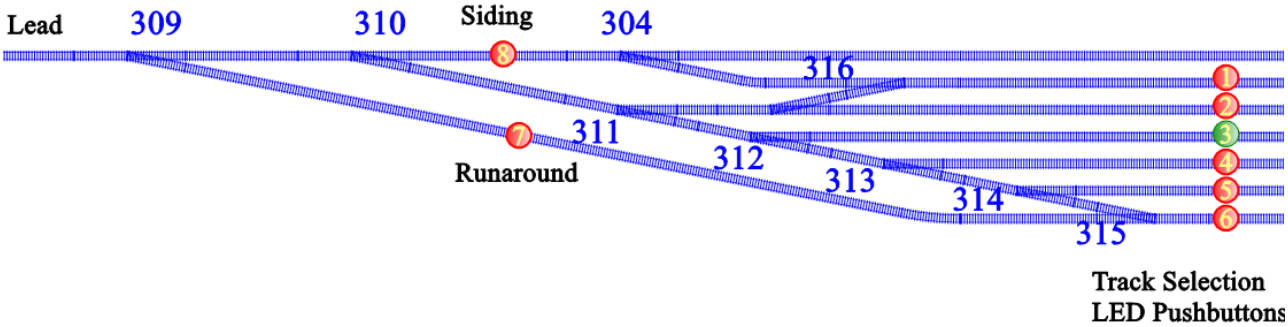
Yard Ladder Alignment Using Cascade and Pushbutton Track Selection

Contents

1 Requirements



Mark Nolan has a 6 track yard accessed via a ladder as shown in the figure (other tracks and turnouts in the area have been omitted for clarity). The yard ladder turnouts plus runaround track require 7 turnouts assigned to the Loconet Turnout Addresses shown. There is also a crossover between yard Tracks 1 and 2 using Turnout 316. Mark wants to use 8 pushbuttons to line the ladder to a specific body track, the Runaround track, or the Siding, plus he wants to have LED indicators that show which track is currently lined.

Crossover 316 is to be lined to cross when Track 1 is selected, and lined straight when Track 2 is selected or Siding turnout 304 is Thrown. Turnout 315 is to be Thrown when Track 6 is selected and Closed when the Runaround track is selected.

We were able to accomplish Mark's goals using one *QuadLN_S* along with eight LED pushbuttons plus mini DIY Fascia Controllers. Let's walk through the implementation and see how we did it.

2 QuadLN_S Preliminary Configuration

Turnout Group	Turnout pin	Turnout Addr	Lock Addr	Fascia Controller	
				pin	Track Select
1	SERVO 1	309	1309	AUX 1	1
2	SERVO 2	310	1310	AUX 2	2
3	SERVO 3	311	1311	AUX 3	3
4	SERVO 4	312	1312	AUX 4	4
5	EXP 1	313	1313	MAIN 1	Siding
6	EXP 2	314	1314	MAIN 2	Runaround
7	EXP 3	315	1315	MAIN 3	5
8	EXP 4	316	1316	MAIN 4	6

Table 1 Loconet Address and IO Pin Assignments

General *QuadLN_S* configuration settings are done on the QuadLN_S tab of the JMRI roster entry. We set the EXPANSION PORT option to **Turnout** to configure the *QuadLN_S* for 8 turnout outputs and 8 fascia controllers. This assigns turnouts 1-4 to the SERVO Port with associated fascia controllers on the AUX Port, and turnouts 5-8 to the EXP Port with associated fascia controllers on the MAIN Port.

Next we assign unique Loconet turnout addresses to this *QuadLN_S*. Address 309-316 are free, so we set the SERVO Turnout Start Address to **309** and the EXP Turnout Start Address to **313**. We also set the SERVO Lock Start Address to **1309** and the EXP Lock Start Address to **1313**.

3 Lock Turnouts

The *QuadLN_S* Lock Turnouts are versatile internal turnouts that pair with each physical turnout. Locks can be used for local control lockout, servo midpoint (with semaphores and 3-way stubs), or oscillation for special effect animations. Since Mark doesn't require those features for the yard track turnouts, the Lock Turnouts are available for other uses. We will configure the *QuadLN_S* to associate each of the 8 Lock Turnouts with one of the 8 selectable yard turnout alignments. Whenever a track alignment is set, the *QuadLN_S* will be configured to set the associated Lock Turnout to Thrown and set all the other Lock Turnouts to Closed.

With the Lock Turnouts function defined, we need a way to display their states. Normally fascia controller LEDs indicate the associated physical turnout position. Here we want each fascia controller LED to show whether or not its associated yard track is selected. There is an LED MODE option for the *QuadLN_S* MAIN IO and AUX IO to display the Lock State instead of the turnout position. That is what we need. Once we get the QuadLN_S Locks working as described above, the LEDs will indicate the selected track.

4 Yard Ladder Alignment and Track Selection

When a Fascia Controller pushbutton is pressed, the *QuadLN*_S can take an action on each of the 8 turnouts. We will take advantage of the capability to get all needed turnouts aligned for a desired track.

Turnout / Group	Track Select	Cascade	ACTIONS 1 LT309	2 LT310	3 LT311	4 LT312	5 LT313	6 LT314	7 LT315	8 LT316	Sec Msg - Trig
1	1		Lock Thrown		Thrown					Thrown	1321 Thrown
2	2	Both 309 Closed		Lock Thrown	Thrown					Closed	1322 Thrown
3	3	Both 310 Thrown			Lock Thrown	Thrown					1323 Thrown
4	4	Both 311 Closed				Lock Thrown	Thrown				1324 Thrown
5	Siding	Both 312 Closed		Closed			Lock Thrown				1325 Thrown
6	Run-around	Both 313 Closed	Thrown					Lock Thrown	Closed		1326 Thrown
7	5	Thrown 314 Closed						Thrown	Lock Thrown		1327 Thrown
8	6								Thrown	Lock Thrown	1328 Thrown

Table 2 Cascade, Action and Secondary Message Settings

Several things need to happen when a yard track pushbutton is pressed.

- Line all turnouts from the selected track out to the Lead
- Set the associated Lock Turnout to Thrown
- Set all the other Lock Turnouts to Closed
- Handle any special cases

4.1 Lining All Turnouts from the Selected Track Out to the Lead

Let's break this step into 2 parts: lining the selected track to the yard throat and then lining the yard throat turnouts from there out to Lead.

4.1.1 Lining Turnouts to the Yard Throat

The first part is straightforward. We set the proper ACTIONS to align any turnouts required to connect the selected yard track to the yard throat. Only lining one turnout is required to reach the throat for Tracks 3-6, while Tracks 1 and 2 must line 2 turnouts due to the crossover.

Let's take Track 1 as an example. To line Track 1 to the yard throat we need 311 Thrown and 316 Thrown, and we want this to happen when the Track 1 Select pushbutton is pressed. Checking

Turnout Group	Turnout pin	Turnout Addr	Lock Addr	Fascia Controller

				pin	Track Select
1	SERVO 1	309	1309	AUX 1	1
2	SERVO 2	310	1310	AUX 2	2
3	SERVO 3	311	1311	AUX 3	3
4	SERVO 4	312	1312	AUX 4	4
5	EXP 1	313	1313	MAIN 1	Siding
6	EXP 2	314	1314	MAIN 2	Runaround
7	EXP 3	315	1315	MAIN 3	5
8	EXP 4	316	1316	MAIN 4	6

Table 1 we see that the Track 1 Select pushbutton is connected to AUX 1 which is part of Group 1. So on the Group 1 tab we set ACTIONS for Turnout 3 (LT311) Thrown and for Turnout 8 (LT316) Thrown.

4.1.2 Lining the Yard Throat Turnouts - Cascade

To line the yard throat turnouts between the selected track and the Lead, we use a feature called "Cascade". Let's say a command is sent to one turnout. The Cascade setting for that turnout can then automatically send a command to a second turnout. If the second turnout has a Cascade setting it can then send a command to a third turnout, and so on. The initial command to one turnout is said to "Cascade" down through the other turnouts.

Let's look at an example using Mark's yard ladder. Turnout 311 is in the path to the Lead from all body tracks. Anytime we are going to pass through Turnout 311, whether it is Thrown (tracks 1-2) or Closed (tracks 3-6), the next turnout we reach is 310 and that turnout needs to be Thrown. So we configure the Cascade for 311 to trigger whenever it is set to Closed or Thrown, and the action it takes is to set 310 to Thrown. Now setting turnout 311 to any state will result in the next turnout towards the lead (310) getting lined.

Next look at Turnout 310. Anytime we are going to pass through Turnout 310 heading towards the Lead, whether 310 is Thrown (tracks 1-6) or Closed (Siding), the next turnout we reach is 309 and that turnout needs to be Thrown. So we configure the Cascade for 310 to trigger whenever it is set to Closed or Thrown, and the action it takes is to set 309 to Closed. Now setting turnout 310 to any state will result in the next turnout towards the lead (309) getting lined.

Now let's put the two parts together. If we select Track 1, Turnouts 316 and 311 get lined via Group 1 Turnout Actions. Lining 311 triggers the Turnout 311 Cascade which lines Turnout 310. This in turn triggers the Turnout 310 Cascade, which lines Turnout 309 and we are lined all the way out to the Lead!

Unlike the other yard throat turnout Cascades, we set the Cascade for Turnout LT315 to trigger only when it is Thrown. We want the Cascade down the yard throat when Track 6 is selected (LT315 Thrown). We don't want the Cascade when the Runaround is selected (LT315 Closed) since that move does not involve the rest of the yard throat. Instead, for the Runaround we just use a ACTION to set LT309 to Thrown.

4.2 Set Associated Lock Turnout to Thrown

Setting the appropriate Lock Turnout to Thrown is easy since the ACTION choices include the ability to directly access the associated Lock Turnout. For each Group we configure an ACTION to set its Lock Turnout to Thrown. For Group 1 we set the ACTION for Turnout 1 to Lock Thrown. For Group 2 we set the ACTION for Turnout 2 to Lock Thrown. We continue this for Groups 3-8.

4.3 Set all the other Lock Turnouts to Closed

Route 1	Route 2
Selector	Extend Route 1
1309 Thrown	1313 Thrown
1310 Thrown	1314 Thrown
1311 Thrown	1315 Thrown
1312 Thrown	1316 Thrown

Table 3 Selector Route

Now that the Lock Turnout for the selected track is Thrown, we need to set all the other 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 is provided 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 of their entry in the Route.

We create a Selector Route that includes all the Lock Turnouts: LT1309 Thrown, LT1310 Thrown. LT1311 Thrown, LT1312 Thrown, LT1313 Thrown, LT1314 Thrown, LT1315 Thrown and LT1316 Thrown. When any turnout in the Selector Route is Thrown, the Route sets all the others to Closed. This is exactly what we need.
One detail - each *QuadLN_S* Route has only room for 4 entries, but we need 8 entries for this Selector Route. No problem, we 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.

4.4 Handle Any Special Cases

Route 3
Normal
304
Thrown
316
Closed
1309
Closed

Table 4 Siding Access to Track 1

Yard Track 1 is accessible from the Siding via LT304. LT304 is controlled from it's own Fascia Controller. When LT304 is Thrown, crossover LT316 must be lined straight. Since LT304 is connected to a different

QuadLN_S than LT316, we cannot just use an ACTION to accomplish this. It is still easy to do though by using a Normal Route that triggers on LT304 Thrown and sets LT316 Closed.

We are almost done, but not quite. We need to inspect how Siding access to Track 1 impacts the yard ladder Track Selection. Suppose the most recent track accessed via the yard ladder was Track 1. That means Lock LT1309 is Thrown and the Track 1 LED is active. Once LT304 is Thrown and the crossover is lined straight, Track 1 cannot be accessed via the yard ladder. So anytime Track 1 is accessed from the Siding, we need to ensure that the ladder Selection for Track 1 is clear. To accomplish that we add an entry to the Route to set LT1309 Closed.

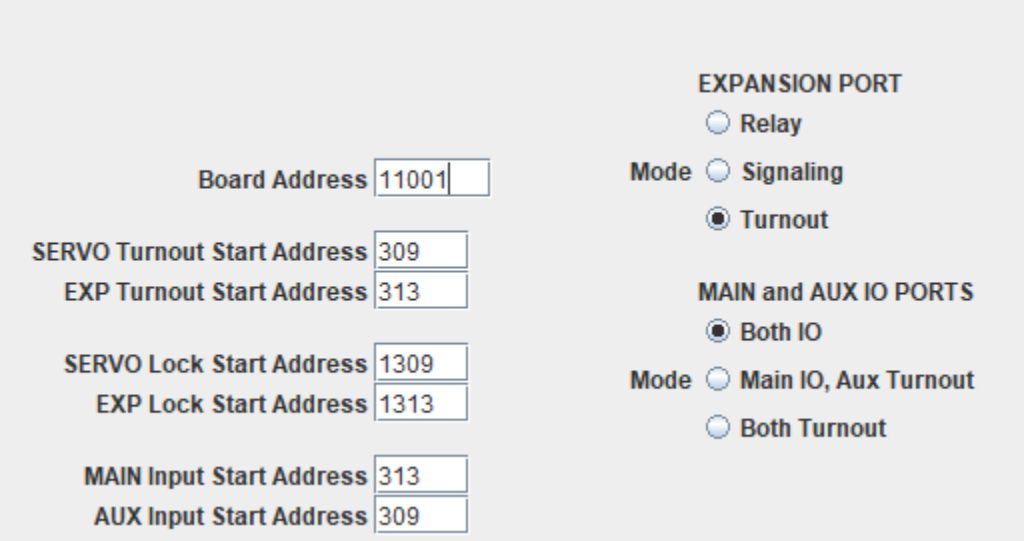
And with that the selection logic is complete.

5 Remote Track Selection (optional)

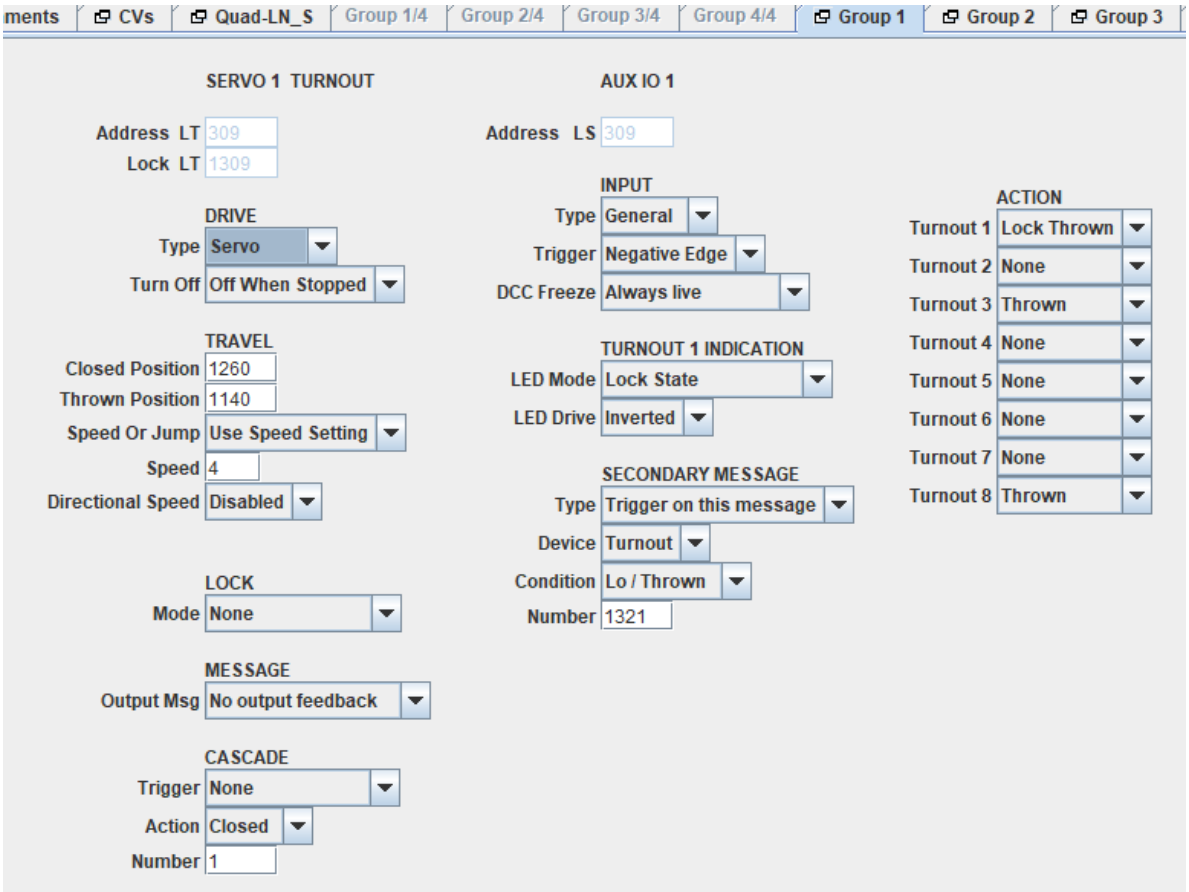
While not one of Mark's requirements, it is easy to add the ability to remotely select a yard track using a throttle or from JMRI. Each Group has a Secondary Message capability. This feature can either send an additional Loconet message when the pushbutton is pressed, or it can mimic a pushbutton press when a specific Loconet Turnout or Sensor message is received. We are going to use the latter capability and remotely trigger each group on a specific Loconet Turnout Thrown command. For this example we chose turnouts LT1321-1326 to select Tracks 1-6, LT1327 to select the Runaround and LT1328 to select the Siding.

6 Full QuadLN_S Configuration

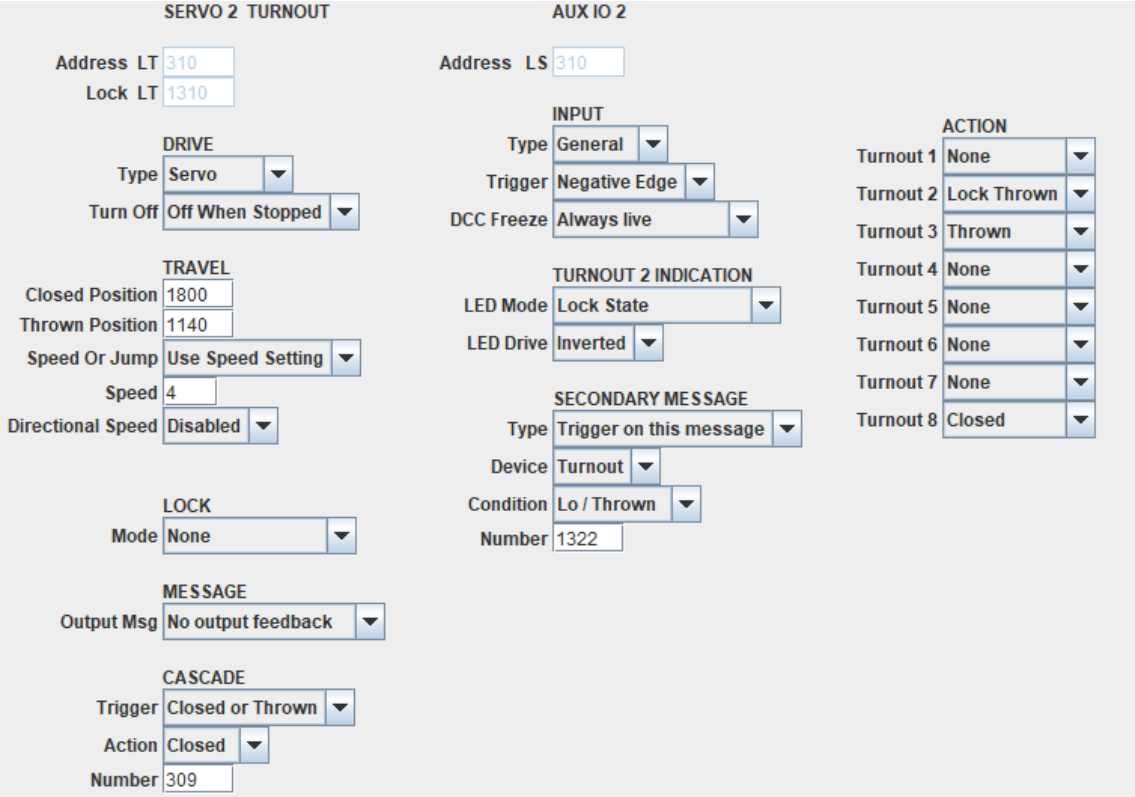
QuadLN_S tab



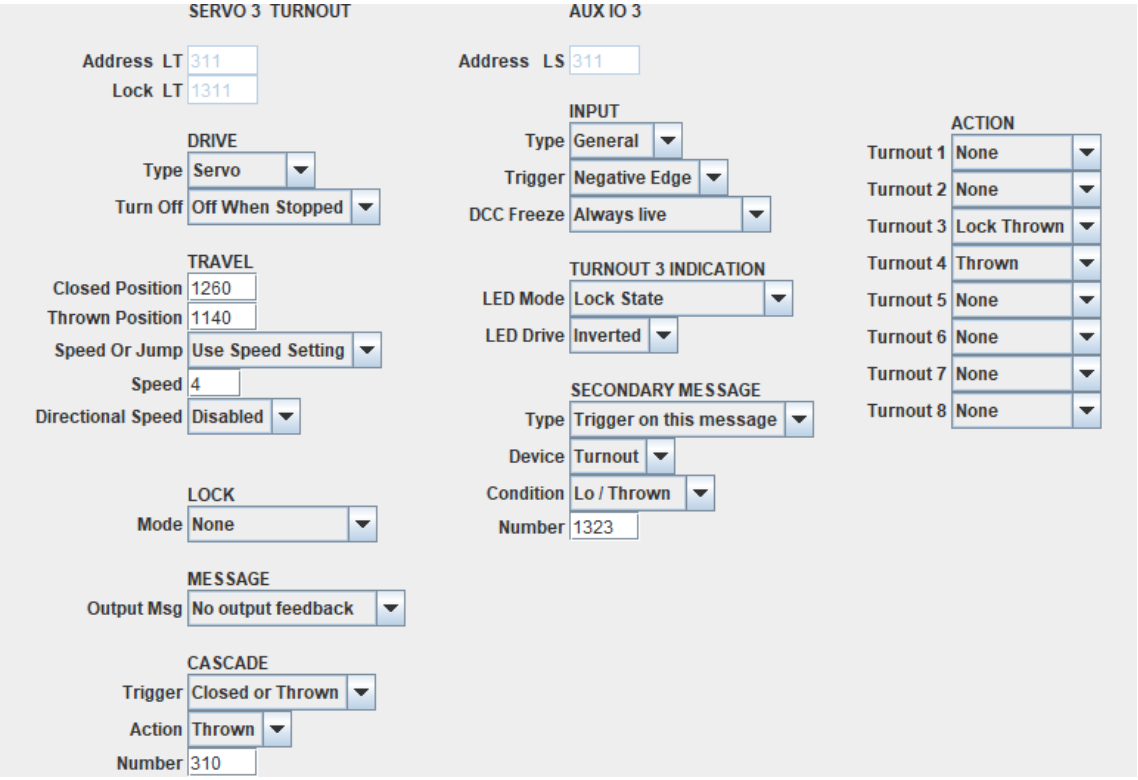
Group 1 tab



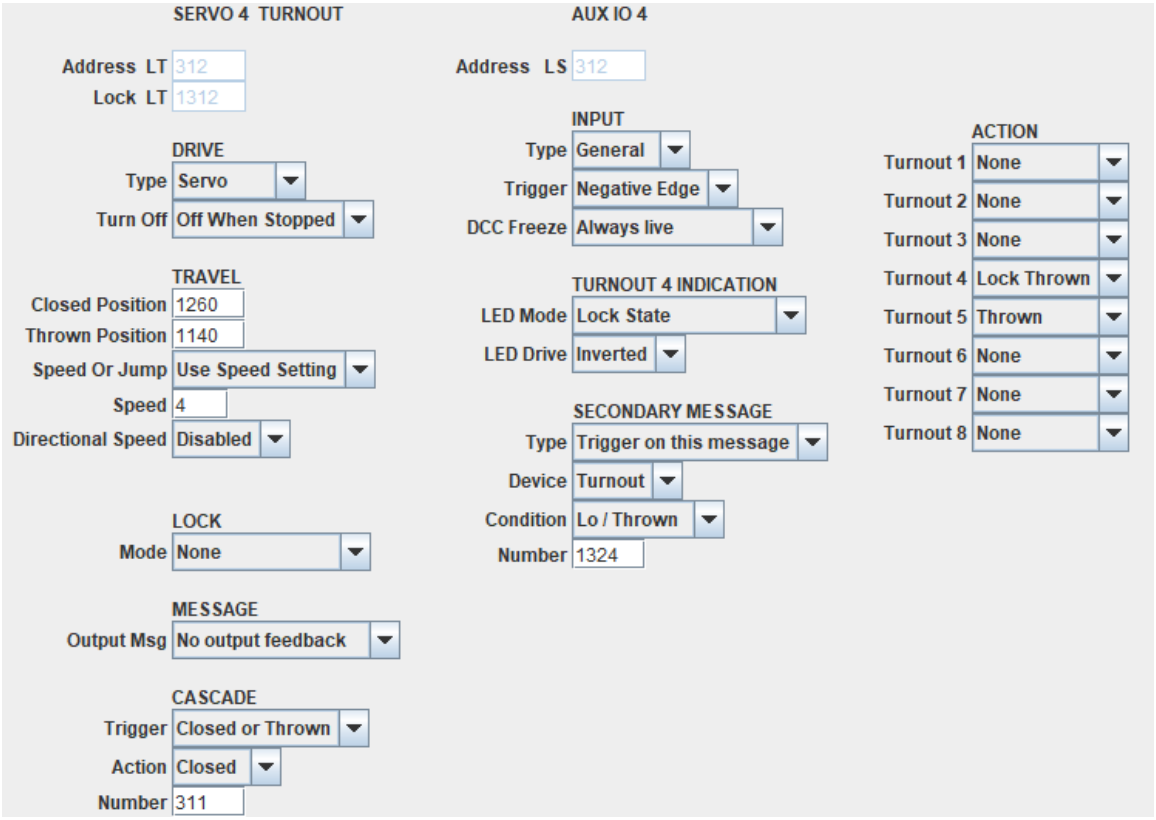
Group 2 tab



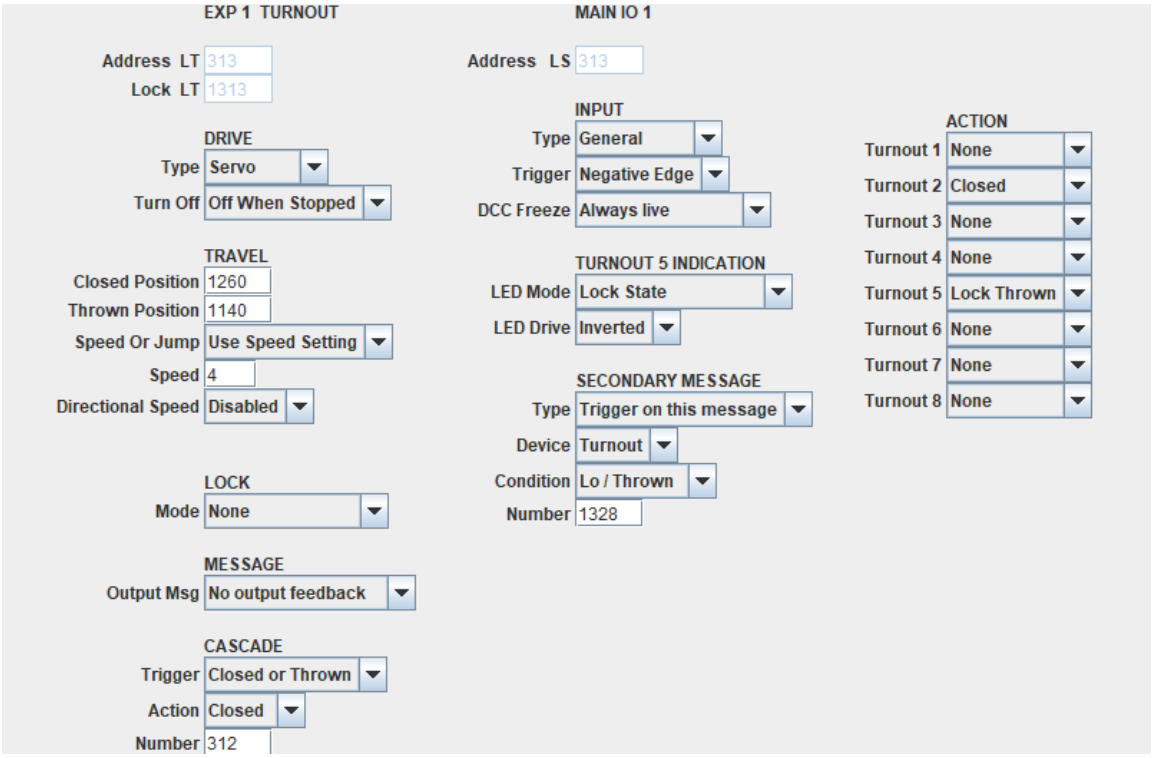
Group 3 tab



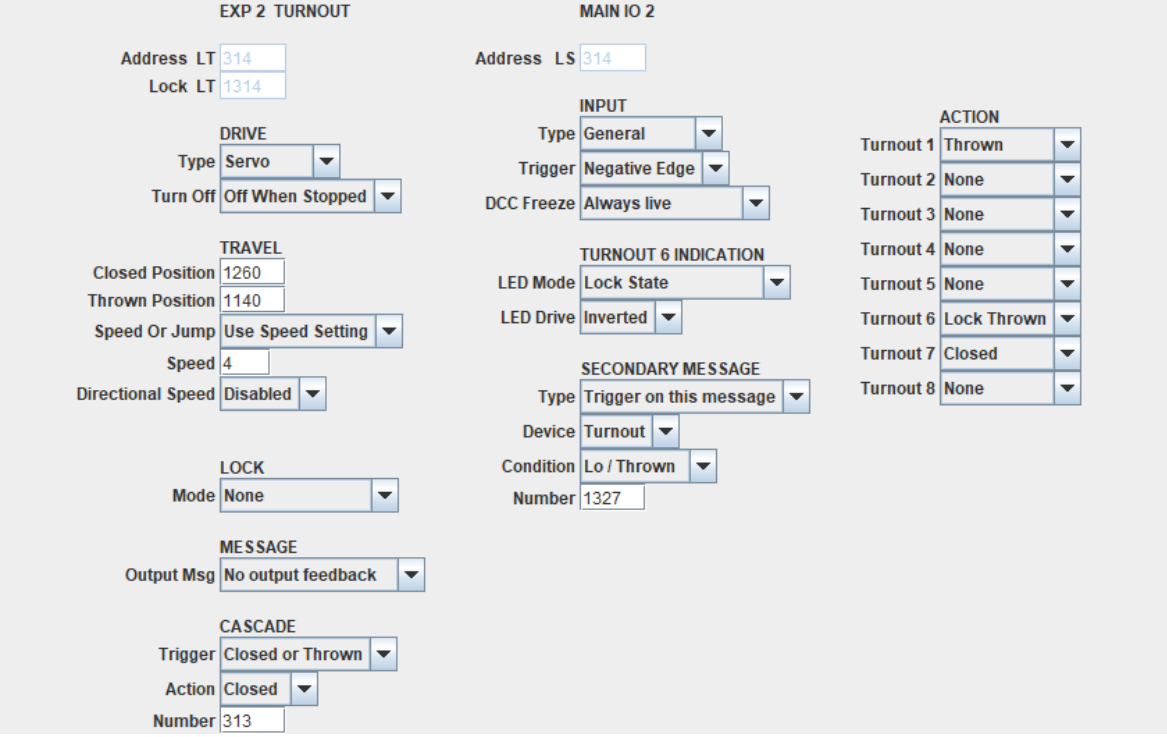
Group 4 tab



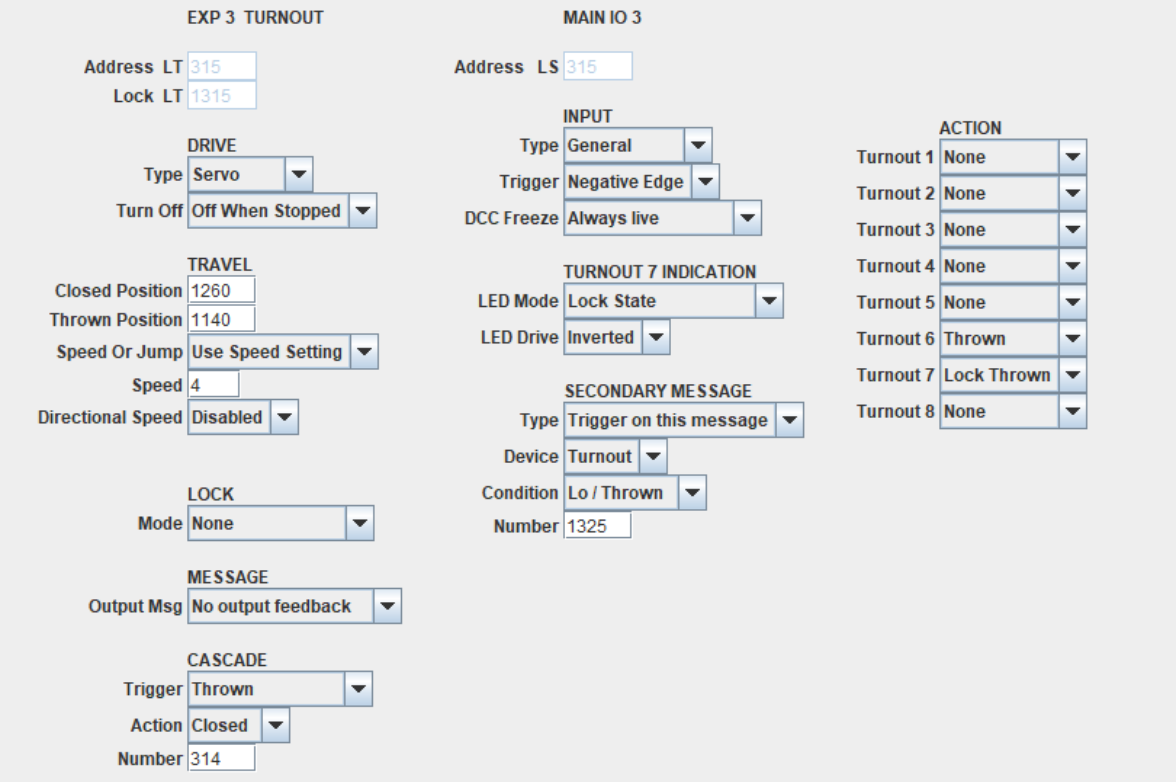
Group 5 tab



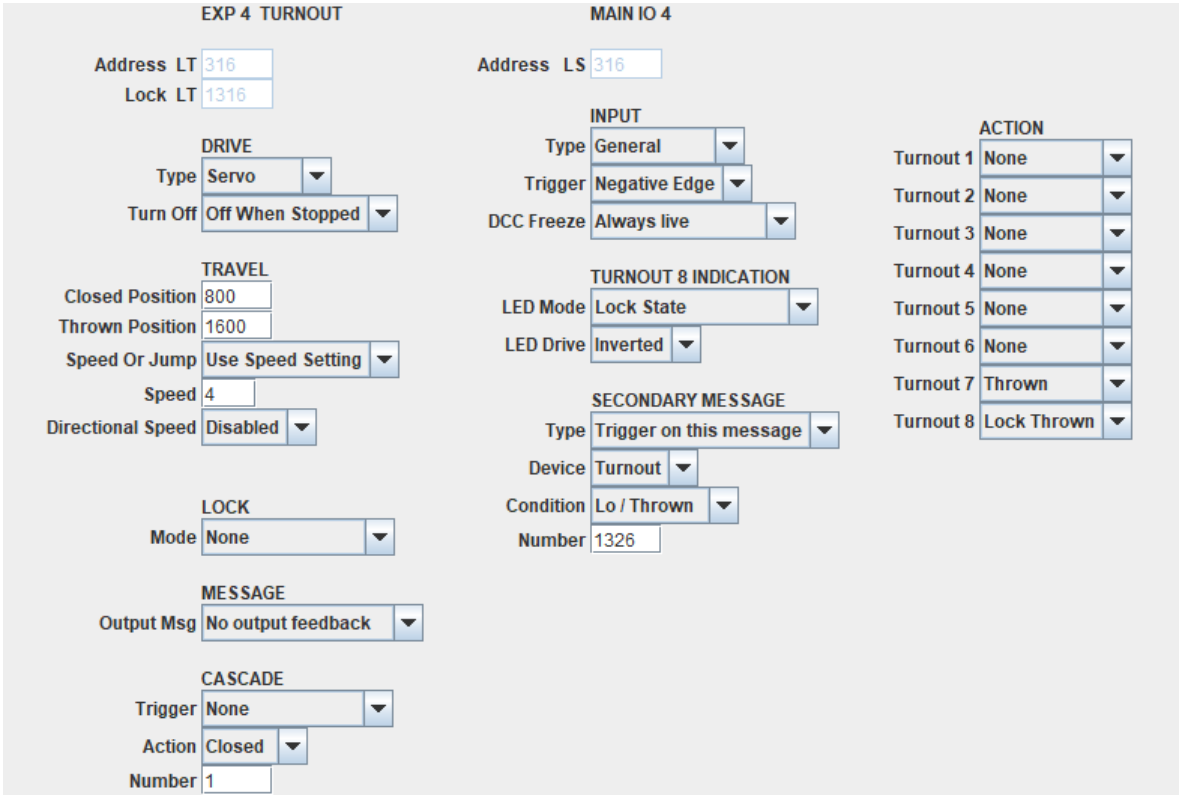
Group 6 tab



Group 7 tab



Group 8 tab



Routes tab