## Yard Ladder Alignment Using Cascade and Pushbutton Track Selection

Requirements

Steve Todd has a main track plus a 6 track yard accessed via a ladder as shown in the figure. The yard ladder uses 5 turnouts which will be assigned to Loconet Turnout Addresses 121-125. Steve wants to use a QuadLN_S along with 6 pushbuttons to line the ladder to any track *and* he wants to have LED indicators that show which track is currently lined. Steve also wants the ability to easily select a yard track using JMRI or a throttle.
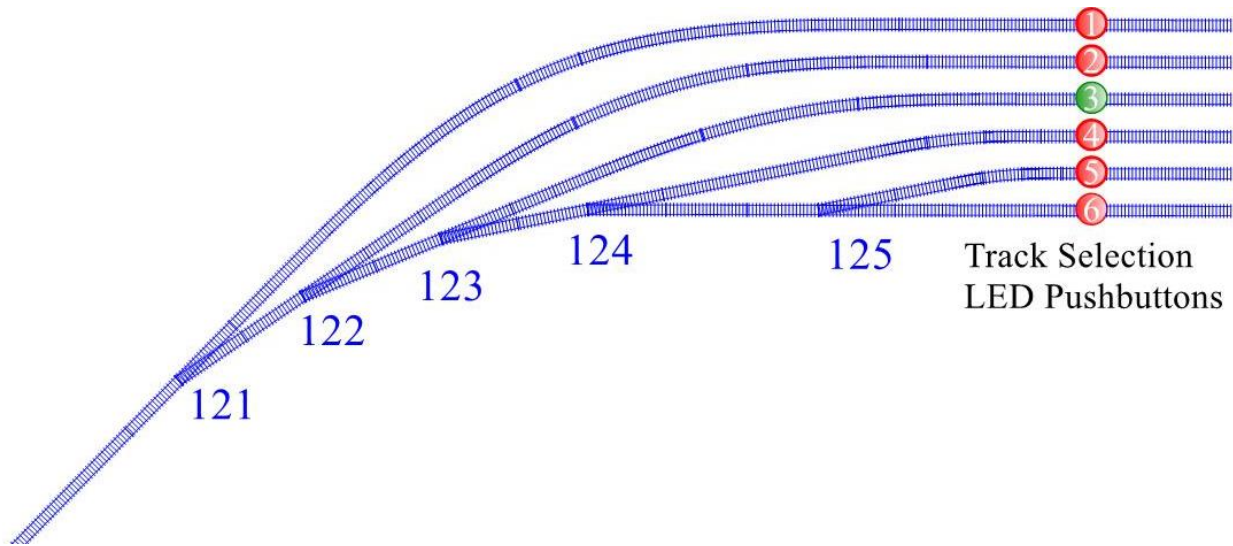
We were able to accomplish Steve's goals using one *QuadLN_S* along with six fascia controllers. Let's walk through the implementation and see how it we did it. After the discussion there are images of the QuadLN_S JMRI decoder template tabs showing the settings.

QuadLN_S Preliminary Configuration

Since the yard has 5 turnouts we set the **QuadLN_S** board to 8 Turnout Mode. To do that we set the EXPANSION PORT option to **Turnout**. We set the Turnout Start Address to **121** so that the Loconet Addresses for the board will be LT121 – LT128. Turnouts 121-124 are wired to pins 1-4 on the SERVO Port and Turnout 105 is wired to pin 1 on the EXP Port. These turnouts are in Group 1-5 of the QuadLN_S decoder template in JMRI.

The fascia controllers providing the track selection pushbuttons and LED track selection indicators are wired to AUX IO 1-4 and MAIN IO 1-2. These IO pins are in Groups 1-6.

Instead of showing turnout position, we want each fascia controller LED to show when its associated yard track is selected. Normally the LED indicates the Group's turnout position, but there is an LED

MODE option for the QuadLN_S MAIN IO and AUX IO to display the Lock State instead. Since Steve isn't using the turnout locking feature, we will put the QuadLN_S Lock Turnouts to work as track selection indicators instead. Once we get the QuadLN_S configured to make that happen, the LEDs will indicate the selected track plus we will be able to use the Lock Turnout Addresses to trigger track selection. We'll go through the details shortly, but for now let's just set the Lock Start Address to 1121, so Lock Turnout Addresses 1121-1126 are in Groups 1-6, just like the pushbutton inputs / LED track selection indicator outputs.

Yard Ladder Alignment Using Cascade

Examining the track diagram above we can see that whether Turnout 125 is Closed or Thrown, any route out of the yard through Turnout 125 requires Turnout 124 to be Thrown. So in Group 5 we set the CASCADE option for Turnout 125 to set Turnout 124 to Thrown whenever Turnout 125 is commanded to be either Closed or Thrown. Now Turnout 124 will be automatically lined towards Turnout 125 anytime a command is sent to Turnout 125.

In a similar fashion we see that whether Turnout 124 is Closed or Thrown, any route out of the yard through Turnout 124 requires Turnout 123 to be Thrown. So in Group 4 we set the CASCADE option for Turnout 124 to set Turnout 123 to Thrown whenever Turnout 123 is commanded to be Closed or Thrown.

We continue the same process for Turnouts 123 and Turnouts 122. Now when any turnout in the ladder is lined it will automatically line the next turnout towards the Main. The next turnout will then automatically line the one after that, and so on, "cascading" all the way down the ladder. With the CASCADE options configured, all we need to do to select a yard track is line the turnout that directly connects to that track. The CASCADE will line all the remaining turnouts in the ladder automatically.

To select Track 1 we just need to command Switch 121 to the Closed position, so no Cascade is needed for this track.

With Cascade in place, here are the single turnout commands that select each track:
LT121 Closed selects Track 1
LT122 Closed selects Track 2
LT123 Closed selects Track 3
LT124 Closed selects Track 4
LT125 Thrown selects Track 5
LT125 Closed selects Track 6

Yard Body Track Selection Using Lock Turnouts

We are going to use Lock Turnouts LT1121-1126 to both **indicate** which track is selected and to **select** the desired yard track. Let's deal with the indication first. When track 1 is selected we want LT1121 to be Thrown so that the corresponding track indicator LED is GREEN. We also want LT1122-1126 to be Closed so that all the remaining track indicator LEDS are RED. Similar when other tracks are selected – we want the corresponding Lock Turnout to be Thrown and the remaining Lock Turnouts to be Closed.

Here is the desired pushbutton action table:
Pushbutton 1 sets LT1121 Thrown
Pushbutton 1 sets LT1122 Thrown
Pushbutton 1 sets LT1123 Thrown
Pushbutton 1 sets LT1124 Thrown
Pushbutton 1 sets LT1125 Thrown
Pushbutton 1 sets LT1126 Thrown

It turns out that LED indication of the selected track is going to be easy since the QuadLN_S Input Actions include options that directly control the Lock Turnouts. To get the track 1 pushbutton to set LED 1121 to Thrown we just go to Group 1 and set the ACTION for Turnout 1 to Lock Thrown. For the track 2 pushbutton we go to Group 2 and set the ACTION for Turnout 2 to Lock Thrown. We continue this for Groups 3-6.

Next we need to trigger the yard ladder alignment of the desired track when the corresponding Lock Turnout is Thrown. For that we need the following actions to happen:
LT1121 Thrown sets LT121 Closed
LT1122 Thrown sets LT122 Closed
LT1123 Thrown sets LT123 Closed
LT1124 Thrown sets LT124 Closed
LT1125 Thrown sets LT125 Thrown
LT1126 Thrown sets LT125 Closed

To set up these relationships we use the built-in Routes. The first Route will be triggered by LT1121 Thrown and will set LT121 Closed. The next Route will be triggered by LT1122 Thrown and will set LT122 Closed. We continue like this for 4 more routes, building the connections between Lock Turnout track selection and yard ladder alignment.

Once the six Routes are in place, pressing a track selection button will Throw the corresponding Lock Turnout and that in turn will set the physical Turnout that lines the desired track by triggering one of the six Routes. You might also notice that setting any of the Lock Turnouts to Thrown via LocoNet will also line the yard ladder to the desired track. We are almost done!

One last detail remains. When one of the Lock Turnouts is Thrown, how do we get all the remaining Lock Turnouts to Closed so that only the indicator for the selected track is GREEN and the rest are RED? For that we use a special type of built-in Route called a "Selector" which was designed just for this purpose. When one of the devices in a Selector Route is set to the state that *matches* its entry in the Route, all the other devices in the Selector Route are set to the *opposite* state from their entry in the Route. Here are the entries for the Selector Route:

LT1121 Thrown

LT1122 Thrown

LT1123 Thrown

LT1124 Thrown

LT1125 Thrown

LT1126 Thrown

Each QuadLN_S route has only 4 entries, but we need 6 entries for this Selector Route. We can use the "Expand Route" feature to combine one Route with the next Route and create a single 8 entry Route that can handle all of the entries in the Selector Route.

Set any of the turnouts in the Selector Route to Thrown and the QuadLN_S will set all the other turnouts in the Route to Closed. Now when a track is selected and its selection indicator Lock Turnout is Thrown, all the other selection indicator Lock Turnouts will get set to Closed. That means the selected track indicator will be GREEN and all the others will be RED. You can see the result in this layout photo.

And with that the last piece of the puzzle is in place.

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Full QuadLN_S Configuration

QuadLN_S tab

EXPANSION PORT

Mode
- ○ Relay
- ○ Signaling
- ⦿ Turnout

Board Address: 11121

Turnout Start Address: 121
Lock Start Address: 1121
Main IO Start Address: 125
Aux IO Start Address: 121

MAIN and AUX IO PORTS

Mode
- ⦿ Both IO
- ○ Main IO, Aux Turnout
- ○ Both Turnout

Group1 tab

Roster Entry | Function Labels | Roster Media | CVs | Quad-LN_S | Group 1/4 | Group 2/4 | Group 3/4 | Group 4/4 | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6

SERVO 1 TURNOUT

Address LT: 121
Lock LT: 1121

DRIVE
Type: Servo
Turn Off: Off When Stopped

TRAVEL
Closed Position: 2396
Thrown Position: 1000
Speed Or Jump: Use Speed Setting
Speed: 6
Directional Speed: Disabled

LOCK
Mode: None

MESSAGE
Output Msg: Exact feedback (sim)

CASCADE
Trigger: None
Action: Closed
Number: 1

AUX IO 1

Address LS: 121

INPUT
Type: General
Trigger: Negative Edge
DCC Freeze: Always live

TURNOUT 1 INDICATION
LED Mode: Lock State
LED Drive: Inverted

SECONDARY MESSAGE
Type: Send this message
Device: Turnout
Condition: None
Number: 1

ACTION
Turnout 1: Lock Thrown
Turnout 2: None
Turnout 3: None
Turnout 4: None
Turnout 5: None
Turnout 6: None
Turnout 7: None
Turnout 8: None

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Group2 tab

| Roster Entry | Function Labels | Roster Media | CVs | Quad-LN_S | Group 1/4 | Group 2/4 | Group 3/4 | Group 4/4 | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 |

SERVO 2 TURNOUT

Address LT `122`
Lock LT `1122`

DRIVE
Type `Servo`
Turn Off `Off When Stopped`

TRAVEL
Closed Position `1008`
Thrown Position `208`
Speed Or Jump `Use Speed Setting`
Speed `6`
Directional Speed `Disabled`

LOCK
Mode `None`

MESSAGE
Output Msg `Exact feedback (sim)`

CASCADE
Trigger `Closed or Thrown`
Action `Thrown`
Number `121`

AUX IO 2

Address LS `122`

INPUT
Type `General`
Trigger `Negative Edge`
DCC Freeze `Always live`

TURNOUT 2 INDICATION
LED Mode `Lock State`
LED Drive `Inverted`

SECONDARY MESSAGE
Type `Send this message`
Device `Turnout`
Condition `None`
Number `1`

ACTION
Turnout 1 `None`
Turnout 2 `Lock Thrown`
Turnout 3 `None`
Turnout 4 `None`
Turnout 5 `None`
Turnout 6 `None`
Turnout 7 `None`
Turnout 8 `None`

Group3 tab

| Roster Entry | Function Labels | Roster Media | CVs | Quad-LN_S | Group 1/4 | Group 2/4 | Group 3/4 | Group 4/4 | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 |

SERVO 3 TURNOUT

Address LT `123`
Lock LT `1123`

DRIVE
Type `Servo`
Turn Off `Off When Stopped`

TRAVEL
Closed Position `1616`
Thrown Position `104`
Speed Or Jump `Use Speed Setting`
Speed `6`
Directional Speed `Disabled`

LOCK
Mode `None`

MESSAGE
Output Msg `Exact feedback (sim)`

CASCADE
Trigger `Closed or Thrown`
Action `Thrown`
Number `122`

AUX IO 3

Address LS `123`

INPUT
Type `General`
Trigger `Negative Edge`
DCC Freeze `Always live`

TURNOUT 3 INDICATION
LED Mode `Lock State`
LED Drive `Inverted`

SECONDARY MESSAGE
Type `Send this message`
Device `Turnout`
Condition `None`
Number `1`

ACTION
Turnout 1 `None`
Turnout 2 `None`
Turnout 3 `Lock Thrown`
Turnout 4 `None`
Turnout 5 `None`
Turnout 6 `None`
Turnout 7 `None`
Turnout 8 `None`

Group4 tab

SERVO 4 TURNOUT

Address LT `124`
Lock LT `1124`

DRIVE
Type `Servo`
Turn Off `Off When Stopped`

TRAVEL
Closed Position `1856`
Thrown Position `912`
Speed Or Jump `Use Speed Setting`
Speed `6`
Directional Speed `Disabled`

LOCK
Mode `None`

MESSAGE
Output Msg `Exact feedback (sim)`

CASCADE
Trigger `Closed or Thrown`
Action `Thrown`
Number `123`

AUX IO 4

Address LS `124`

INPUT
Type `General`
Trigger `Negative Edge`
DCC Freeze `Always live`

TURNOUT 4 INDICATION
LED Mode `Lock State`
LED Drive `Inverted`

SECONDARY MESSAGE
Type `Send this message`
Device `Turnout`
Condition `None`
Number `1`

ACTION
Turnout 1 `None`
Turnout 2 `None`
Turnout 3 `None`
Turnout 4 `Lock Thrown`
Turnout 5 `None`
Turnout 6 `None`
Turnout 7 `None`
Turnout 8 `None`

Group5 tab

EXP 1 TURNOUT

Address LT `125`
Lock LT `1125`

DRIVE
Type `Servo`
Turn Off `Off When Stopped`

TRAVEL
Closed Position `1104`
Thrown Position `248`
Speed Or Jump `Use Speed Setting`
Speed `6`
Directional Speed `Disabled`

LOCK
Mode `None`

MESSAGE
Output Msg `Exact feedback (sim)`

CASCADE
Trigger `Closed or Thrown`
Action `Thrown`
Number `124`

MAIN IO 1

Address LS `125`

INPUT
Type `General`
Trigger `Negative Edge`
DCC Freeze `Always live`

TURNOUT 5 INDICATION
LED Mode `Lock State`
LED Drive `Inverted`

SECONDARY MESSAGE
Type `Send this message`
Device `Turnout`
Condition `None`
Number `1`

ACTION
Turnout 1 `None`
Turnout 2 `None`
Turnout 3 `None`
Turnout 4 `None`
Turnout 5 `Lock Thrown`
Turnout 6 `None`
Turnout 7 `None`
Turnout 8 `None`

Group6 tab

Roster Entry | Function Labels | Roster Media | CVs | Quad-LN_S | Group 1/4 | Group 2/4 | Group 3/4 | Group 4/4 | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6

EXP 2 TURNOUT

Address LT `126`
Lock LT `1126`

DRIVE
Type `Servo`
Turn Off `Off When Stopped`

TRAVEL
Closed Position `2376`
Thrown Position `128`
Speed Or Jump `Use Speed Setting`
Speed `6`
Directional Speed `Disabled`

LOCK
Mode `None`

MESSAGE
Output Msg `Exact feedback (sim)`

CASCADE
Trigger `Closed or Thrown`
Action `Follow`
Number `1127`

MAIN IO 2

Address LS `126`

INPUT
Type `General`
Trigger `Negative Edge`
DCC Freeze `Always live`

TURNOUT 6 INDICATION
LED Mode `Lock State`
LED Drive `Inverted`

SECONDARY MESSAGE
Type `Send this message`
Device `Turnout`
Condition `None`
Number `1`

ACTION
Turnout 1 `None`
Turnout 2 `None`
Turnout 3 `None`
Turnout 4 `None`
Turnout 5 `None`
Turnout 6 `Lock Thrown`
Turnout 7 `None`
Turnout 8 `None`

Route tab

Group 10 | Group 11 | Group 12 | Group 13 | Group 14 | Group 15 | Group 16 | 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

ROUTE 1
Type `Selector`
`1121` `Thrown`
`1122` `Thrown`
`1123` `Thrown`
`1124` `Thrown`

ROUTE 2
Type `Expand Route1`
`1125` `Thrown`
`1126` `Thrown`
`1` `None`
`1` `None`

ROUTE 3
Type `Normal Route`
`1121` `Thrown`
`121` `Closed`
`1` `None`
`1` `None`

ROUTE 4
Type `Normal Route`
`1122` `Thrown`
`122` `Closed`
`1` `None`
`1` `None`

ROUTE 5
Type `Normal Route`
`1123` `Thrown`
`123` `Closed`
`1` `None`
`1` `None`

ROUTE 6
Type `Normal Route`
`1124` `Thrown`
`124` `Closed`
`1` `None`
`1` `None`

ROUTE 7
Type `Normal Route`
`1125` `Thrown`
`125` `Closed`
`1` `None`
`1` `None`

ROUTE 8
Type `Normal Route`
`1126` `Thrown`
`125` `Thrown`
`1` `None`
`1` `None`