previously covered because that is the basis for the CTC operation.
  - We will attempt to cover the basic steps required for the CTC panel, continuing from where we left off with the SSL.
  - The completed 2009Clinic7.xml panel has indicators for all the required logic.
  - The 2009Clinic8.xml panel only includes prototypical indications, other than the traffic simulation toggles.

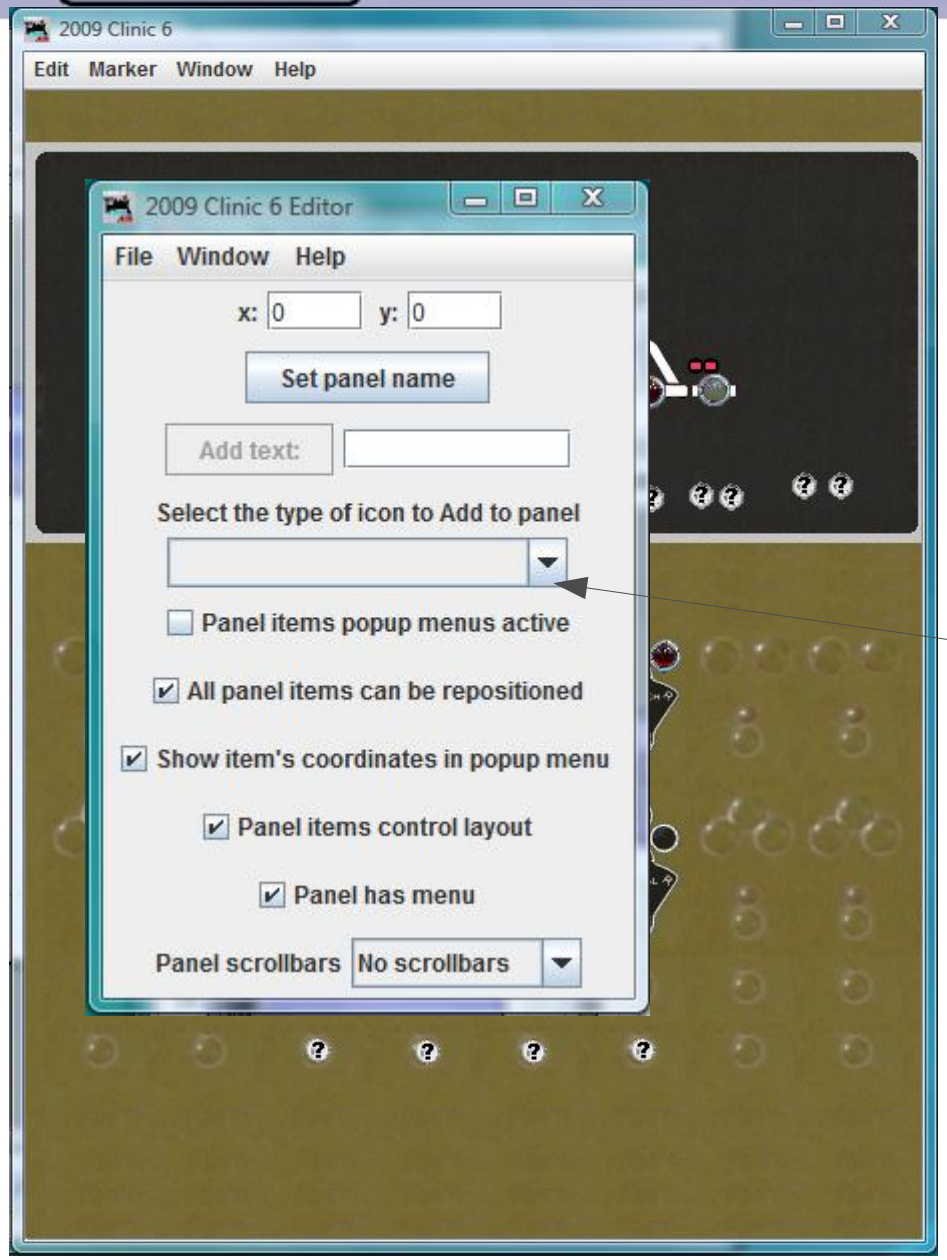
CTC



CTC basics

- This panel is the one we left with at the end of the SSL section. It has relay sounds and delays between the block sensors and the panel indicators.

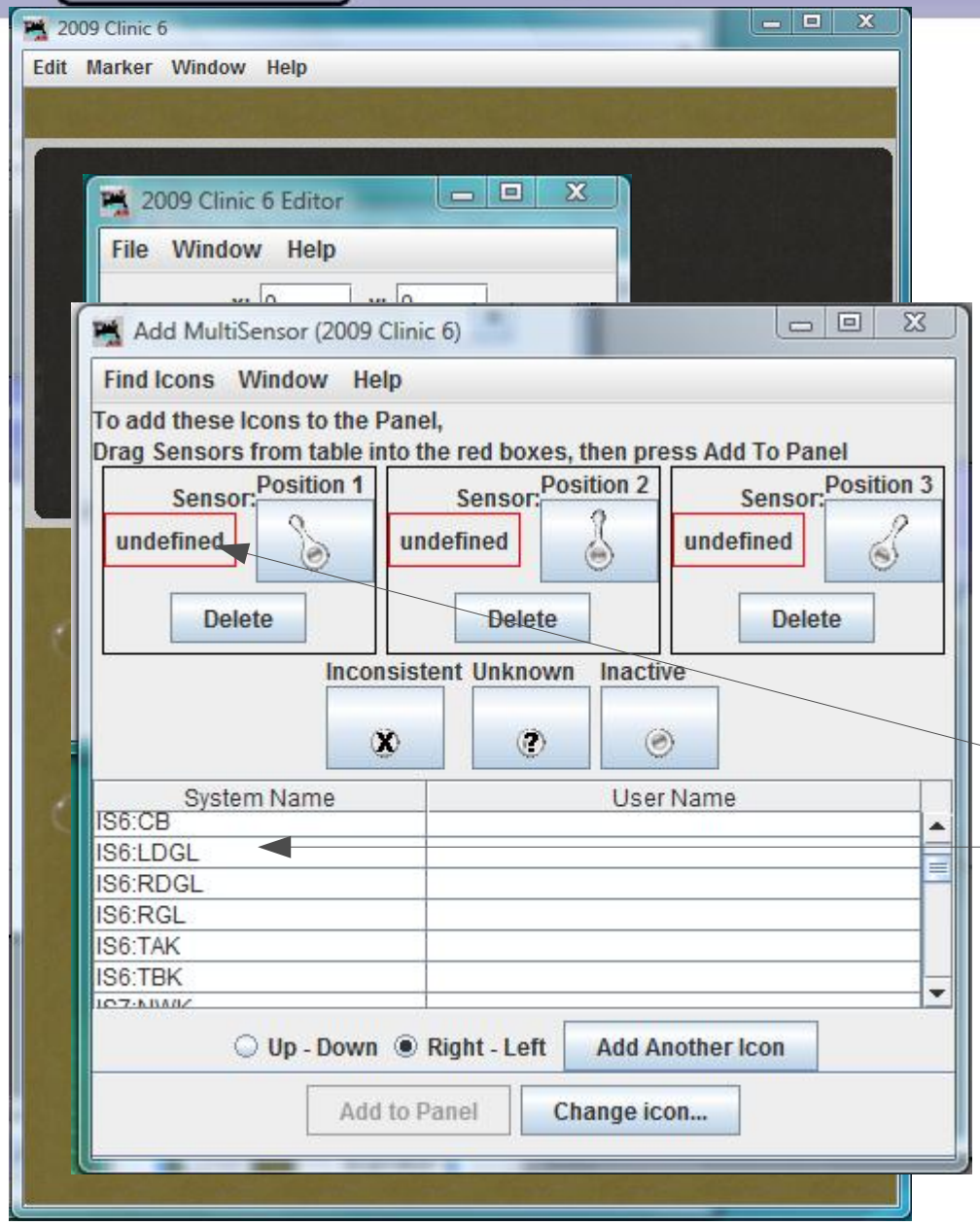
CTC



CTC basics

- This panel is the one we left with at the end of the SSL section. It has relay sounds and delays between the block sensors and the panel indicators.
- Open the Panel Editor and select 'Add Multisensor'.

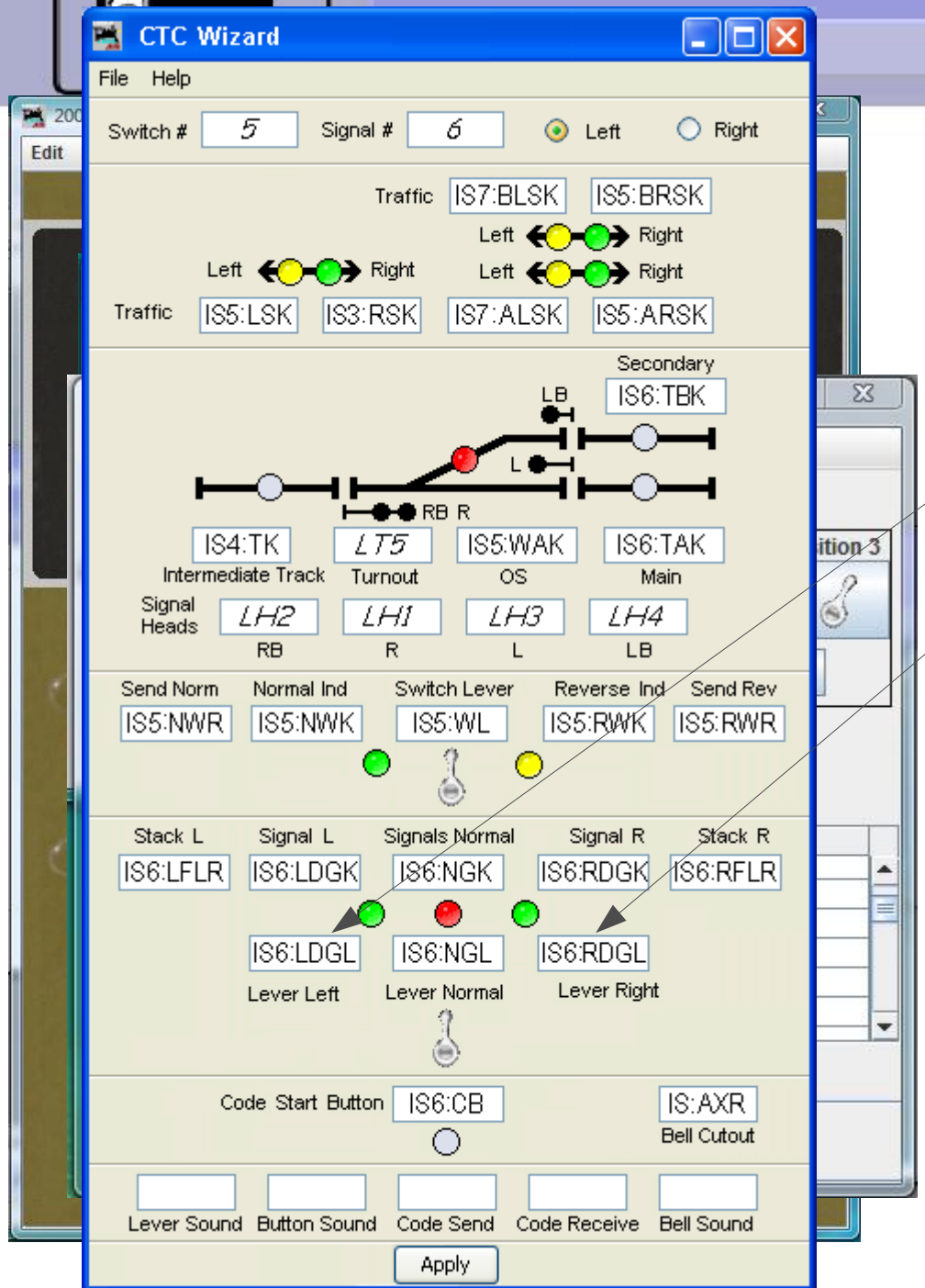
CTC



CTC basics

- This panel is the one we left with at the end of the SSL section. It has relay sounds and delays between the block sensors and the panel indicators.
- Open the Panel Editor and select 'Add Multisensor'.
- Drag the system items to the correct icon for each lever position, then click ;Add to Panel'.

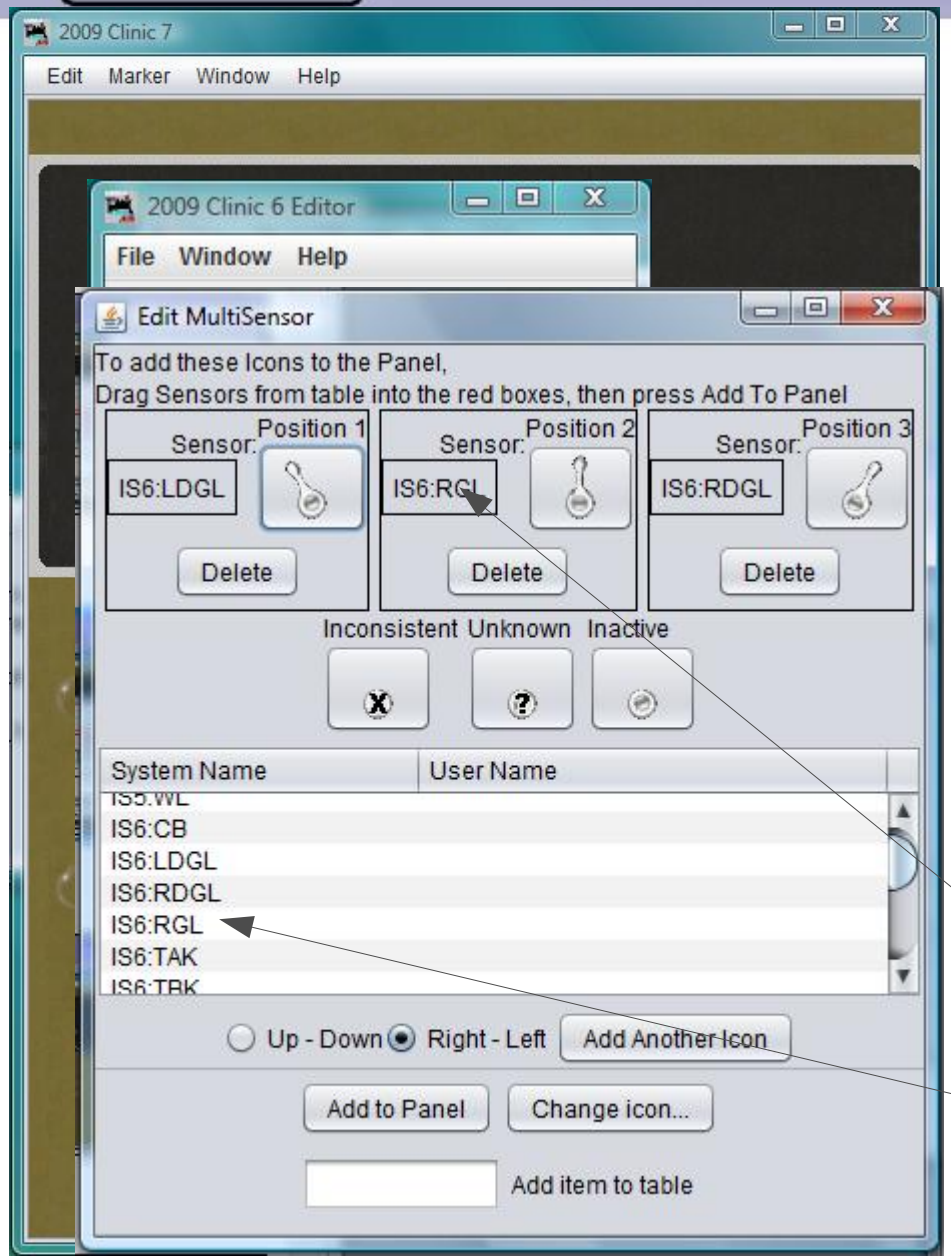
CTC



CTC basics

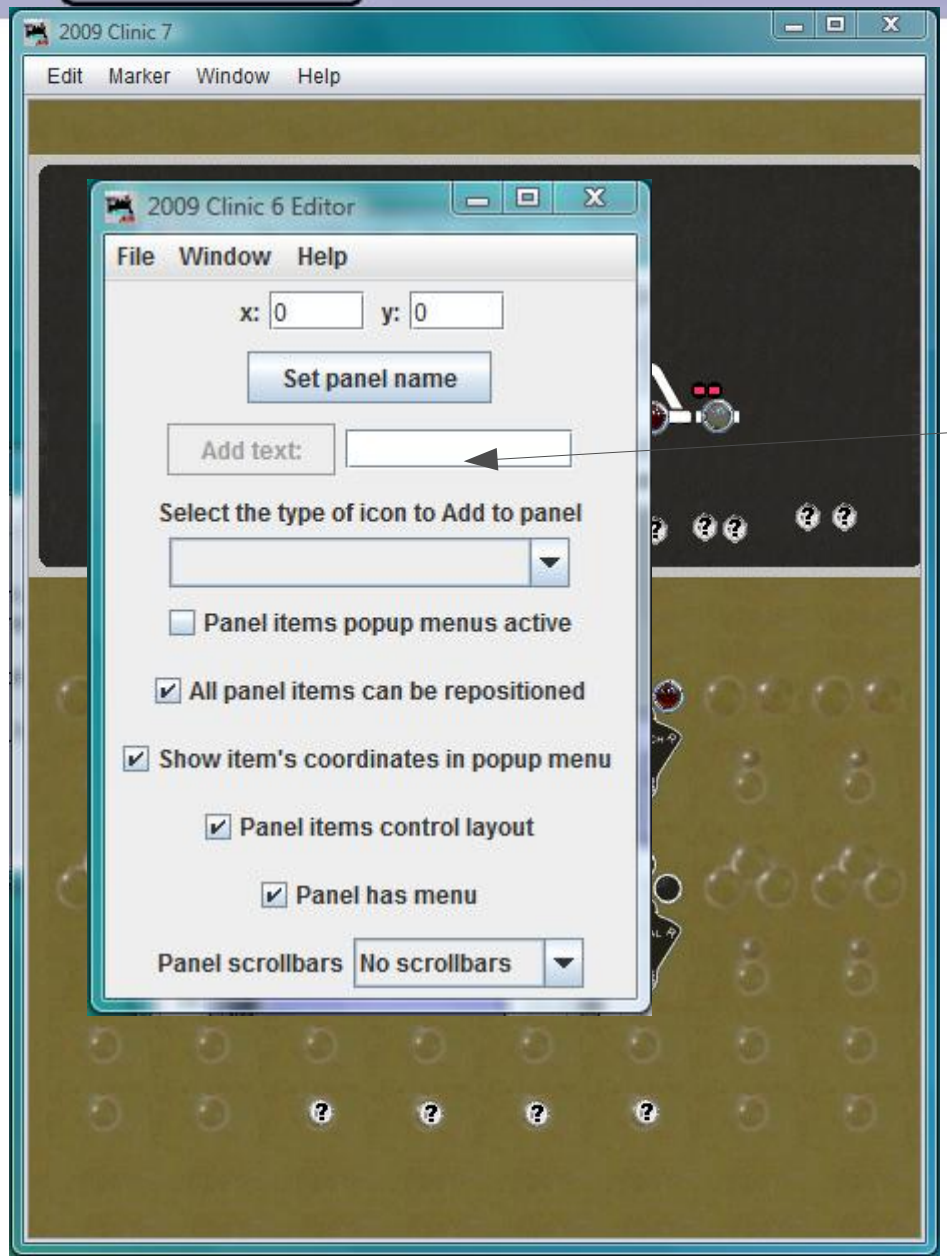
- Note: Here is the image showing all the variable names for Plant 5-6

CTC



CTC basics

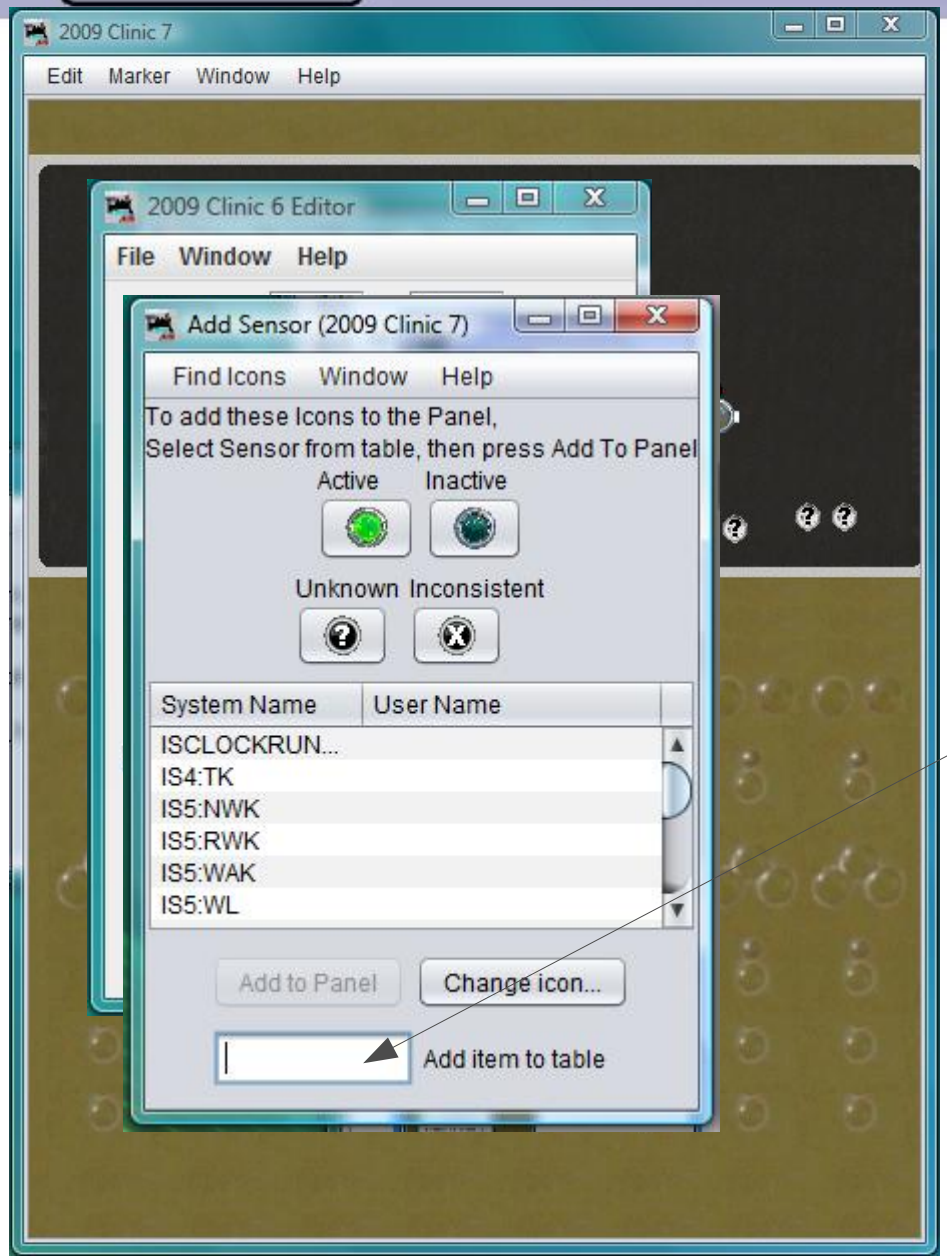
- This panel is the one we left with at the end of the SSL section. It has relay sounds and delays between the block sensors and the panel indicators.
- Open the Panel Editor and select 'Add Multisensor'.
- Drag the system items to the correct icon for each lever position, then click ;Add to Panel'.
- Do the same for all 4 signal levers.



CTC basics

- Now add the signal indicator lamps. Select 'Add Sensor' and set the icons to green jewels.

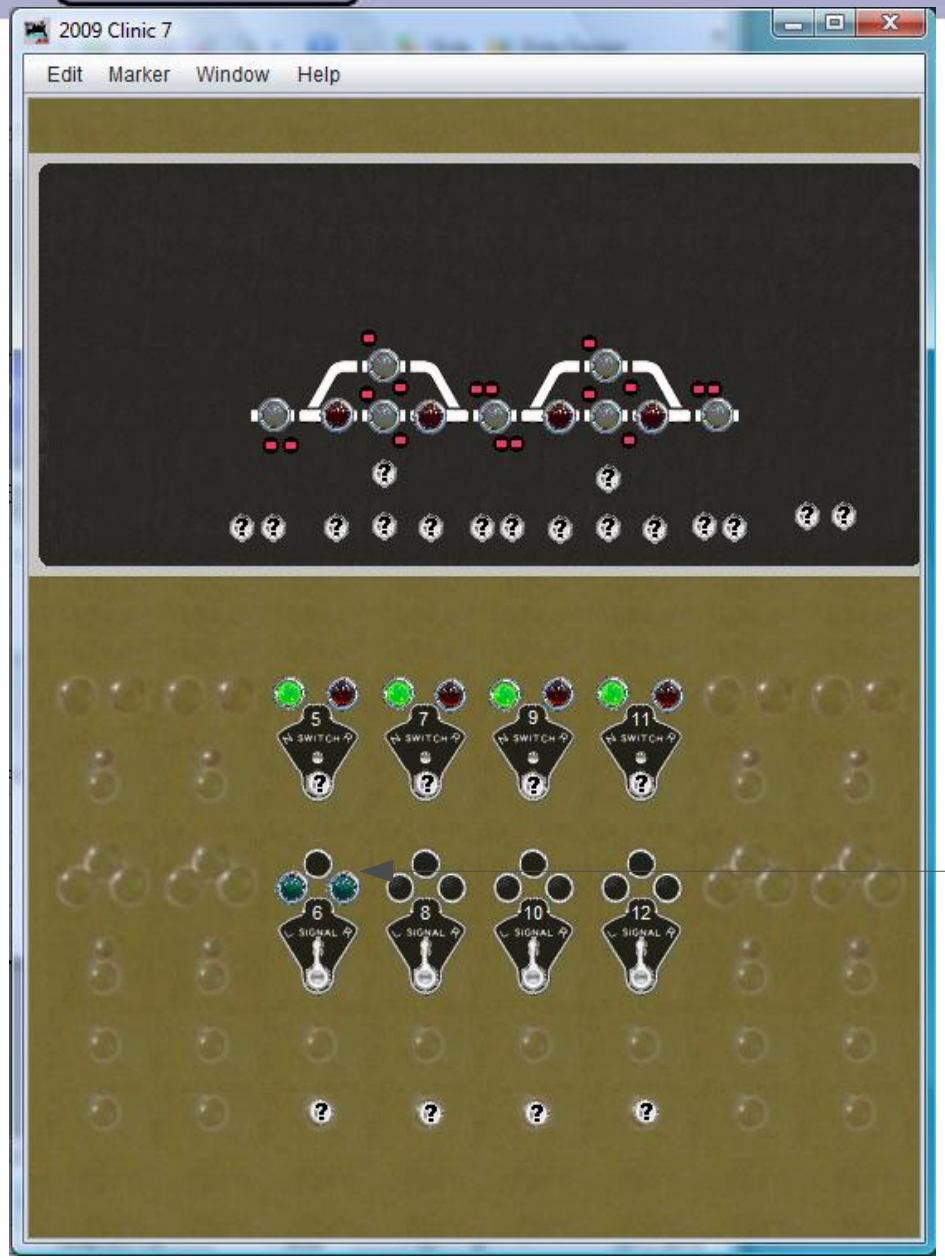
CTC



CTC basics

- Now add the signal indicator lamps. Select 'Add Sensor' and set the icons to green jewels.
- Then add: IS6:LDGK (Plant **6: L**eft proce**D** si**G**nal indi**K**tor) and IS6:RDGK (Plant **6: R**ight proce**D** si**G**nal indi**K**tor)

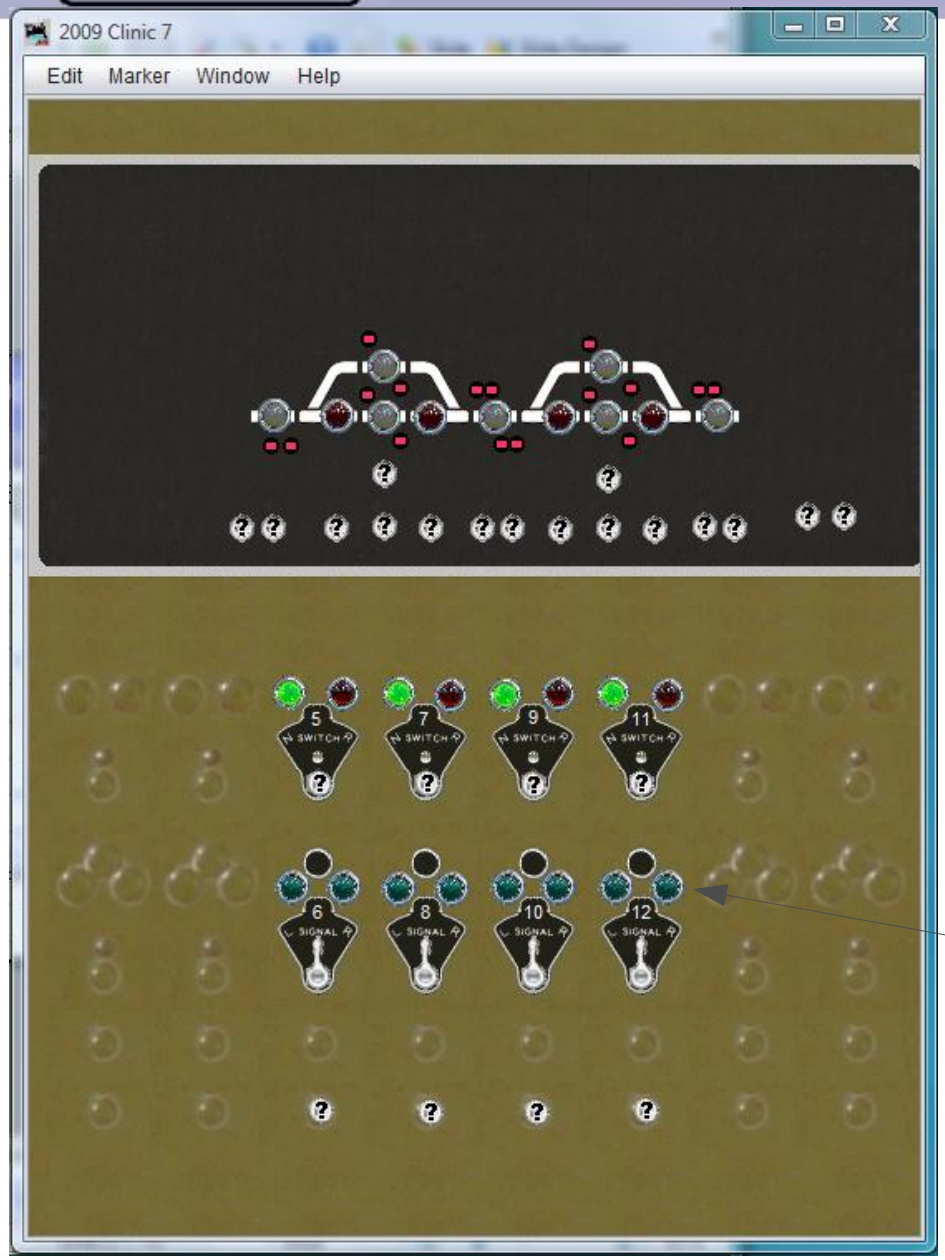
CTC



CTC basics

- Now add the signal indicator lamps. Select 'Add Sensor' and set the icons to green jewels.
- Then add: IS6:LDGK (Plant **6: L**eft proceed**D** si**G**nal indi**K**tor) and IS6:RDGK (Plant **6: R**ight proceed**D** si**G**nal indi**K**tor)
- Move them into position.

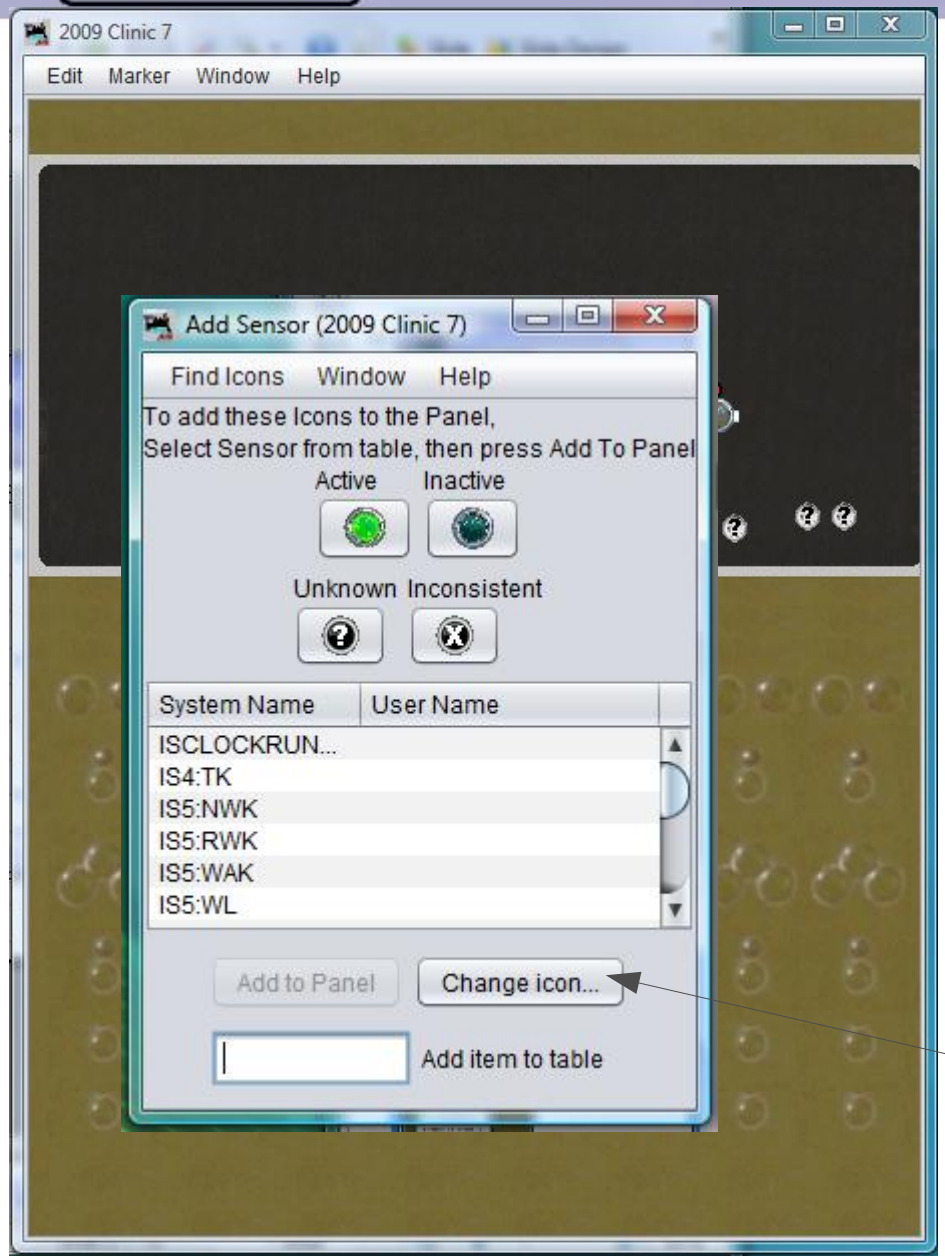
CTC



CTC basics

- Now add the signal indicator lamps. Select 'Add Sensor' and set the icons to green jewels.
- Then add: IS6:LDGK (Plant **6: L**eft proceed**D** si**G**nal indi**K**tor) and IS6:RDGK (Plant **6: R**ight proceed**D** si**G**nal indi**K**tor)
- Move them into position.
- And repeat for plant 8, 10, and 12.

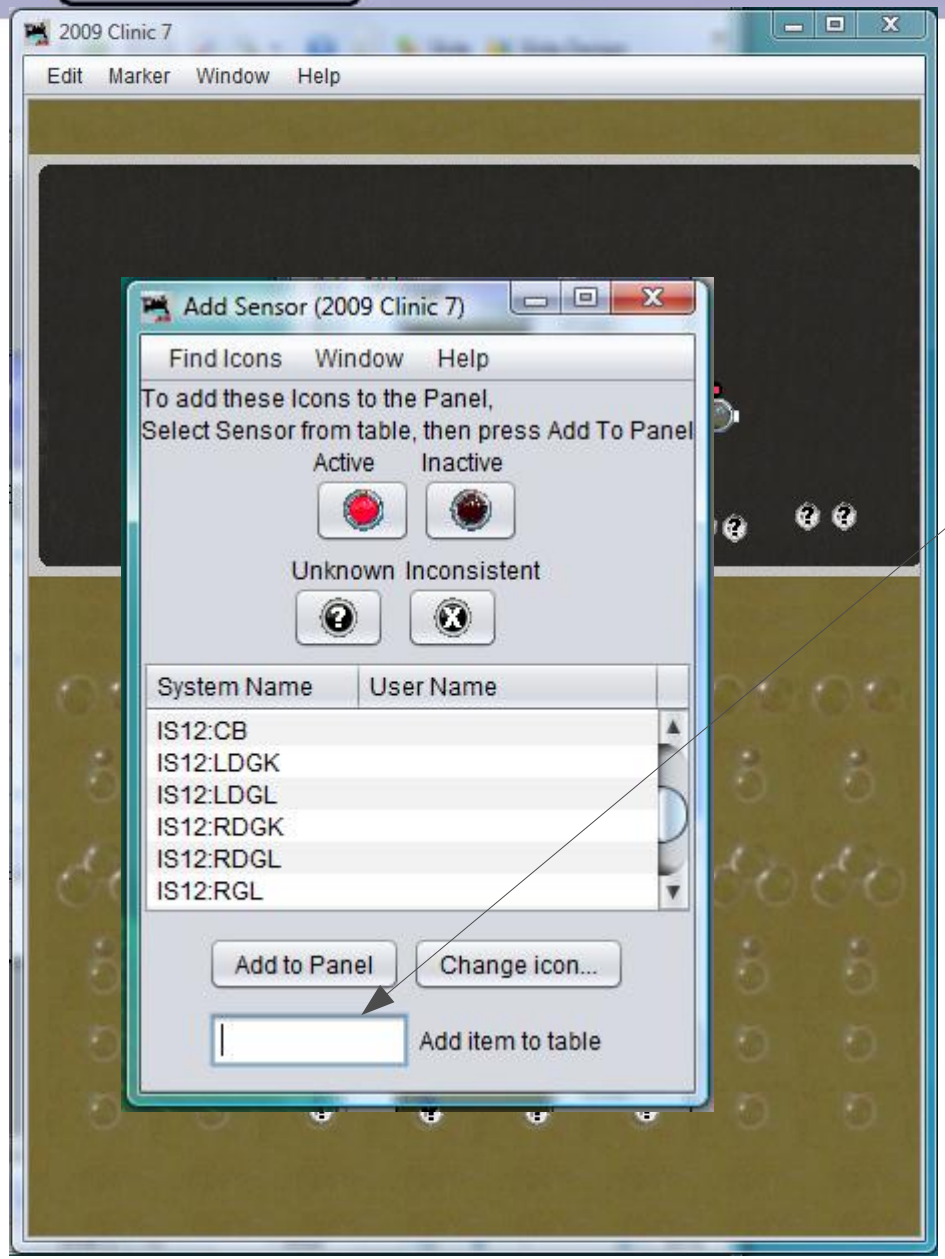
CTC



CTC basics

- Now add the signal indicator lamps. Select 'Add Sensor' and set the icons to green jewels.
- Then add: IS6:LDGK (Plant **6: L**eft proce**D** si**G**nal indi**K**tor) and IS6:RDGK (Plant **6: R**ight proce**D** si**G**nal indi**K**tor)
- Move them into position.
- And repeat for plant 8, 10, and 12.
- Now change the icons to red jewels.

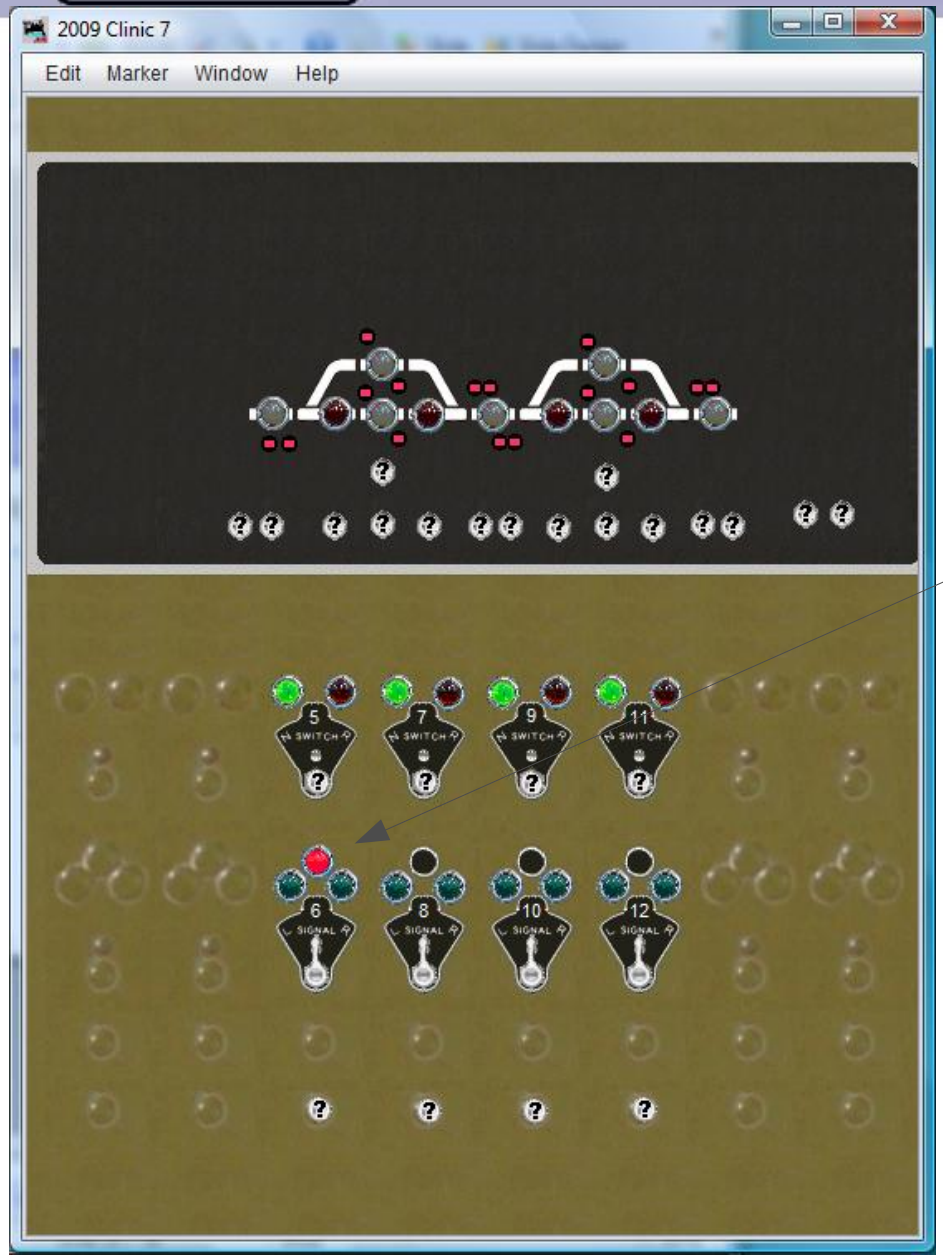
CTC



CTC basics

- Then add: IS6:NGK (Plant **6:** **N**ormal si**G**nal indi**K**tor)

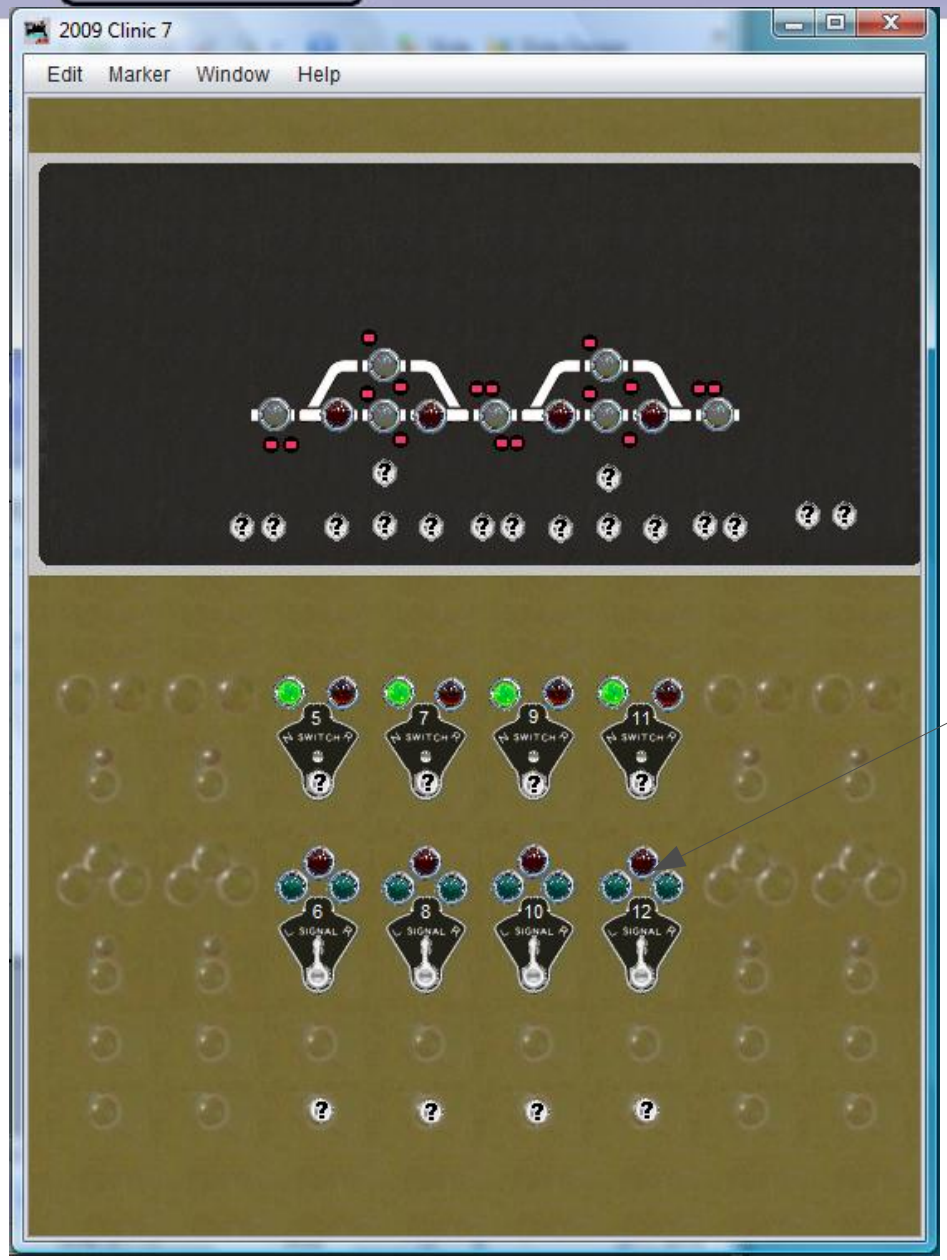
CTC



CTC basics

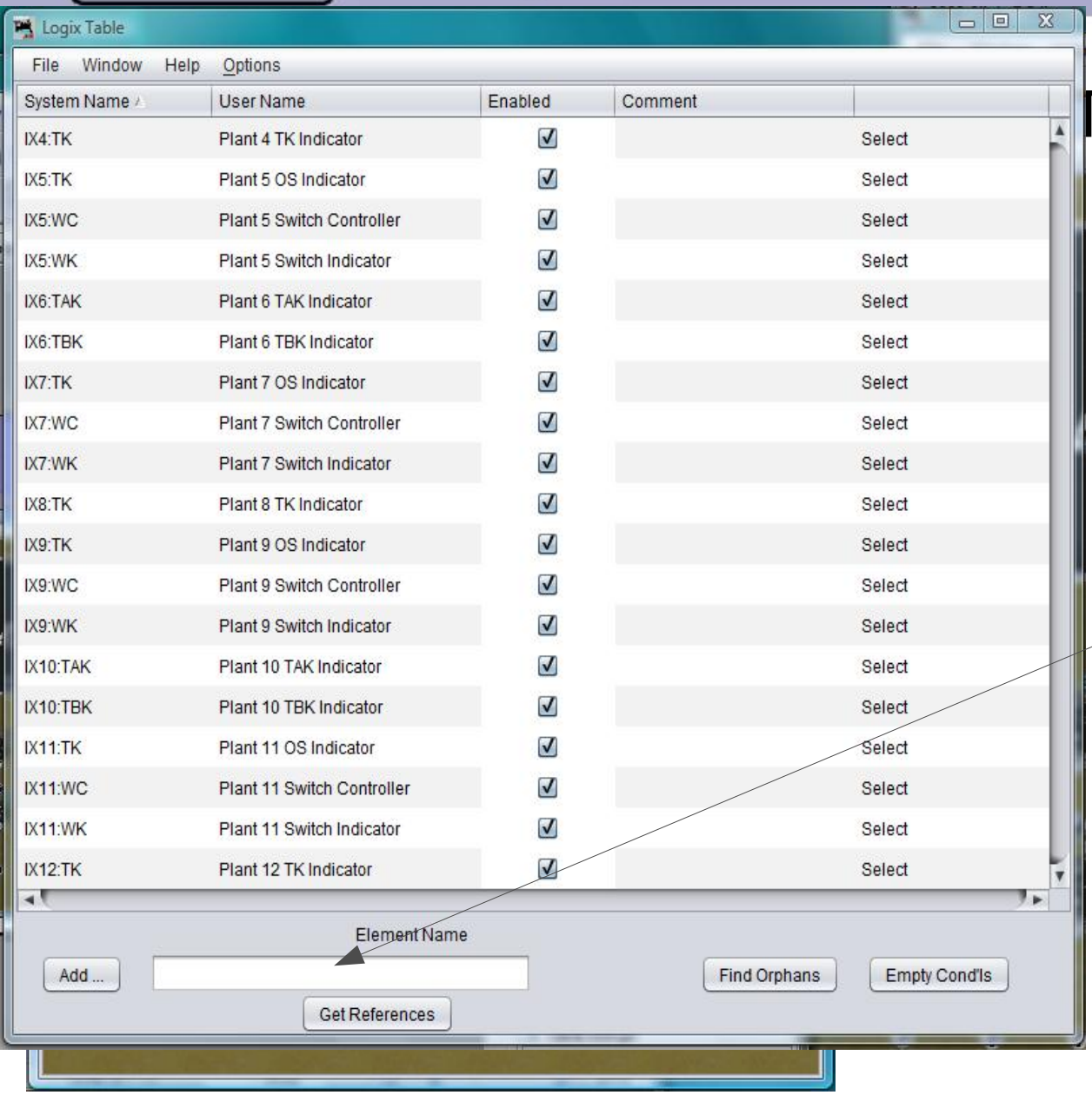
- Then add: IS6:NGK (Plant **6:** **N**ormal si**G**nal indi**K**tor)
- Move it into position.

CTC



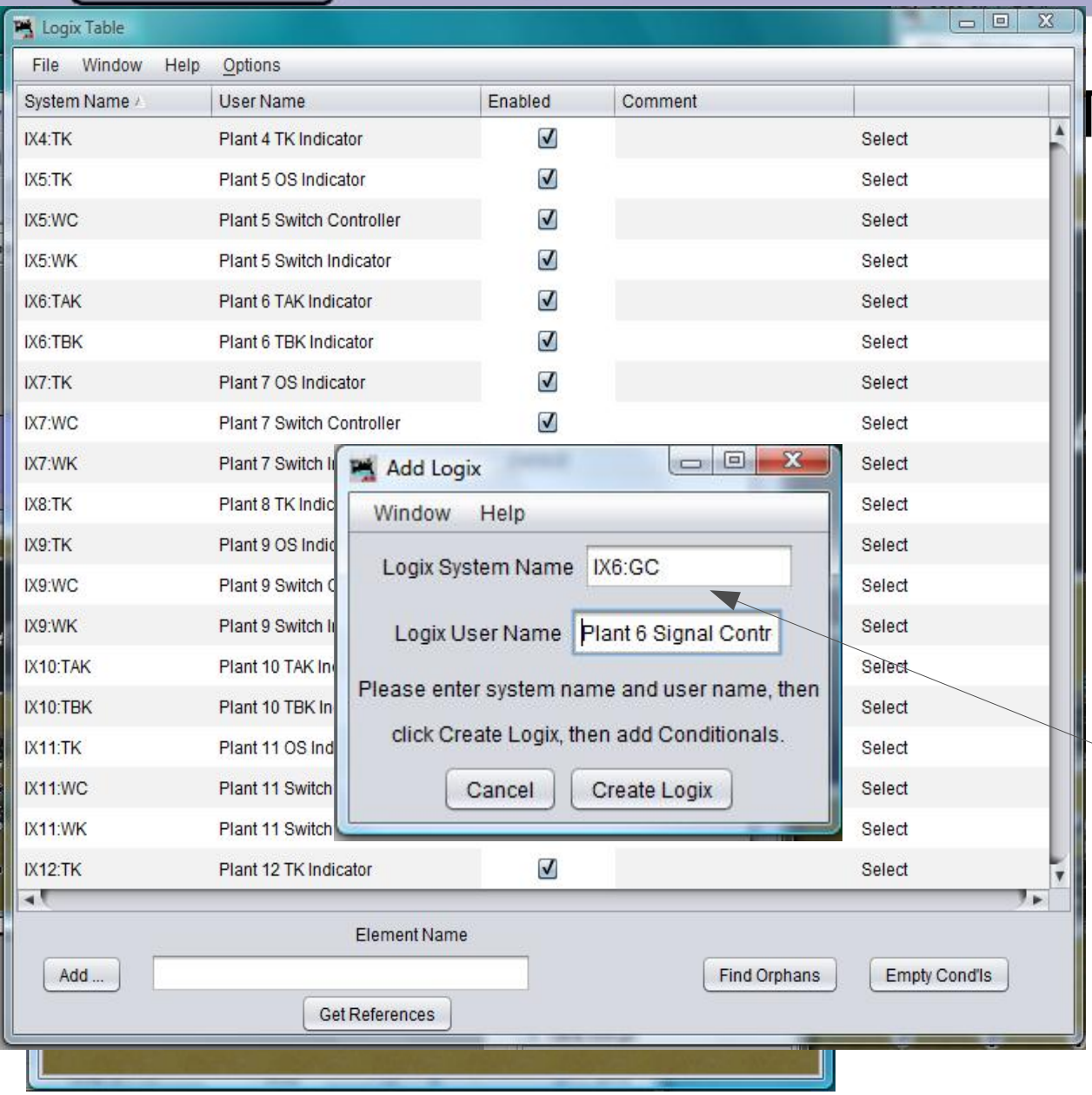
CTC basics

- Then add: IS6:NGK (Plant **6:** **N**ormal si**G**nal indi**K**tor)
- Move it into position.
- And repeat for plant 8, 10, and 12.



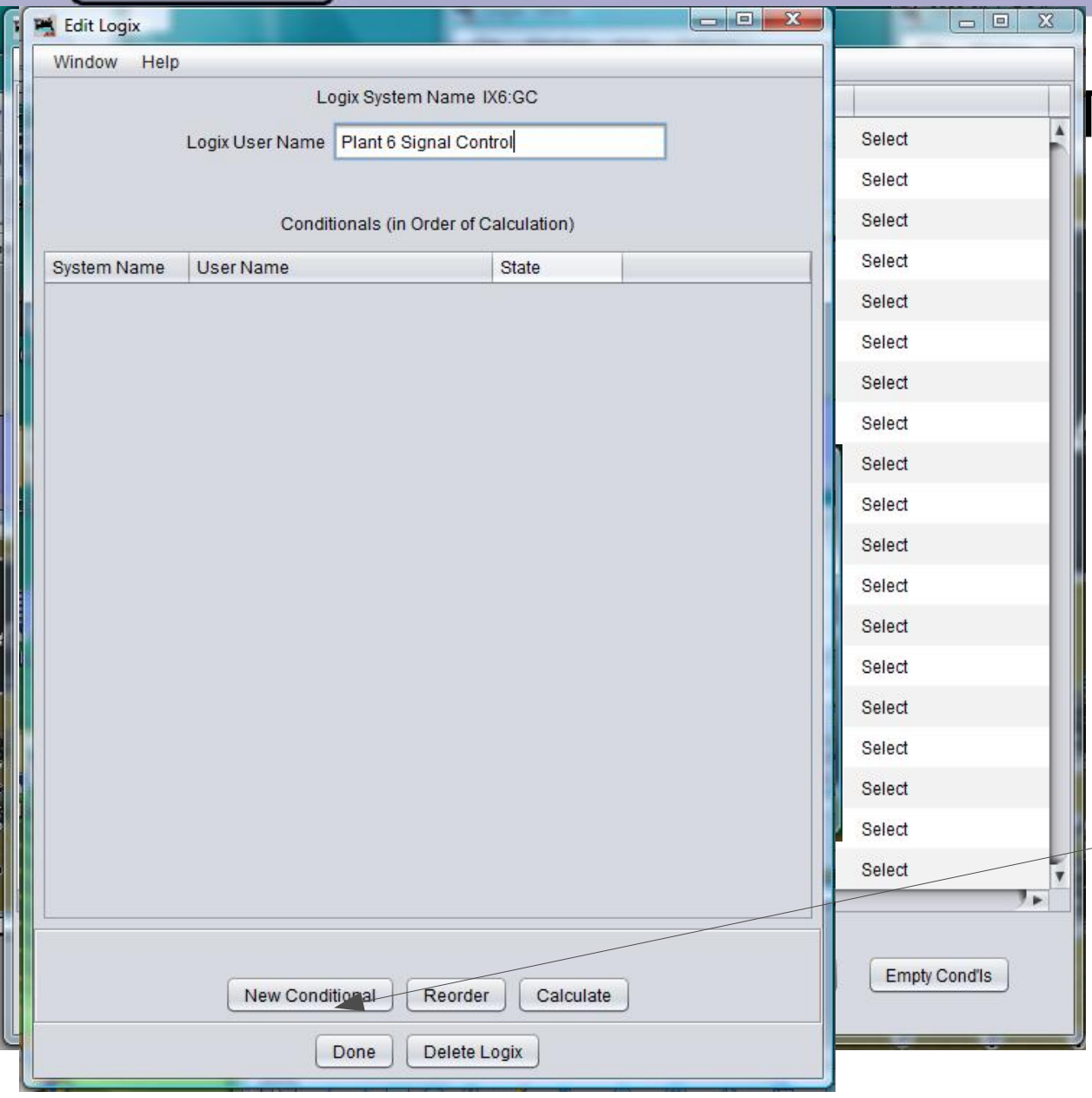
TC basics

- Then add: IS6:NGK (Plant **6:** **N**ormal si**G**nal indi**K**tor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table



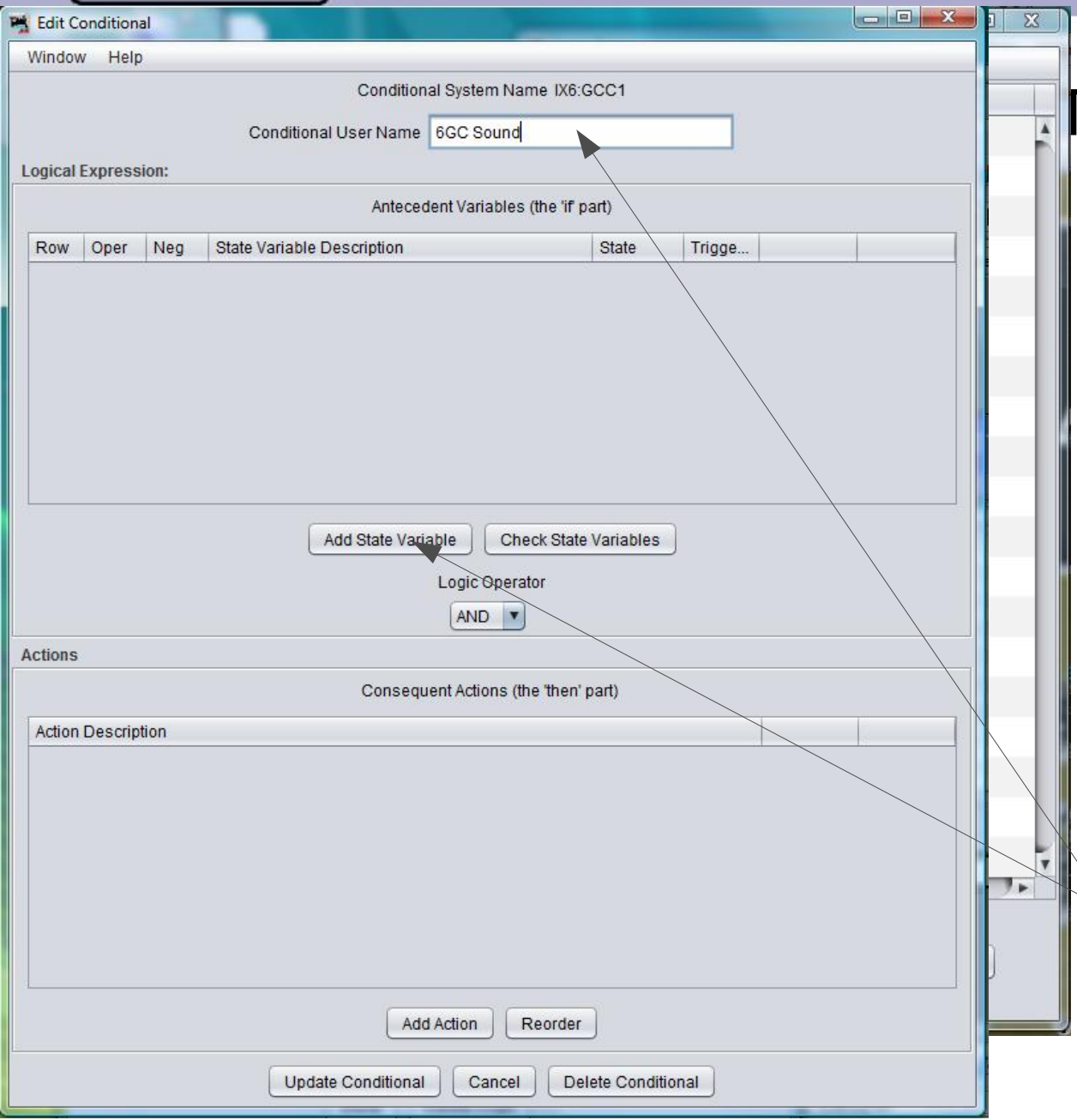
TC basics

- Then add: IS6:NGK (Plant **6:** **N**ormal si**G**nal indi**K**tor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table
- Add IX6:GC (Plant **6** si**G**nal **C**ontrol



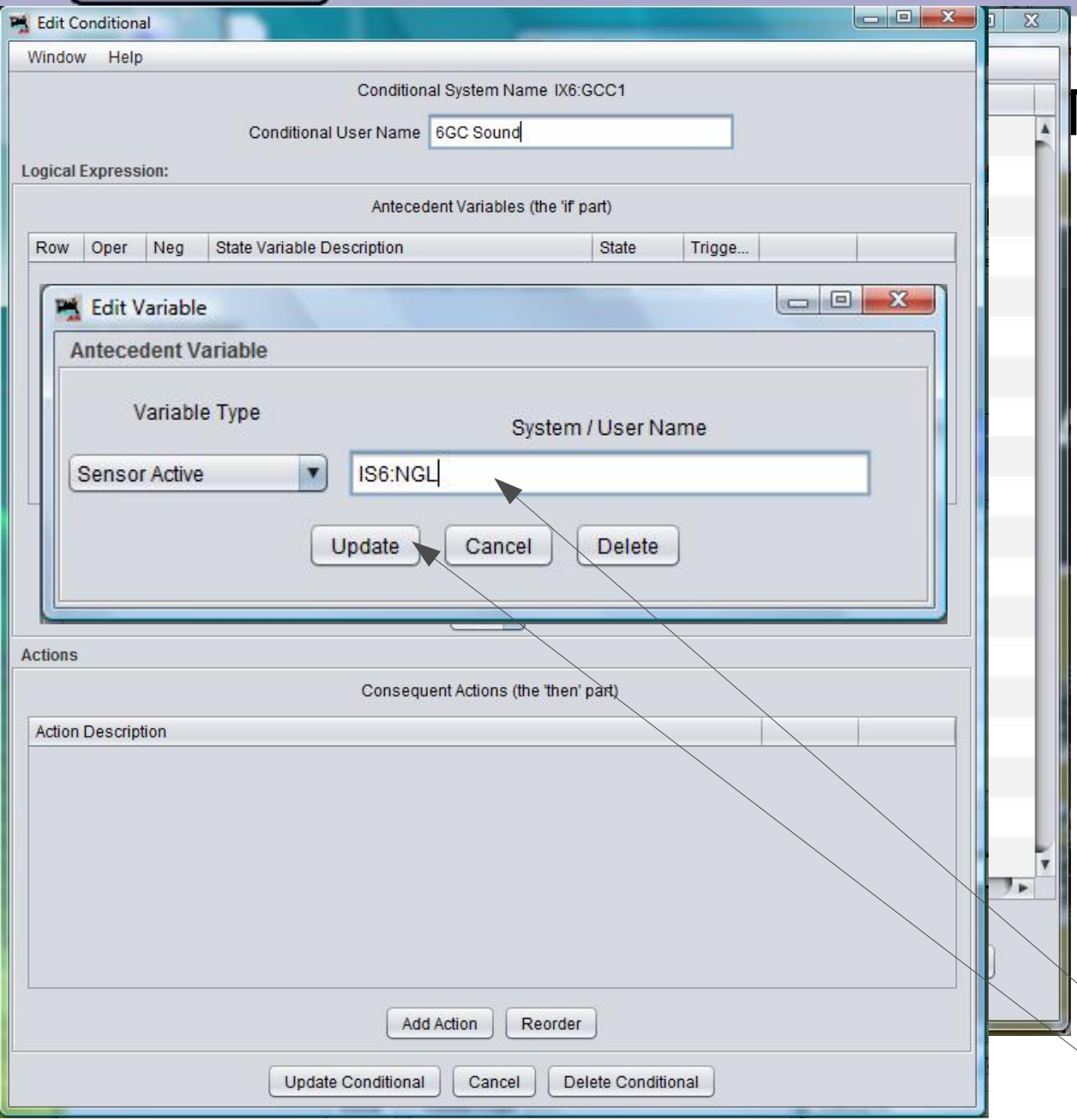
TC basics

- Then add: IS6:NGK (Plant **6:** **N**ormal si**G**nal indi**K**tor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table
- Add IX6:GC (Plant **6** si**G**nal **C**ontrol
- Click 'New Conditional'



TC basics

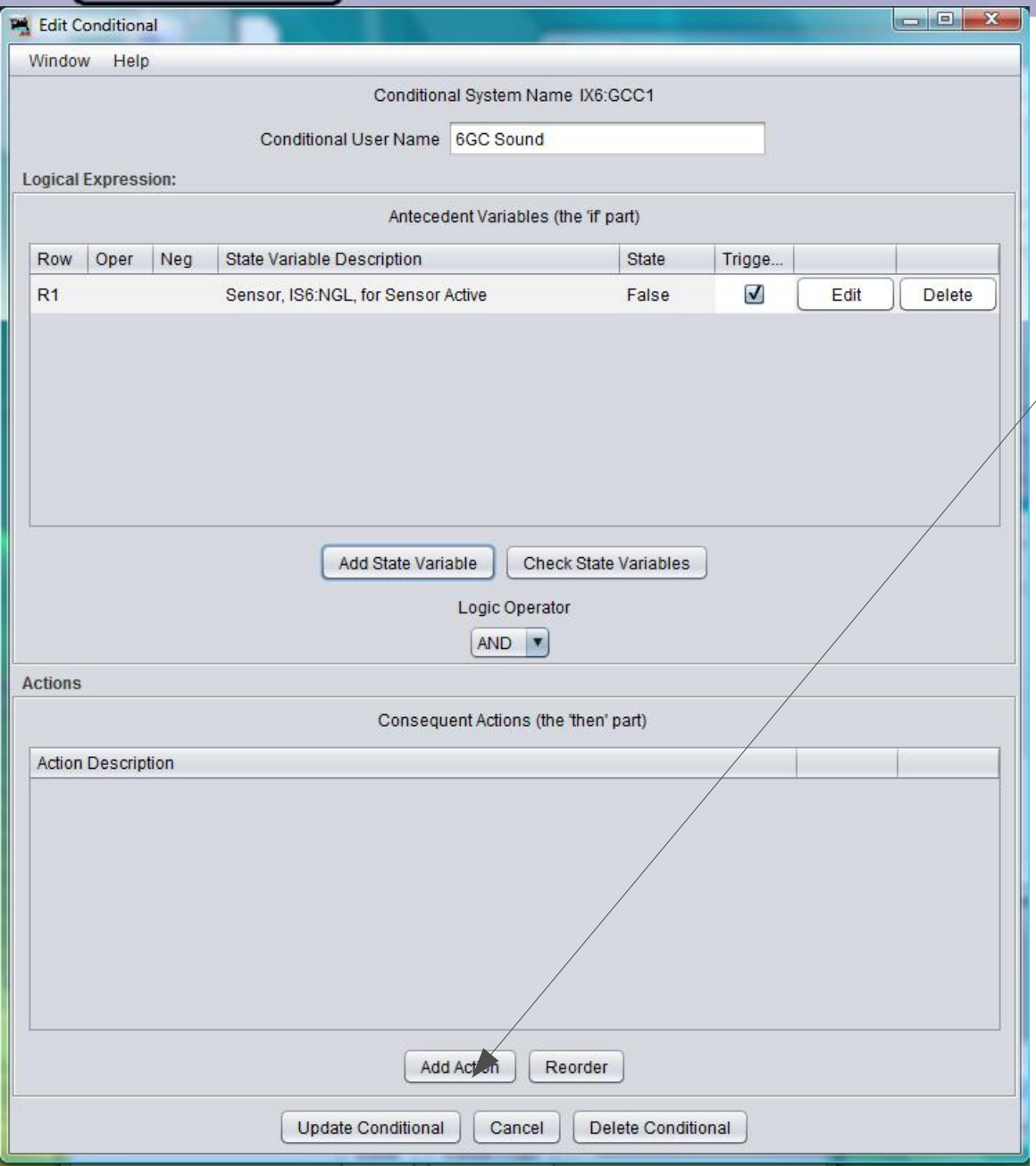
- Then add: IS6:NGK (Plant **6: N**ormal si**G**nal indi**K**tor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table
- Add IX6:GC (Plant **6** si**G**nal **C**ontrol
- Click 'New Conditional'
- and name it 6GC Sound then 'Add State Variable'



TC basics

- Then add: IS6:NGK (Plant **6:** **N**ormal si**G**nal indi**K**tor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table
- Add IX6:GC (Plant **6** si**G**nal **C**ontrol
- Click 'New Conditional'
- and name it 6GC Sound then 'Add State Variable'
- 'Sensor Active' IS6:NGL and 'Update Conditional'.

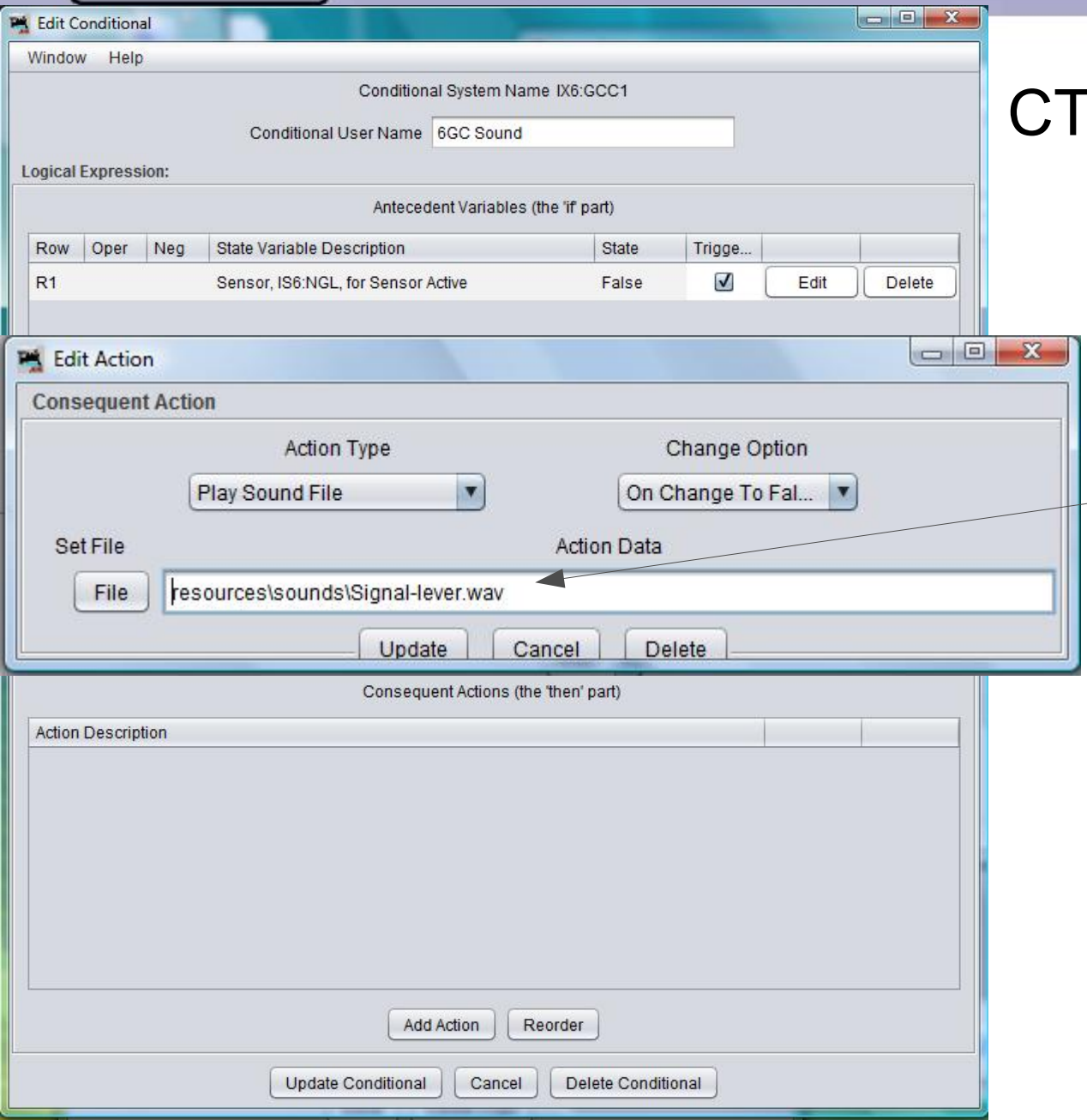
CTC



CTC basics

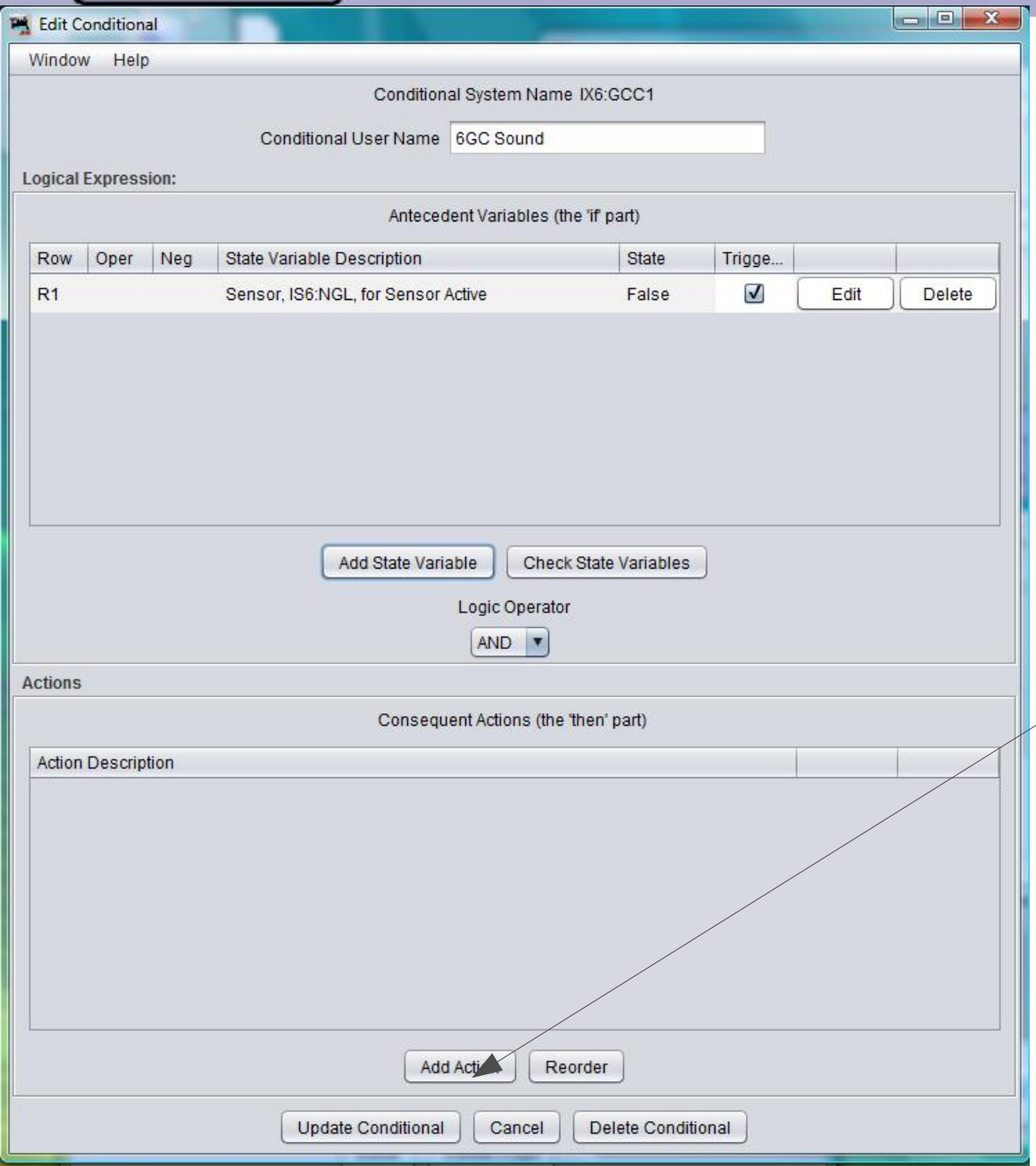
- What we are doing is adding sound to the lever action.

CTC



CTC basics

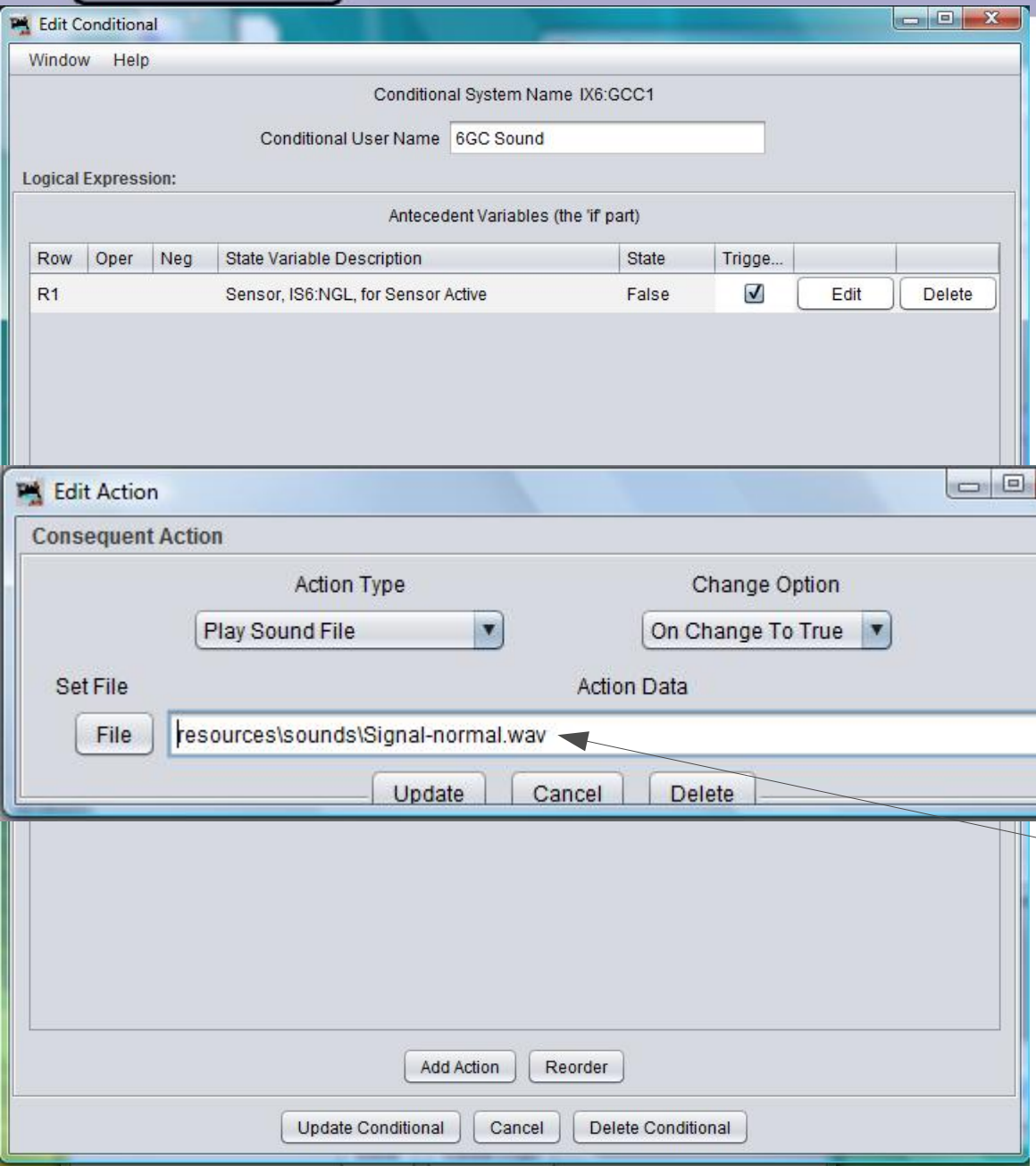
- What we are doing is adding sound to the lever action.
- 'Play Sound File' on 'Change to False' the 'Signal-lever'



CTC basics

- What we are doing is adding sound to the lever action.
- 'Play Sound File' on 'Change to False' the 'Signal-lever'
- We also need to play the sound of the lever restoring to normal.

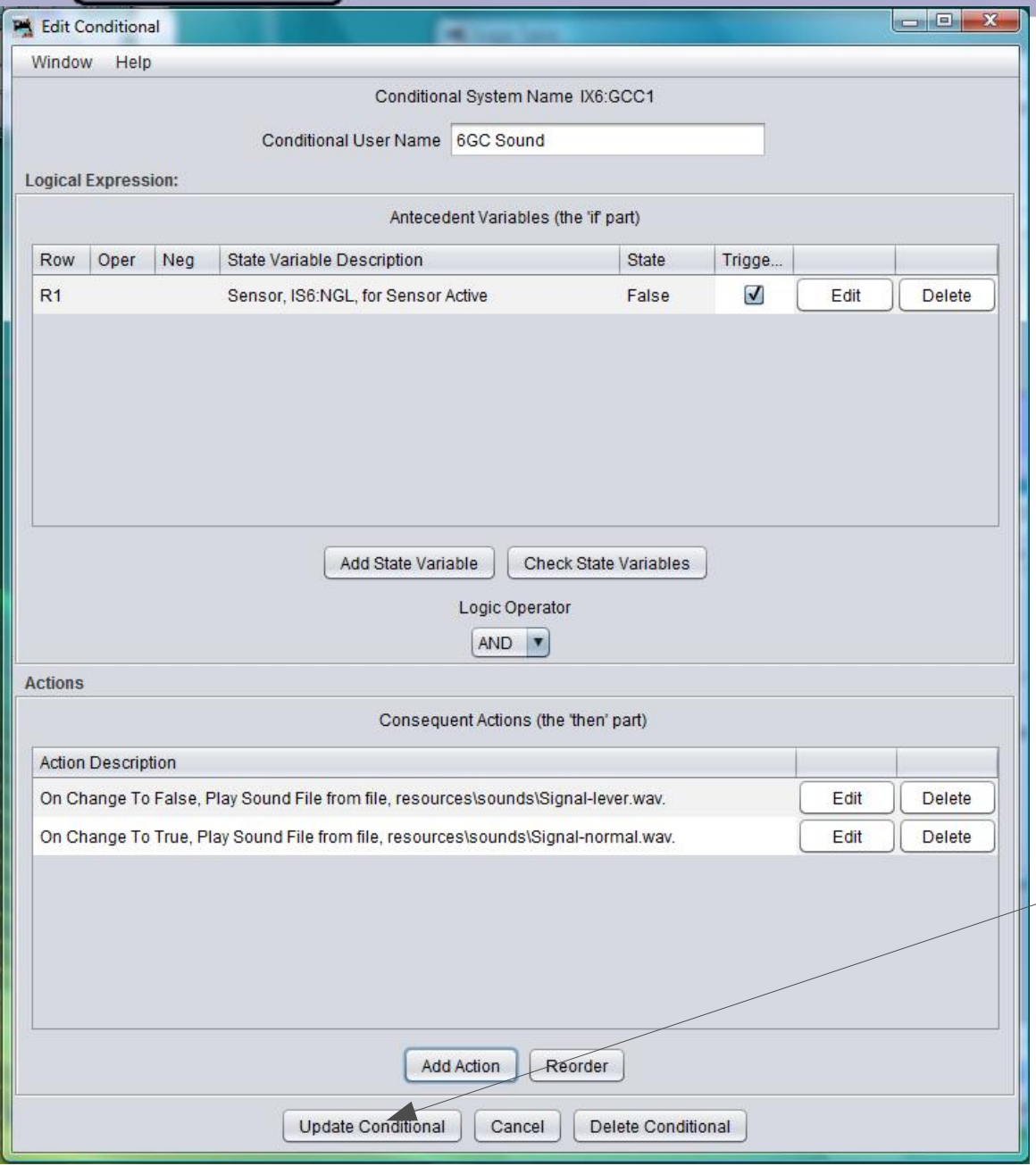
CTC



CTC basics

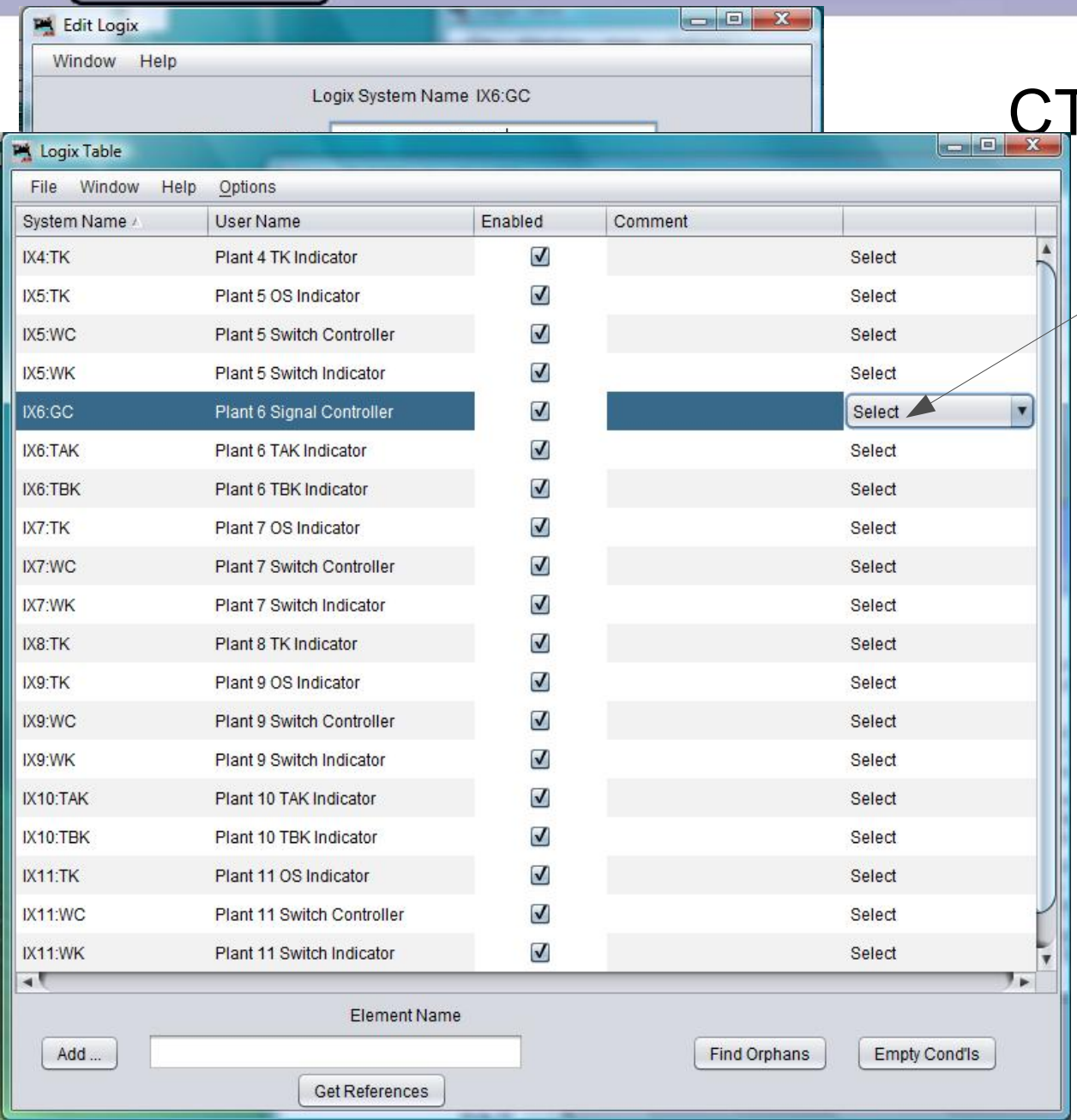
- What we are doing is adding sound to the lever action.
- 'Play Sound File' on 'Change to False' the 'Signal-lever'
- We also need to play the sound of the lever restoring to normal.
- 'Play Sound File' on 'Change to True' the 'Signal-normal'

CTC



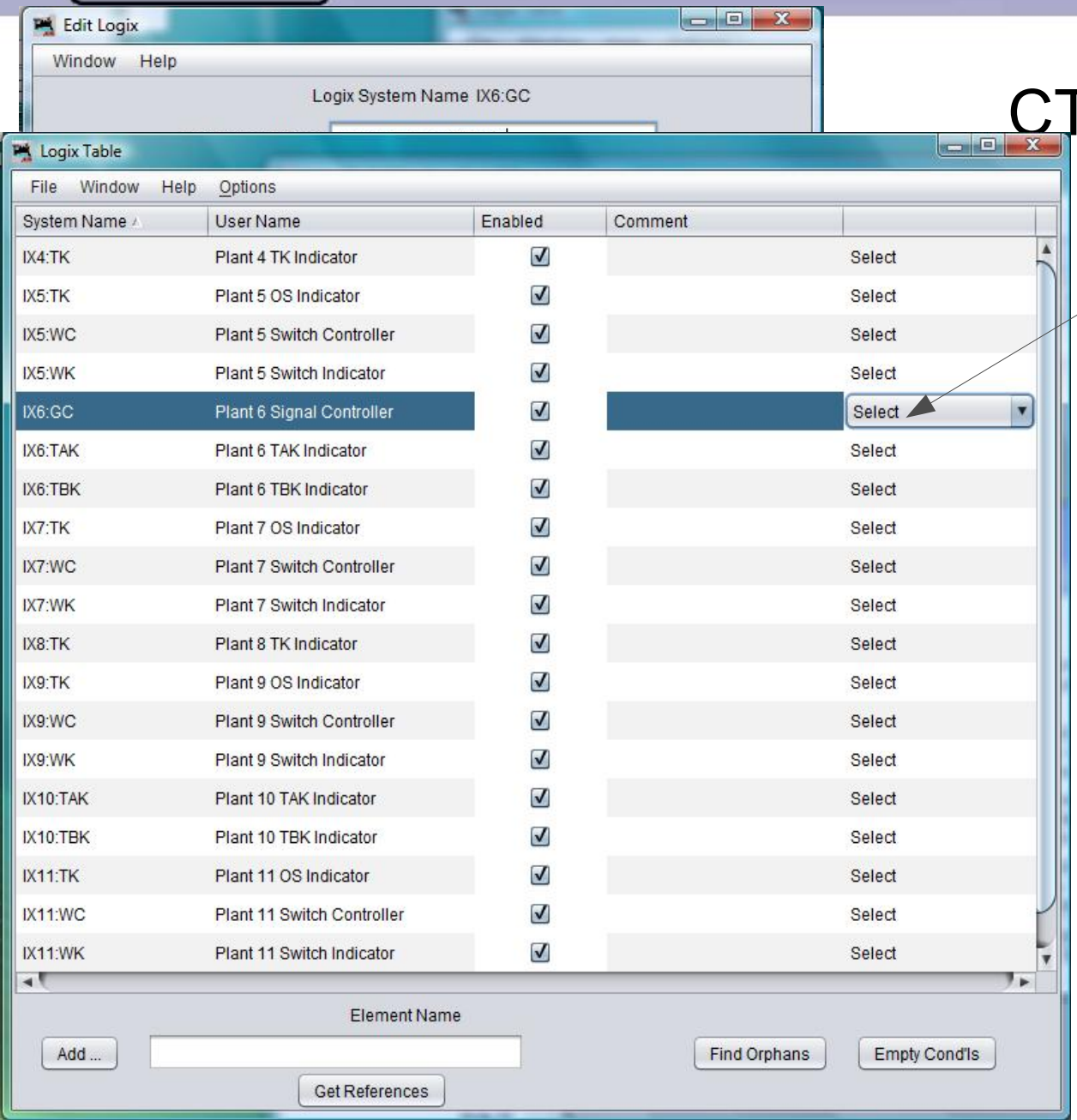
CTC basics

- What we are doing is adding sound to the lever action.
- 'Play Sound File' on 'Change to False' the 'Signal-lever'
- We also need to play the sound of the lever restoring to normal.
- 'Play Sound File' on 'Change to True' the 'Signal-normal'
- 'Update Conditional' and we should have sound on the lever.



CTC basics

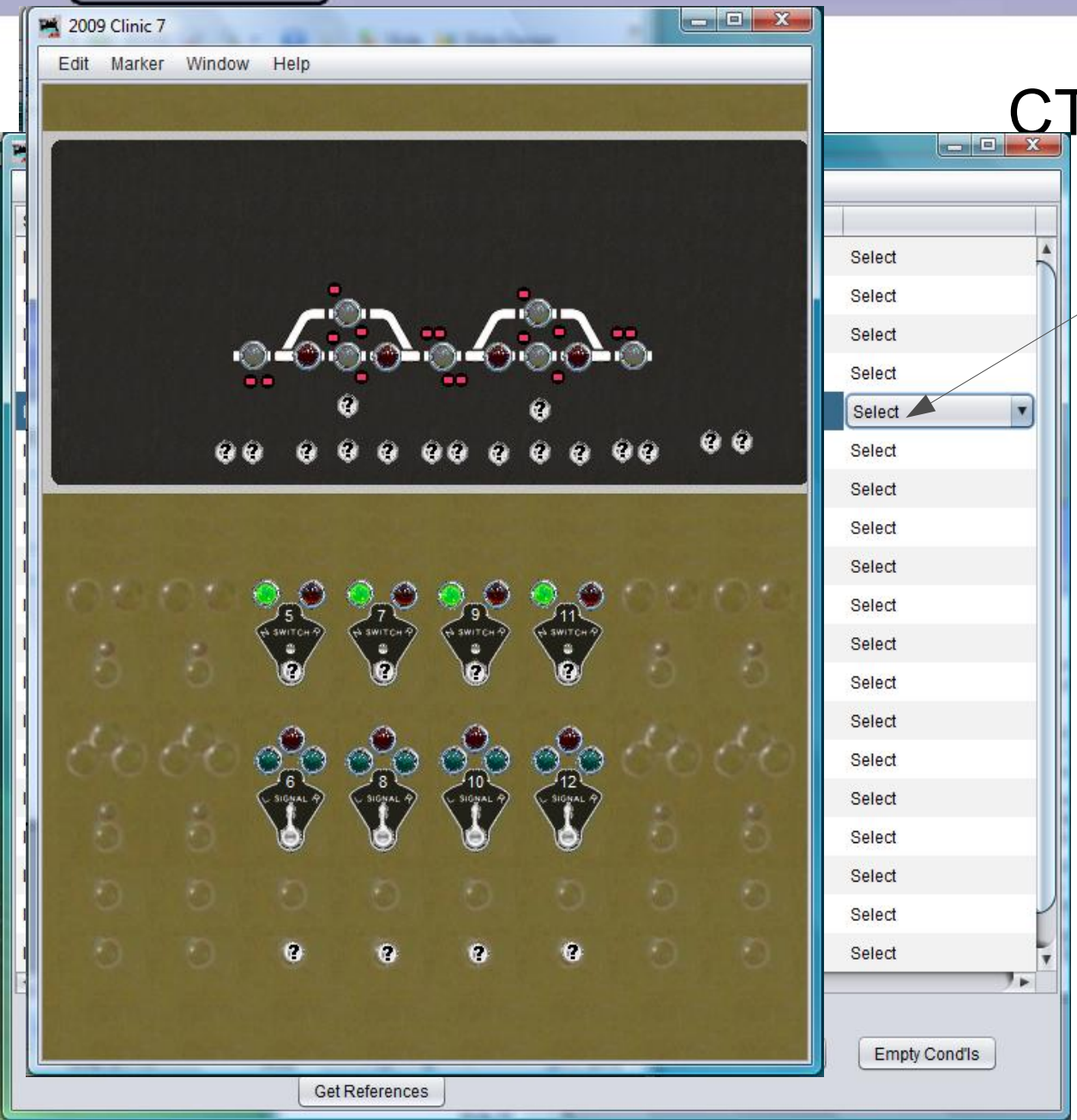
- Now copy the Logix for IS8:GC, IS10:GC, and IS12:GC.



CTC basics

- Now copy the Logix for IS8:GC, IS10:GC, and IS12:GC.
- Then edit each entry to reflect the required new values.

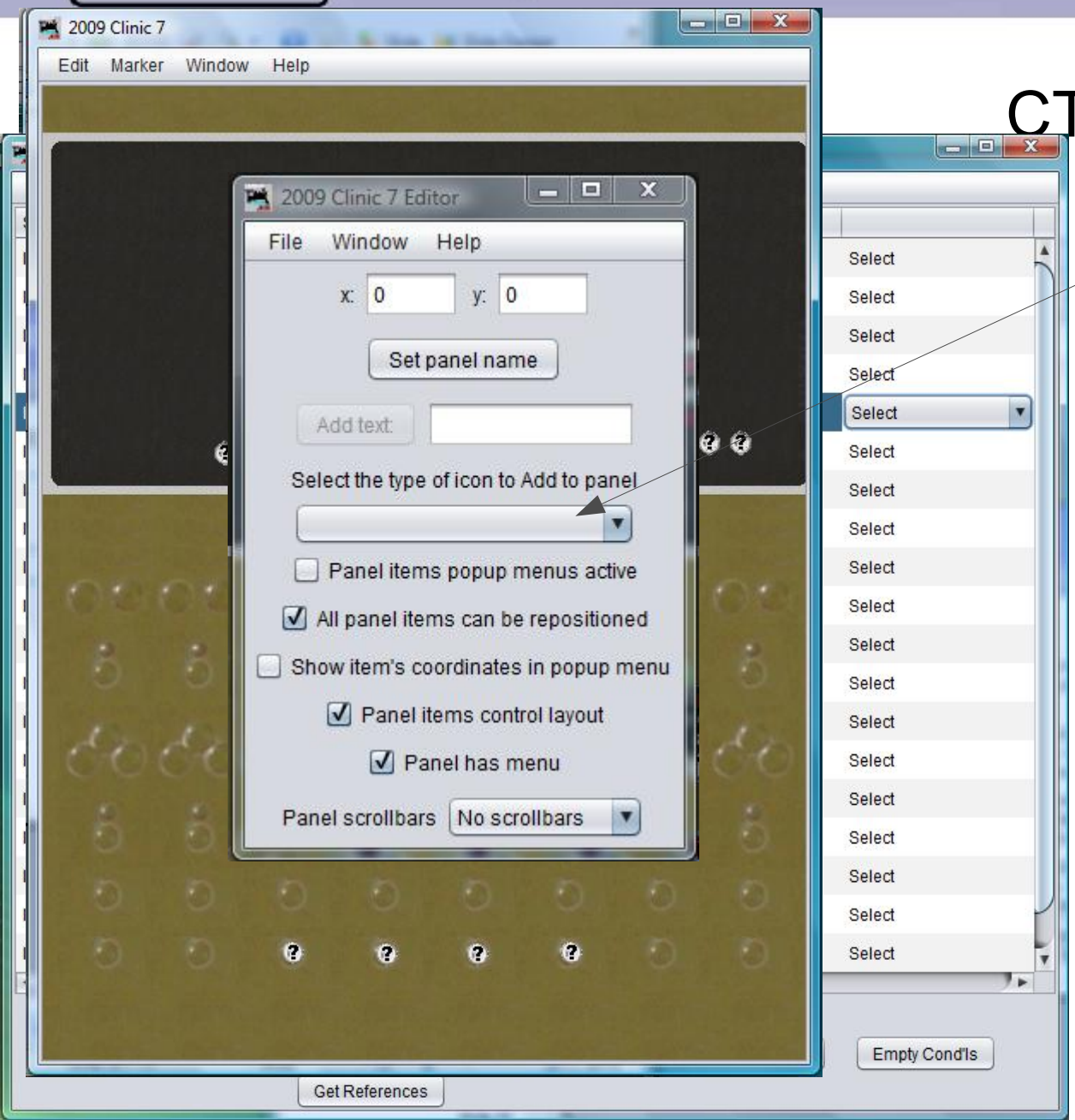
CTC



CTC bell

- Now copy the Logix for IS8:GC, IS10:GC, and IS12:GC.
- Then edit each entry to reflect the required new values.
- Go back to our panel. The CTC panel had a bell that rang every time a train entered an OS section. This was to alert the dispatcher of train movements in case he was away from the panel. However he was able to disable the bell.

CTC



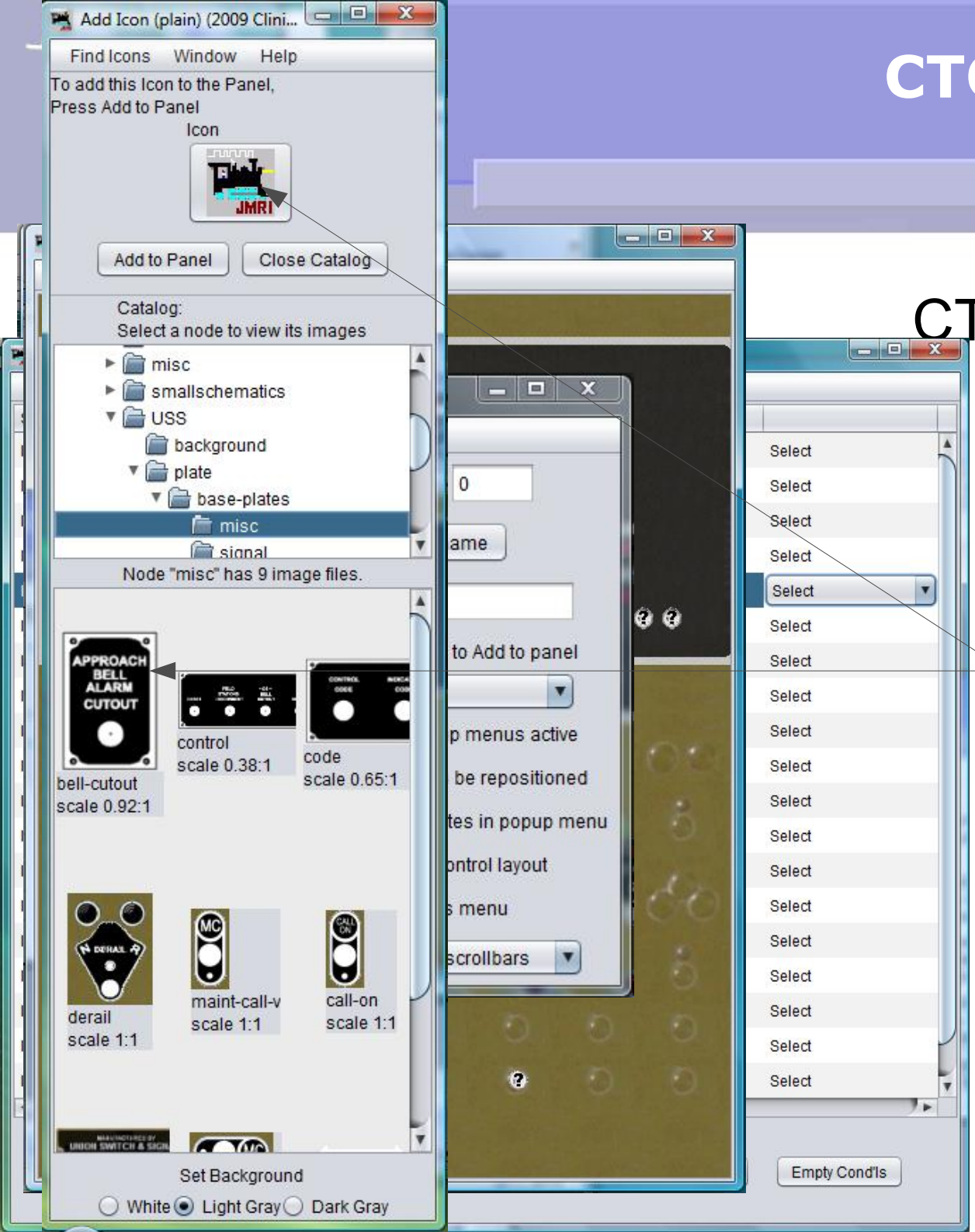
CTC bell

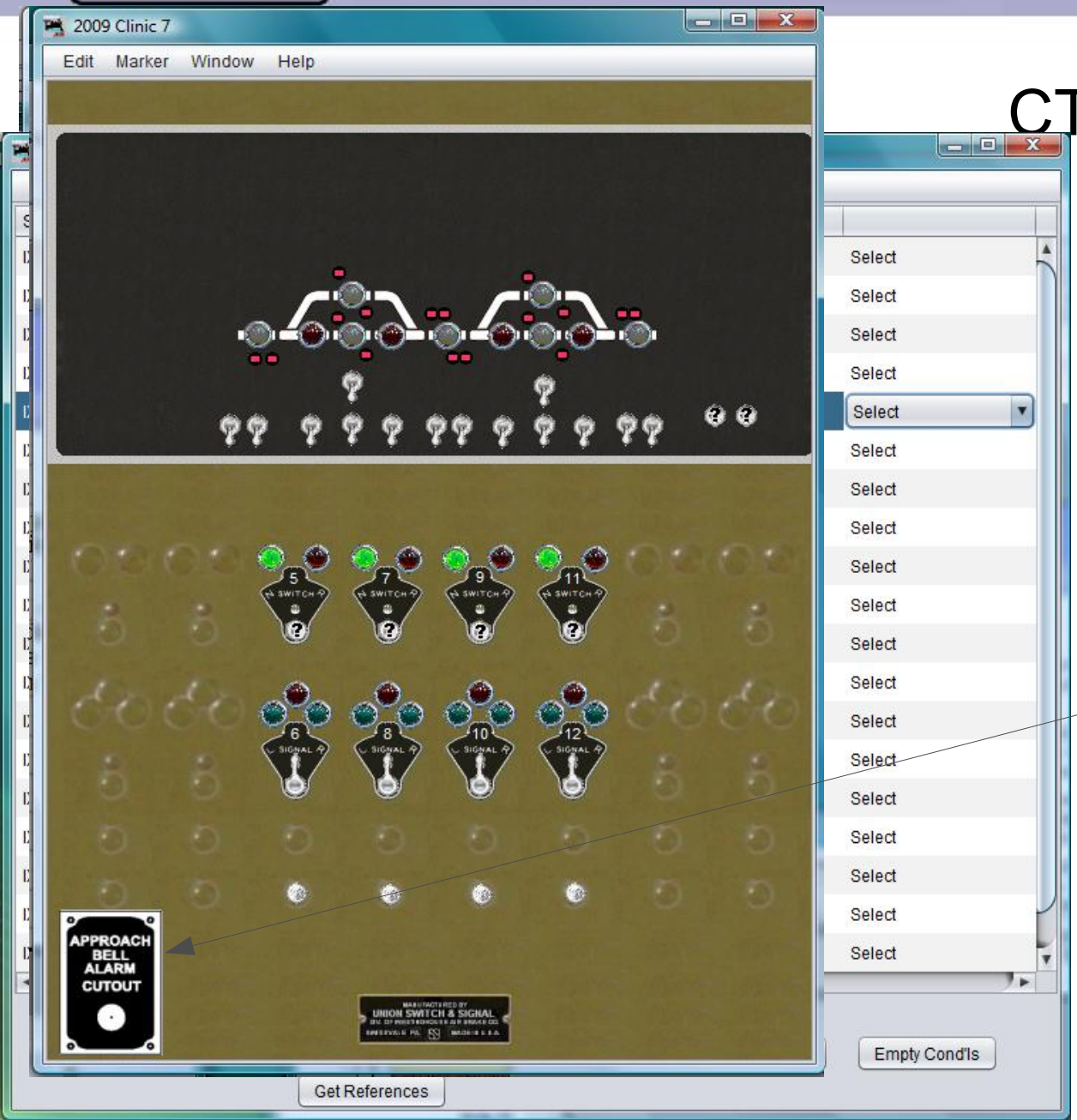
- Start by adding a plate for the bell cutout switch. 'Add Icon (plain)'

CTC

CTC bell

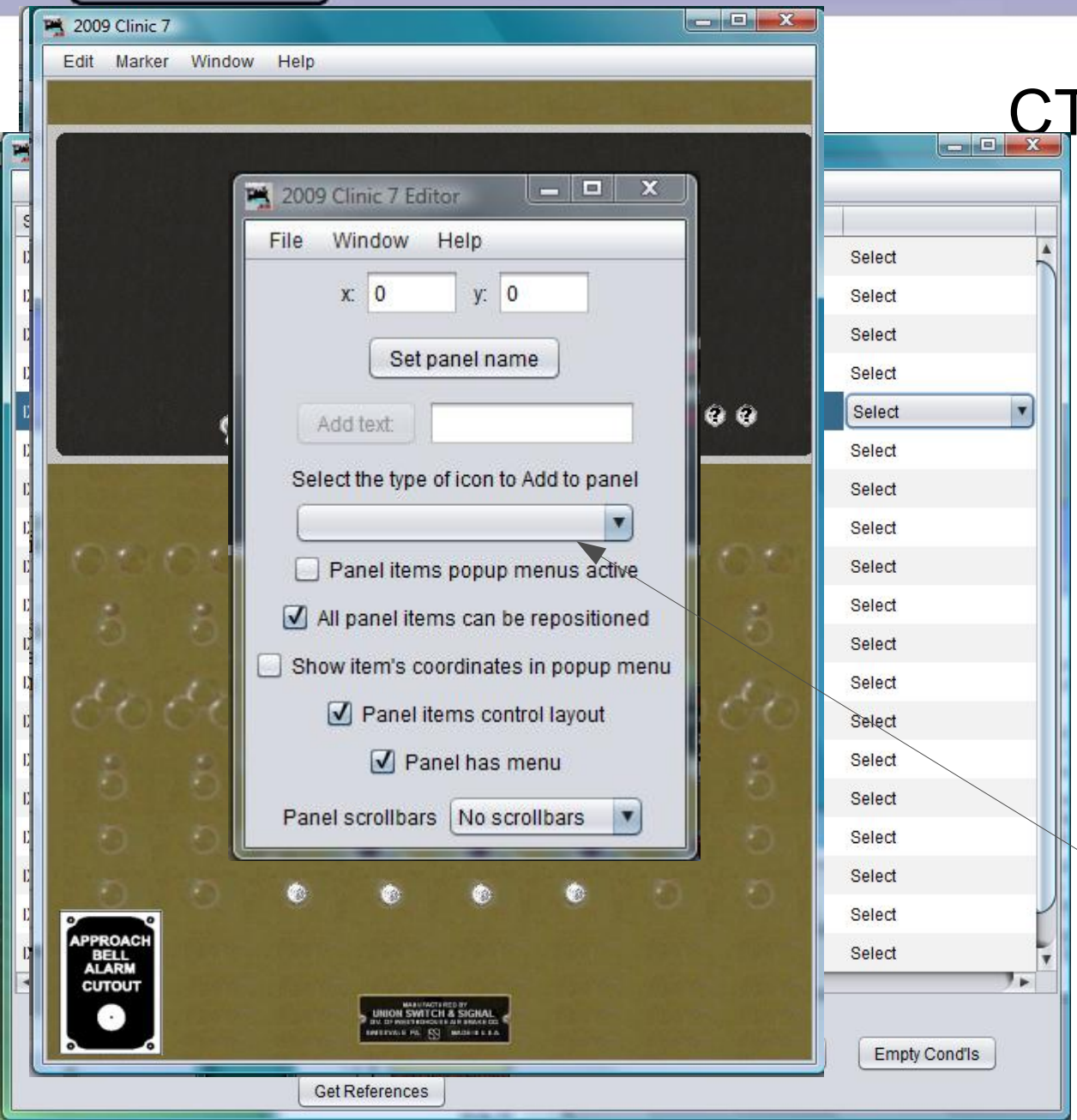
- Start by adding a plate for the bell cutout switch. 'Add Icon (plain)'
- Navigate to 'icons – USS – plate – misc' and drag the 'bell-cutout' image to the icon position, then 'Add to Panel'





CTC bell

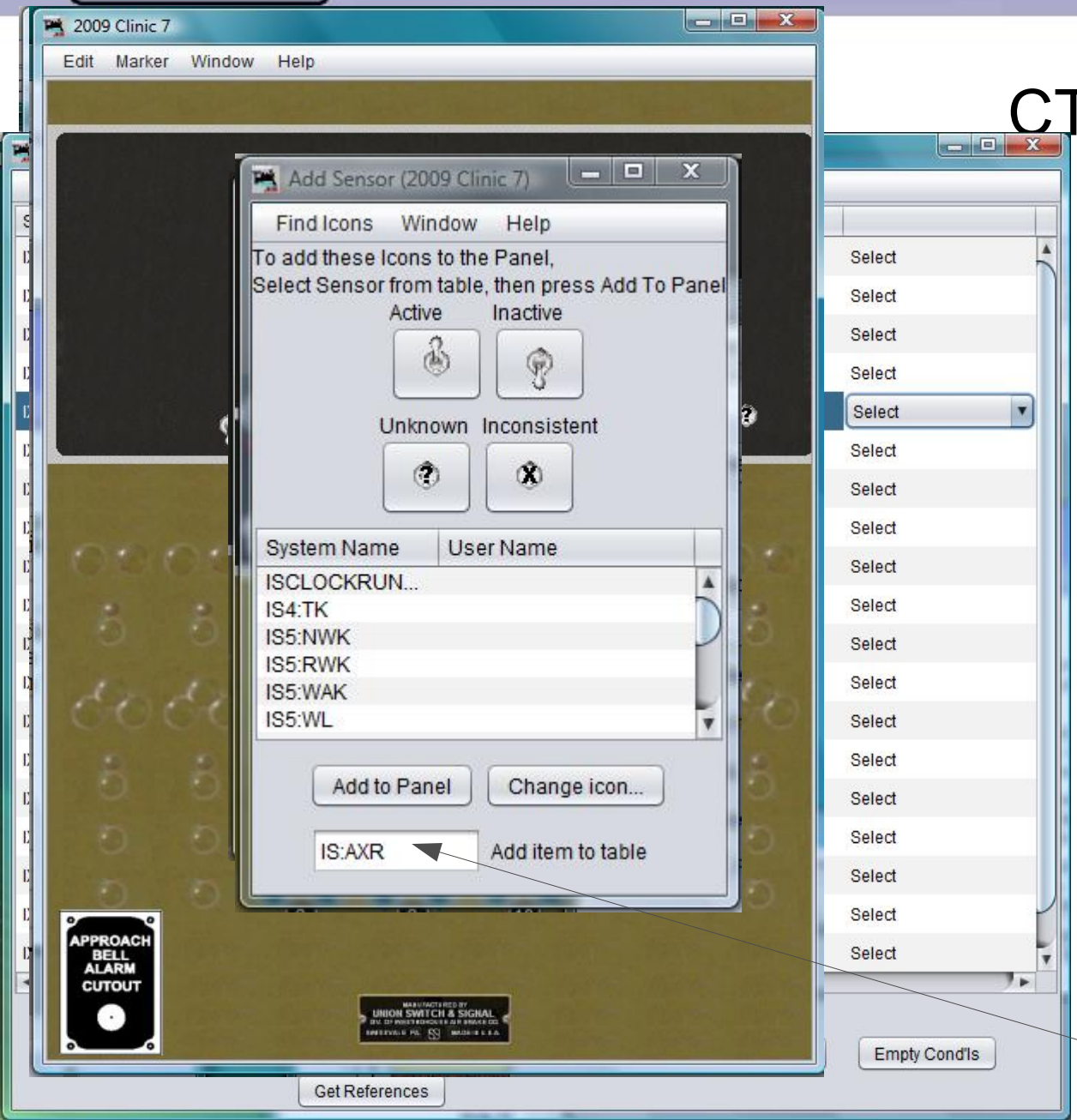
- Start by adding a plate for the bell cutout switch. 'Add Icon (plain)'
- Navigate to 'icons – USS – plate – misc' and drag the 'bell-cutout' image to the icon position, then 'Add to Panel'
- Move it into position near the bottom of the panel.



CTC bell

- Start by adding a plate for the bell cutout switch. 'Add Icon (plain)'
- Navigate to 'icons – USS – plate – misc' and drag the 'bell-cutout' image to the icon position, then 'Add to Panel'
- Move it into position near the bottom of the panel.
- Now select 'Add Sensor' and set the icon image to be a toggle switch.

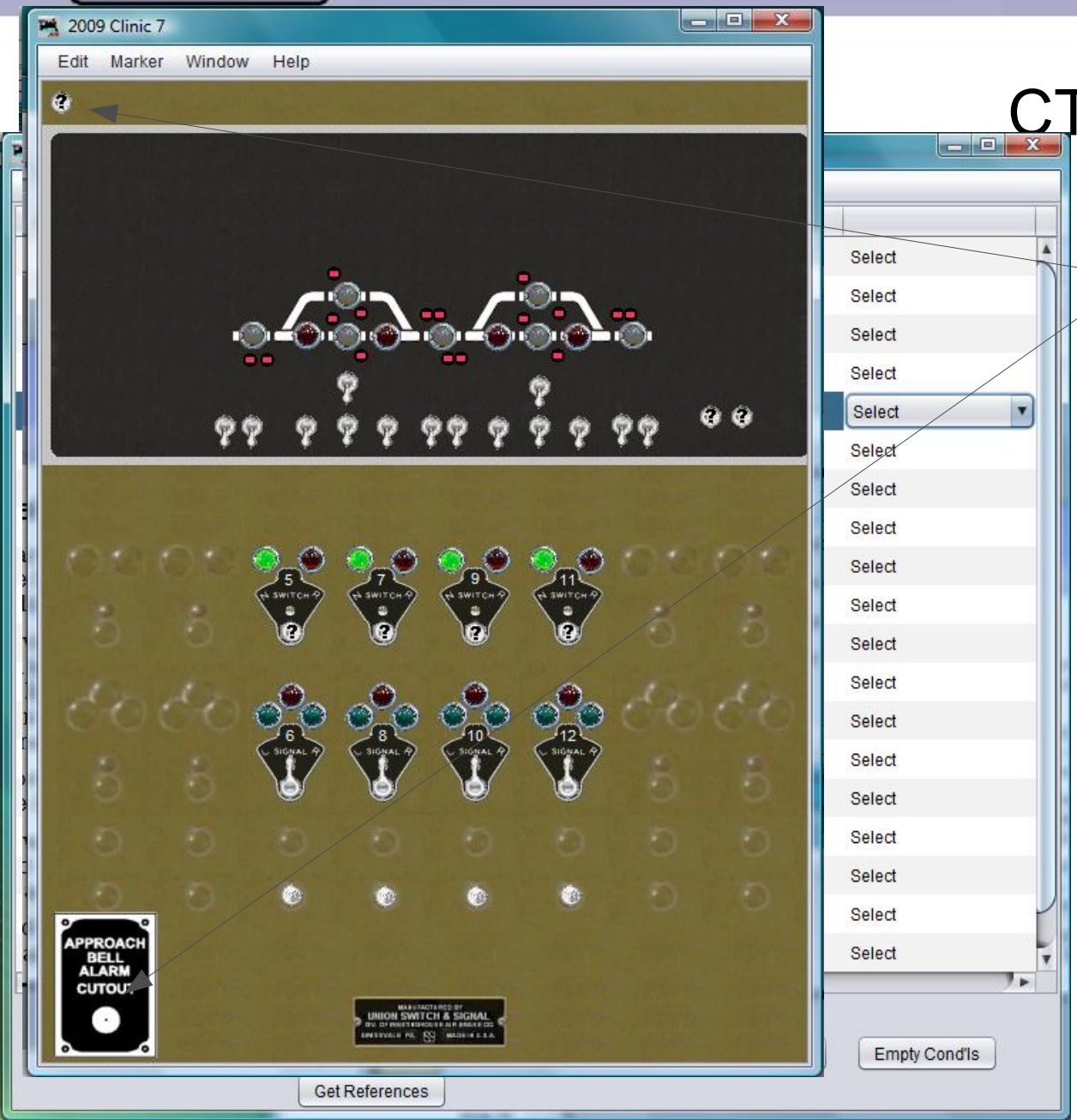
CTC



CTC bell

- Start by adding a plate for the bell cutout switch. 'Add Icon (plain)'
- Navigate to 'icons – USS – plate – misc' and drag the 'bell-cutout' image to the icon position, then 'Add to Panel'
- Move it into position near the bottom of the panel.
- Now select 'Add Sensor' and set the icon image to be a toggle switch.
- Add a sensor IS:AXR (Approach Bell Relay).

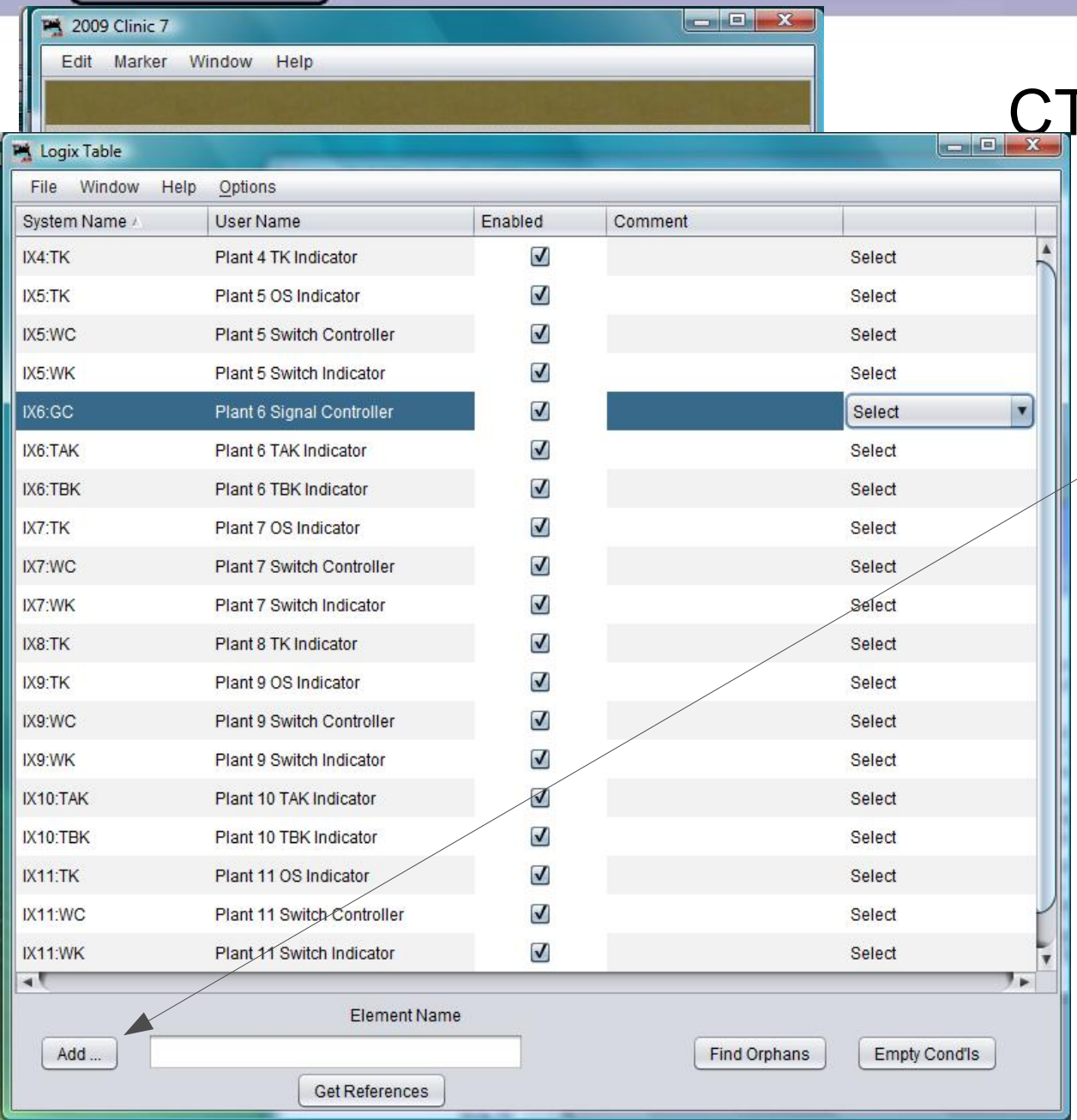
CTC



CTC bell

- Move the toggle switch into position on the bell cutout plate

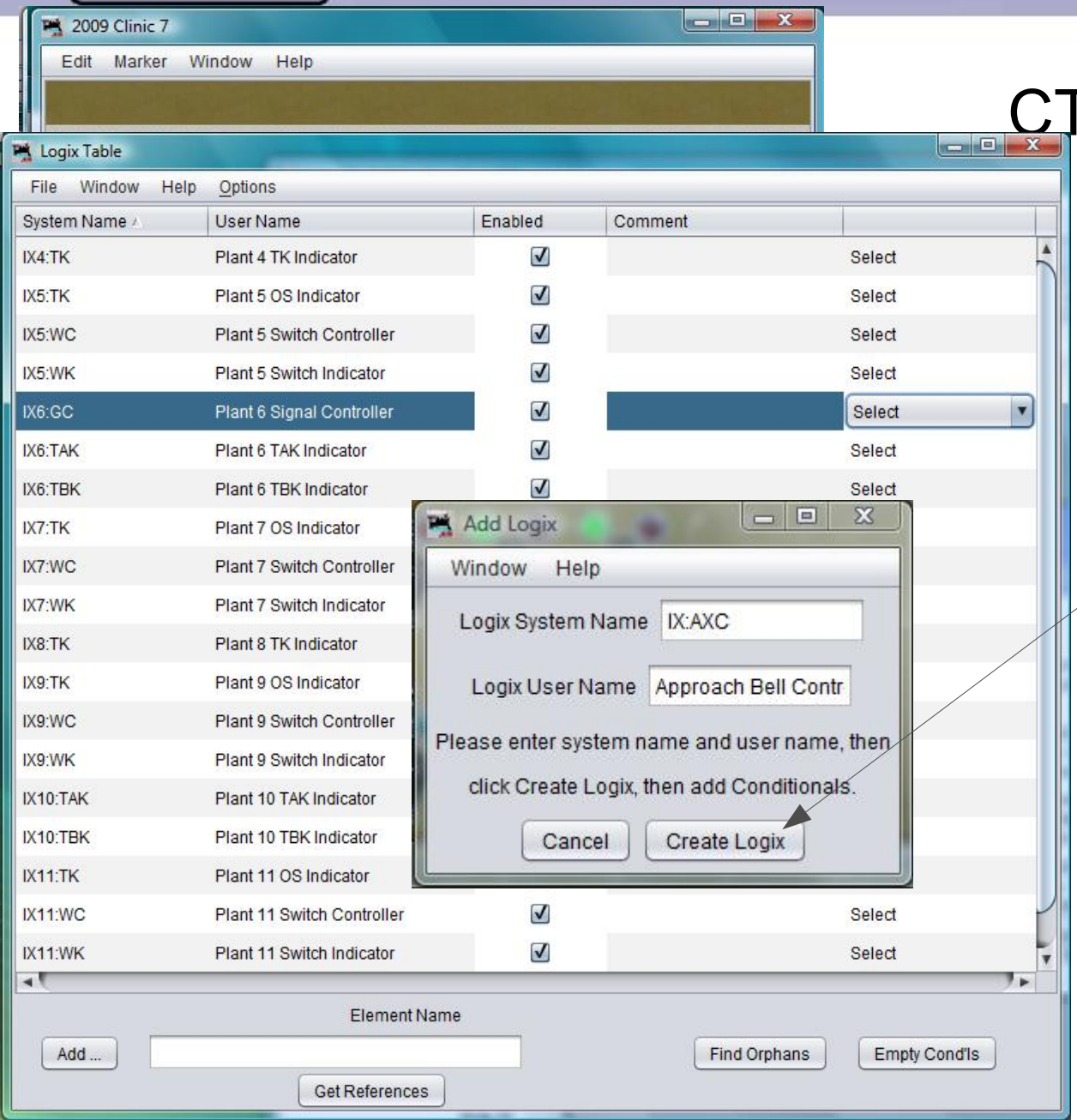
CTC



CTC bell

- Move the toggle switch into position on the bell cutout plate
- Now add a Logix and call it IX:AXC (Approach Bell Control)

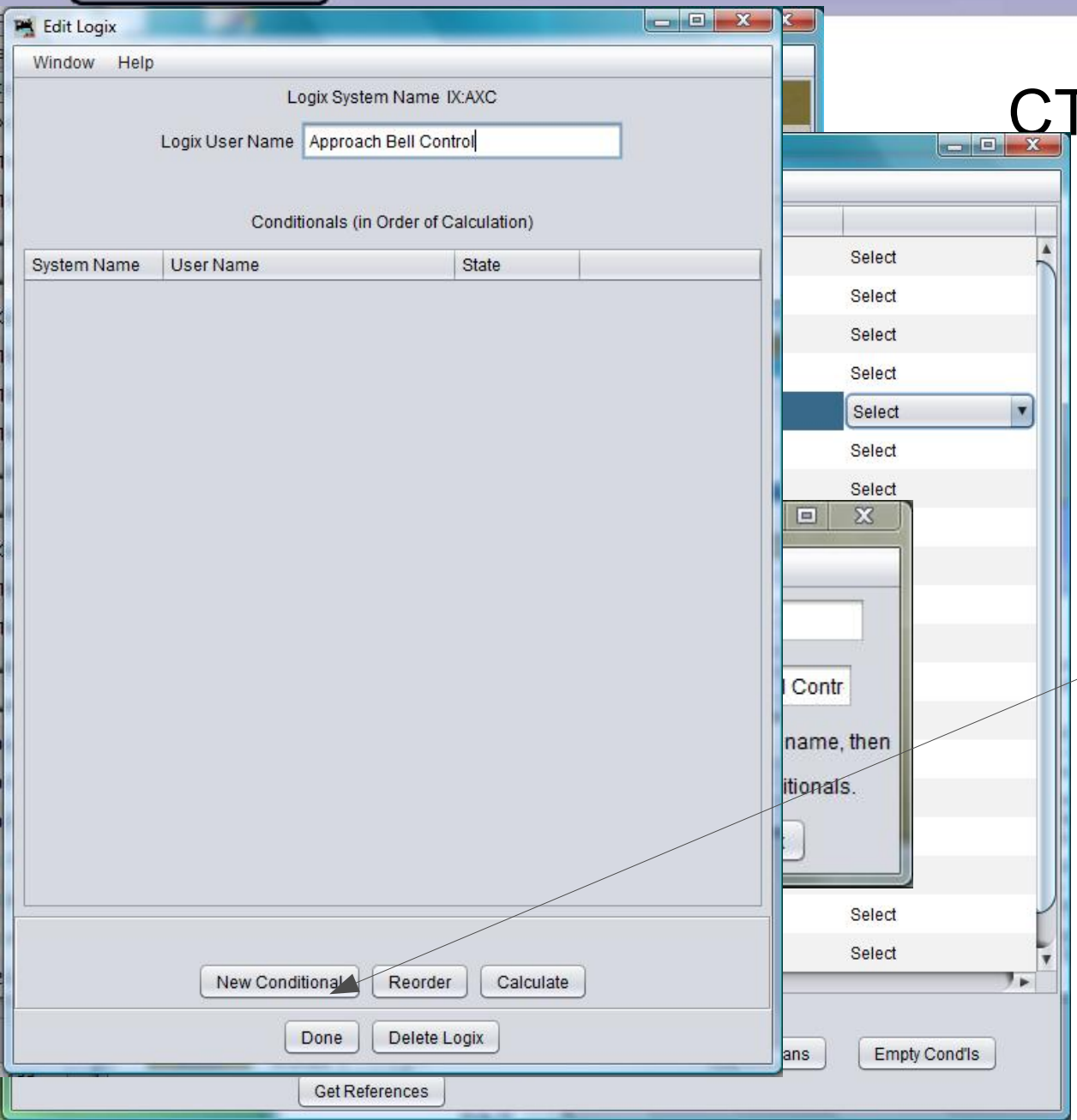
CTC



CTC bell

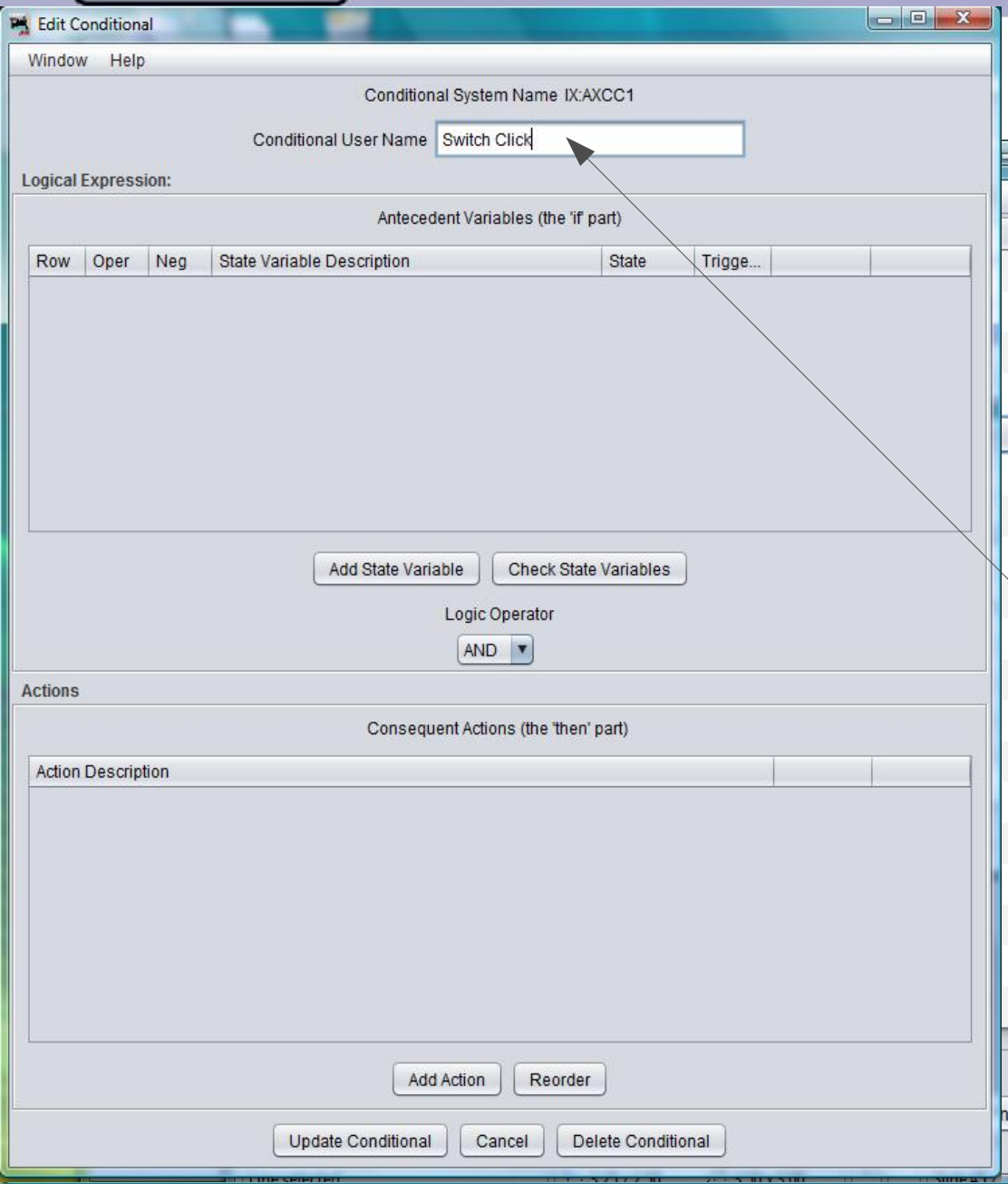
- Move the toggle switch into position on the bell cutout plate
- Now add a Logix and call it IX:AXC (Approach Bell Control)
- Create it.

CTC



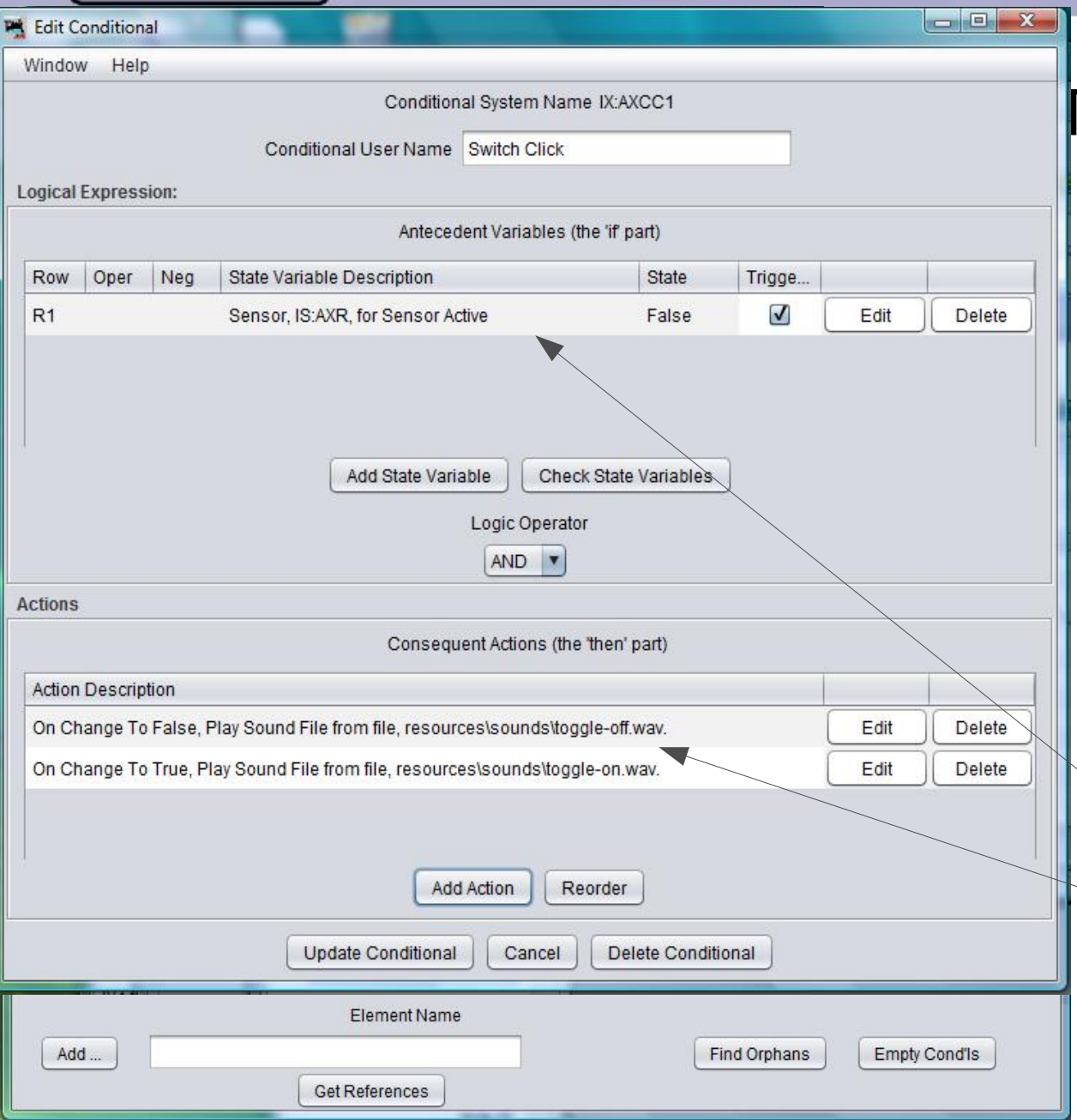
CTC bell

- Move the toggle switch into position on the bell cutout plate
- Now add a Logix and call it IX:AXC (Approach Bell Control)
- Create it.
- Add a 'New Conditional'.



CTC bell

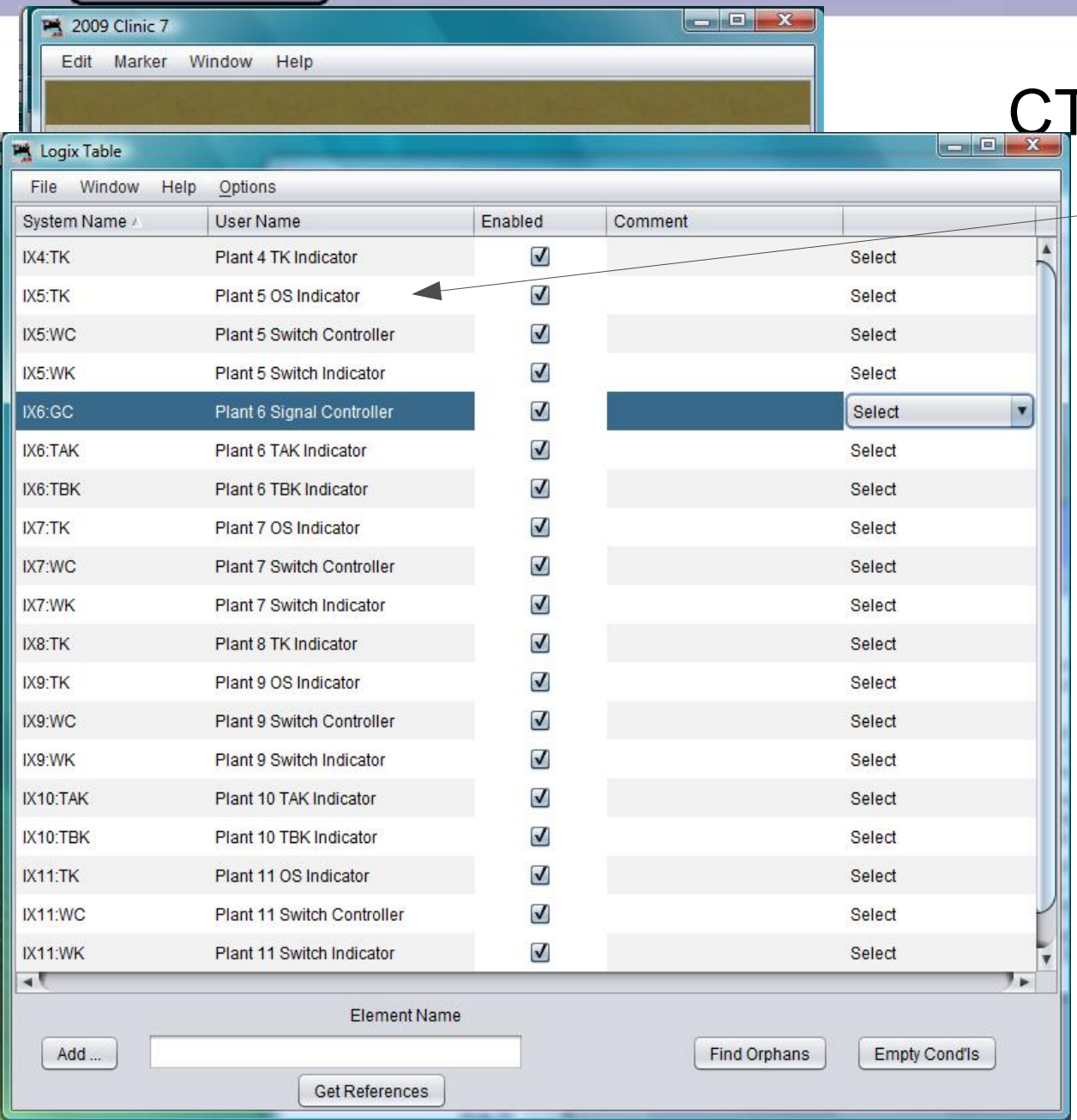
- Move the toggle switch into position on the bell cutout plate
- Now add a Logix and call it IX:AXC (Approach Bell Control)
- Create it.
- Add a 'New Conditional'.
- and call it 'Switch Click'.



TC bell

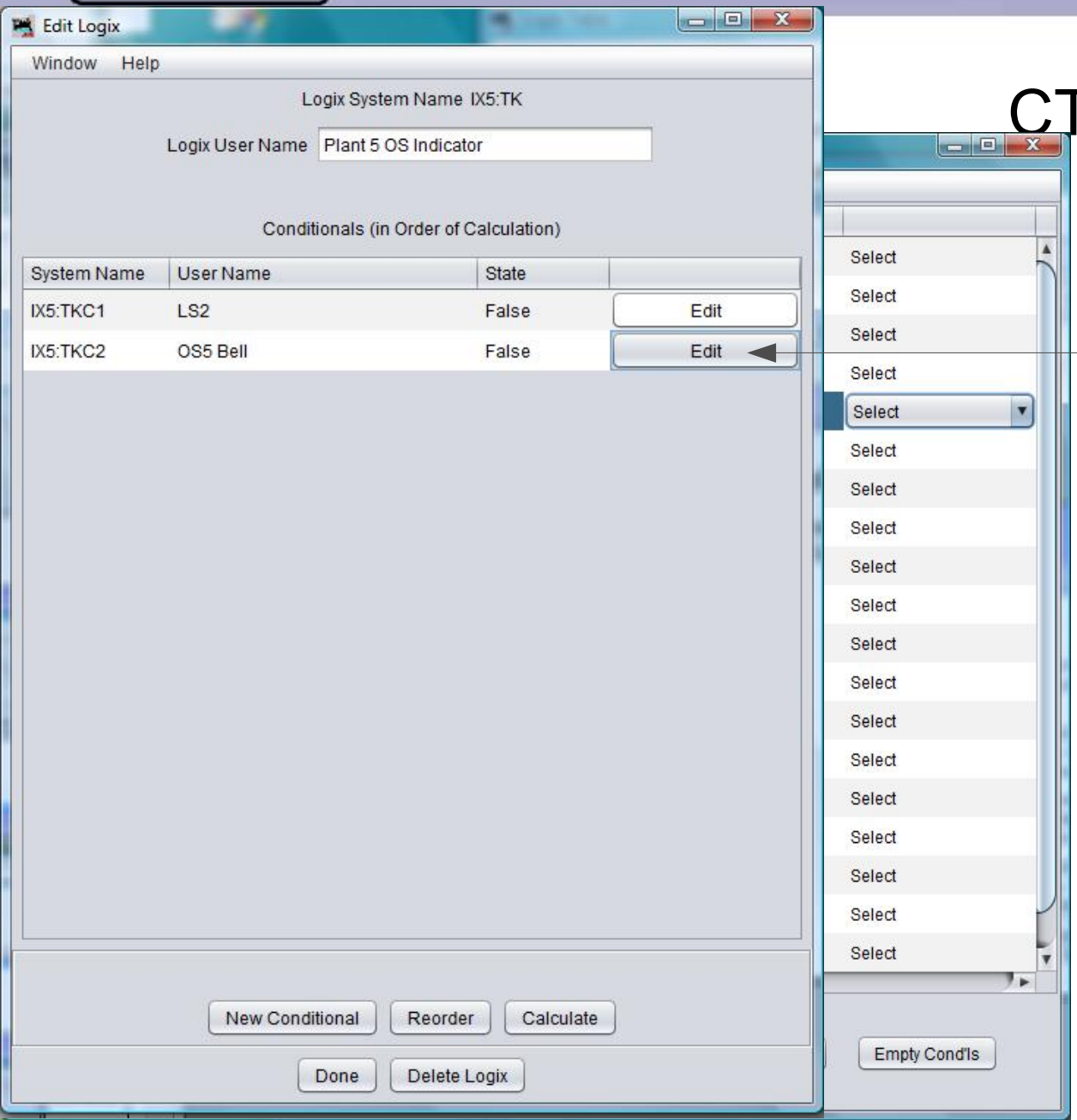
- Move the toggle switch into position on the bell cutout plate
- Now add a Logix and call it IX:AXC (Approach Bell Control)
- Create it.
- Add a 'New Conditional'.
- and call it 'Switch Click'.
- The variable is IS:AXR and we play 'toggle-on' when it goes 'true', and 'toggle-off' when it goes 'false'. Then 'Update Conditional'.

CTC



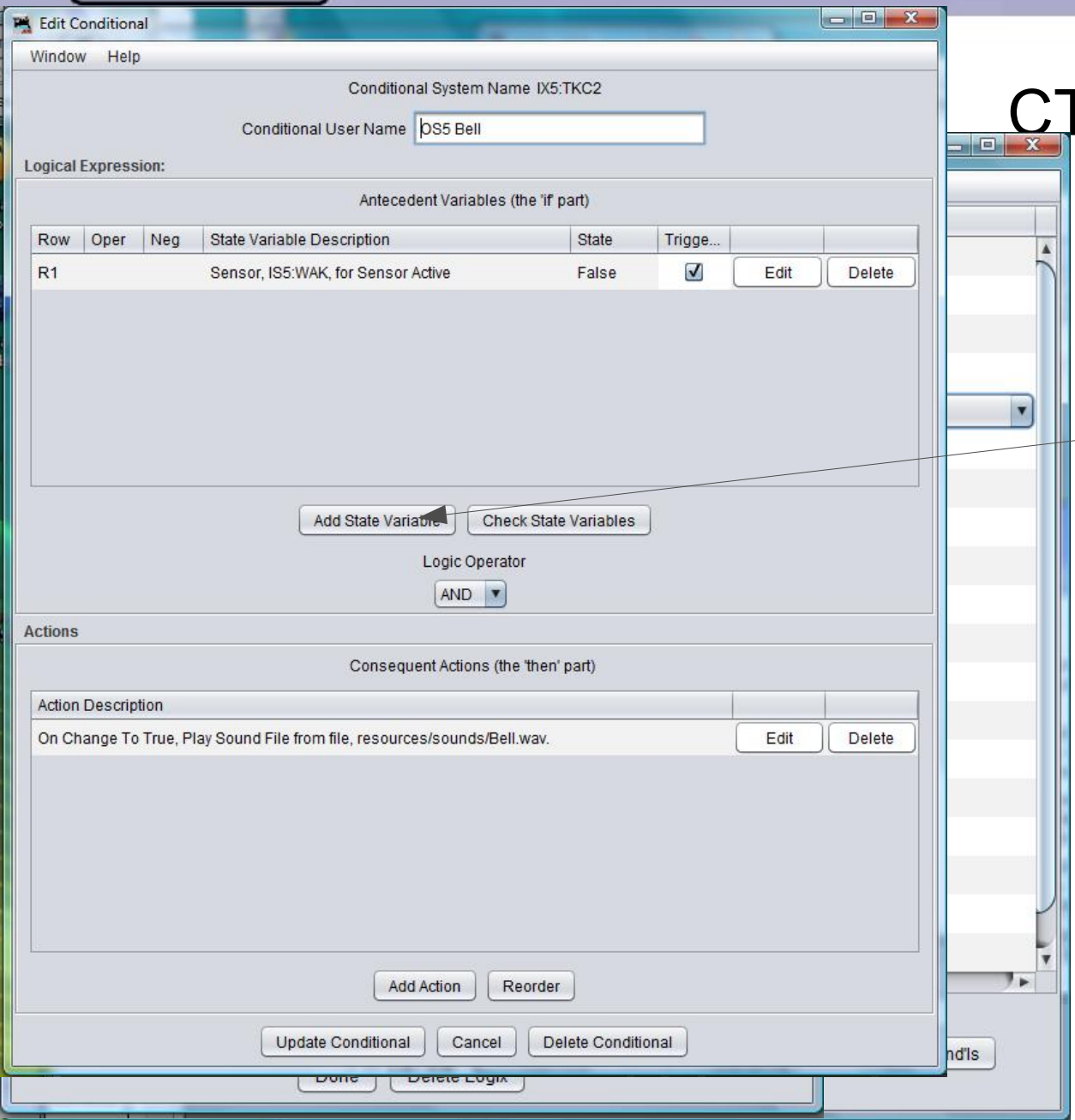
CTC bell

- Now open 'Plant 5 OS Indicator'.



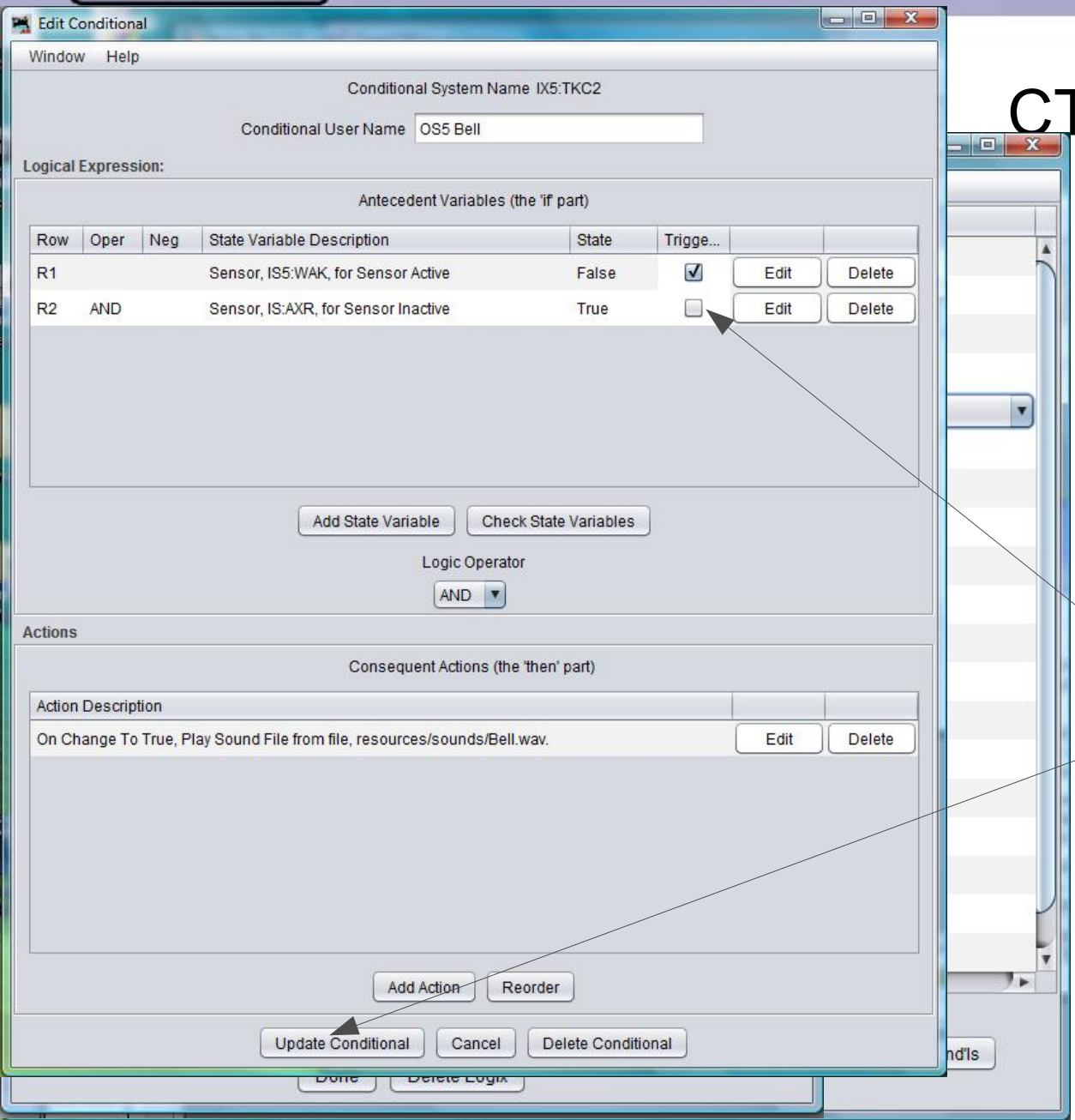
CTC bell

- Now open 'Plant 5 OS Indicator'.
- Edit the OS5 Bell entry.



CTC bell

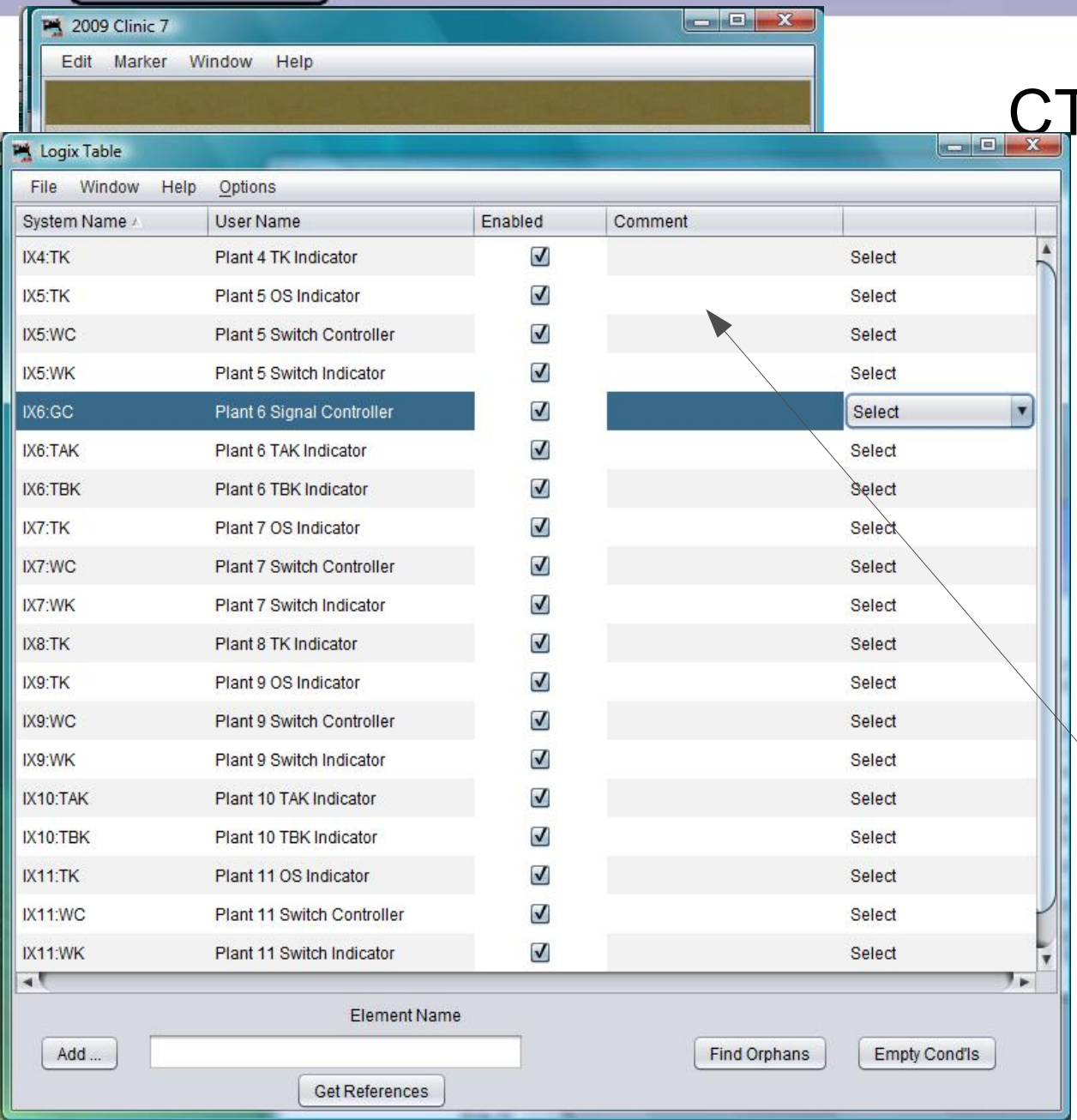
- Now open 'Plant 5 OS Indicator'.
- Edit the OS5 Bell entry.
- Add a new variable for the 'Bell Cutout' switch.



CTC bell

- Now open 'Plant 5 OS Indicator'.
- Edit the OS5 Bell entry.
- Add a new variable for the 'Bell Cutout' switch.
- Uncheck the trigger option for the switch so the bell does not ring if the switch is thrown.
'Update Conditional'

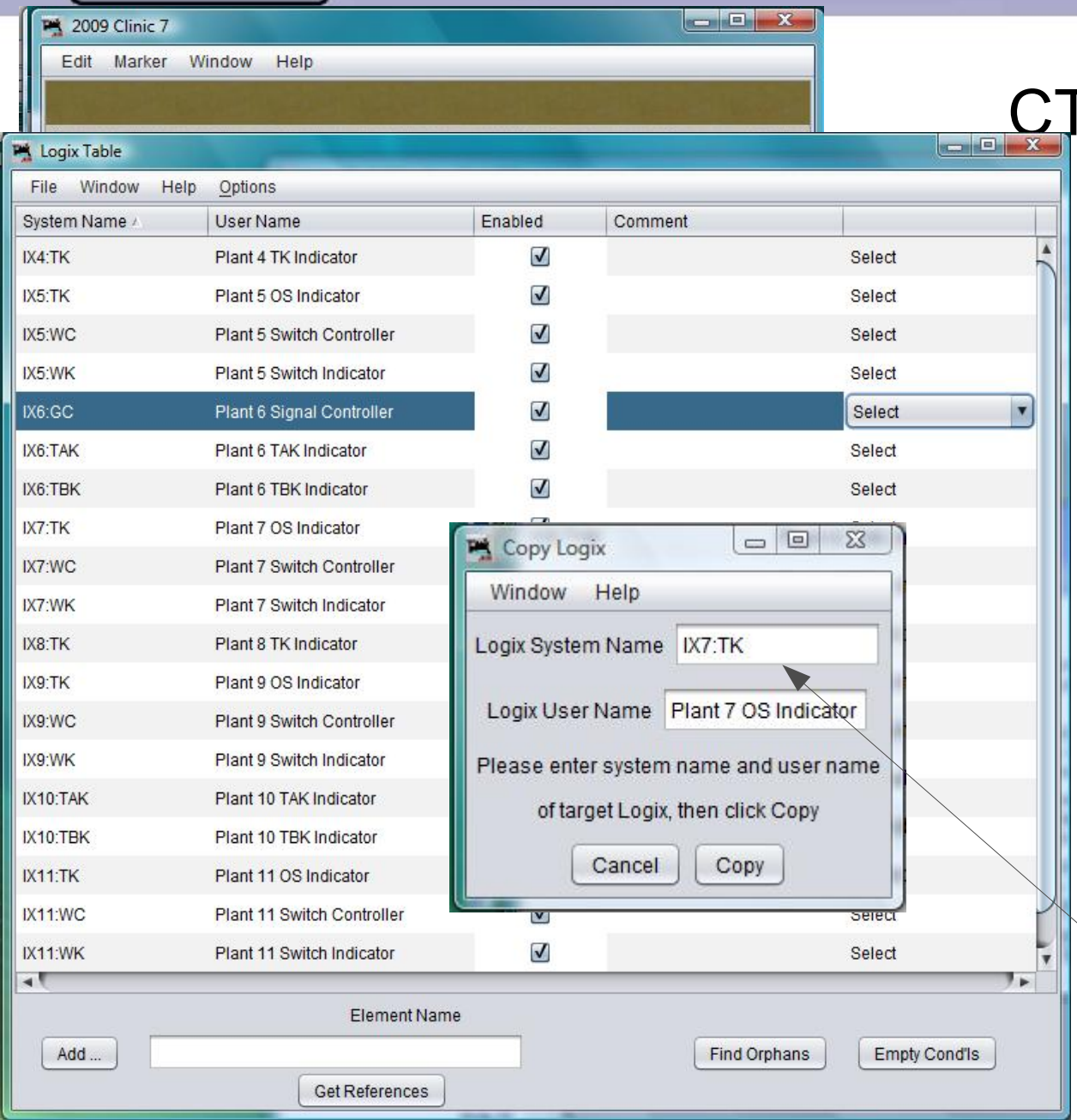
CTC



CTC bell

- Now open 'Plant 5 OS Indicator'.
- Edit the OS5 Bell entry.
- Add a new variable for the 'Bell Cutout' switch.
- Uncheck the trigger option for the switch so the bell does not ring if the switch is thrown. 'Update Conditional'
- Now 'Copy' the changes from 'Plant 5 OS Indicator into 'Plant 7 OS Indicator'.

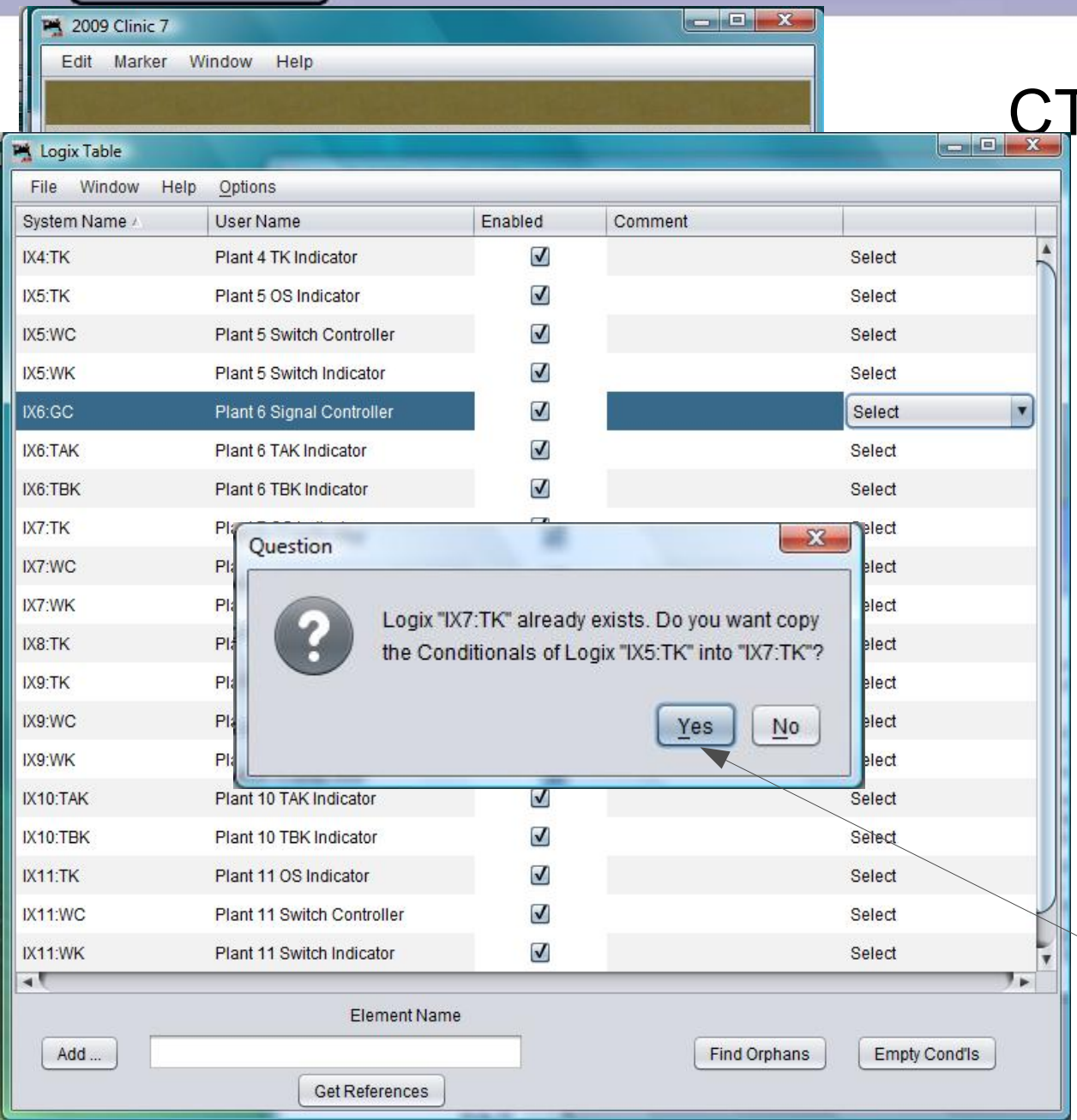
CTC



CTC bell

- Now open 'Plant 5 OS Indicator'.
- Edit the OS5 Bell entry.
- Add a new variable for the 'Bell Cutout' switch.
- Uncheck the trigger option for the switch so the bell does not ring if the switch is thrown. 'Update Conditional'
- Now 'Copy' the changes from 'Plant 5 OS Indicator into 'Plant 7 OS Indicator'.

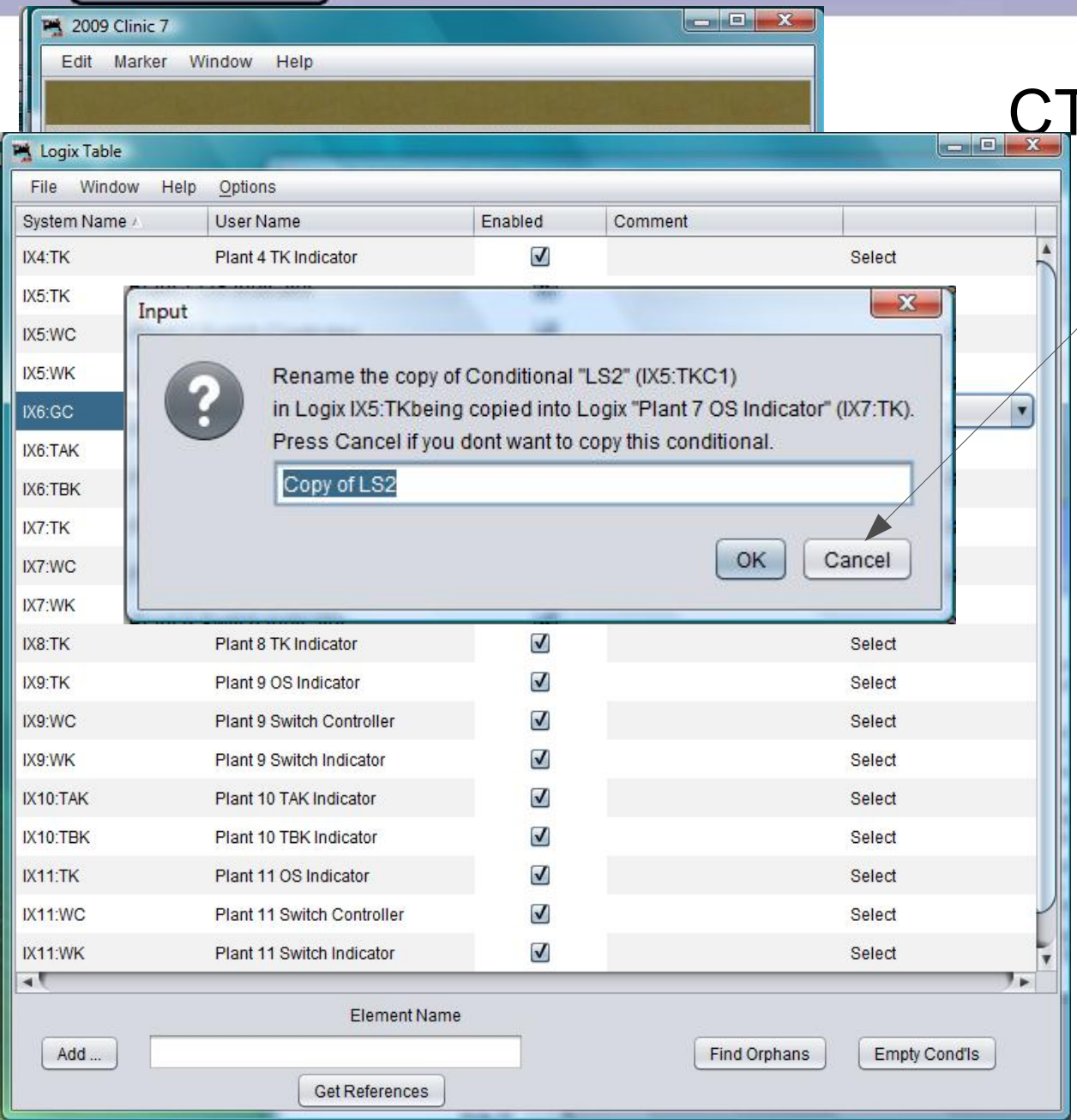
CTC



CTC bell

- Now open 'Plant 5 OS Indicator'.
- Edit the OS5 Bell entry.
- Add a new variable for the 'Bell Cutout' switch.
- Uncheck the trigger option for the switch so the bell does not ring if the switch is thrown. 'Update Conditional'
- Now 'Copy' the changes from 'Plant 5 OS Indicator into 'Plant 7 OS Indicator'.
- Yes, we do want to copy the new conditional.

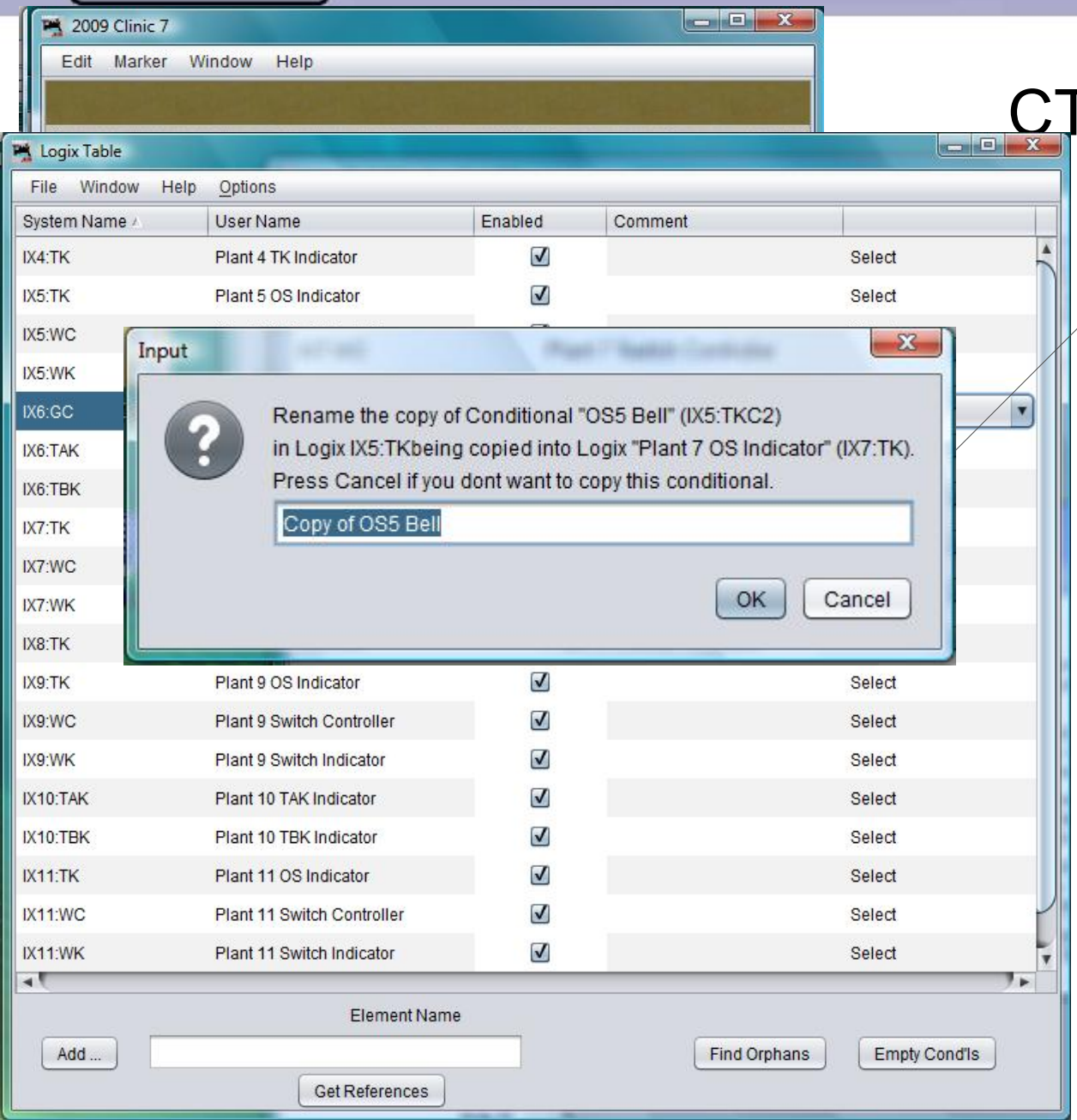
CTC



CTC bell

- No, we don't need the sensor, we have it already, so click 'Cancel'.

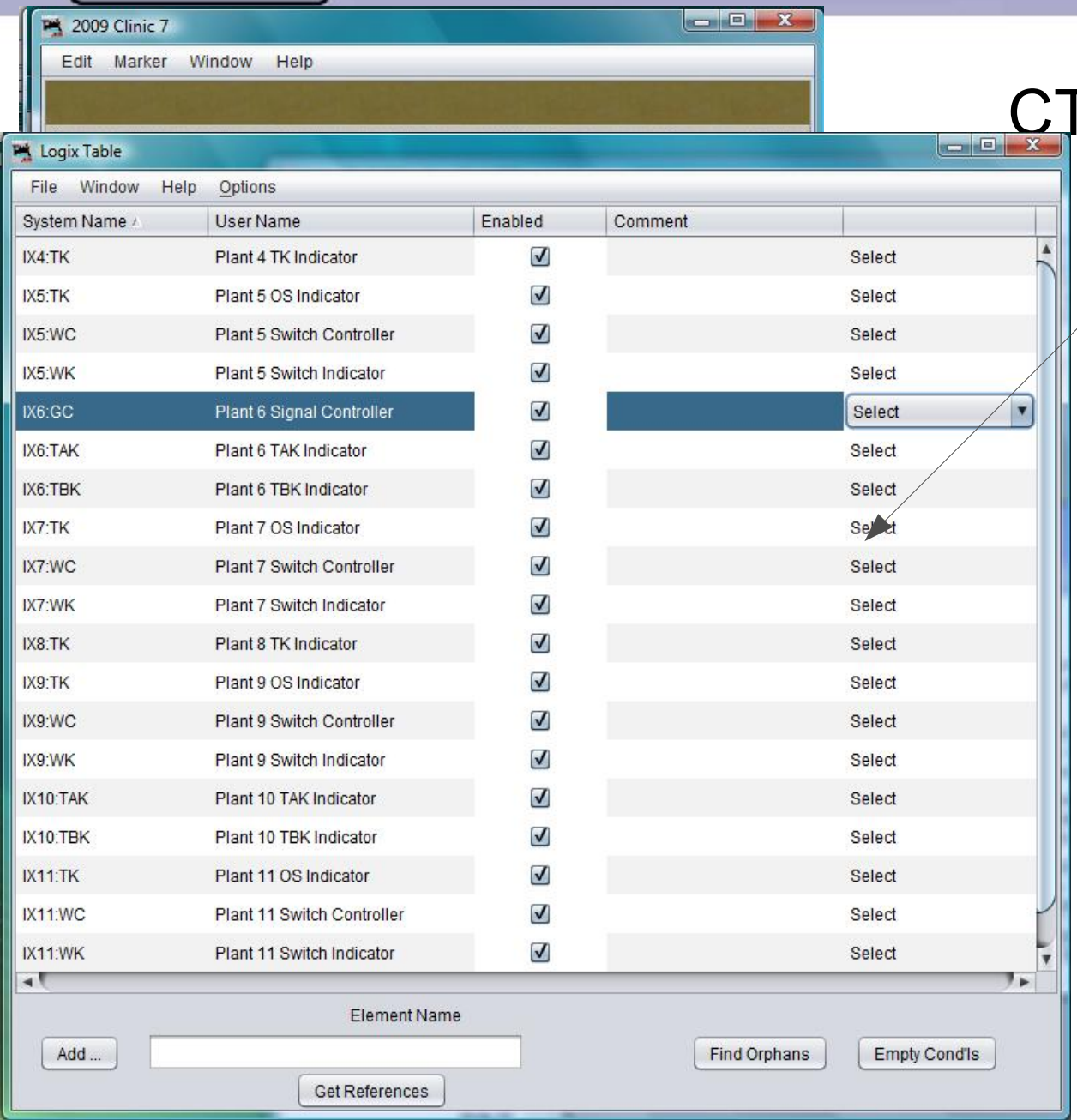
CTC



CTC bell

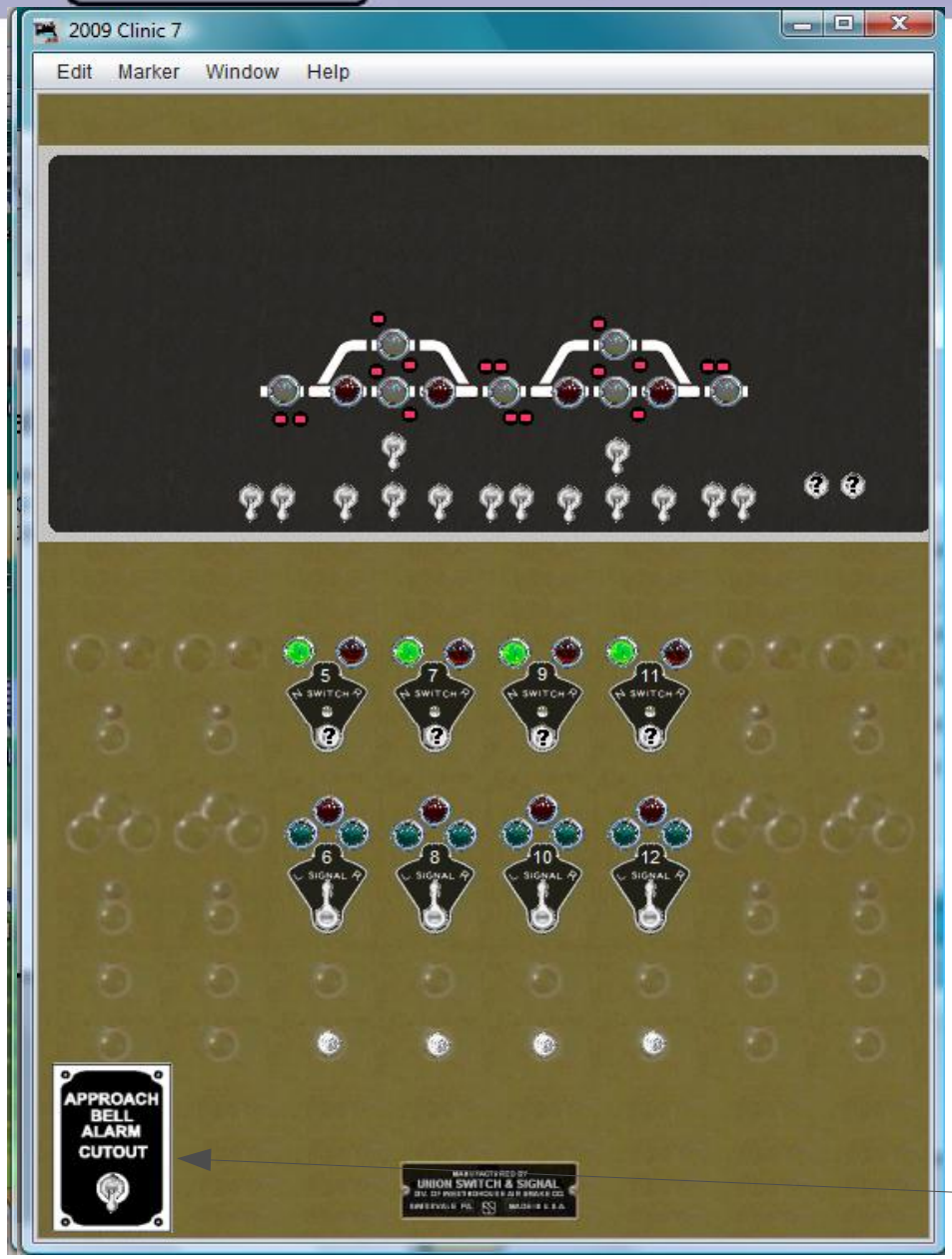
- No, we don't need the sensor, we have it already, so click 'Cancel'.
- Yes we do need the new bell control, so rename to 'OS7 Bell' and add it by clicking 'OK'.

CTC



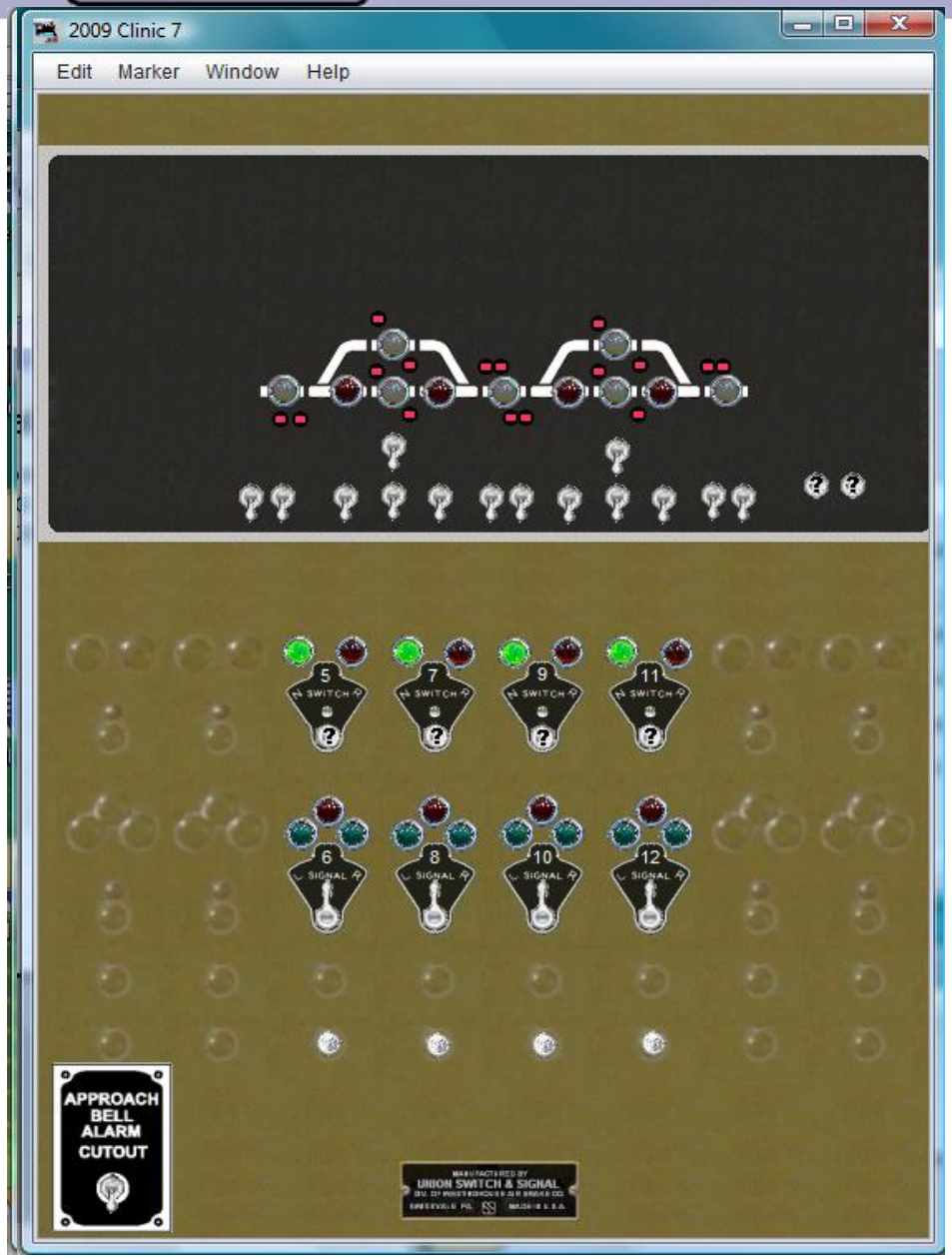
CTC bell

- No, we don't need the sensor, we have it already, so click 'Cancel'.
- Yes we do need the new bell control, so rename to 'OS7 Bell' and add it by clicking 'OK'.
- Do the same for the 'Plant 9 OS Indicator' and 'Plant 11 OS Indicator', being sure to edit each new entry to match its proper OS indicator.



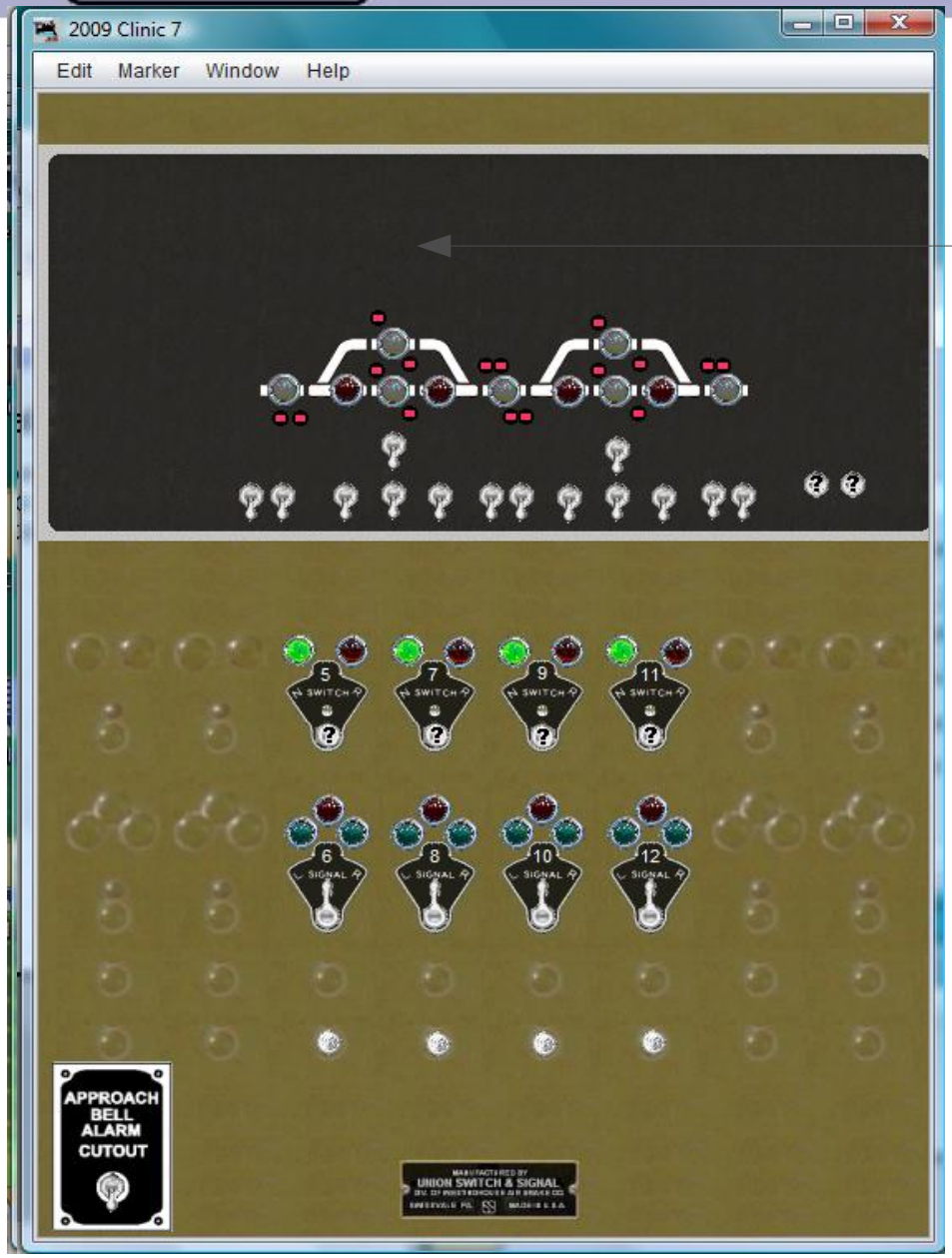
CTC bell

- No, we don't need the sensor, we have it already, so click 'Cancel'.
- Yes we do need the new bell control, so rename to 'OS7 Bell' and add it by clicking 'OK'.
- Do the same for the 'Plant 9 OS Indicator' and 'Plant 11 OS Indicator', being sure to edit each new entry to match its proper OS indicator.
- We now have OS alarm bells with cutout.



CTC traffic direction

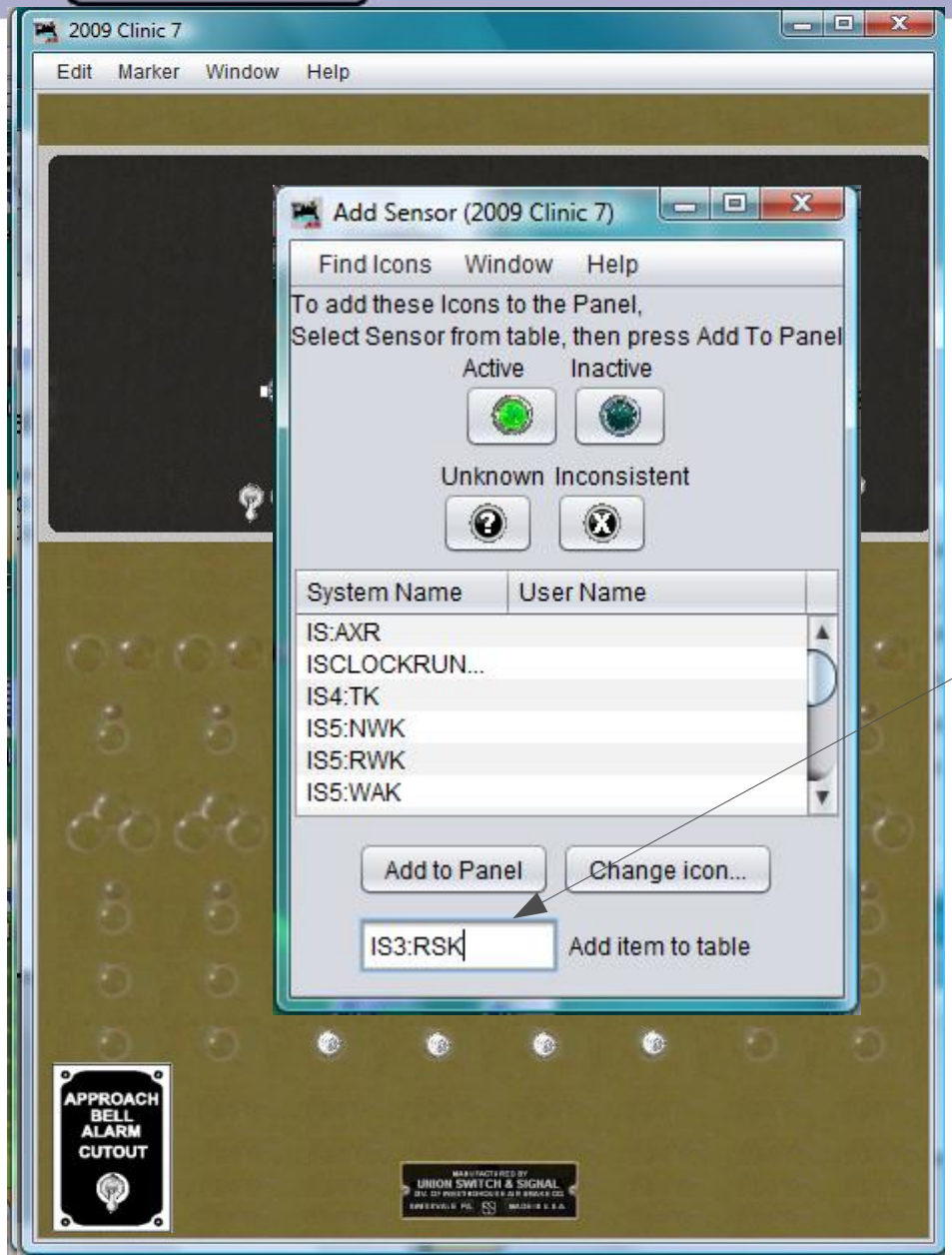
- Probably the most important item in the CTC logic is the traffic direction information. Internally this is required for each section of track. Usually the direction is only added to the panel itself for the single track sections, or double track where either track can have traffic in either direction. For purposes of this clinic we will add indicators for each direction controller. This information is what controls the signal 'Hold' status that allows the signals to be set to 'proceed' under dispatcher control.



CTC traffic direction

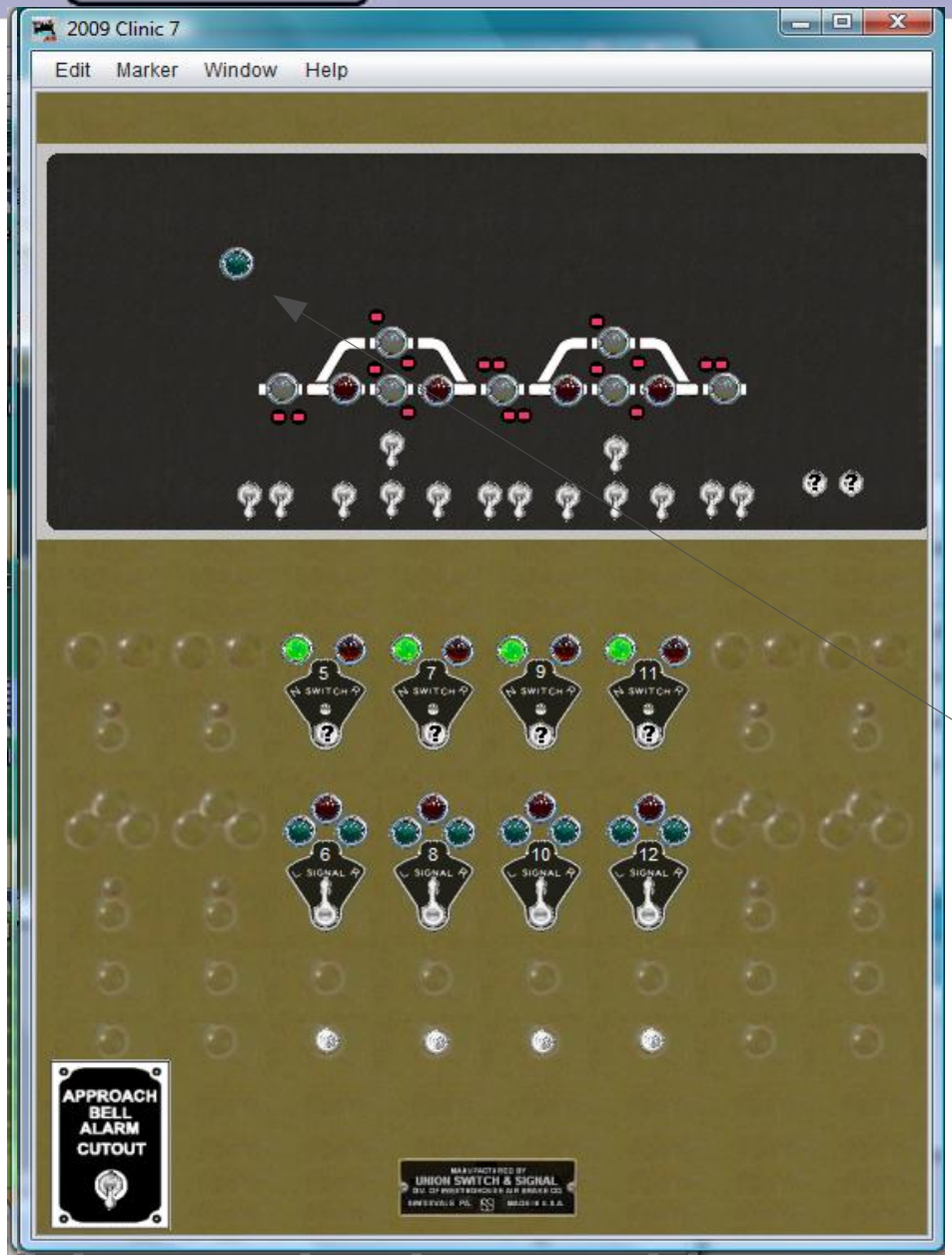
- First we will add indicators for each traffic option. We will use 'green jewels for 'Righthand' and amber jewels for 'Lefthand' traffic.

CTC



CTC traffic direction

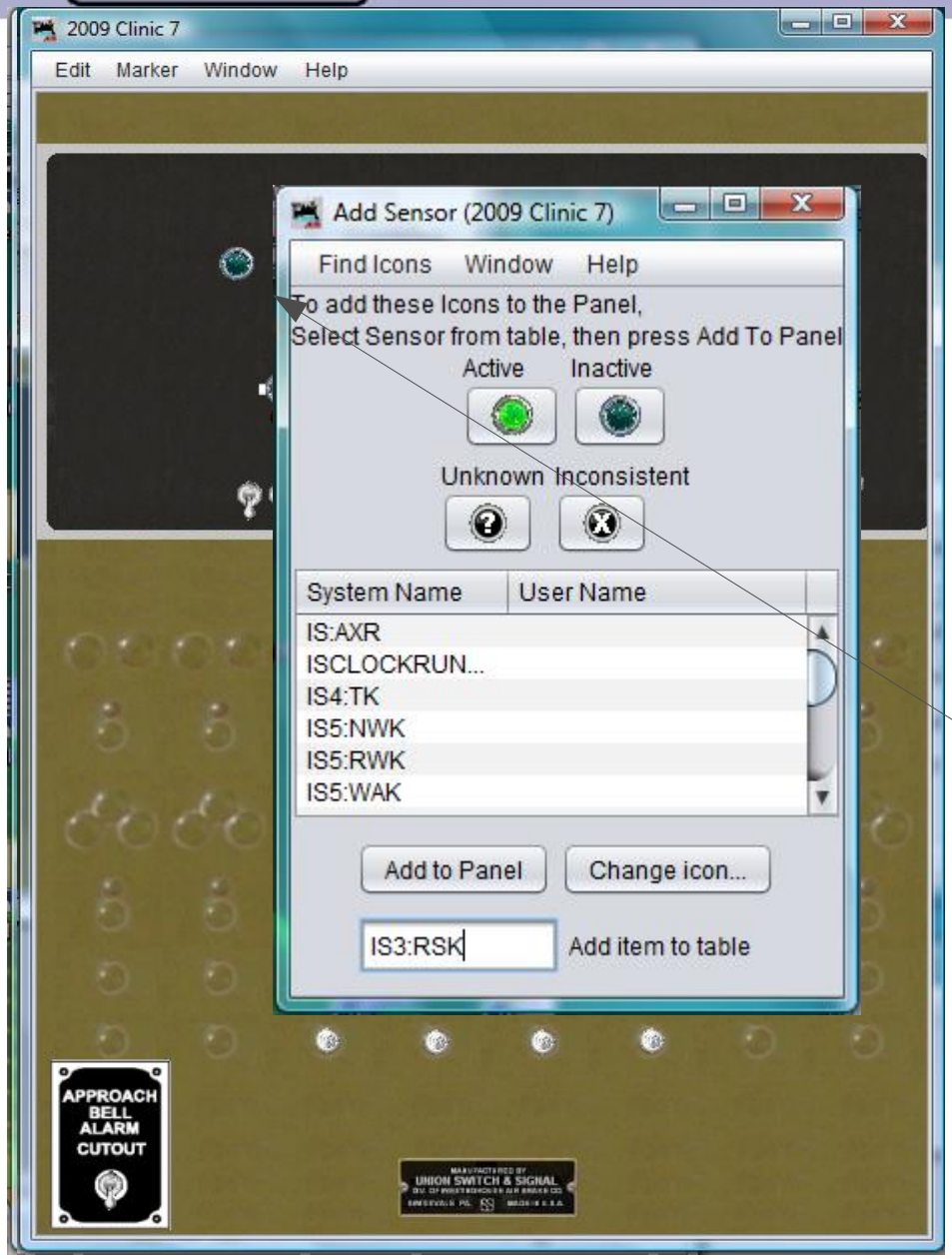
- First we will add indicators for each traffic option. We will use 'green jewels for 'Righthand' and amber jewels for 'Lefthand' traffic.
- The first indicator is IS3:RSK (Plant **3**: **R**ight **S**tick indi**K**tor)



CTC traffic direction

- First we will add indicators for each traffic option. We will use 'green jewels for 'Righthand' and amber jewels for 'Lefthand' traffic.
- The first indicator is IS3:RSK (Plant **3**: **R**ight **S**tick indi**K**tor)
- Add it to the panel and move into position.

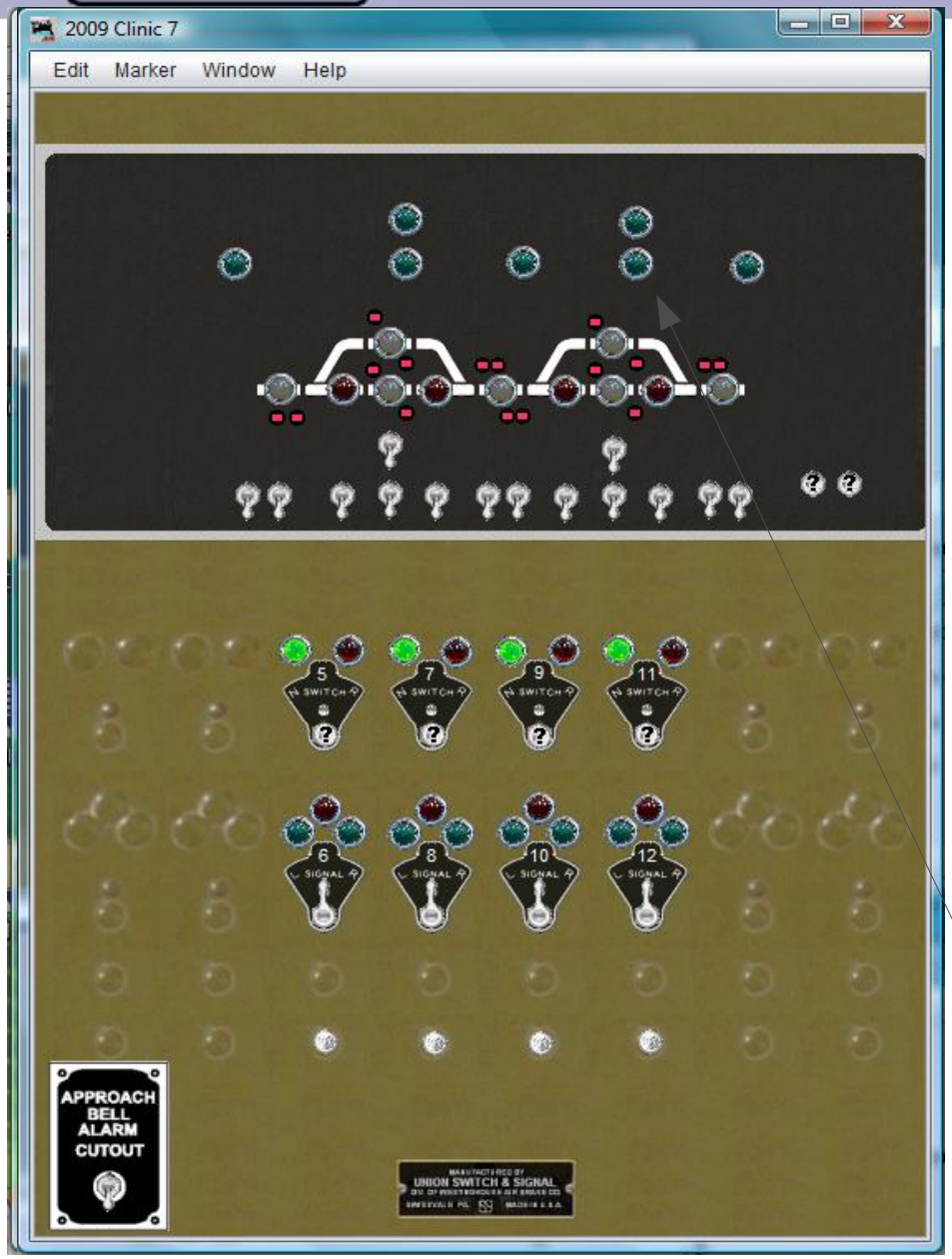
CTC



CTC traffic direction

- First we will add indicators for each traffic option. We will use 'green jewels for 'Righthand' and amber jewels for 'Lefthand' traffic.
- The first indicator is IS3:RSK (Plant **3**: **R**ight **S**tick indi**K**tor)
- Add it to the panel and move into position.
- Now add IS5:ARSK (Plant **5**: track **A** **R**ight **S**tick indi**K**tor) IS5:BRSK, IS7:RSK, IS9:ARSK, IS9:BRSK, and IS11:RSK.

CTC



CTC traffic direction

- First we will add indicators for each traffic option. We will use 'green jewels for 'Righthand' and amber jewels for 'Lefthand' traffic.
- The first indicator is IS3:RSK (Plant **3**: **R**ight **S**tick indi**K**tor)
- Add it to the panel and move into position.
- Now add IS5:ARSK (Plant **5**: track **A** **R**ight **S**tick indi**K**tor) IS5:BRSK, IS7:RSK, IS9:ARSK, IS9:BRSK, and IS11:RSK.
- Add them to the panel and move them all into position.

CTC

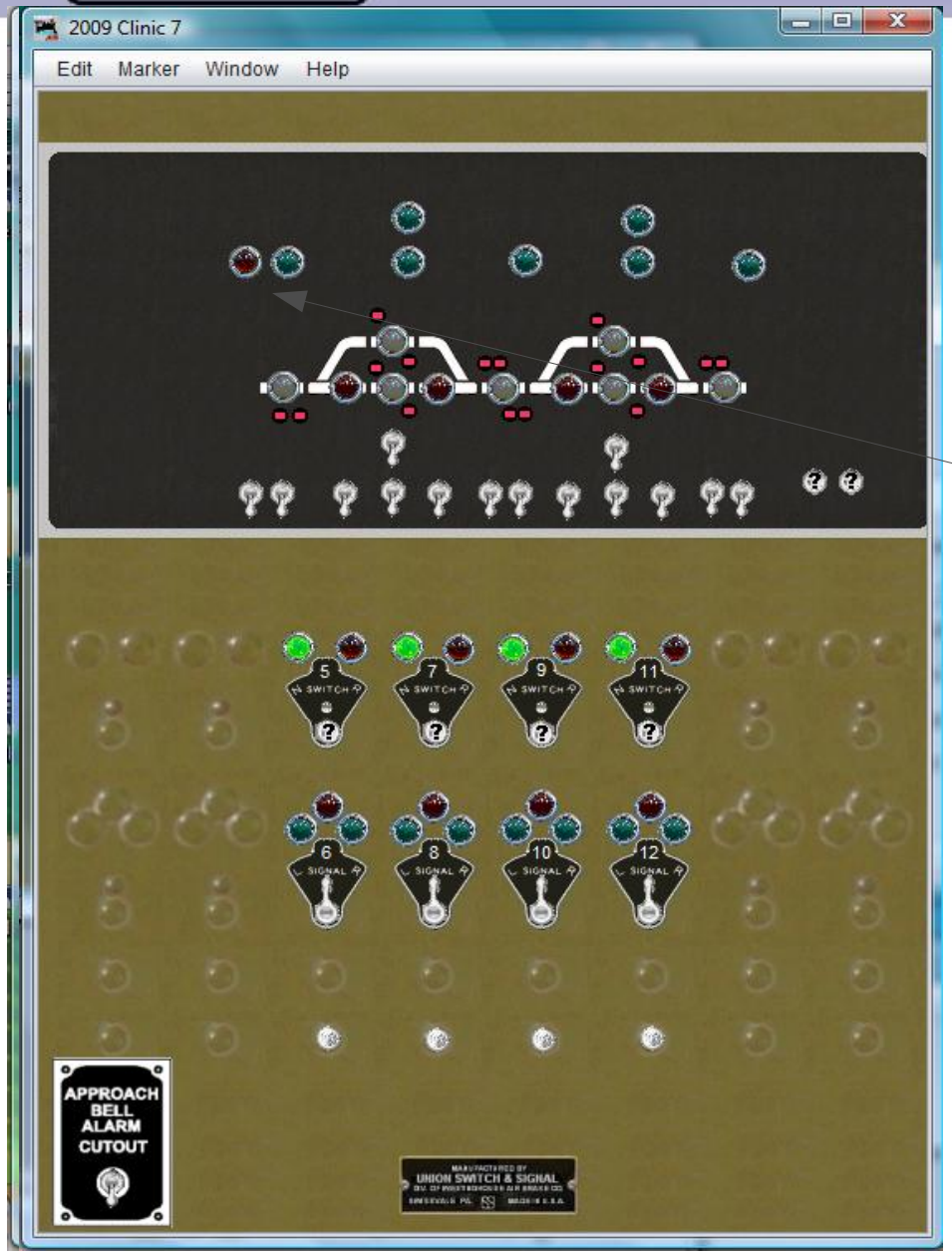
CTC traffic direction

- Now change to amber jewels.

CTC traffic direction

- Now change to amber jewels.
- Add IS5:LSK (Plant **5**: **L**eft **S**tick indi**K**tor) and add it to the panel.

CTC



CTC traffic direction

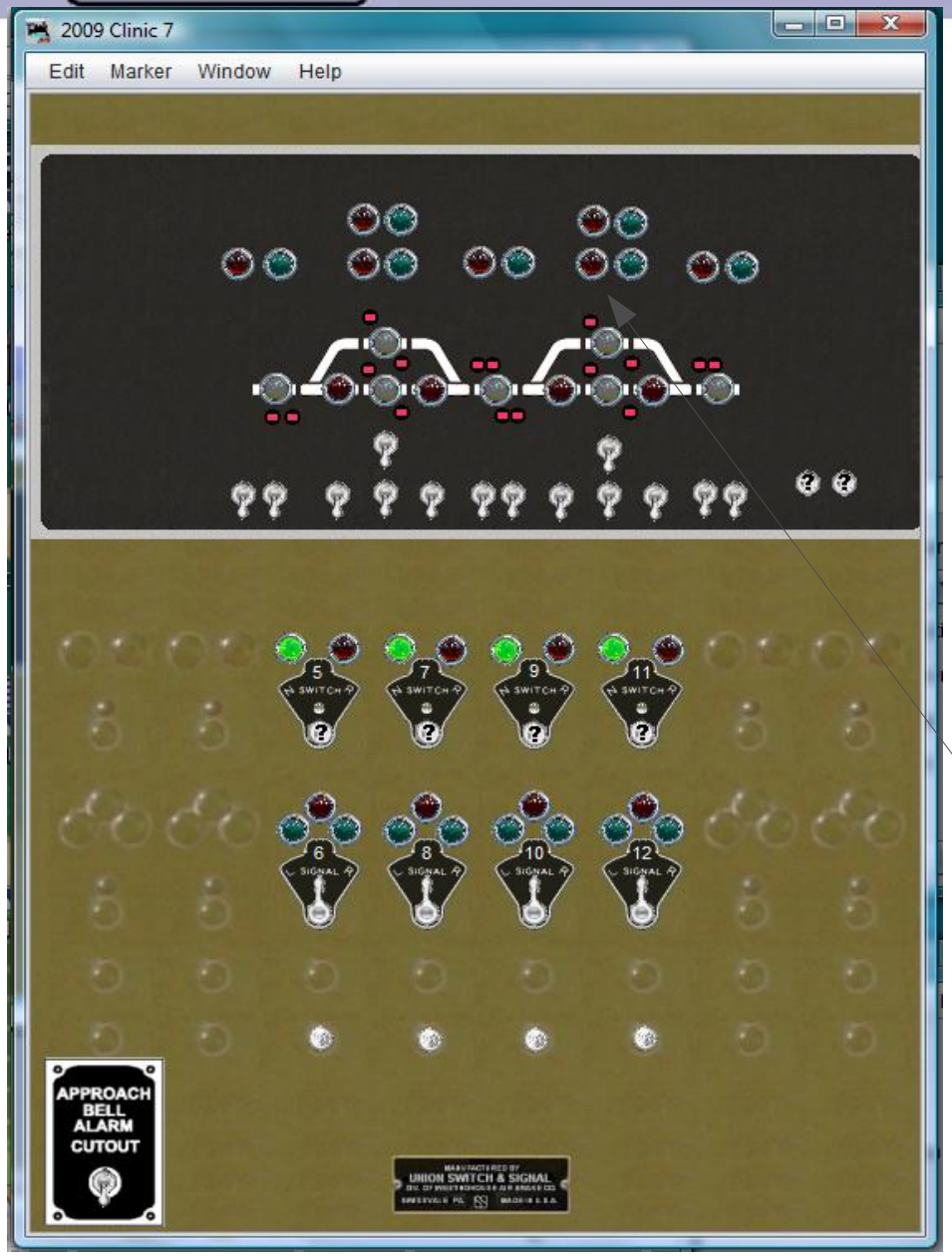
- Now change to amber jewels.
- Add IS5:LSK (Plant **5**: **L**eft **S**tick indi**K**tor) and add it to the panel.
- Move into position.

CTC

CTC traffic direction

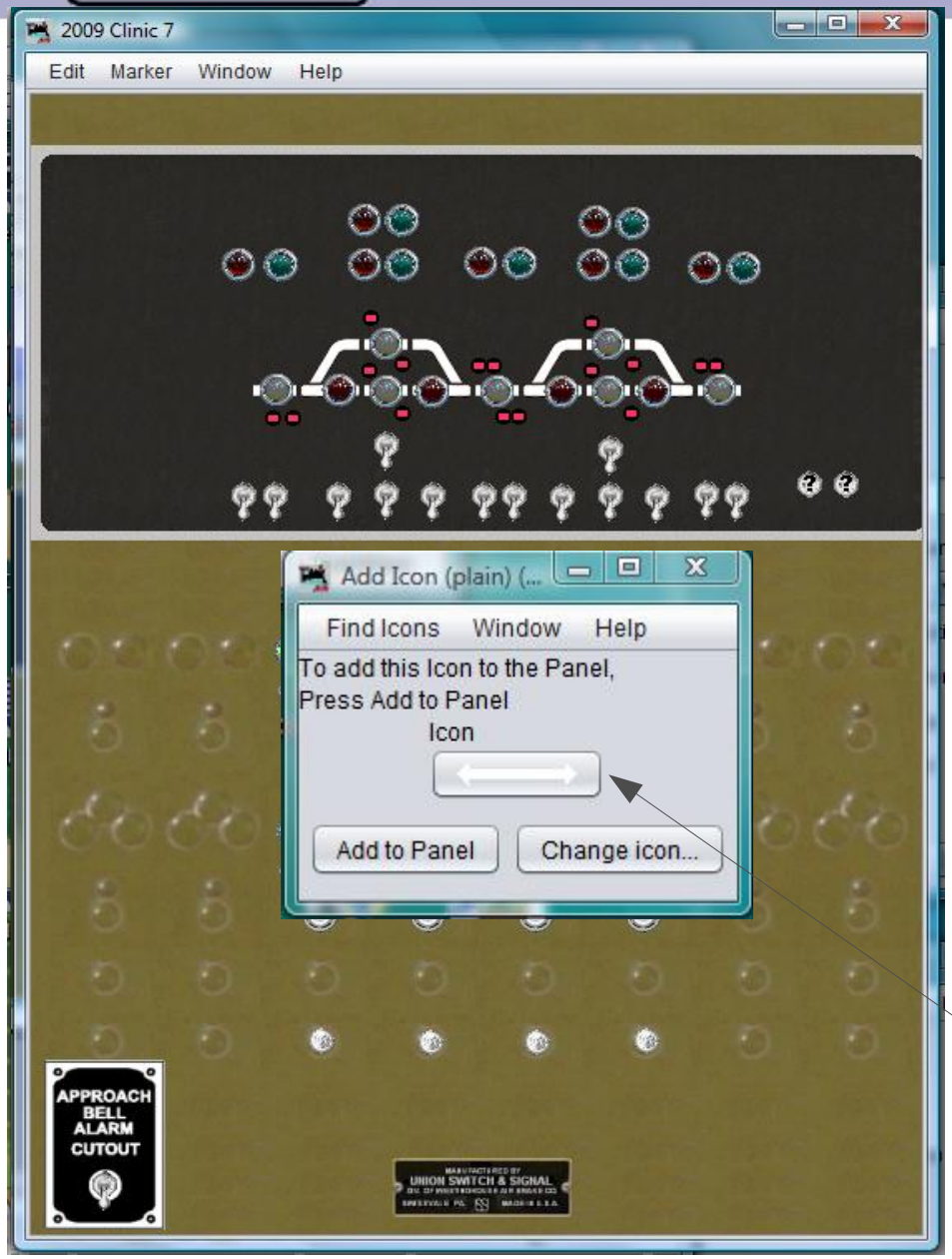
- Now change to amber jewels.
- Add IS5:LSK (Plant **5**: **L**eft **S**tick indi**K**tor) and add it to the panel.
- Move into position.
- Now add IS7:ALSK (Plant **7**: track **A** **l**eft **S**tick indi**K**tor) IS7:BLSK, IS9:LSK, IS11:ALSK, IS11:BLSK, and IS13:LSK.

CTC



CTC traffic direction

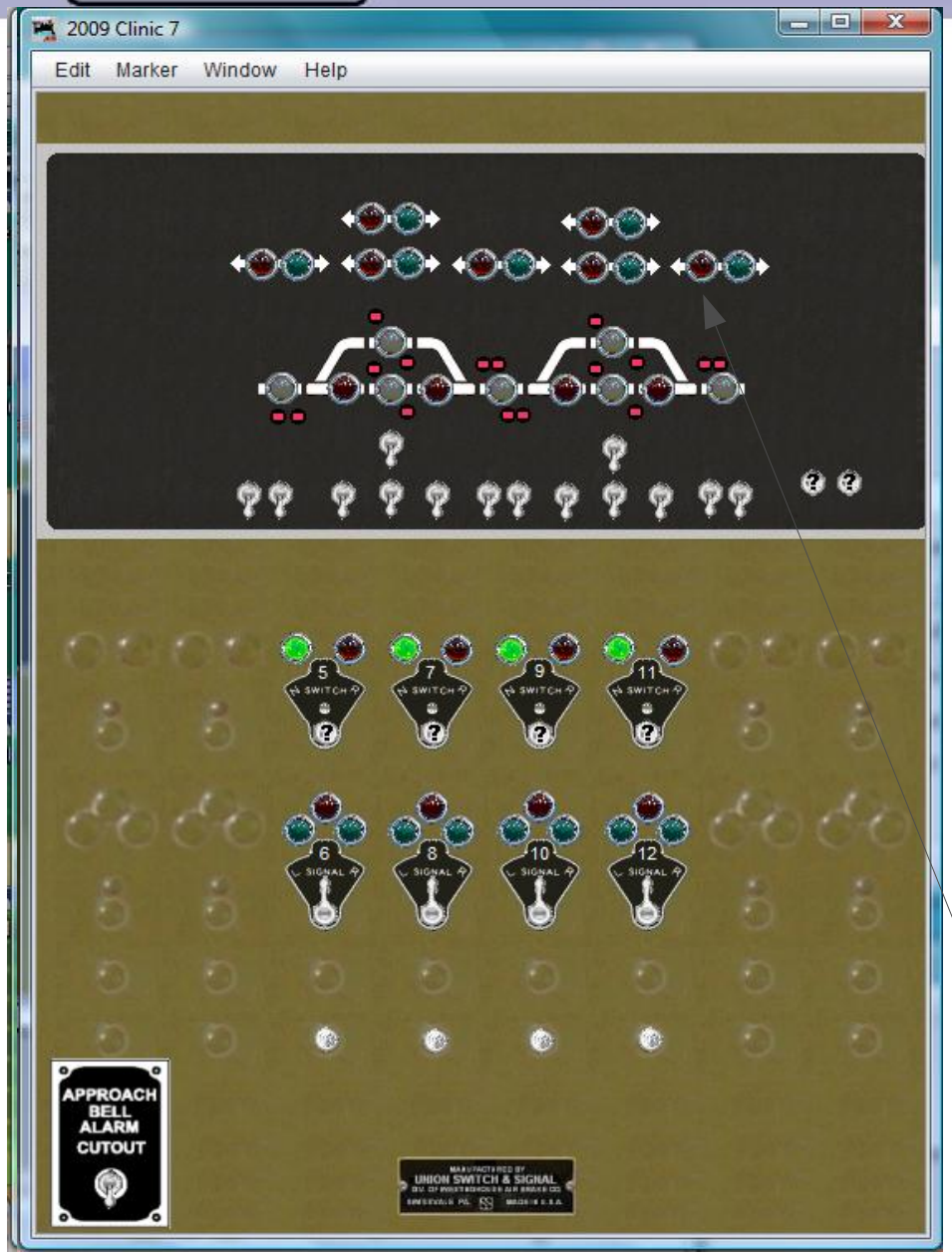
- Now change to amber jewels.
- Add IS5:LSK (Plant **5**: **L**eft **S**tick indi**K**tor) and add it to the panel.
- Move into position.
- Now add IS7:ALSK (Plant **7**: track **A** **l**eft **S**tick indi**K**tor) IS7:BLSK, IS9:LSK, IS11:ALSK, IS11:BLSK, and IS13:LSK.
- Add them to the panel and move them all into position.



CTC traffic direction

- Now change to amber jewels.
- Add IS5:LSK (Plant **5**: **L**eft **S**tick indi**K**tor) and add it to the panel.
- Move into position.
- Now add IS7:ALSK (Plant **7**: track **A** **l**eft **S**tick indi**K**tor) IS7:BLSK, IS9:LSK, IS11:ALSK, IS11:BLSK, and IS13:LSK.
- Add them to the panel and move them all into position.
- Add in some plain icons of the traffic arrows to make it nicer looking.

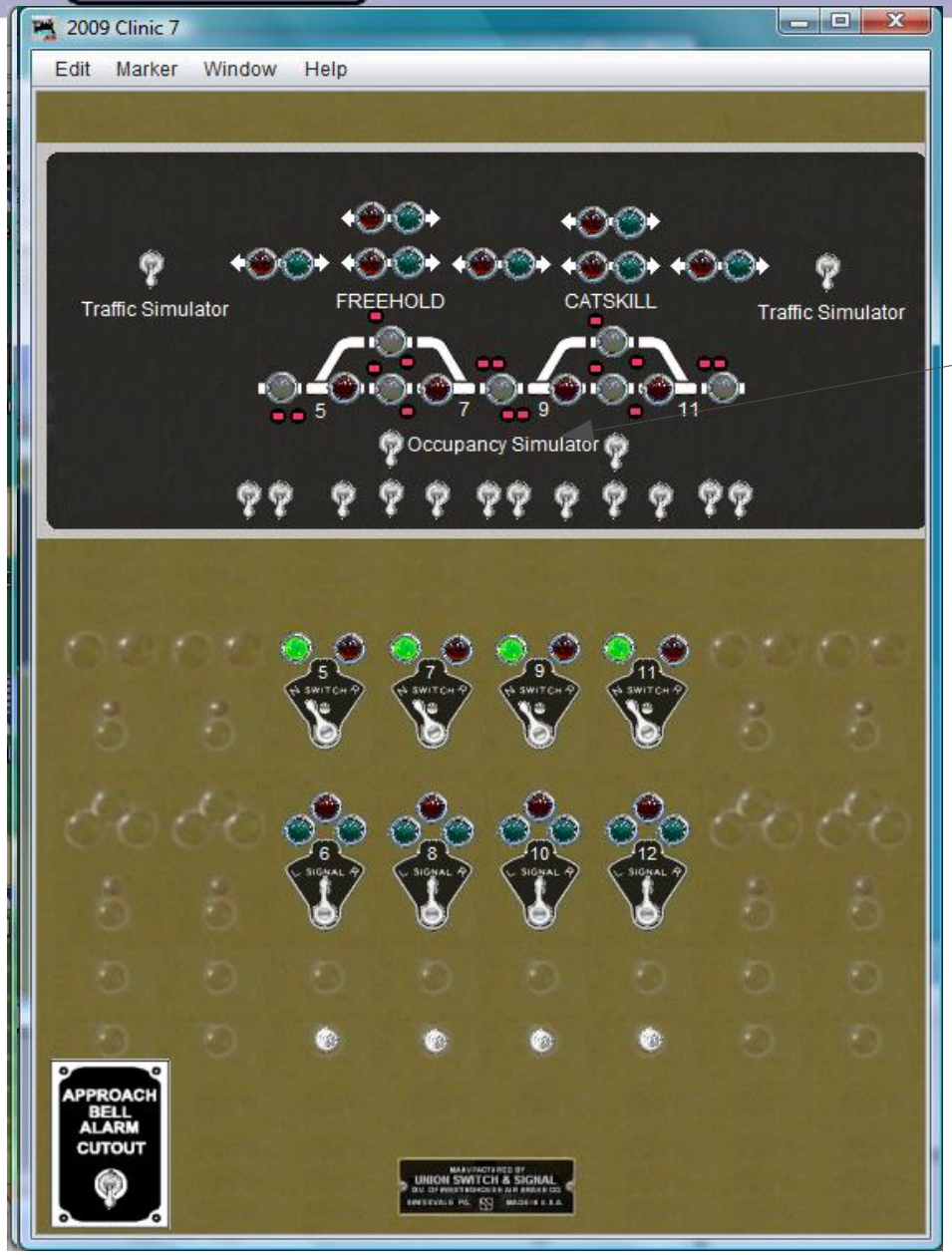
CTC



CTC traffic direction

- Now change to amber jewels.
- Add IS5:LSK (Plant **5**: **L**eft **S**tick indi**K**tor) and add it to the panel.
- Move into position.
- Now add IS7:ALSK (Plant **7**: track **A** **l**eft **S**tick indi**K**tor) IS7:BLSK, IS9:LSK, IS11:ALSK, IS11:BLSK, and IS13:LSK.
- Add them to the panel and move them all into position.
- Add in some plain icons of the traffic arrows to make it nicer looking.
- The arrows in position.

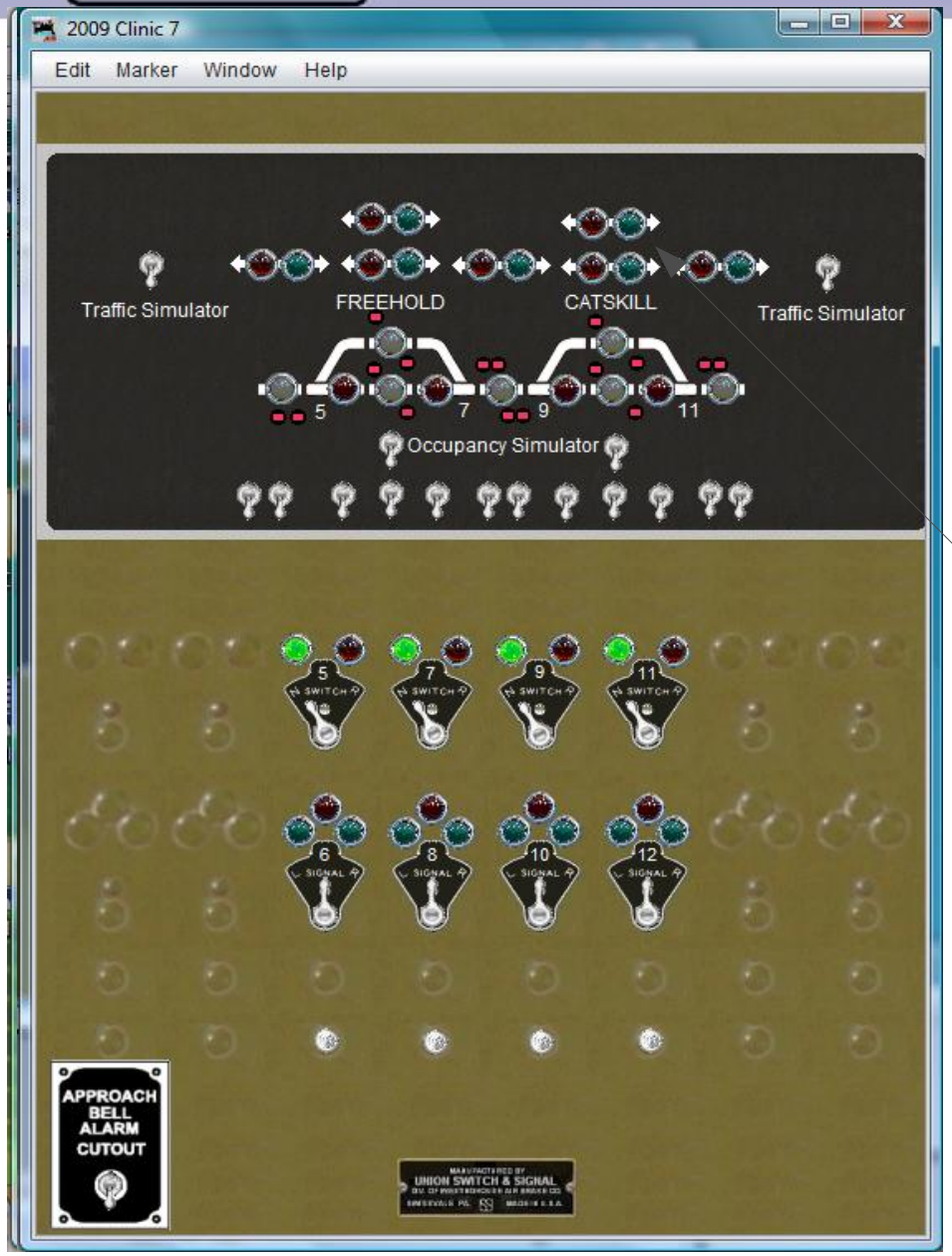
CTC



CTC traffic direction

- This concludes the display portion of the CTC panel. We can add some text to clarify things.

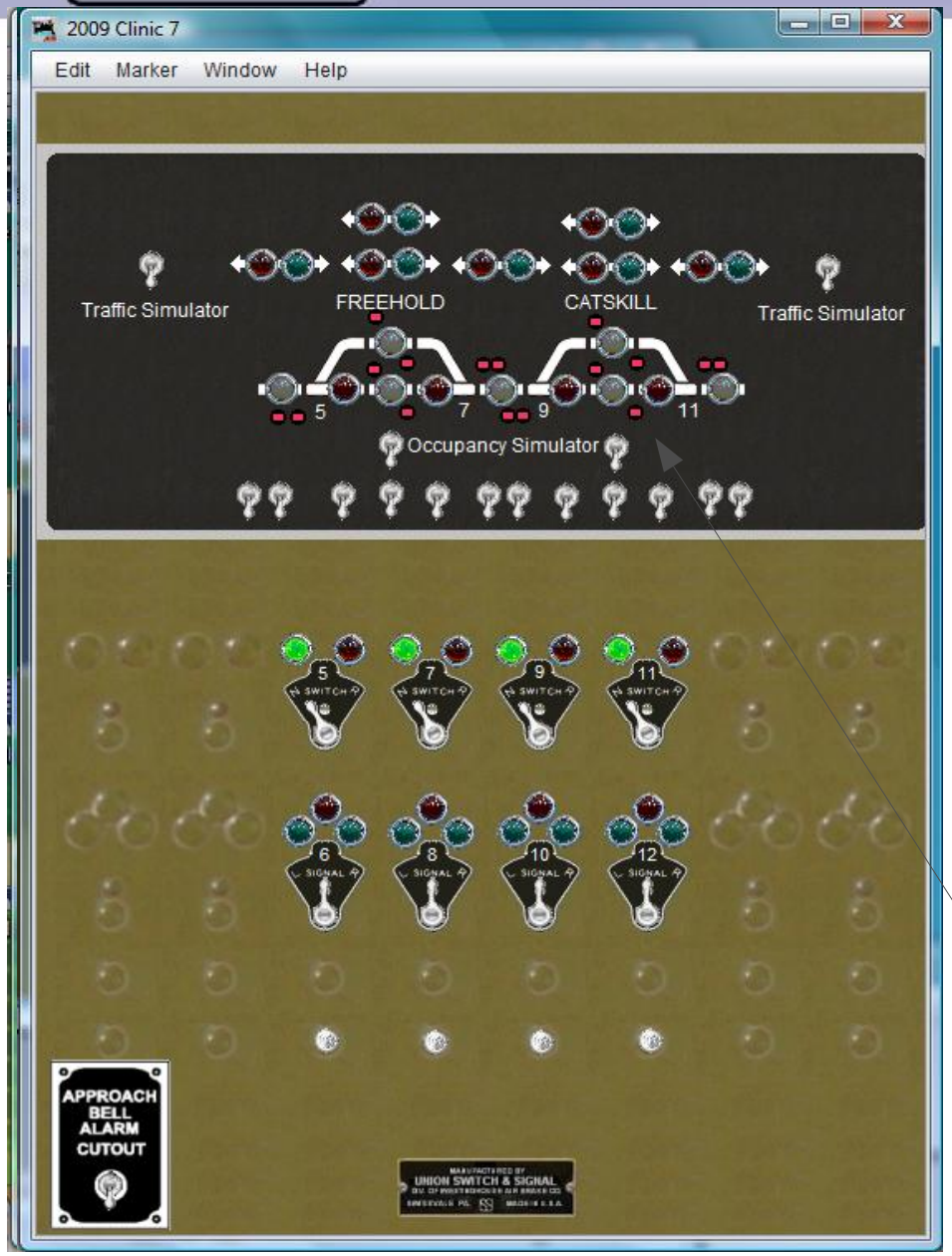
CTC



CTC traffic direction

- This concludes the display portion of the CTC panel. We can add some text to clarify things.
- This panel includes traffic direction indicators in the passing areas to show the logic required for operation. This was not usually done for passing sidings, but was sometimes done on multi-track lines when traffic could normally be sent either way on the same line.

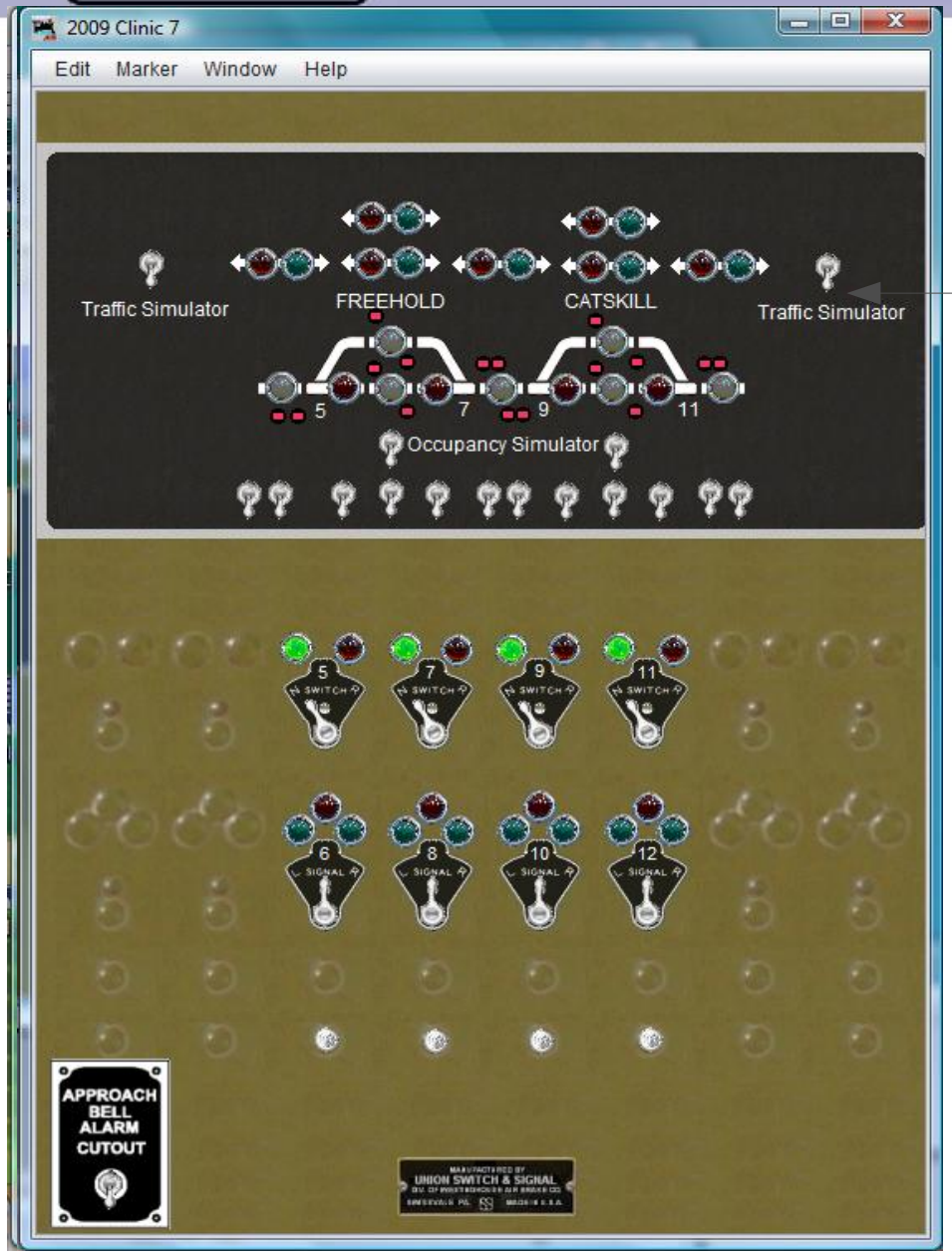
CTC



CTC traffic direction

- This concludes the display portion of the CTC panel. We can add some text to clarify things.
- This panel includes traffic direction indicators in the passing areas to show the logic required for operation. This was not usually done for passing sidings, but was sometimes done on multi-track lines when traffic could normally be sent either way on the same line.
- CTC panels did not have actual signal indications. Operators could only infer aspects from the status of the panel lamps.

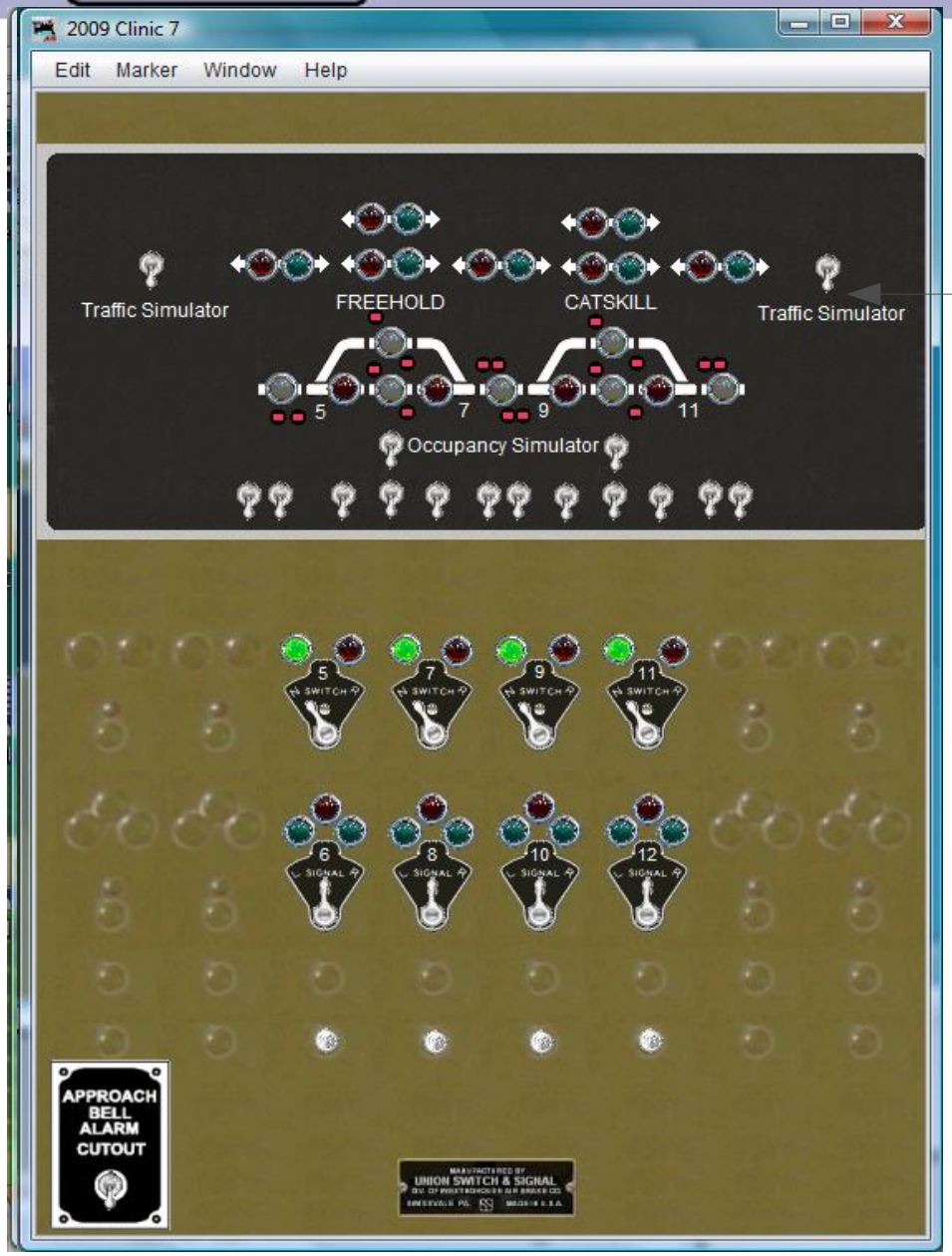
CTC



CTC traffic direction

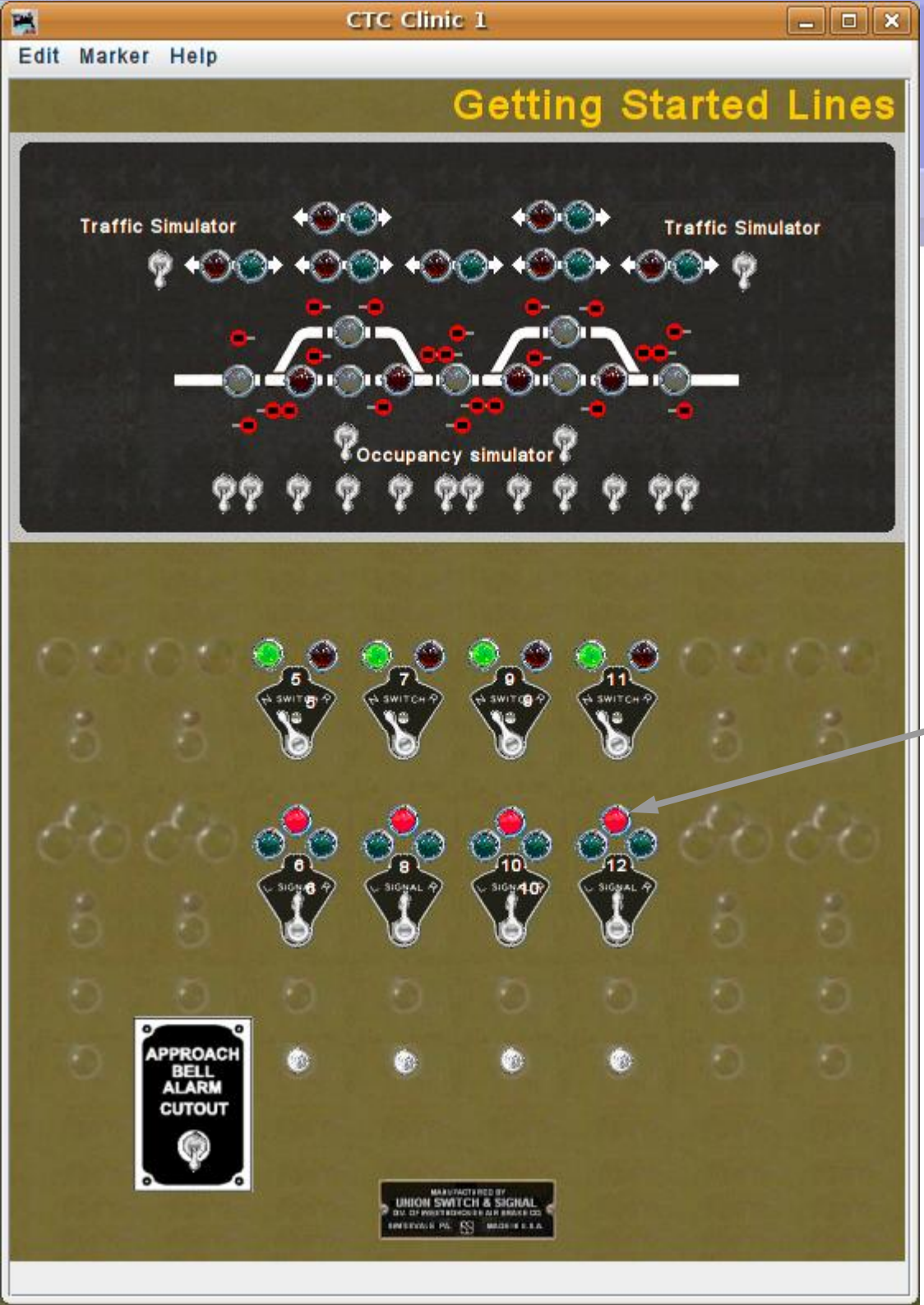
- Traffic Simulation. There is no connection to other CTC panels, so off board traffic is simulated.

CTC



CTC traffic direction

- Traffic Simulation. There is no connection to other CTC panels, so off board traffic is simulated.
- This panel is shown in the 'Normal' condition. All switches are set to the mainline.



CTC

CTC operation

- This panel is shown in the 'Normal' condition. All switches are set to the mainline.
- All traffic direction levers are set to the middle 'Signals Normal' position. This holds all signals in the 'Stop' aspect.

CTC (Panel)

- What we have covered so far:
  - Placing signals on a panel.
  - Simple Panel Logic and sounds.
- Where we are going next:
  - CTC Panel Logix (09-8 CTC-Logix)