

# Create a Detailed CTC Machine Model with JMRI/PanelPro

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Other Clinics in this series:

- Introduction to Layout Control with JMRI/PanelPro

Repeated 4:00 PM, Friday, July 10<sup>th</sup>





- 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 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 basics

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- 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 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

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



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  - We will attempt to cover the basic steps required for the CTC panel, continuing from where we left off with the SSL.

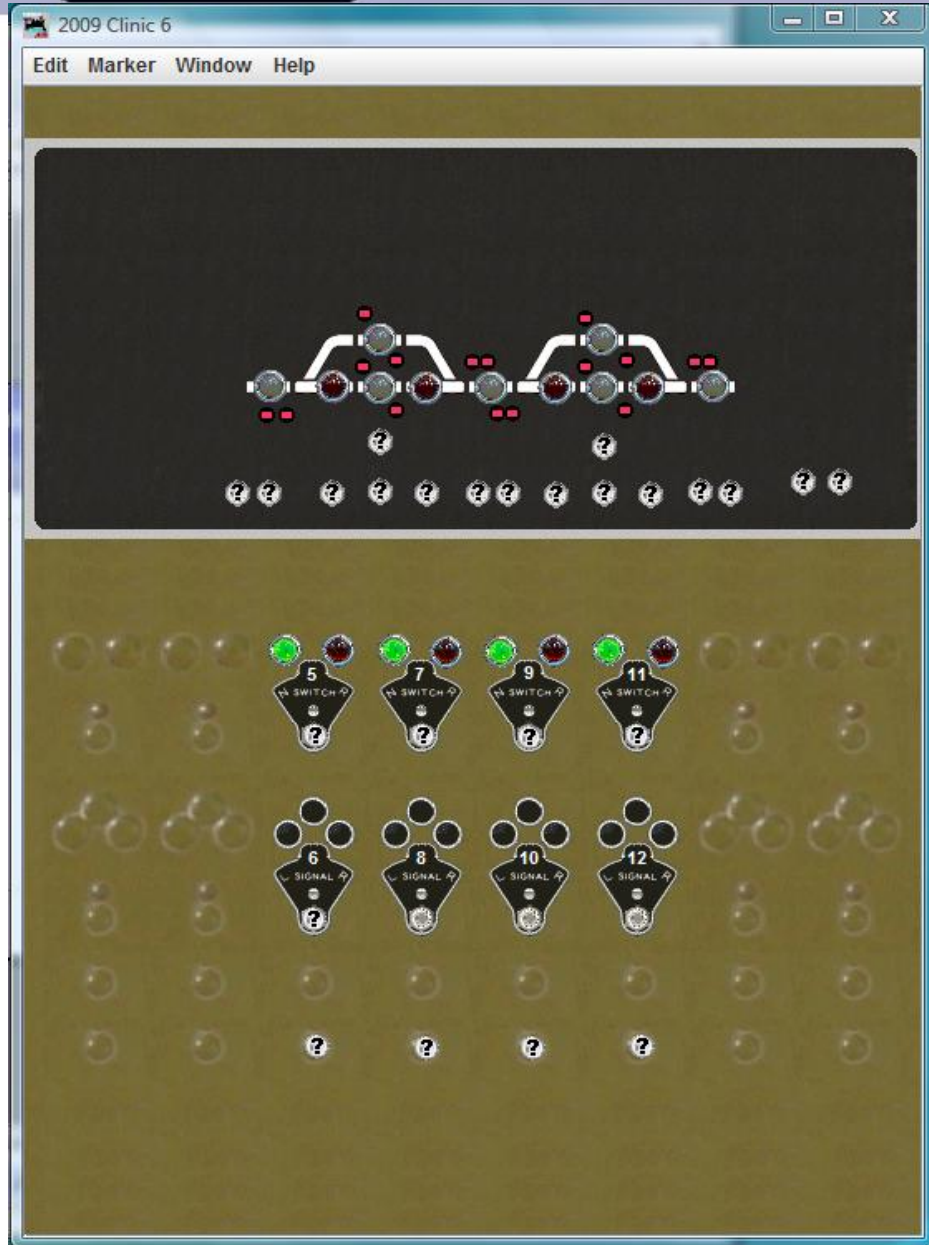


- CTC basics
  - This clinic assumes that you understand the ABS signal system previously covered because that is the basis for the CTC operation.
  - We will attempt to cover the basic steps required for the CTC panel, continuing from where we left off with the SSL.
  - The completed 2009Clinic7.xml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



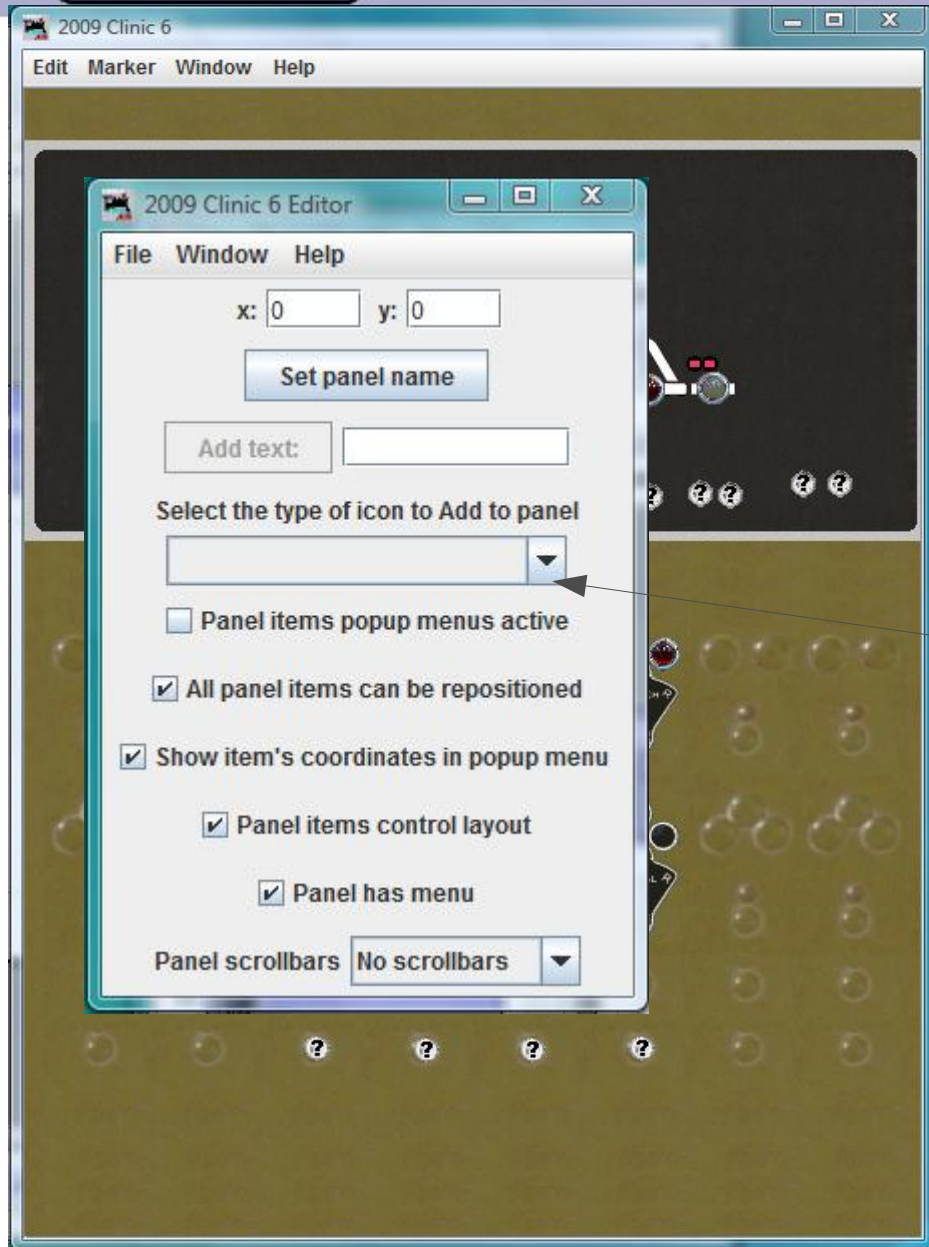


- CTC basics
  - This clinic assumes that you understand the ABS signal system previously covered because that is the basis for the CTC operation.
  - We will attempt to cover the basic steps required for the CTC panel, continuing from where we left off with the SSL.
  - The completed 2009Clinic7.xml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



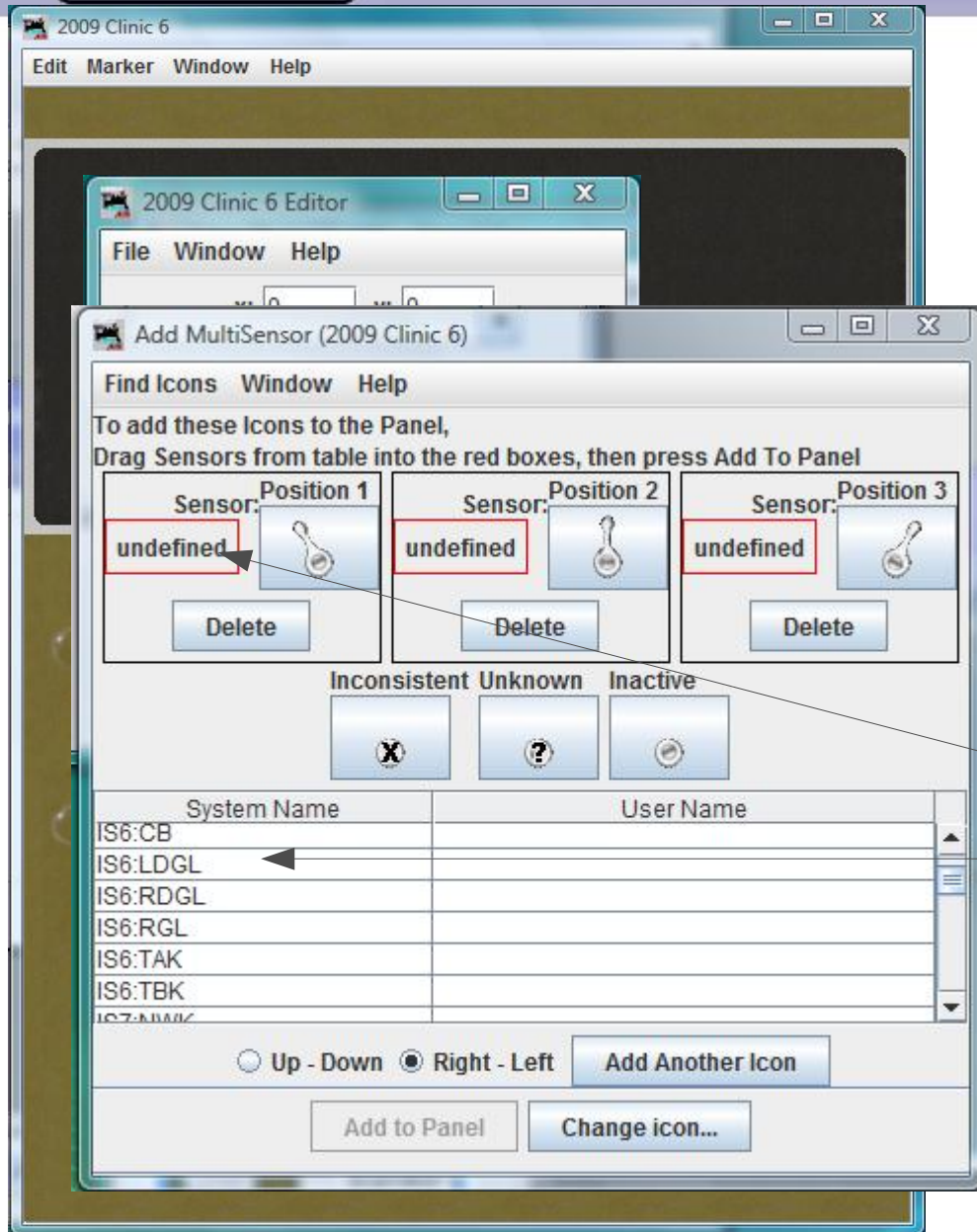
## CTC basics

- 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.



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- Open the Panel Editor and select 'Add Multisensor'.



## 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'.

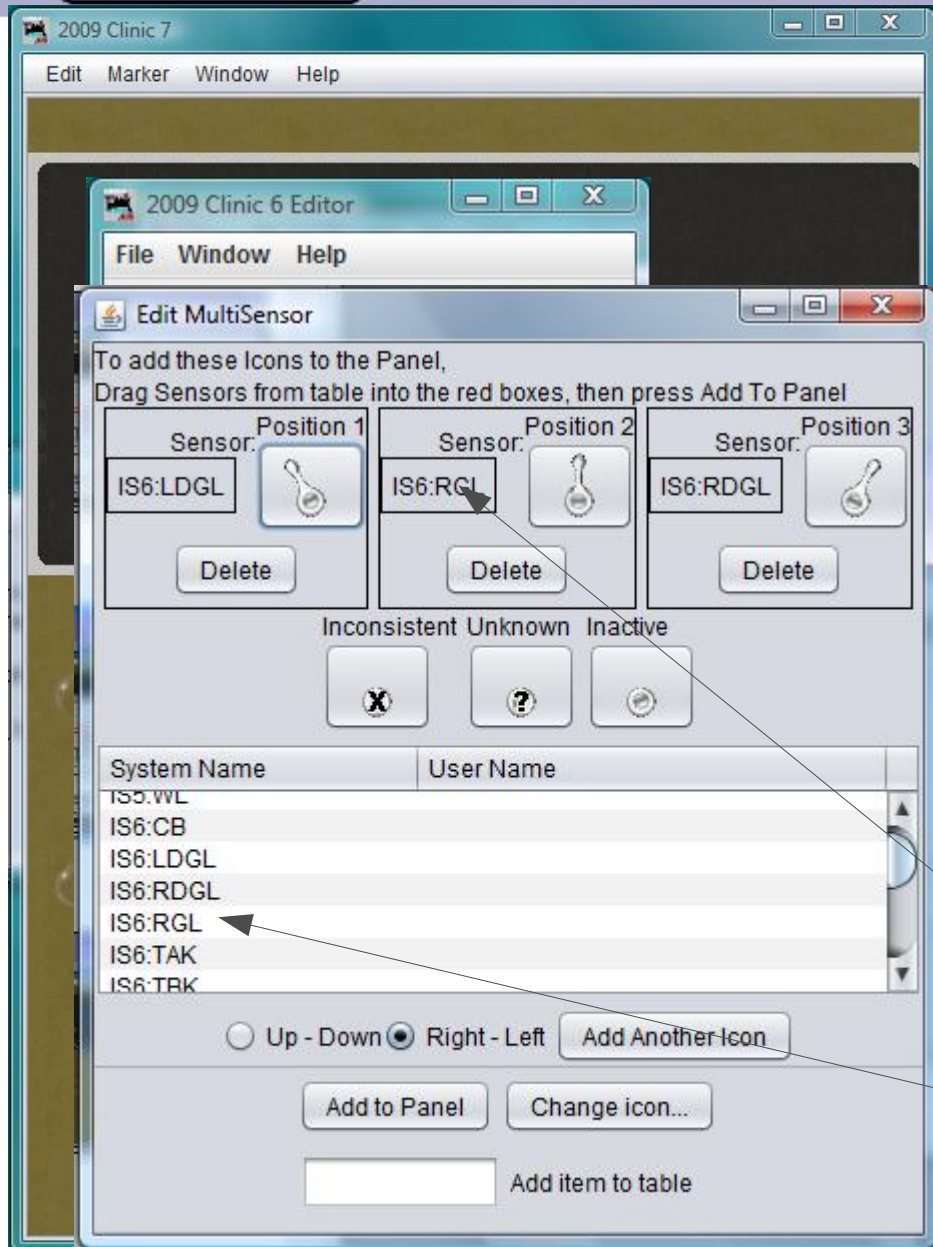
## CTC basics

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

The screenshot shows the CTC Wizard interface for Plant 5-6. The window title is "CTC Wizard" and it has a menu bar with "File" and "Help". The interface is divided into several sections:

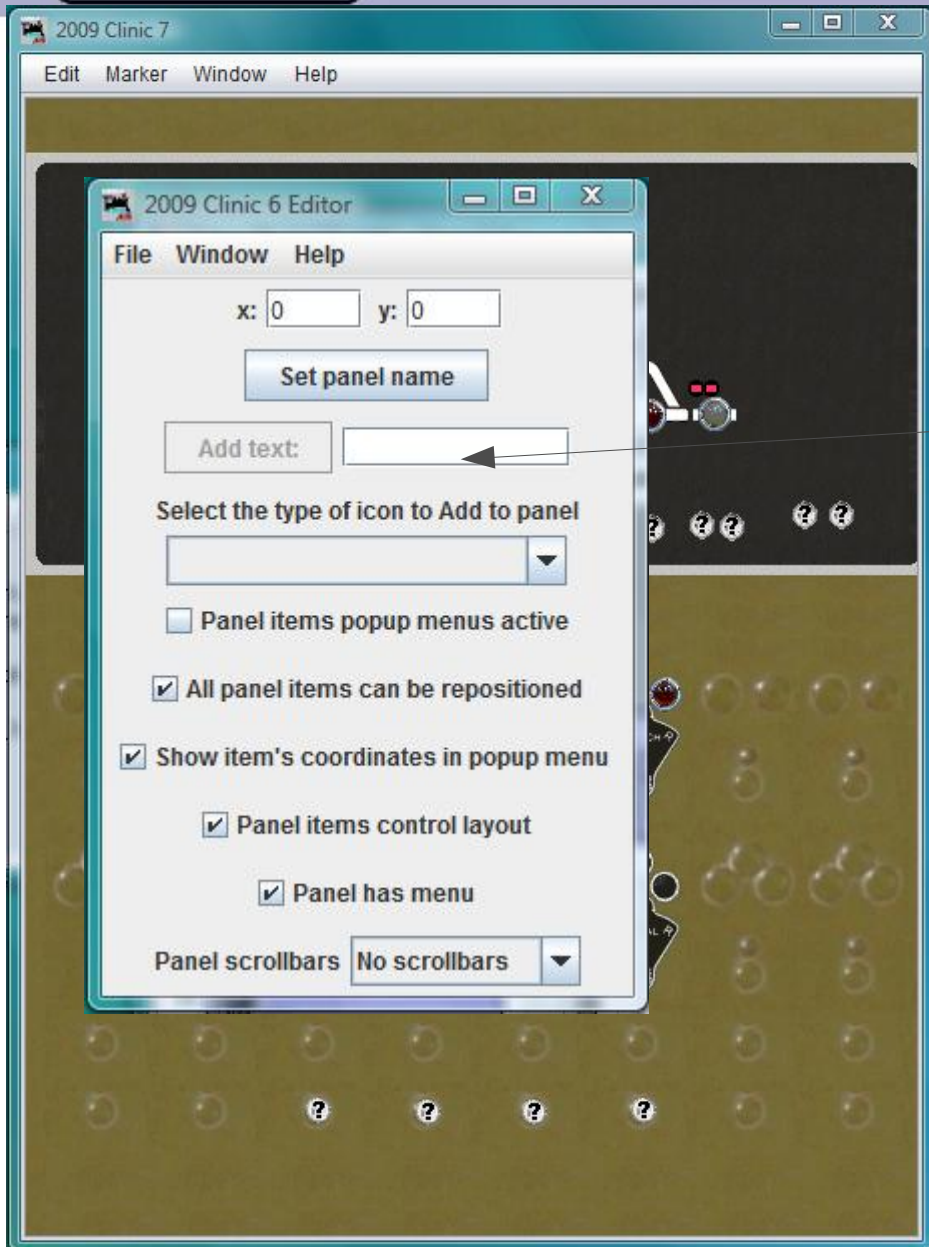
- Header:** Switch #  Signal #   Left  Right
- Traffic:** IS7:BLSK IS5:BRSK  
Left   Right  
Left   Right  
Traffic IS5:LSK IS3:RSK IS7:ALSK IS5:ARSK
- Secondary:** IS6:TBK  
Diagram showing tracks and signals with labels LB, L, RB, R.
- Intermediate Track:** IS4:TK  
**Turnout:** LT5  
**OS:** IS5:WAK  
**Main:** IS6:TAK
- Signal Heads:** LH2 LH1 LH3 LH4  
RB R L LB
- Send Norm:** IS5:NWR  
**Normal Ind:** IS5:NWK  
**Switch Lever:** IS5:WL  
**Reverse Ind:** IS5:RWK  
**Send Rev:** IS5:RWR
- Stack L:** IS6:LFLR  
**Signal L:** IS6:LDGK  
**Signals Normal:** IS6:NGK  
**Signal R:** IS6:RDGK  
**Stack R:** IS6:RFLR
- Lever Left:** IS6:LDGL  
**Lever Normal:** IS6:NGL  
**Lever Right:** IS6:RDGL
- Code Start Button:** IS6:CB  
**Bell Cutout:** IS:AXR
- Bottom:** Lever Sound Button Sound Code Send Code Receive Bell Sound





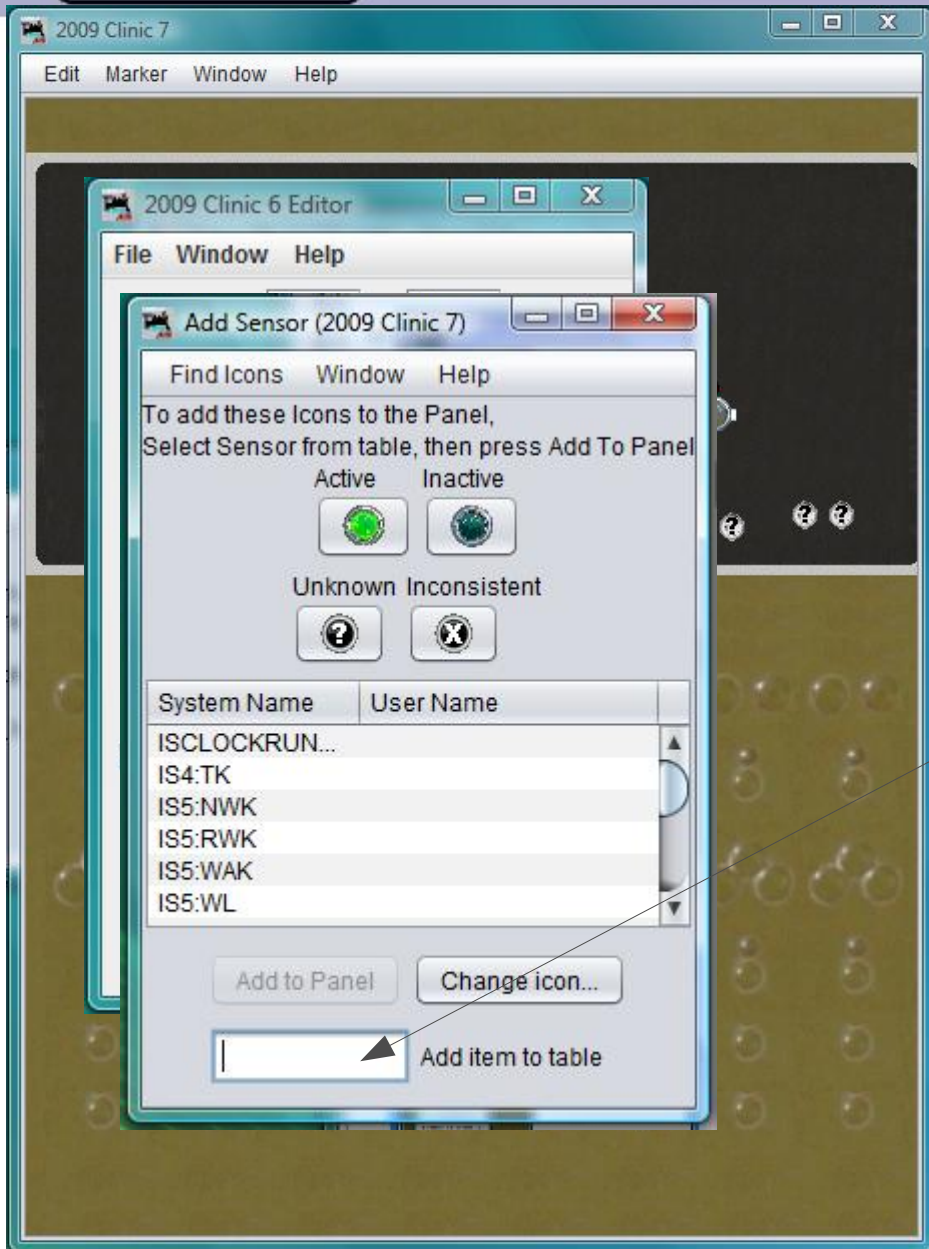
## CTC basics

- 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

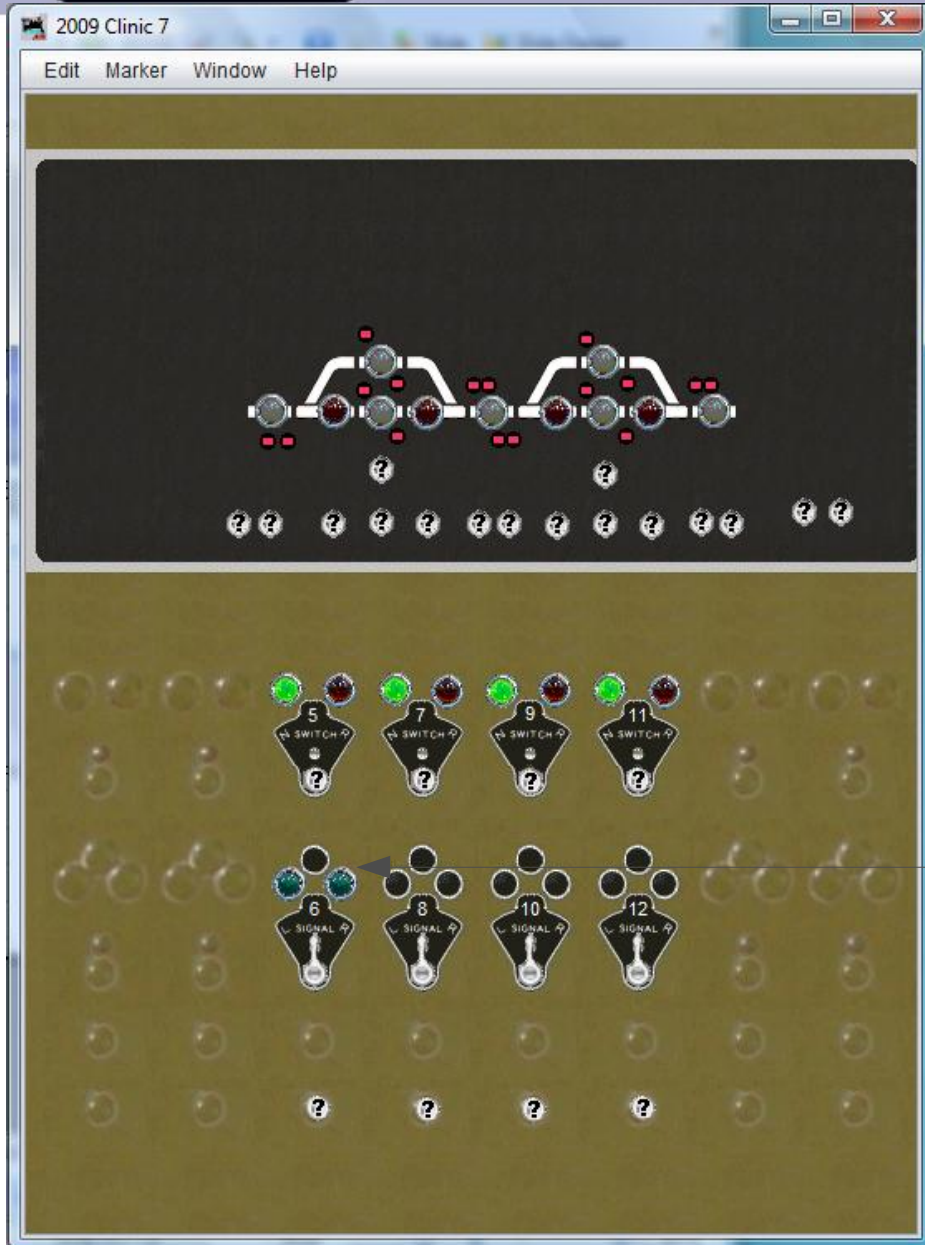
- Now add the signal indicator lamps. Select 'Add Sensor' and set the icons to green jewels.



## CTC 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 **p**roceed **D** si**G**nal indi**K**tor) and IS6:RDGK (Plant **6**: **R**ight **p**roceed **D** si**G**nal indi**K**tor)





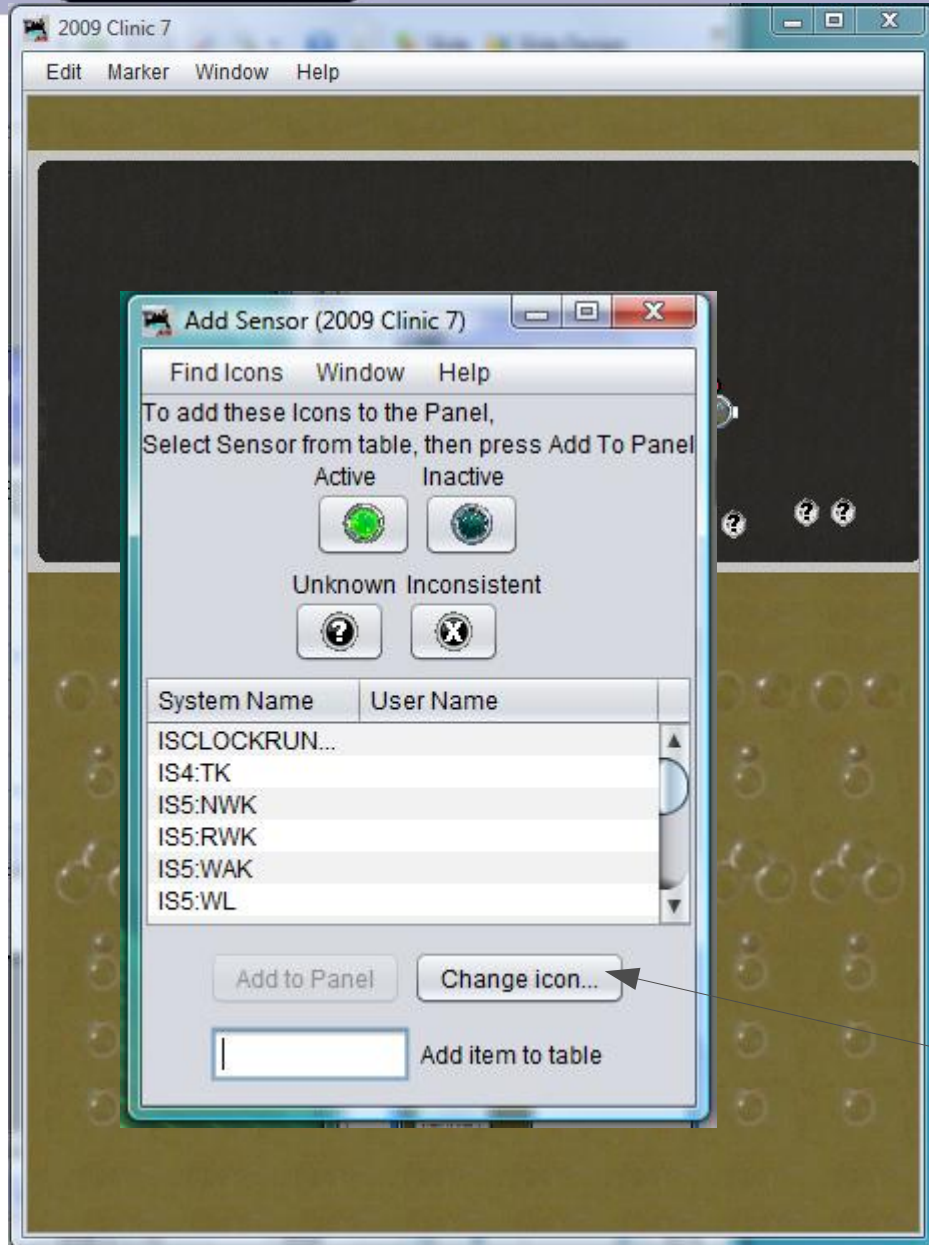
## CTC basics

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



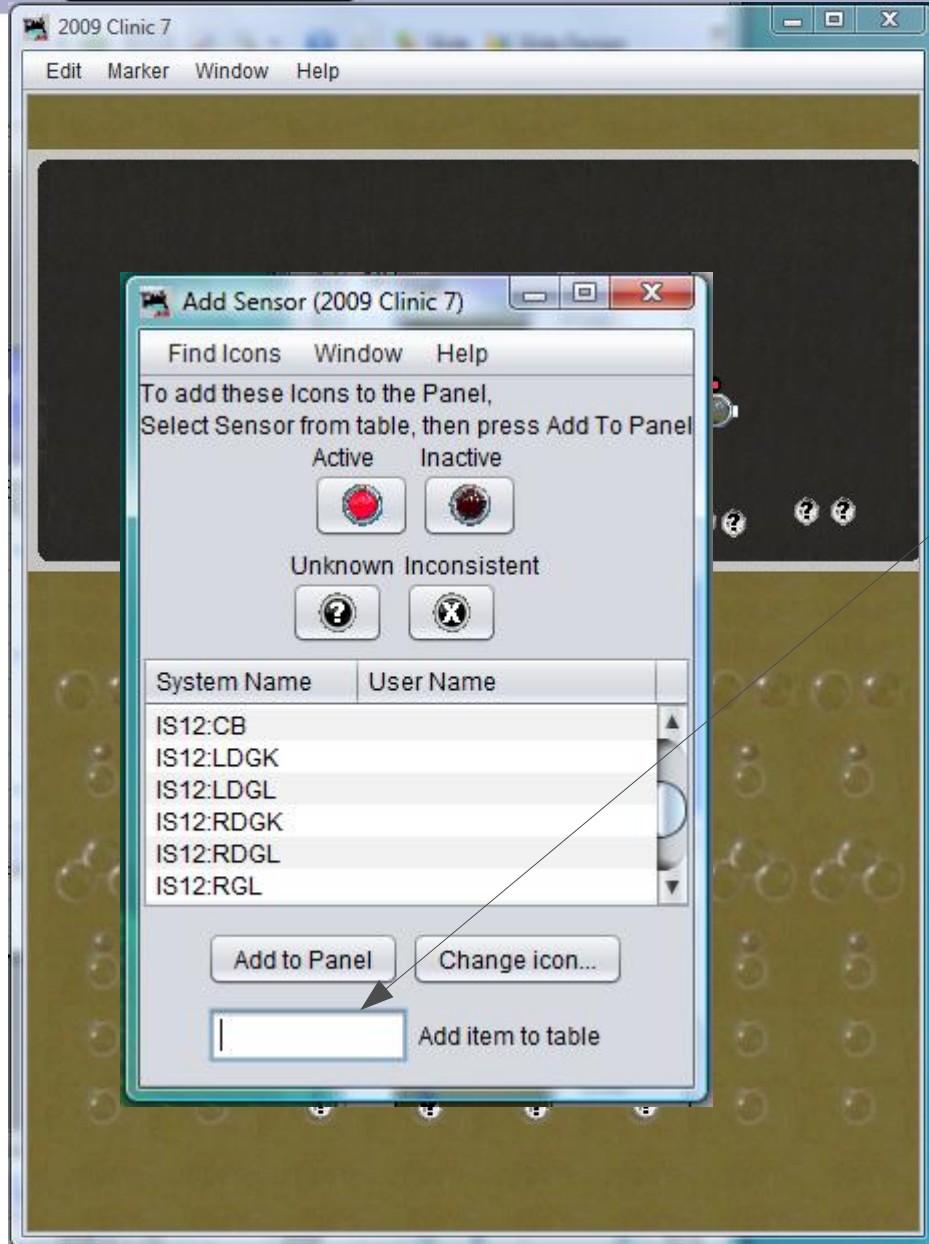
## CTC basics

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



## CTC basics

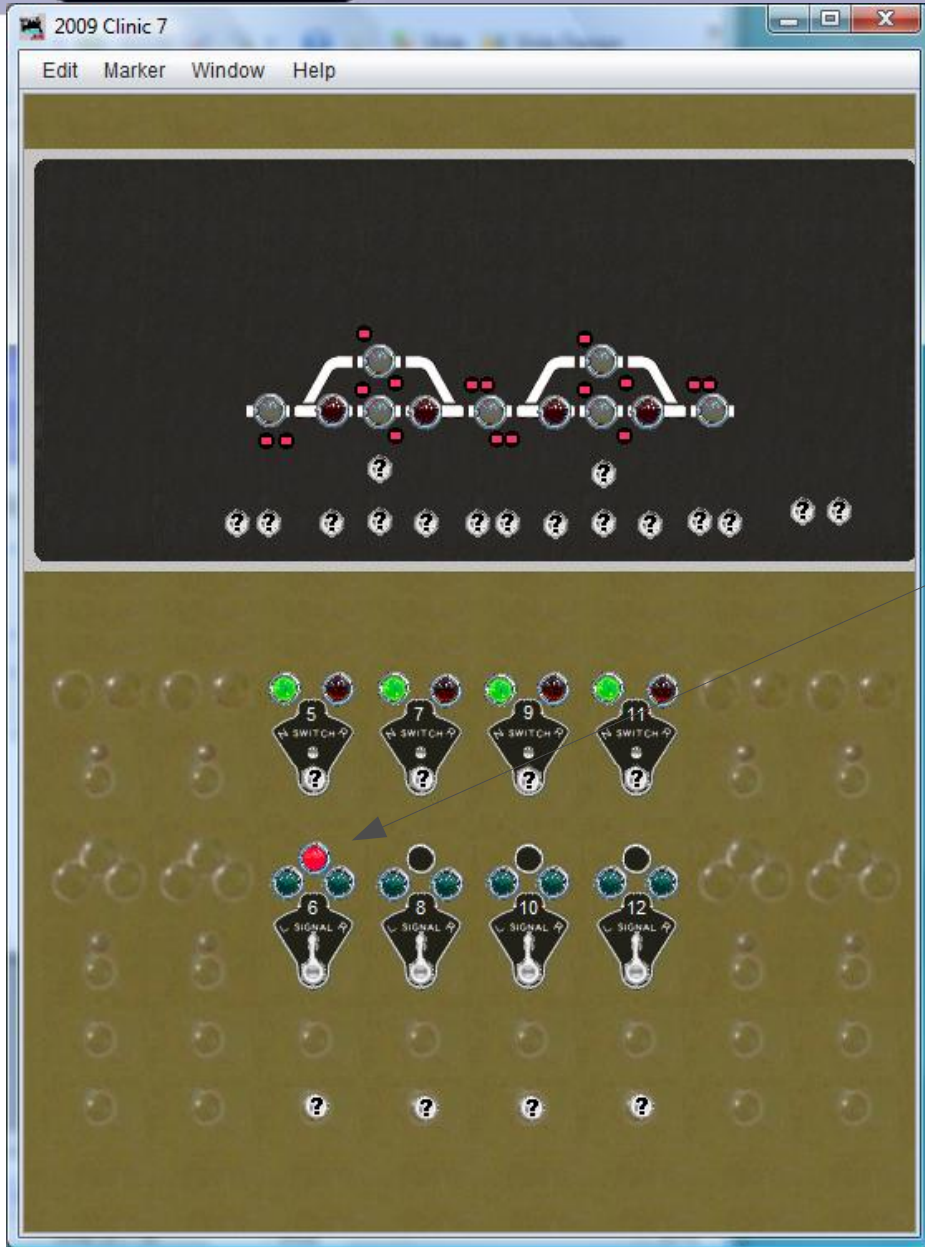
- Now add the signal indicator lamps. Select 'Add Sensor' and set the icons to green jewels.
- Then add: IS6:LDGK (Plant **6**: Left proceed signal indicator) and IS6:RDGK (Plant **6**: Right proceed signal indicator)
- Move them into position.
- And repeat for plant 8, 10, and 12.
- Now change the icons to red jewels.



## CTC basics

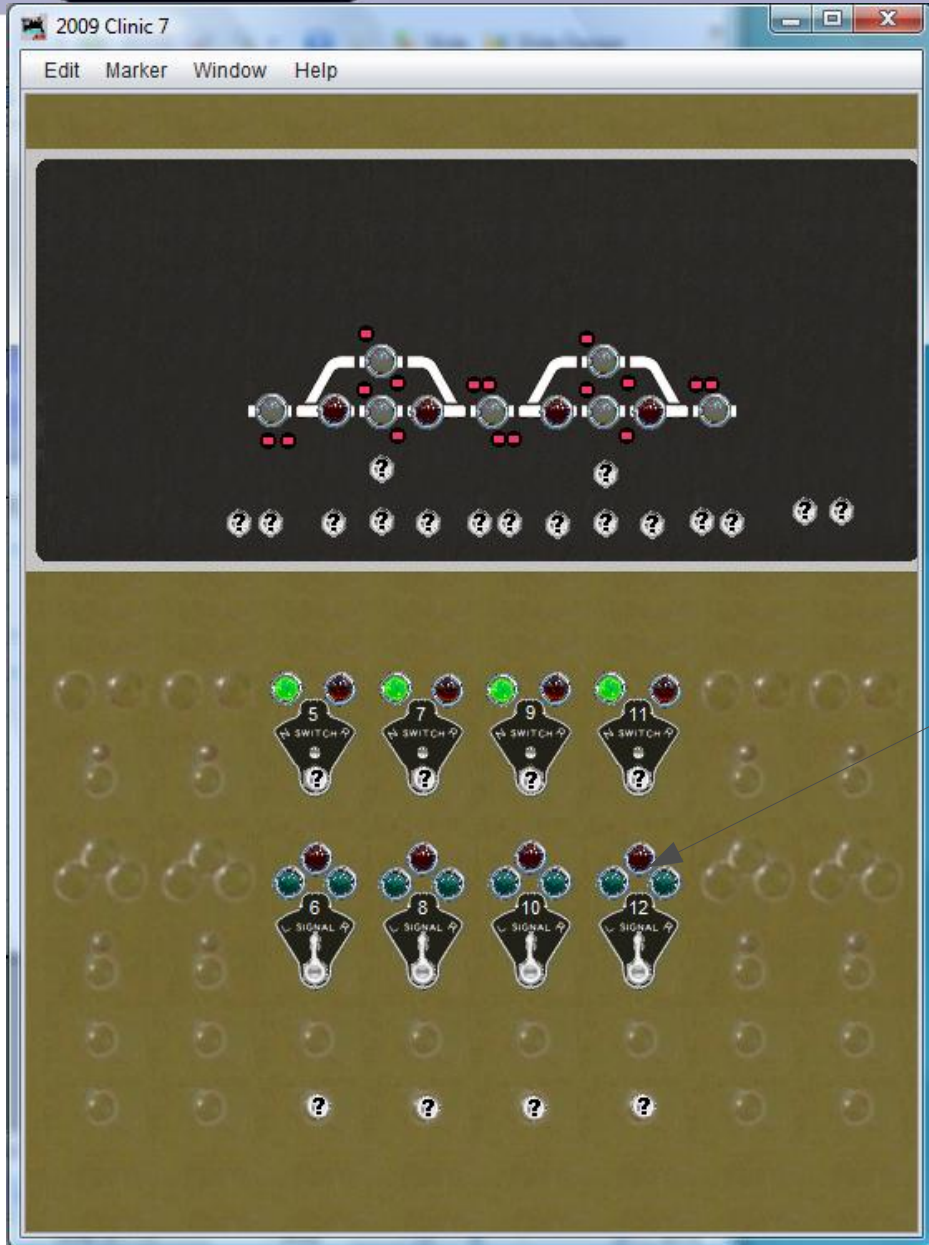
- Then add: IS6:NGK (Plant **6**: Normal siGnal indiKtor)





## CTC basics

- Then add: IS6:NGK (Plant **6**: Normal siGnal indiKtor)
- Move it into position.



## CTC basics

- Then add: IS6:NGK (Plant **6**: Normal siGnal indiKtor)
- Move it into position.
- And repeat for plant 8, 10, and 12.



Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX12:TK	Plant 12 TK Indicator	<input checked="" type="checkbox"/>		Select

Element Name

Add ...  Find Orphans Empty Conds

Get References

## CTC basics

- Then add: IS6:NGK (Plant **6: Normal siGnal indiKtor**)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table



Logix Table

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX12:TK	Plant 12 TK Indicator	<input checked="" type="checkbox"/>		Select

Element Name

Add ...  Find Orphans Empty Conds

Get References

Add Logix

Window Help

Logix System Name

Logix User Name

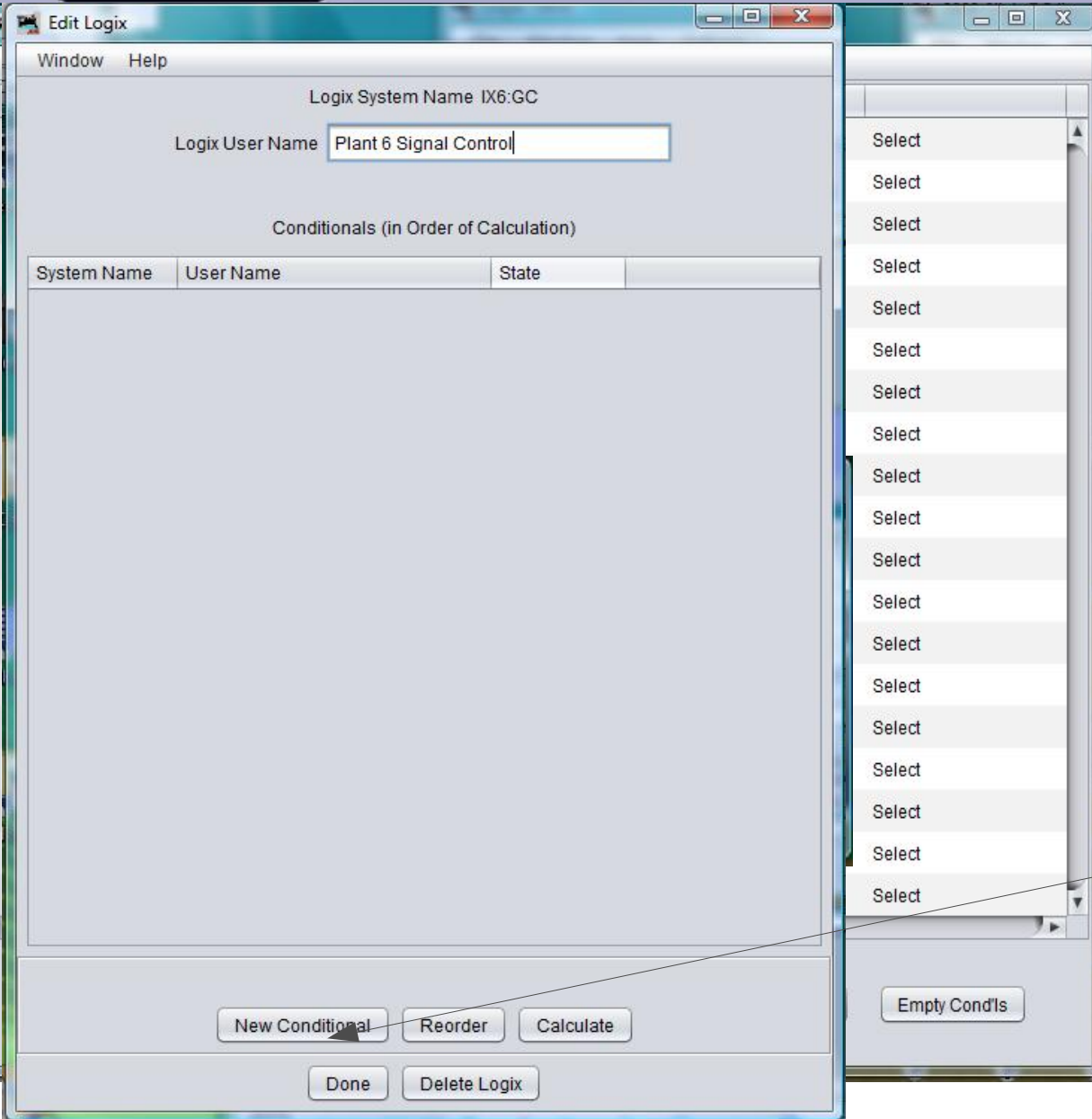
Please enter system name and user name, then click Create Logix, then add Conditionals.

Cancel Create Logix

## CTC basics

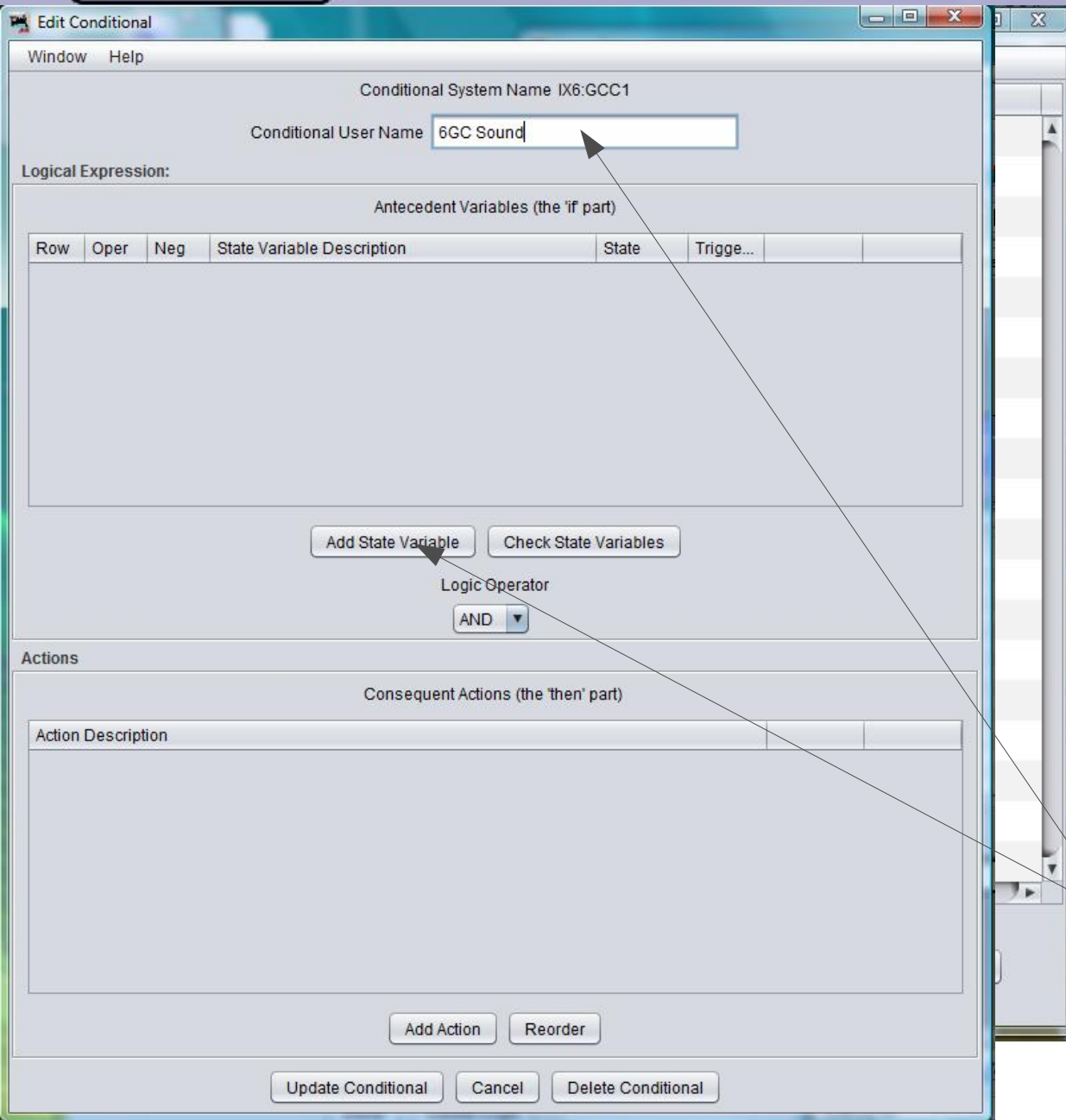
- Then add: IS6:NGK (Plant 6: Normal siGnal indiKtor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table
- Add IX6:GC (Plant 6 siGnal Control)





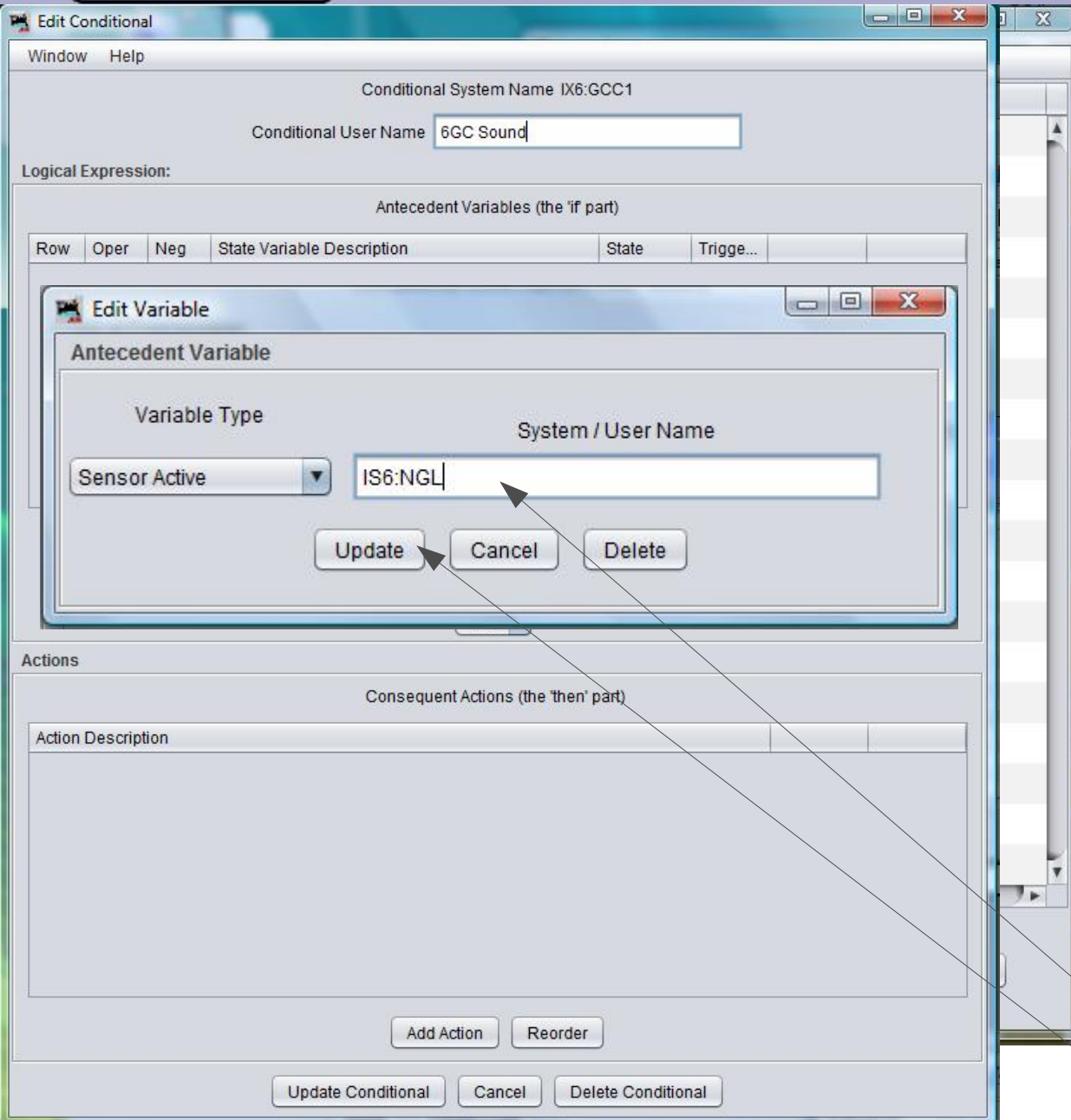
## CTC basics

- Then add: IS6:NGK (Plant **6**: Normal siGnal indiKtor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table
- Add IX6:GC (Plant **6** siGnal Control)
- Click 'New Conditional'



## CTC basics

- Then add: IS6:NGK (Plant **6**: Normal siGnal indiKtor)
- Move it into position.
- And repeat for plant 8, 10, and 12.
- Open the Logix table
- Add IX6:GC (Plant **6** siGnal Control)
- Click 'New Conditional' and name it 6GC Sound then 'Add State Variable'



## CTC basics

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



Edit Conditional

Window Help

Conditional System Name IX6:GCC1

Conditional User Name 6GC Sound

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS6:NGL, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete

Add State Variable Check State Variables

Logic Operator

AND

Actions

Consequent Actions (the 'then' part)

Action Description

Add Action Reorder

Update Conditional Cancel Delete Conditional

## CTC basics

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



## CTC basics

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

Conditional System Name IX6:GCC1

Conditional User Name 6GC Sound

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS6:NGL, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete

Consequent Action

Action Type: Play Sound File

Change Option: On Change To Fal...

Set File: File resources\sounds\Signal-lever.wav

Action Data: resources\sounds\Signal-lever.wav

Update Cancel Delete

Consequent Actions (the 'then' part)

Action Description

Add Action Reorder

Update Conditional Cancel Delete Conditional





## 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.

Edit Conditional

Window Help

Conditional System Name IX6:GCC1

Conditional User Name 6GC Sound

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS6:NGL, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete

Add State Variable Check State Variables

Logic Operator

AND

Actions

Consequent Actions (the 'then' part)

Action Description

Add Action Reorder

Update Conditional Cancel Delete Conditional



## 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'

Edit Conditional

Window Help

Conditional System Name IX6:GCC1

Conditional User Name 6GC Sound

Logical Expression:

Antecedent Variables (the 'if part')

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS6:NGL, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete

Edit Action

Consequent Action

Action Type: Play Sound File

Change Option: On Change To True

Set File: File

Action Data: resources\sounds\Signal-normal.wav

Update Cancel Delete

Add Action Reorder

Update Conditional Cancel Delete Conditional



# 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.

Conditional System Name IX6:GCC1

Conditional User Name 6GC Sound

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS6:NGL, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete

Add State Variable Check State Variables

Logic Operator

AND

Actions

Consequent Actions (the 'then' part)

Action Description		
On Change To False, Play Sound File from file, resources\sounds\Signal-lever.wav.	Edit	Delete
On Change To True, Play Sound File from file, resources\sounds\Signal-normal.wav.	Edit	Delete

Add Action Reorder

Update Conditional Cancel Delete Conditional





## CTC basics

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

The screenshot shows the 'Logix Table' window with a menu bar (File, Window, Help, Options) and a table of Logix elements. The table has columns for System Name, User Name, Enabled, Comment, and a dropdown menu. The row for 'IX6:GC' is selected, and its dropdown menu is open, showing 'Select'. Below the table is an 'Element Name' field with an 'Add ...' button, and buttons for 'Find Orphans' and 'Empty Cond'ls'. A 'Get References' button is also present.

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select



## CTC basics

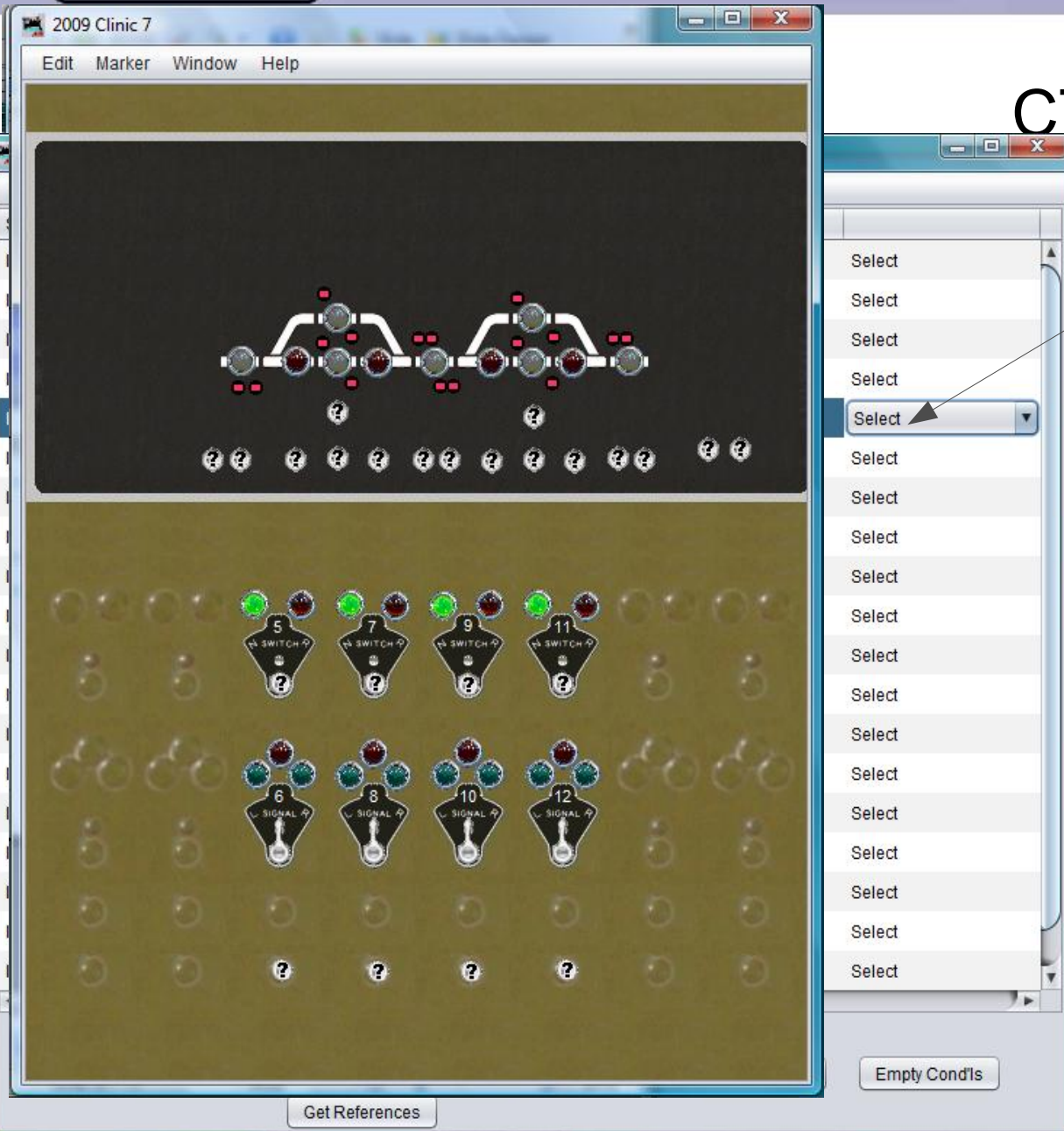
- Now copy the Logix for IS8:GC, IS10:GC, and IS12:GC.
- Then edit each entry to reflect the required new values.

Logix Table

System Name	User Name	Enabled	Comment
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>	Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>	Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>	Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>	Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>	Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>	Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>	Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>	Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>	Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>	Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>	Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>	Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>	Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>	Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>	Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>	Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>	Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>	Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>	Select

Element Name

Add ... Find Orphans Empty Cond'ls Get References



## CTC bell

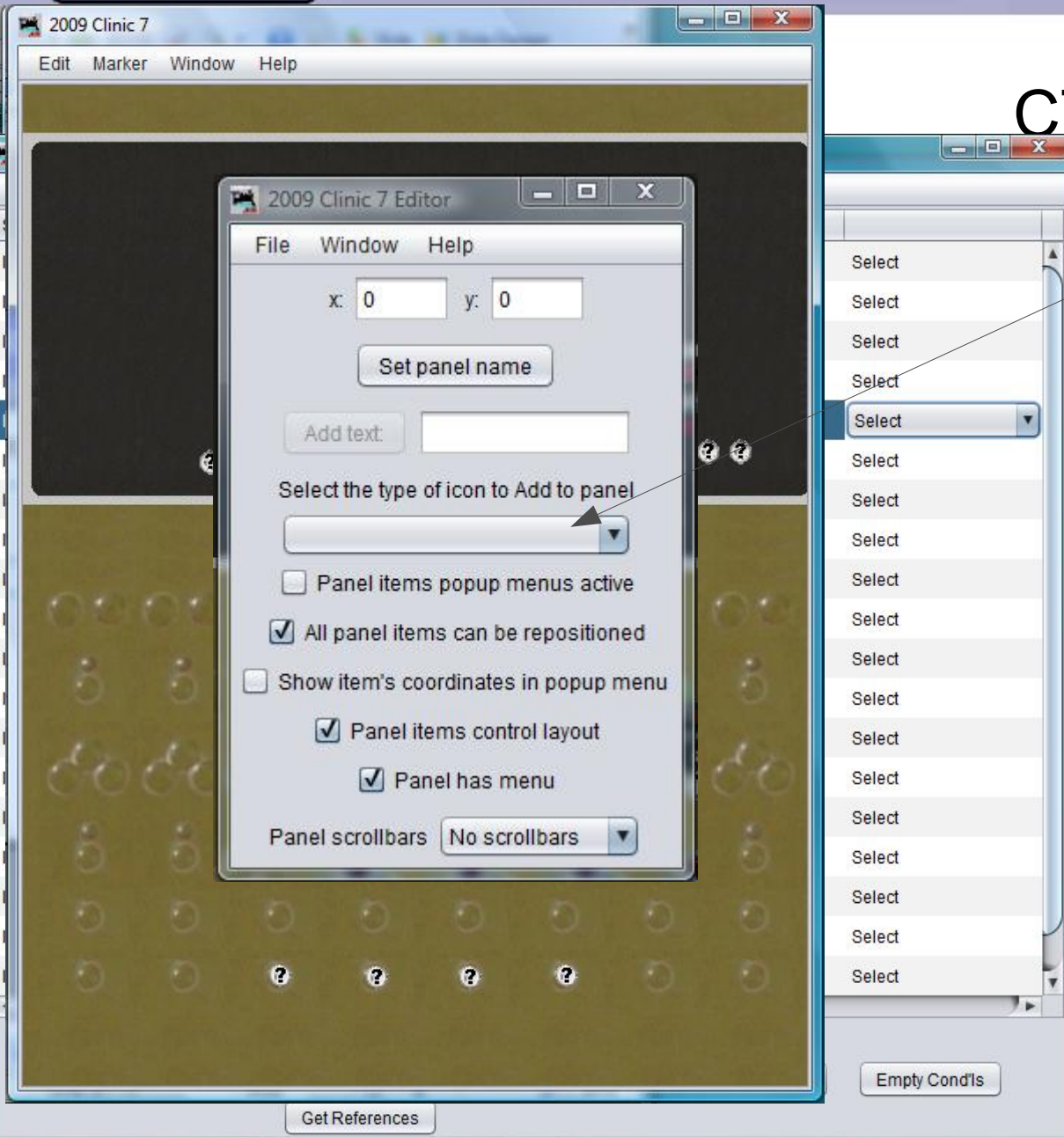
- Now copy the Logix for IS8:GC, IS10:GC, and IS12:GC.
- Then edit each entry to reflect the required new values.
- Go back to our panel. The CTC panel had a bell that rang every time a train entered an OS section. This was to alert the dispatcher of train movements in case he was away from the panel.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





## CTC bell

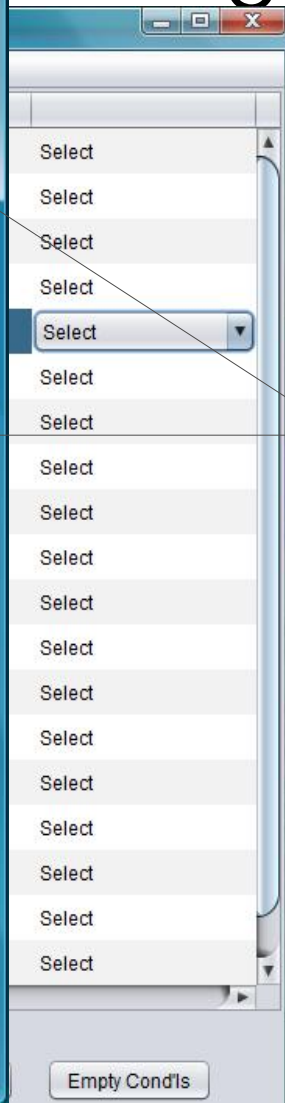
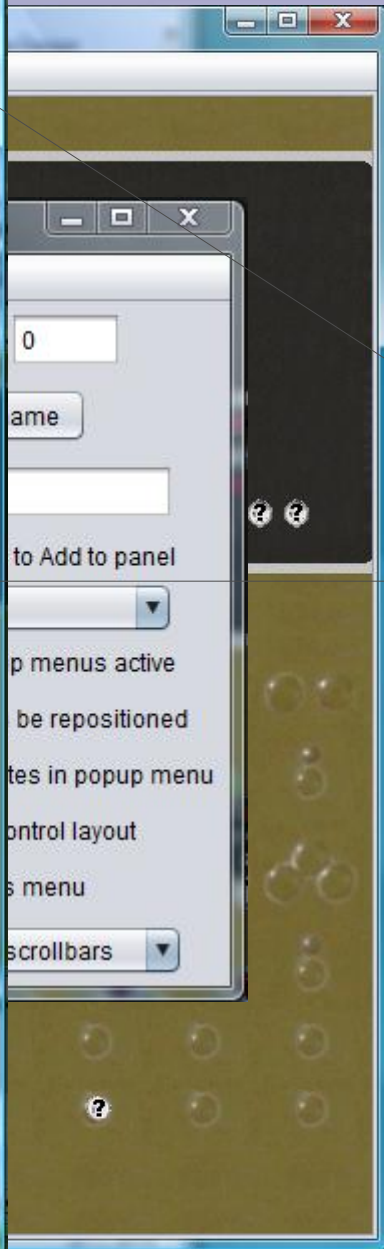
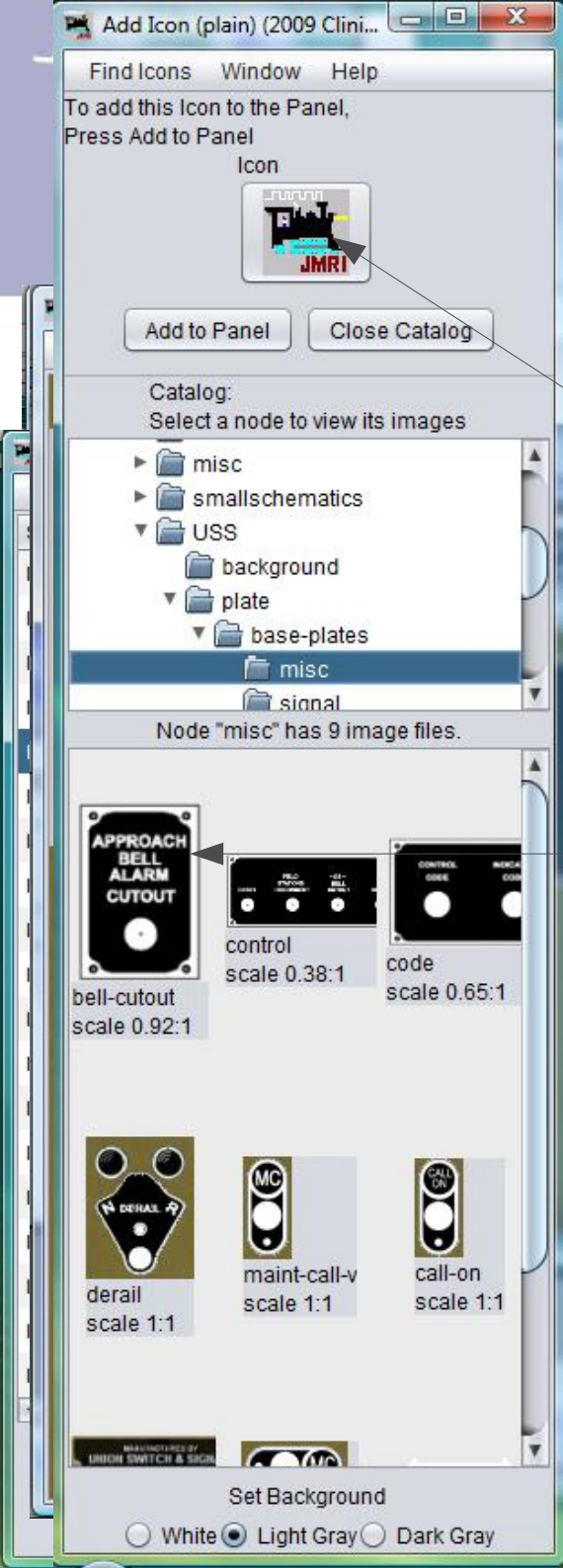
- Start by adding a plate for the bell cutout switch.  
'Add Icon (plain)'



# CTC

## CTC bell

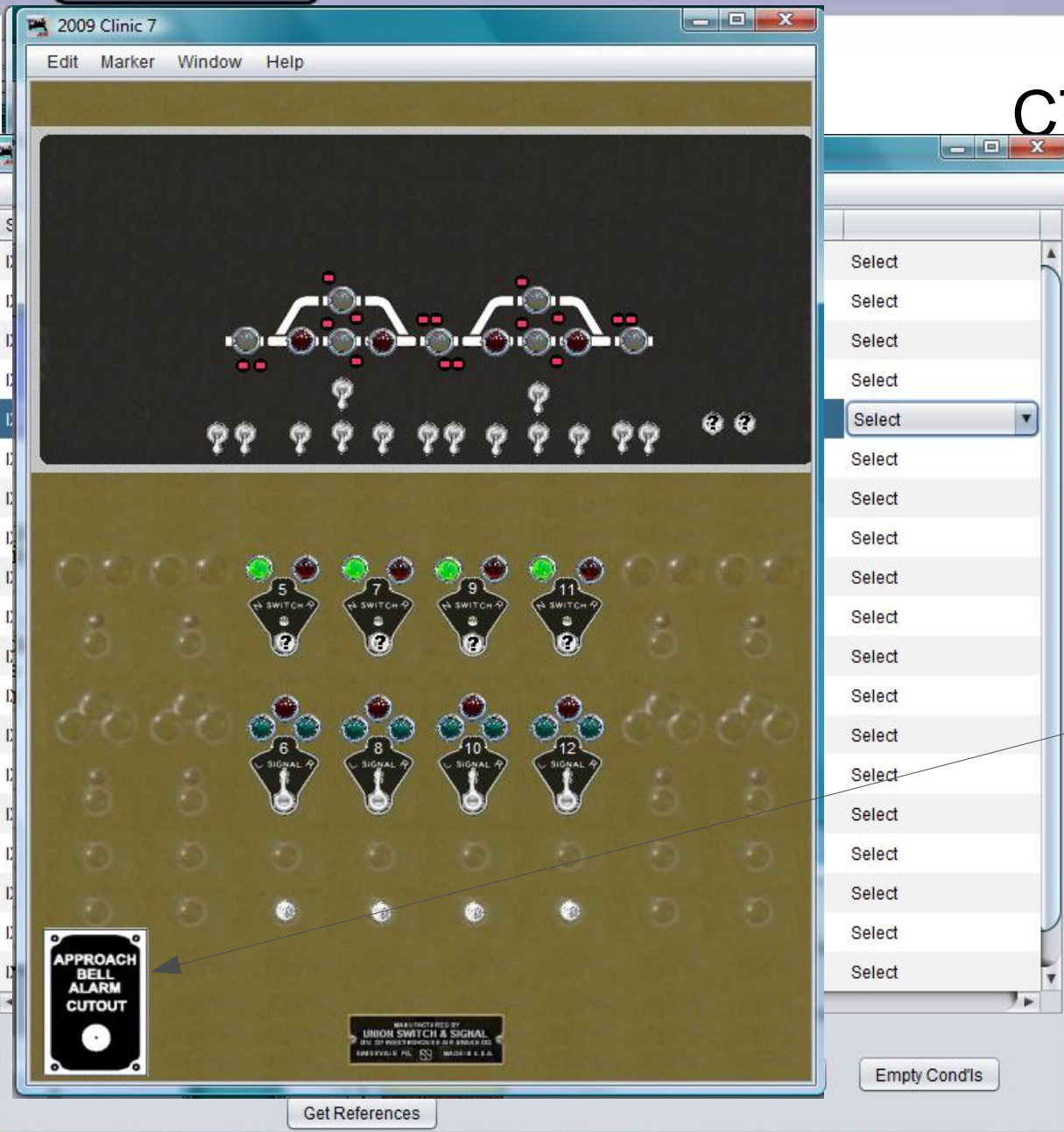
- Start by adding a plate for the bell cutout switch. 'Add Icon (plain)'
- Navigate to 'icons - USS - plate - misc' and drag the 'bell-cutout' image to the icon position, then 'Add to Panel'





## 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.



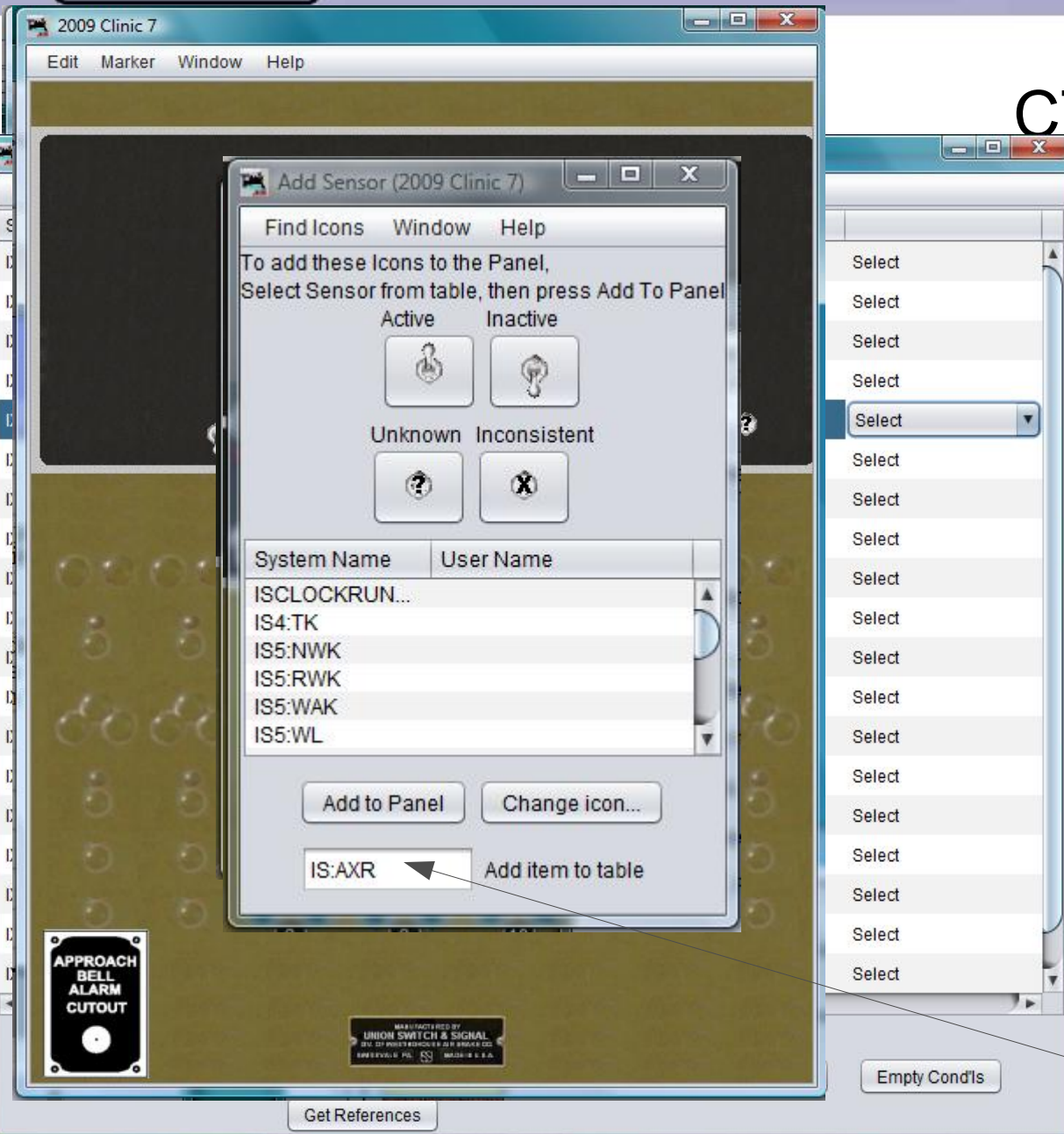






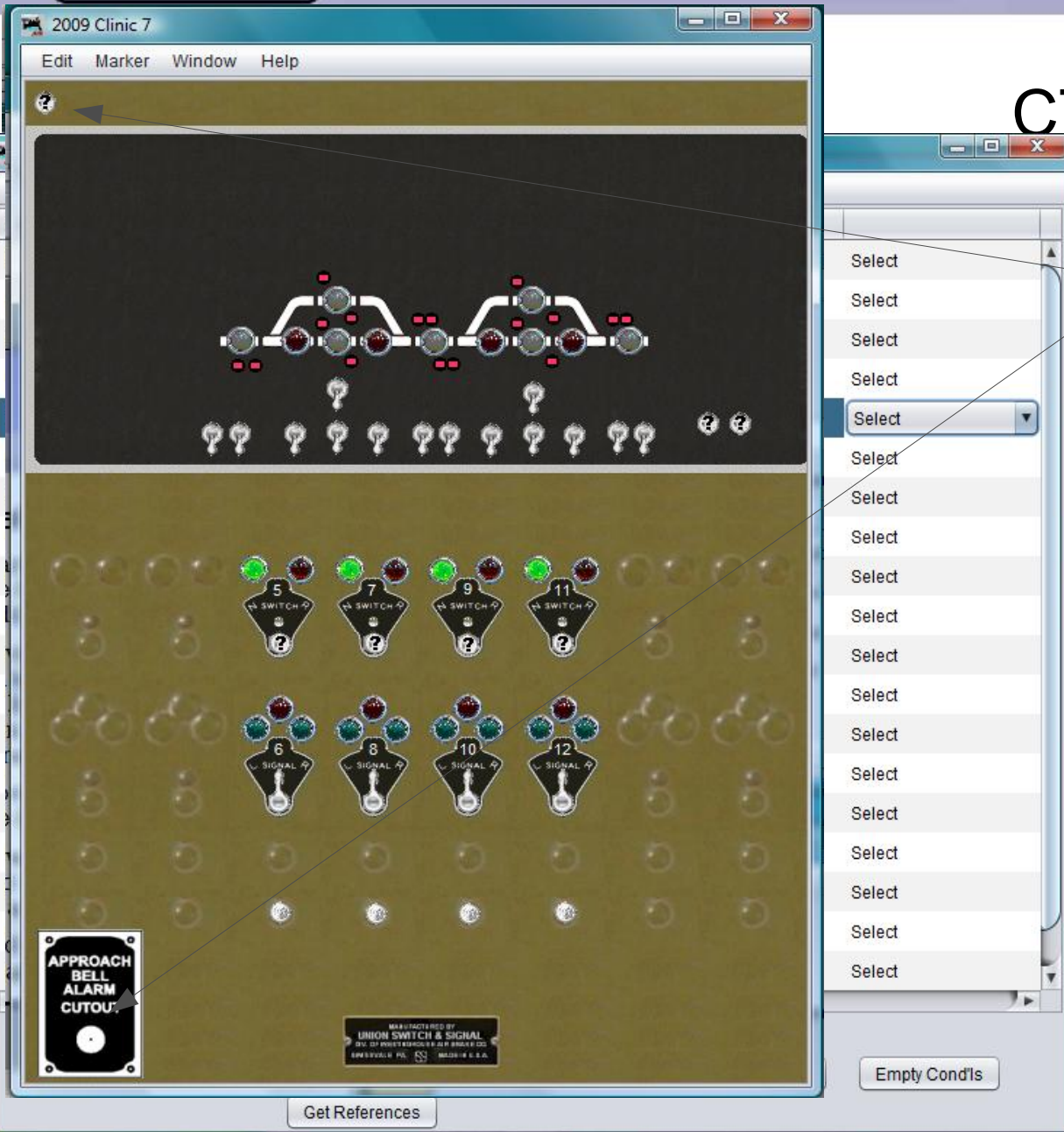
## CTC bell

- 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.
- Add a sensor IS:AXR (Approach Bell Relay).





# CTC



## CTC bell

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



## 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)

2009 Clinic 7

Edit Marker Window Help

Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

Element Name

Add ... Find Orphans Empty Cond'ls Get References



## 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.

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Edit Marker Window Help

Logix Table

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator			
IX7:WC	Plant 7 Switch Controller			
IX7:WK	Plant 7 Switch Indicator			
IX8:TK	Plant 8 TK Indicator			
IX9:TK	Plant 9 OS Indicator			
IX9:WC	Plant 9 Switch Controller			
IX9:WK	Plant 9 Switch Indicator			
IX10:TAK	Plant 10 TAK Indicator			
IX10:TBK	Plant 10 TBK Indicator			
IX11:TK	Plant 11 OS Indicator			
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

File Window Help Options

Element Name

Add ... Find Orphans Empty Cond'ls

Get References

Add Logix

Window Help

Logix System Name IX:AXC

Logix User Name Approach Bell Contr

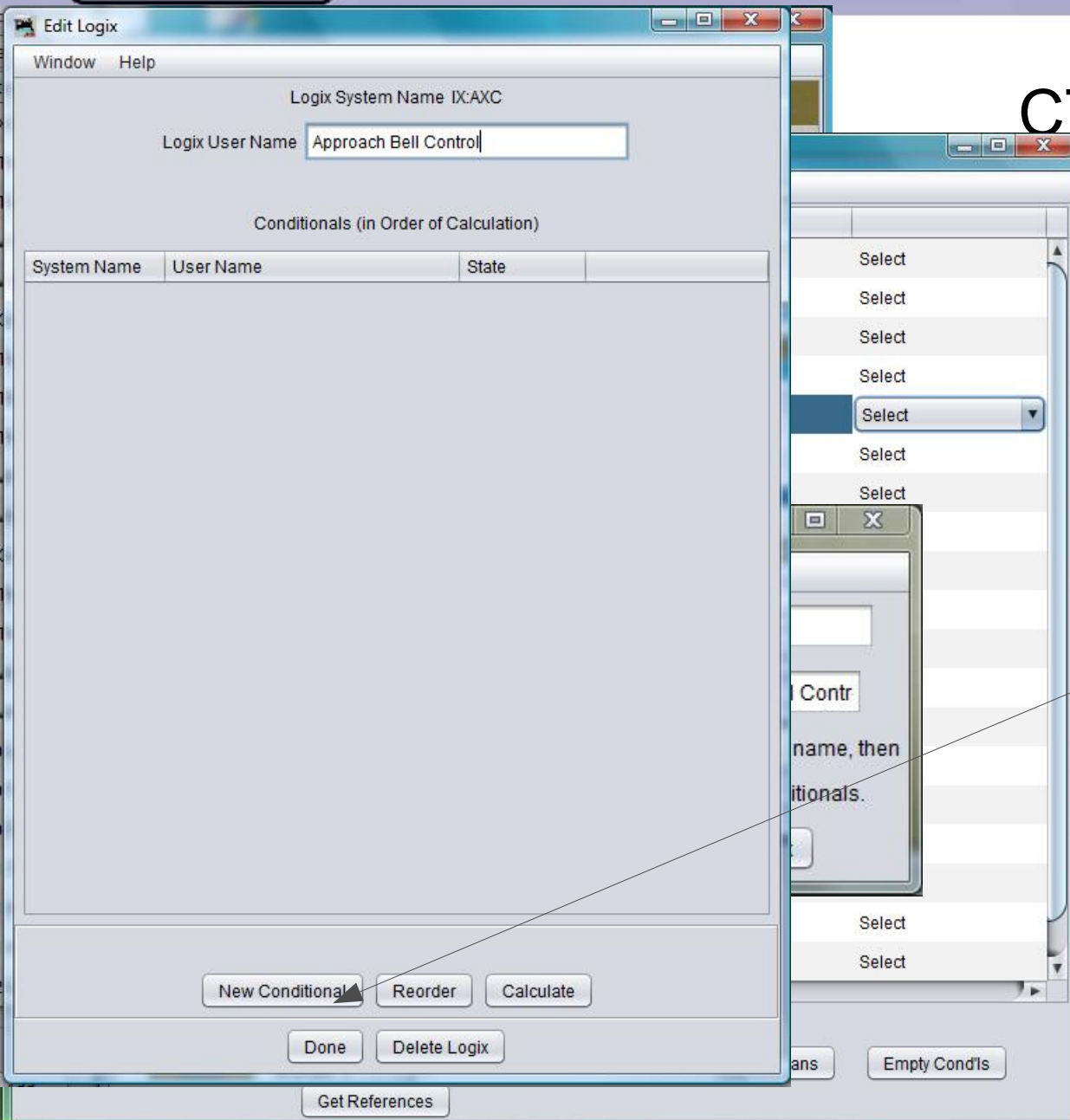
Please enter system name and user name, then click Create Logix, then add Conditionals.

Cancel Create Logix



## 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'.

Window Help

Conditional System Name IX:AXCC1

Conditional User Name

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...
-----	------	-----	----------------------------	-------	-----------

Add State Variable Check State Variables

Logic Operator

AND

Actions

Consequent Actions (the 'then' part)

Action Description
--------------------

Add Action Reorder

Update Conditional Cancel Delete Conditional





Conditional System Name IX:AXCC1

Conditional User Name

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS:AXR, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete

Add State Variable    Check State Variables

Logic Operator

AND

Actions

Consequent Actions (the 'then' part)

Action Description		
On Change To False, Play Sound File from file, resources\sounds\toggle-off.wav.	Edit	Delete
On Change To True, Play Sound File from file, resources\sounds\toggle-on.wav.	Edit	Delete

Add Action    Reorder

Update Conditional    Cancel    Delete Conditional

Element Name

Add ...        Find Orphans    Empty Cond'ls

Get References

## 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'.
- 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 bell

- Now open 'Plant 5 OS Indicator'.

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Edit Marker Window Help

Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

Element Name

Add ...

Find Orphans Empty Cond'ls

Get References





## CTC bell

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

Conditional System Name IX5:TKC2

Conditional User Name OS5 Bell

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS5:WAK, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete

Add State Variable Check State Variables

Logic Operator

AND

Actions

Consequent Actions (the 'then' part)

Action Description		
On Change To True, Play Sound File from file, resources/sounds/Bell.wav.	Edit	Delete

Add Action Reorder

Update Conditional Cancel Delete Conditional



## 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'

Conditional System Name IX5:TKC2

Conditional User Name OS5 Bell

Logical Expression:

Antecedent Variables (the 'if' part)

Row	Oper	Neg	State Variable Description	State	Trigge...		
R1			Sensor, IS5:WAK, for Sensor Active	False	<input checked="" type="checkbox"/>	Edit	Delete
R2	AND		Sensor, IS:AXR, for Sensor Inactive	True	<input type="checkbox"/>	Edit	Delete

Add State Variable Check State Variables

Logic Operator AND

Actions

Consequent Actions (the 'then' part)

Action Description		
On Change To True, Play Sound File from file, resources/sounds/Bell.wav.	Edit	Delete

Add Action Reorder

Update Conditional Cancel Delete Conditional





## 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'.

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Edit Marker Window Help

Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

Element Name

Add ...

Find Orphans

Empty Cond'ls

Get References



## 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'.

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Edit Marker Window Help

Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

Copy Logix

Window Help

Logix System Name IX7:TK

Logix User Name Plant 7 OS Indicator

Please enter system name and user name of target Logix, then click Copy

Cancel Copy

Element Name

Add ... Find Orphans Empty Cond'ls Get References



## 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.

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Edit Marker Window Help

Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 TK Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

Question

Logix "IX7:TK" already exists. Do you want copy the Conditionals of Logix "IX5:TK" into "IX7:TK"?

Yes No

Element Name

Add ... Find Orphans Empty Cond'ls Get References





## CTC bell

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

The screenshot shows the 'Logix Table' application window. It contains a table with the following data:

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK				
IX5:WC				
IX5:WK				
IX6:GC				
IX6:TAK				
IX6:TBK				
IX7:TK				
IX7:WC				
IX7:WK				
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

An 'Input' dialog box is overlaid on the table, containing the following text:

Input

Rename the copy of Conditional "LS2" (IX5:TKC1) in Logix IX5:TK being copied into Logix "Plant 7 OS Indicator" (IX7:TK). Press Cancel if you don't want to copy this conditional.

Copy of LS2

OK Cancel



## 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'.

2009 Clinic 7

Edit Marker Window Help

Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC				
IX5:WK				
IX6:GC				
IX6:TAK				
IX6:TBK				
IX7:TK				
IX7:WC				
IX7:WK				
IX8:TK				
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

Input

Rename the copy of Conditional "OS5 Bell" (IX5:TKC2) in Logix IX5:TK being copied into Logix "Plant 7 OS Indicator" (IX7:TK). Press Cancel if you don't want to copy this conditional.

Copy of OS5 Bell

OK Cancel

Element Name

Add ... Find Orphans Empty Cond'ls Get References





## 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.

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Edit Marker Window Help

Logix Table

File Window Help Options

System Name	User Name	Enabled	Comment	
IX4:TK	Plant 4 TK Indicator	<input checked="" type="checkbox"/>		Select
IX5:TK	Plant 5 OS Indicator	<input checked="" type="checkbox"/>		Select
IX5:WC	Plant 5 Switch Controller	<input checked="" type="checkbox"/>		Select
IX5:WK	Plant 5 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX6:GC	Plant 6 Signal Controller	<input checked="" type="checkbox"/>		Select
IX6:TAK	Plant 6 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX6:TBK	Plant 6 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX7:TK	Plant 7 OS Indicator	<input checked="" type="checkbox"/>		Select
IX7:WC	Plant 7 Switch Controller	<input checked="" type="checkbox"/>		Select
IX7:WK	Plant 7 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX8:TK	Plant 8 TK Indicator	<input checked="" type="checkbox"/>		Select
IX9:TK	Plant 9 OS Indicator	<input checked="" type="checkbox"/>		Select
IX9:WC	Plant 9 Switch Controller	<input checked="" type="checkbox"/>		Select
IX9:WK	Plant 9 Switch Indicator	<input checked="" type="checkbox"/>		Select
IX10:TAK	Plant 10 TAK Indicator	<input checked="" type="checkbox"/>		Select
IX10:TBK	Plant 10 TBK Indicator	<input checked="" type="checkbox"/>		Select
IX11:TK	Plant 11 OS Indicator	<input checked="" type="checkbox"/>		Select
IX11:WC	Plant 11 Switch Controller	<input checked="" type="checkbox"/>		Select
IX11:WK	Plant 11 Switch Indicator	<input checked="" type="checkbox"/>		Select

Element Name

Add ...  Find Orphans Empty Cond'ls

Get References



## 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



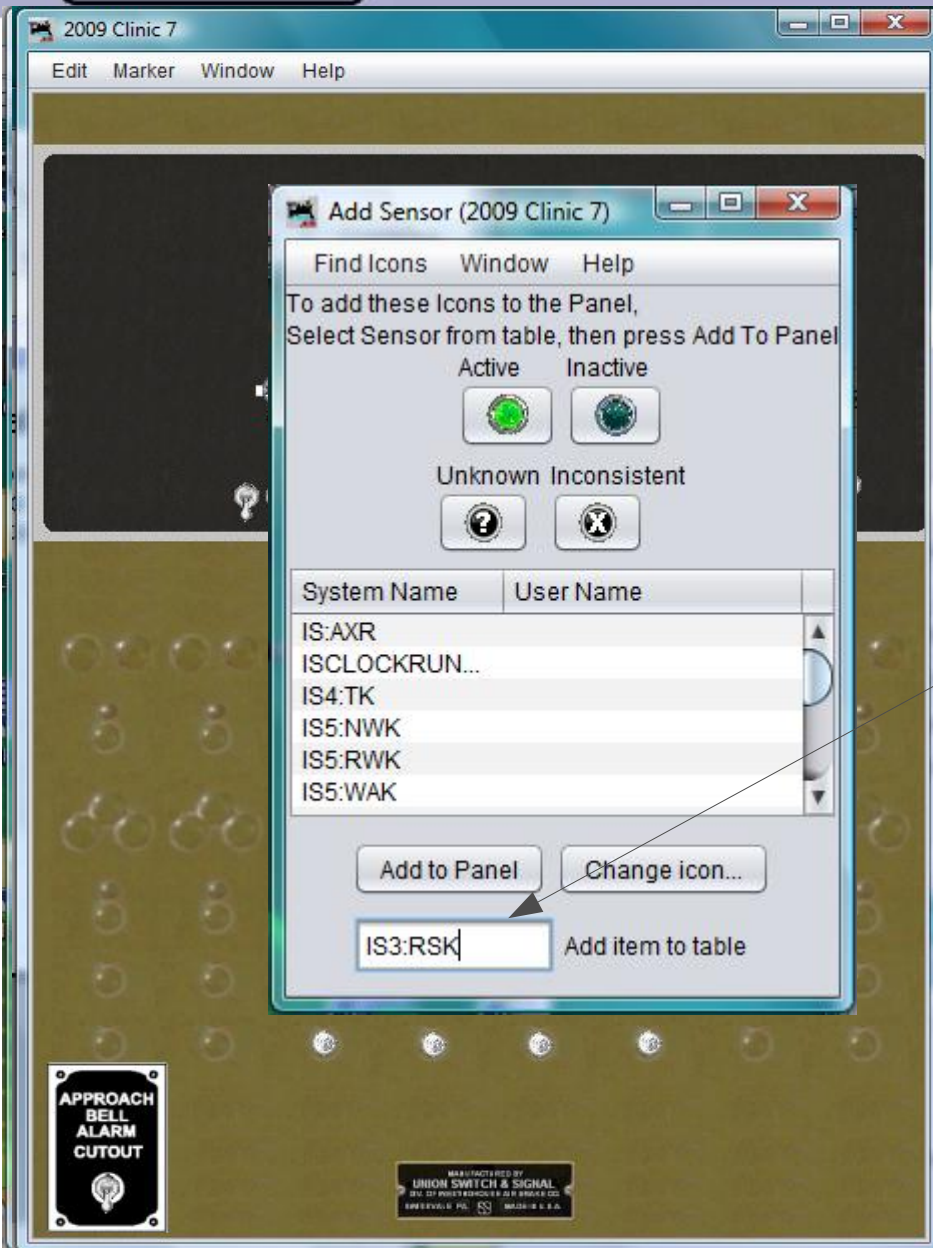
## CTC traffic direction

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



## CTC 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)







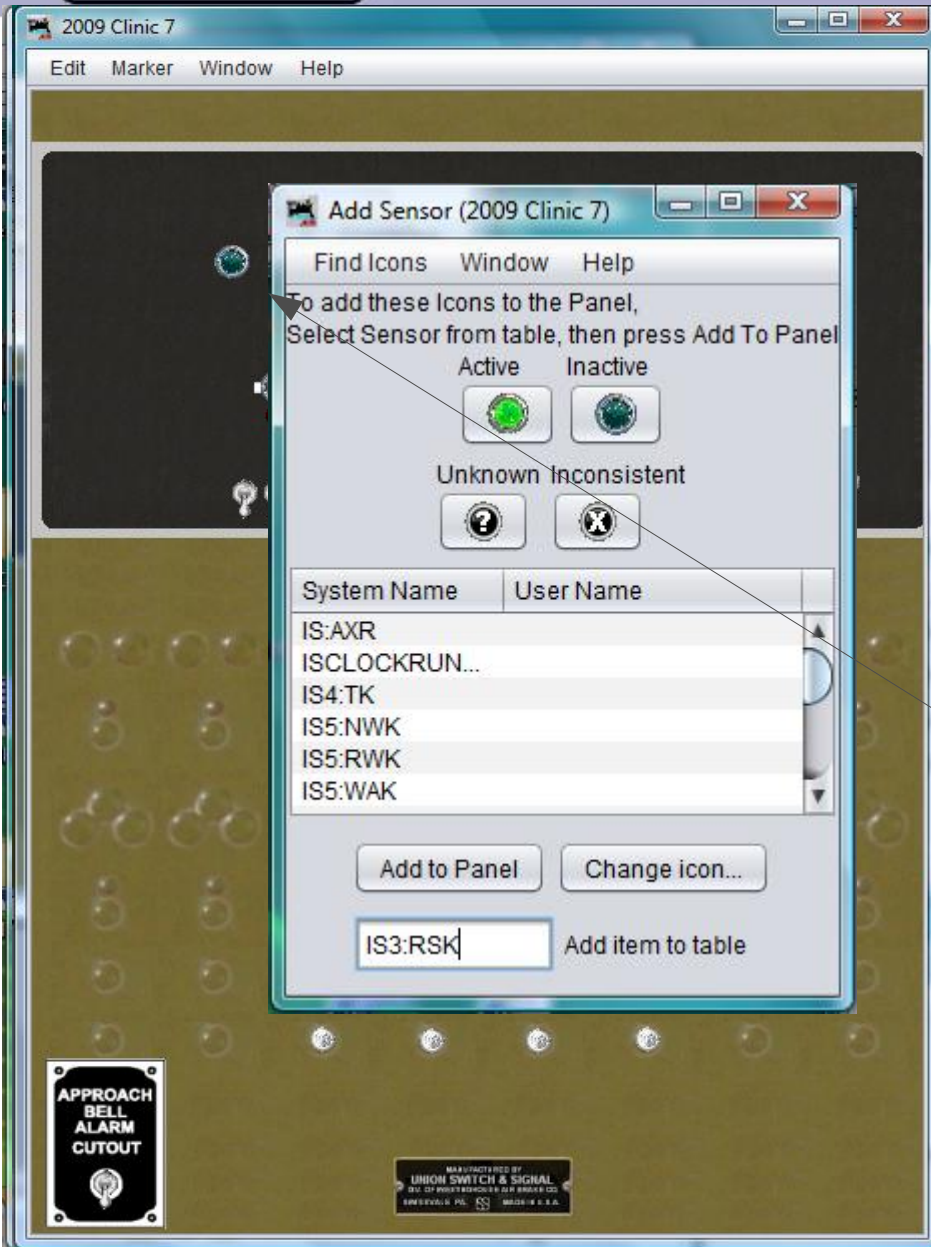
## CTC traffic direction

- 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 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 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.



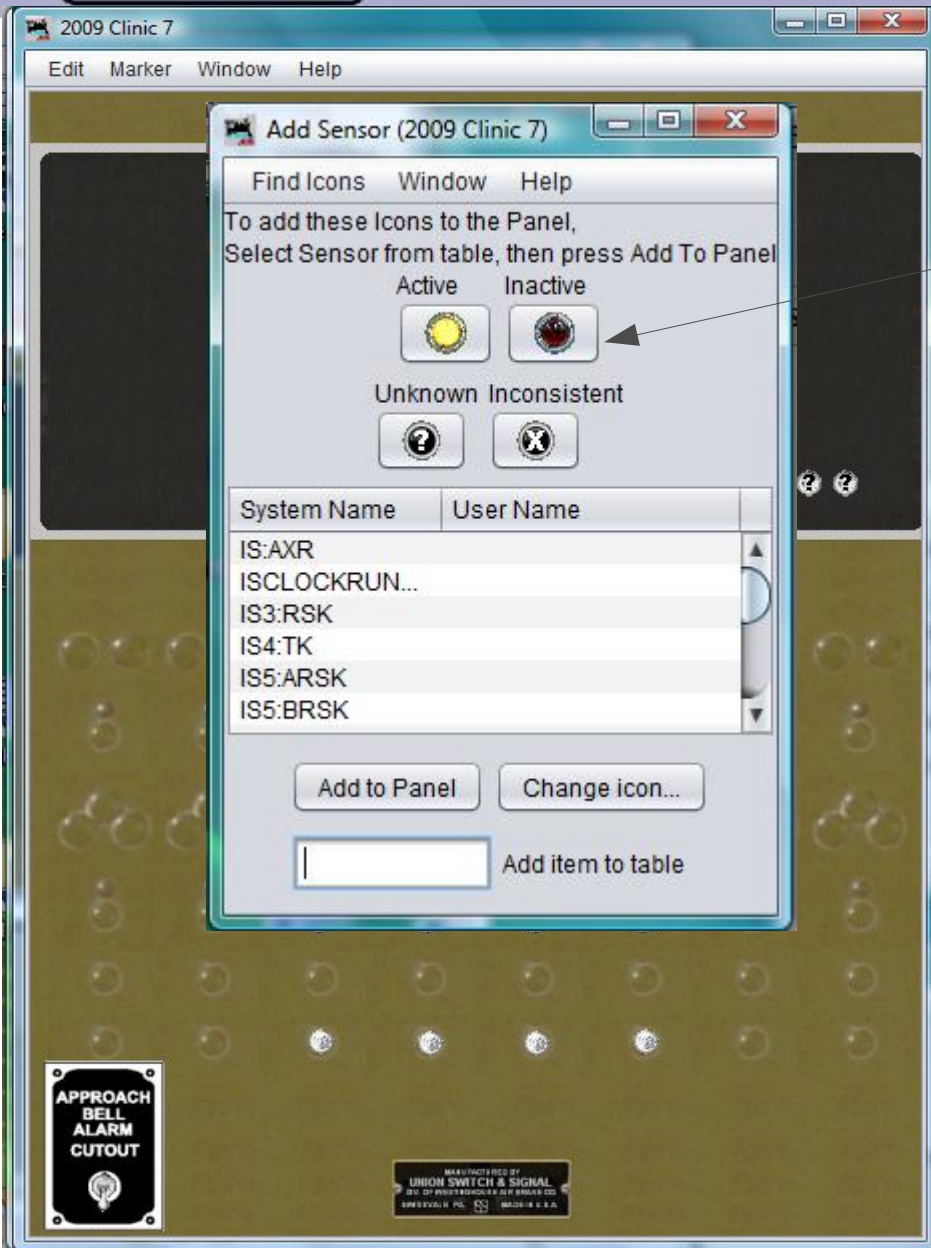






## CTC traffic direction

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



# CTC



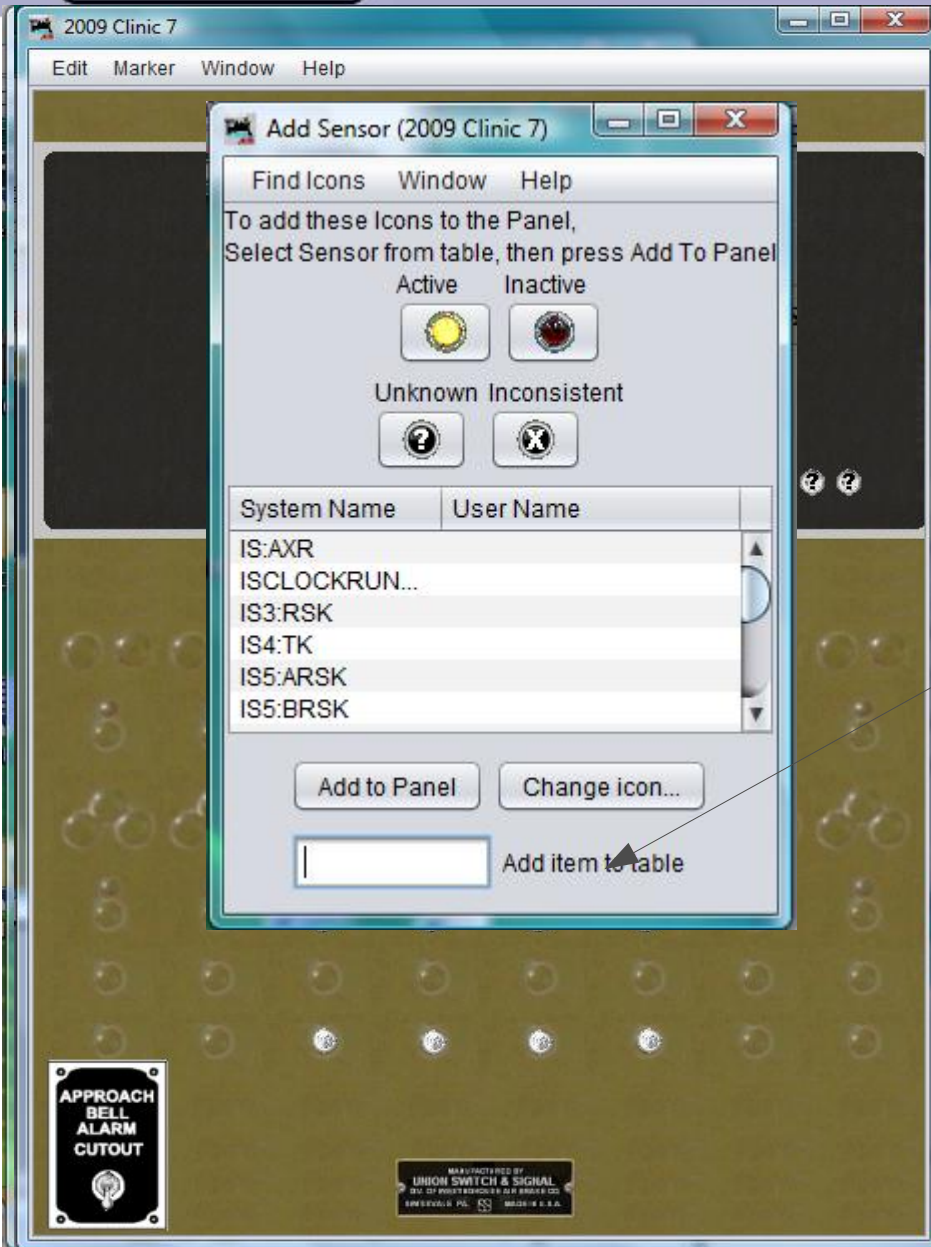
## CTC traffic direction

- 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.

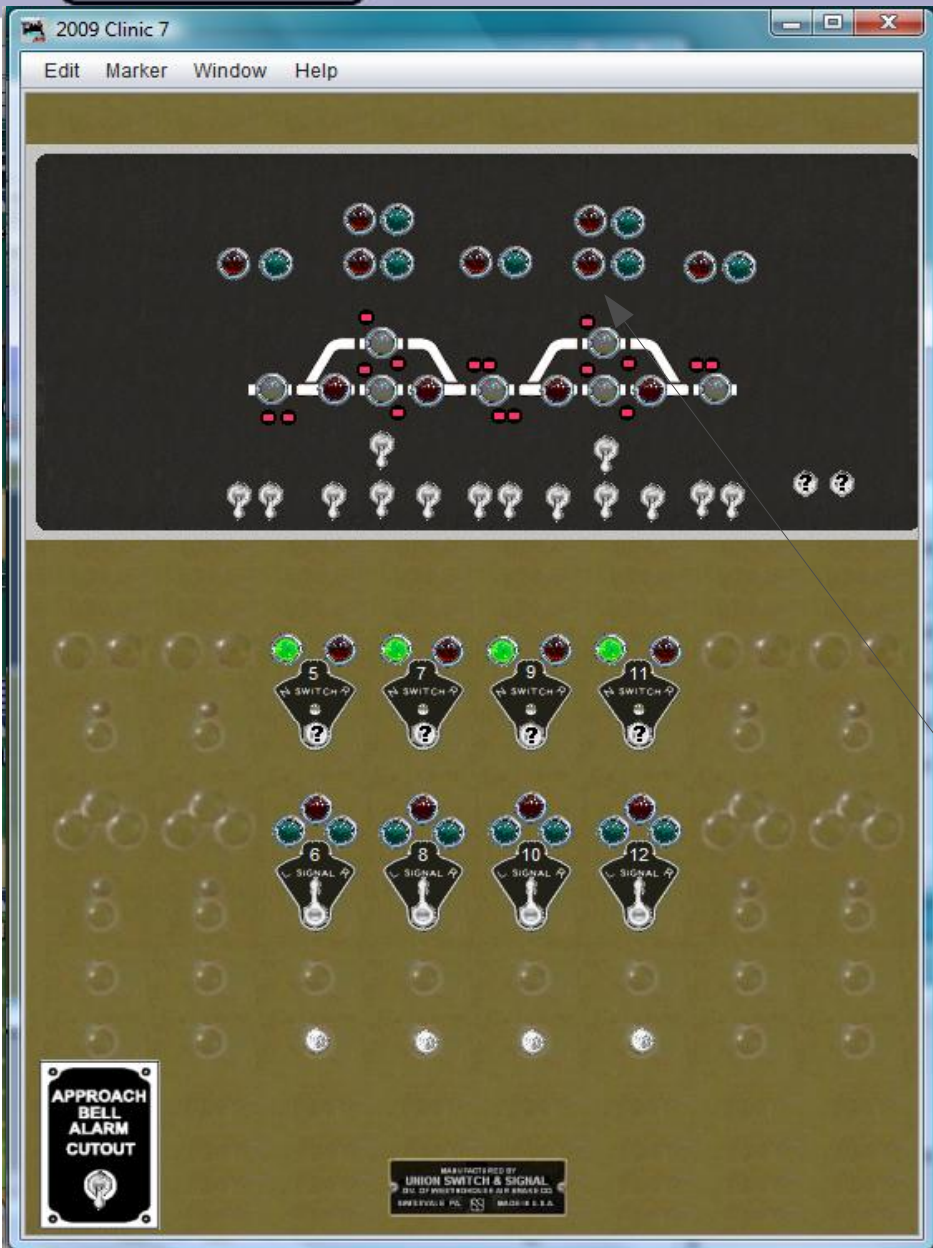


## CTC traffic direction

- 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** left **S**tick indi**K**tor) IS7:BLSK, IS9:LSK, IS11:ALSK, IS11:BLSK, and IS13:LSK.



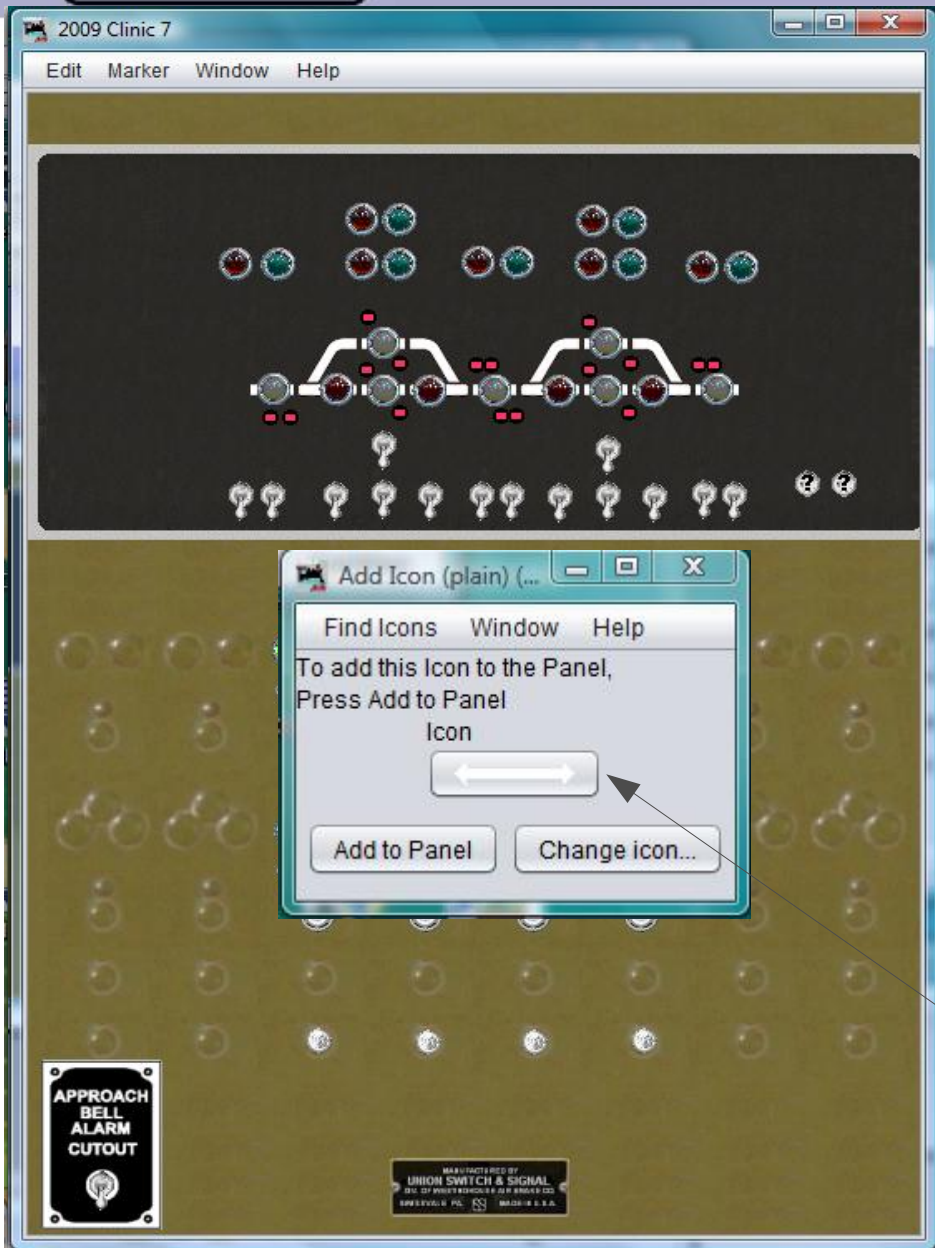




## CTC traffic direction

- 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** left **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** left **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

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- Add IS5:LSK (Plant 5: **L**eft **S**tick indi**K**tor) and add it to the panel.
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- Now add IS7:ALSK (Plant 7: track **A** left **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.





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## 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.



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- This panel is shown in the 'Normal' condition. All switches are set to the mainline.



## Getting Started Lines



## 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)