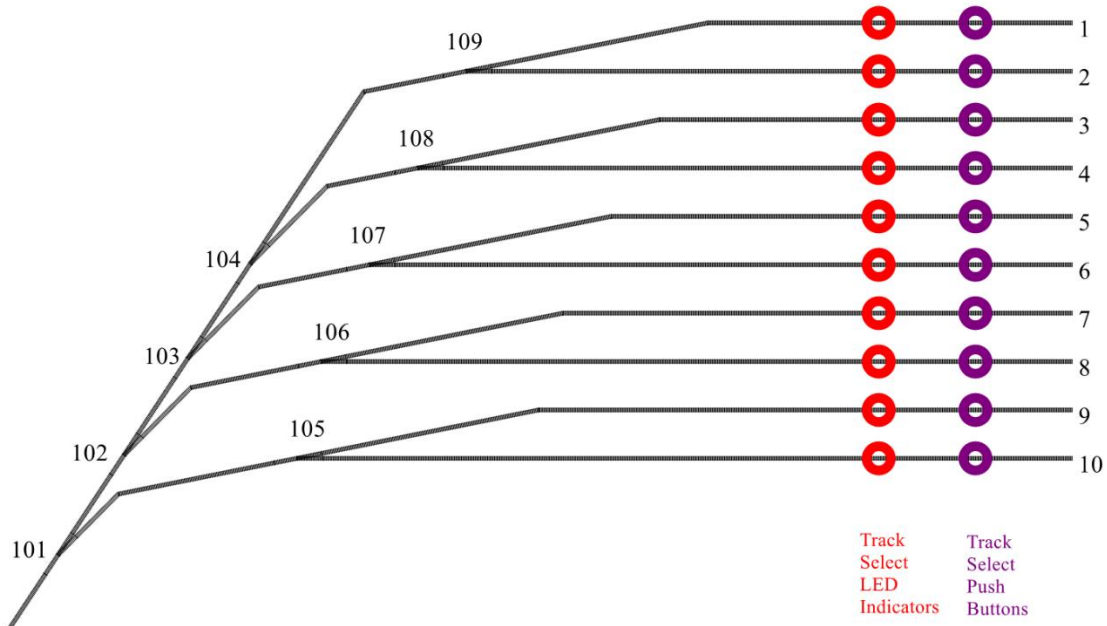# 1   Yard Ladder Alignment Using Cascade

Yard ladder alignment. We have a number of yard tracks accessed via a ladder as shown in the figure below. The yard has 10 body tracks. We wish to fully line the route through the yard ladder to any body track by only issuing one Switch command.

Since the yard has 9 turnouts to control we will use two **QuadLN_S** boards. The Expansion Port option on the first board will be set to **Servos 5-8** so that this board can control 8 servos. The Expansion Port option on the second board will be set to **Signaling** so that we can use a **Signal** board to control the LED indicators, which will be explained later.

The first QuadLN_S controls controls turnouts 101 -108. We set the Servo Start Address to **101** so that the Loconet turnout addresses for the 8 servos will be LT101 – LT108. The second QuadLN_S controls controls turnouts 109 -112, although only 109 is used in this yard ladder. We set the Servo Start Address to **109** so that the Loconet turnout addresses for the 4 servos will be LT109 – LT123.

We are going to select Track 1 by just commanding Switch 109 to the Closed position. We are going to select Track 2 by just commanding Switch 109 to the Thrown position. All other turnouts needed to reach Track 1 or 2 will get commanded to the proper position via Cascade. To get to either Track 1 or Track 2, Switch 104 needs to be in the Closed position. So whenever we send any command to Switch 109, we want Switch 104 to become Closed. To make this happen, set Switch 109 Servo Cascade Trigger to **Closed or Thrown**, Cascade Action to **Closed**, and Cascade Turnout to **104**. Now whenever Switch 109

receives any command, it will send a message to Switch 104 to move to the Closed position.   This is the start of the Cascade.

Repeat the process we used for Track 1 and Track 2 to configure the start of the proper Cascade action for Switch 105, 106, 107 and 108.

With Switches 105 – 109 configured to start the Cascade, we now need to continue the Cascade down the ladder. To reach switch 104, Switch 103 needs to be in the Closed position. So whenever we send any command to Switch 104, we want Switch 103 to become Closed. To make this happen, set Switch 104 Servo Cascade Trigger to **Closed or Thrown**, Cascade Action to **Closed**, and Cascade Turnout to **103**. Now whenever Switch 104 receives any command, it will send a message to Switch 103 to move to the Closed position.

To reach switch 103, Switch 102 needs to be in the Closed position. So whenever we send any command to Switch 103, we want Switch 102 to become Closed. To make this happen, set Switch 103 Servo Cascade Trigger to **Closed or Thrown**, Cascade Action to **Closed**, and Cascade Turnout to **102**. Now whenever Switch 103 receives any command, it will send a message to Switch 102 to move to the Closed position.

To reach switch 102, Switch 101 needs to be in the Closed position. So whenever we send any command to Switch 102, we want Switch 101 to become Closed. To make this happen, set Switch 102 Servo Cascade Trigger to **Closed or Thrown**, Cascade Action to **Closed**, and Cascade Turnout to **101**. Now whenever Switch 102 receives any command, it will send a message to Switch 101 to move to the Closed position.

The Cascade action for Track 1 and Track 2 is now complete. Sending any command to Switch 109 will result in a Closed command to Switch 104. This will result in a Closed command to Switch 103, which will result in a Closed command to Switch 102, which will result in a Closed command to Switch 101. Now to fully line the ladder to Track 1, we just need to set Switch 109 to Closed. To fully line the ladder to Track 2, we just need to set Switch 109 to Thrown. All that remains is to wire the Track 1 and Track 2 selection pushbuttons to IO pins on the first QuadLN and then configure the IO features.

2   Yard Body Track Selection Via Pushbutton

The Cascade is in place so now we need a pushbutton for each body track to start the proper Cascade for that track. Let's use Track 1 as an example. We wire the Track 1 select pushbutton to an IO. We set the INPUT Trigger to **Negative Edge** if we want things to happen when the button is pressed or to **Positive Edge** if we want things to happen when the button is released. Finally we set the Servo 1 ACTION to **Closed**.

There are a few other input options to consider, but that is pretty much it. If we want to select Track 1, pressing the Track 1 pushbutton will command Switch 101 to Closed and the Cascade action will take care of the rest of the ladder.

2.1   Optional Reuse of IO Inputs for Track Selection

Tam Valley Depot Fascia Controllers are being used to display the position of each Switch in the ladder. Each Fascia Controller uses up one **QuadLN_S** IO connection. In this yard there are 9 Switches so that uses up 9 IO. There are 10 Track Select pushbuttons that each require an IO connection as well which seems to bring the total number of required IO connections to 19. It would take a third **QuadLN_S** to bring the number of available IO up high enough to cover this many connections.

It would be very desirable to bring the number of required IO down. Since we have Track Select pushbuttons for every yard track, we don't really need the ability to control the individual Switches directly. We can repurpose the **QuadLN_S** inputs for the pushbuttons on the 9 Fascia Controllers so that they each select a yard track. This means we will only need one additional IO for the 10th yard track Track Select pushbutton, reducing the total number of required IO connections from 19 down to 10.

The following tables show how we will set up the IO. Since two of the Track Select pushbuttons are wired to the second **QuadLN_S**, we use the Secondary Message feature to get these buttons to generated the desired Action.

QuadLN_S 1

Group	Servo	Cascade	IO ACTION	IO Effect
1	101		5 Closed	Track Select 9
2	102	101 Closed	6 Closed	Track Select 7
3	103	102 Closed	7 Closed	Track Select 5
4	104	103 Closed	8 Closed	Track Select 3
5	105	101 Thrown	5 Thrown	Track Select 10
6	106	102 Thrown	6 Thrown	Track Select 8
7	107	103 Thrown	7 Thrown	Track Select 6
8	108	104 Thrown	8 Thrown	Track Select 4

QuadLN_S 2

Group	Servo	Cascade	Main IO ACTION	IO Effect	Aux IO ACTION	IO Effect
1	109	104 Closed	1 Closed	Track Select 1	1 Thrown	Track Select 2
2						
3						
4						

3   Using Signals to Indicate the Selected Body Track

At this point we have a working system in place to select a body track by pressing a single button. But we don't yet have an indicator showing which body track is selected. For the track select indicators we will use Signal board LEDs 1-10. Wire the cathode of each LED to its associated Signal board output pin (pin closest to the number). Wire the anodes of each LEDs to +5V on the signal board (middle pin). The total LED current will be low since only one LED will be lit at a time, so if desired we can connect groups of the LED anodes to +5V using a single wire per group or even connect all the anodes to +5V using a single wire.

To set up the track indicators we first configure the LEDs and then configure Signal Aspects for each of the 10 indications. On **QuadLN_S** 2 we start with the LED 1-12 tab. Not much setup – we just specify that LED 1 through 10 are on the same Head, turn Effects Off, check the Fade checkbox to get a nice lamp-type on and off fade, and set LED Common to Anode.

Next we will define the 10 required signal aspects – one aspect for each track selection. Since we are using Cascade to select the yard track, we will just use the message associated with the start of each Cascade to trigger the Signal Aspect that corresponds to that track. For example, Turnout 109 Closed starts the Cascade for Track 1 so we set the first Aspect to trigger on Turnout 109 Closed and when that happens turn on LED 1 (or whatever LED indicates track 1).   You can have the selected LED on steady or you can even have it Flash, just choose the desired Mode for the LED.

Aspect 1	**Aspect 2**	**Aspect 3**	**Aspect 4**	**Aspect 5**	**Aspect 6**	**Aspect 7**	**Aspect 8**
In Use ✔	In Use ✔	In Use ✔	In Use ✔	In Use ✔	In Use ✔	In Use ✔	In Use ✔
Addr Mode Turnout	Addr Mode Turnout	Addr Mode Turnout	Addr Mode Turnout	Addr Mode Turnout	Addr Mode Turnout	Addr Mode Turnout	Addr Mode Turnout
Addr 109	Addr 109	Addr 108	Addr 108	Addr 107	Addr 107	Addr 106	Addr 106
Group 0	Group 0	Group 0	Group 0	Group 0	Group 0	Group 0	Group 0
Action Closed	Action Thrown	Action Closed	Action Thrown	Action Closed	Action Thrown	Action Closed	Action Thrown
Led A Out 1	Led A Out 2	Led A Out 3	Led A Out 4	Led A Out 5	Led A Out 6	Led A Out 7	Led A Out 8
Mode Steady	Mode Steady	Mode Steady	Mode Steady	Mode Steady	Mode Steady	Mode Steady	Mode Steady
Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐
Led B Out 1	Led B Out 1	Led B Out 7	Led B Out 5	Led B Out 5	Led B Out 4	Led B Out 4	Led B Out 6
Mode None	Mode None	Mode None	Mode None	Mode None	Mode None	Mode None	Mode None
Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐
Led C Out 1	Led C Out 1	Led C Out 1	Led C Out 1	Led C Out 2	Led C Out 16	Led C Out 5	Led C Out 5
Mode None	Mode None	Mode None	Mode None	Mode None	Mode None	Mode None	Mode None
Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐
Led D Out 1	Led D Out 1	Led D Out 5	Led D Out 5	Led D Out 4	Led D Out 2	Led D Out 2	Led D Out 2
Mode None	Mode None	Mode None	Mode None	Mode None	Mode None	Mode None	Mode None
Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐	Bicolor ☐

Tabs: Group 5/8 | Group 6/8 | Group 7/8 | Group 8/8 | Routes | LED 1-12 | LED 13-24 | Aspect 1-8 | Aspect 9-16 | Aspect 17-24 | Aspect 25-32 | Aspect 33-40 | Aspect 41-48

Function Labels | Roster Media | Basic | CVs | Quad-LN_S | Group 1/4 | Group 2/4 | Group 3/4 | Group 4/4 | Group 1/8 | Group 2/8

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| 4/8 | Group 5/8 | Group 6/8 | Group 7/8 | Group 8/8 | Routes | LED 1-12 | LED 13-24 | Aspect 1-8 | Aspect 9-16 | Aspect 1 |

| ster Entry | Function Labels | Roster Media | Basic | CVs | Quad-LN_S | Group 1/4 | Group 2/4 |

Aspect 9

In Use ☑
Addr Mode Turnout ▼
Addr 105
Group 0 ▼
Action Closed ▼

Led A Out 9 ▼
Mode Steady ▼
Bicolor ☐

Led B Out 2 ▼
Mode None ▼
Bicolor ☐

Led C Out 11 ▼
Mode None ▼
Bicolor ☐

Led D Out 2 ▼
Mode None ▼
Bicolor ☐

Aspect 10

In Use ☑
Addr Mode Turnout ▼
Addr 105
Group 0 ▼
Action Thrown ▼

Led A Out 10 ▼
Mode Steady ▼
Bicolor ☐

Led B Out 11 ▼
Mode None ▼
Bicolor ☐

Led C Out 11 ▼
Mode None ▼
Bicolor ☐

Led D Out 11 ▼
Mode None ▼
Bicolor ☐

Aspect 11

In Use ☐
Addr Mode Signal ▼
Addr 404
Aspect ID 31 ▼

Led A Out 6 ▼
Mode None ▼
Bicolor ☐

Led B Out 10 ▼
Mode None ▼
Bicolor ☐

Led C Out 4 ▼
Mode None ▼
Bicolor ☐

Led D Out 9 ▼
Mode None ▼
Bicolor ☐

Aspect 12

In Use ☐
Addr Mode Signal ▼
Addr 404
Aspect ID 0 ▼

Led A Out 10 ▼
Mode Steady ▼
Bicolor ☐

Led B Out 7 ▼
Mode Steady ▼
Bicolor ☐

Led C Out 13 ▼
Mode None ▼
Bicolor ☐

Led D Out 10 ▼
Mode None ▼
Bicolor ☐

Asp

In Use ☐
Addr Mode Sig
Addr 404
Aspect ID 1

Led A Out 8
Mode Stea
Bicolor ☐

Led B Out 7
Mode Stea
Bicolor ☐

Led C Out 11
Mode Non
Bicolor ☐

Led D Out 2
Mode Non
Bicolor ☐

That should be it! Notice that all 10 Aspects are in the same Group, in this case Group 0. There can only be one active Aspect per group, so putting all 10 Aspects in one Group tells Signal logic to turn off the previous LED track select indicator whenever it turns on a new one. If we were to configure additional Aspects on this Signal board for another throat then we would use a different Group number for those Aspects.