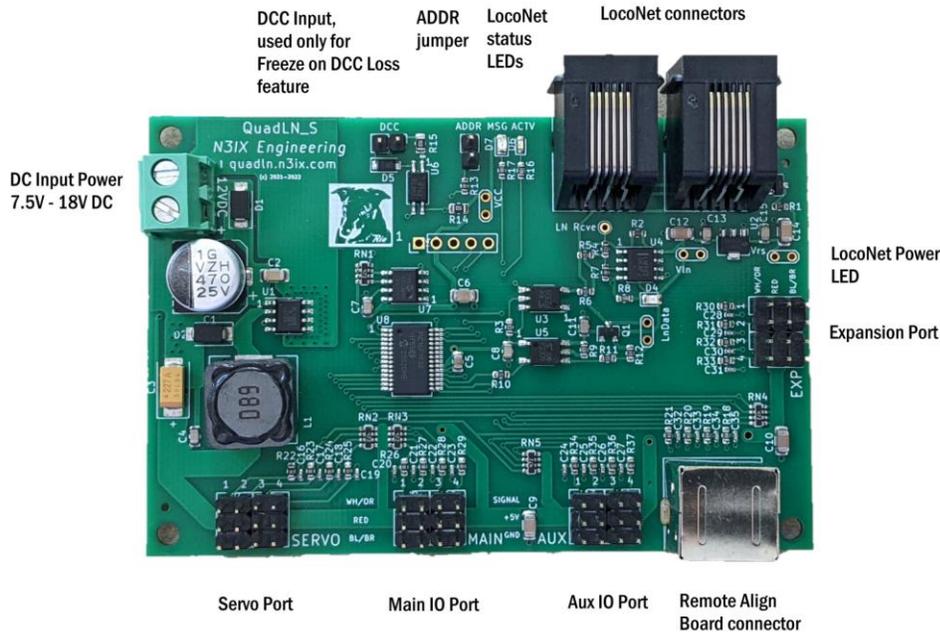




## 1 QuadLN\_S Basics



### 1.1 Overview

The *QuadLN\_S* is a stationary decoder that can control turnouts by driving servos (and stall motors using Driver add-on boards). The turnouts can be actuated using pushbutton or toggle switch inputs connected to **Main IO** or **Aux IO** ports. A single input can control one turnout or multiple turnouts.

The *QuadLN\_S* can display the Turnout state on a Fascia Controller or drive user control panel LEDs. Besides showing whether a turnout is Closed or Thrown, the *QuadLN\_S* can indicate when a servo is in motion (without requiring Turnout Position Feedback sensors!) and when a turnout is Locked.

The *QuadLN\_S V3.1 firmware* can drive turnouts on all ports, meaning it can control up to **16** independent servos! This capability was added especially for users who employ software panels on tablets and smartphones to control their turnouts, and as a result do not require IO lines to connect pushbuttons or toggle switches. Table 1-1 below shows all the available port configuration combinations. Besides driving servos, optional inexpensive Driver add-on boards allow any mix of servo outputs and steady 5 volt outputs for stall motors or relays.

The *QuadLN\_S* provides realistic signaling effects for Searchlight and Color Position Light signals and for Crossing signals using the optional Signal Board. Both Signal Head/Mast addressing and Turnout addressing for signals are available.

The *QuadLN\_S* supports up to 4 current sense detectors using the optional Detector board.



The *QuadLN\_S* is a LocoNet device. Turnout outputs (servos and stall motors) can be controlled via LocoNet Switch commands. Turnout position can be reported to software such as JMRI. The *QuadLN\_S* even provides local control Lockout capability so that local control of turnouts can be disabled on an individual turnout basis whenever desired by just sending a LocoNet Switch command.

*QuadLN\_S* inputs can be wired to external detectors and then report block occupancy using LocoNet General Sensor messages. Almost any device with a contact closure or 5V logic-level signal output can be wired to an available *QuadLN\_S* input and then reported via LocoNet.

The *QuadLN\_S* also includes Cascade and programmable Routes/ Selectors features that take advantage of the LocoNet to implement layout control functions such as yard ladder control and track selection.

Port Settings		Turnouts				IO			New in Ver 3.0
Expansion	Main and Aux IO	Total	Main	Aux	Exp	Total	Detector Board	Signal Board	
Relays	Both IO	4				8			
Signaling	Both IO	4				8		X	
Turnout	Both IO	8			5-8	8			
Relays	Both IO	4				4	X		
Signaling	Both IO	4				4	X	X	
Turnout	Both IO	8			5-8	4	X		
Relays	Main IO, Aux Turnout	8		5-8		4			X
Signaling	Main IO, Aux Turnout	8		5-8		4			X
Turnout	Main IO, Aux Turnout	12		5-8	9-12	4			X
Relays	Main IO, Aux Turnout	8		5-8		0	X		X
Signaling	Main IO, Aux Turnout	8		5-8		0	X	X	X
Turnout	Main IO, Aux Turnout	12		5-8	9-12	0	X		X
Relays	Both Turnout	12	5-8	9-12		0			X
Signaling	Both Turnout	12	5-8	9-12		0		X	X
Turnout	Both Turnout	16	5-8	9-12	13-16	0			X

**Table 1-1 Available Port Combinations with Firmware Version 3**



## 1.2 Turnouts - Servos and Stall Motors

The *QuadLN\_S* can drive up to 16 SG-90 servos for controlling turnouts or performing other layout animation tasks. Independent control over the travel and speed for each servo make turnout movement realistic. With the addition of inexpensive Driver Add-on Boards, the *QuadLN\_S* can control a mixture of servos and 5 volt devices such as stall motors or low current relays.

## 1.3 External Power Supply

The *QuadLN\_S* requires an external DC power supply between +7.5V and +18V. Do not exceed +18V DC. Typical current is 100-500 mA from a 12V supply, but heavy servos mechanical loads can increase the current beyond that range. See Section 2.1 for connection details.

## 1.4 Onboard LED Indicators

There are 3 LEDs on the *QuadLN\_S*.

### LN Power LED

The LN POWER LED indicates that LocoNet Rail Sync is present and the opto-isolated LocoNet interface is powered. This LED should be ON when a LocoNet cable is plugged into the *QuadLN\_S*.

### MSG LED

The MSG LED is normally lit. The LED blinks once when any LocoNet message traffic is seen, other than messages sent by the *QuadLN\_S*. If this LED never blinks then there is probably a LocoNet connection issue.

### ACTV LED

The ACTV LED is normally lit. The LED blinks once when any LocoNet message is sent by the *QuadLN\_S* or when the *QuadLN\_S* acts upon any incoming LocoNet message.

## 1.5 Frog Power

The *QuadLN\_S* can drive 5 volt remote relay boards for powering turnout frogs and other uses. The relay state changes at the turnout travel midpoint to reduce problems with electrical shorts during turnout movement.

## 1.6 Inputs

The *QuadLN\_S* provides 4 “Main” Inputs and 4 “Aux” Inputs. All inputs are fully configurable, including what action to take and what type of input change should trigger the action. Possible actions on an input change include controlling the onboard turnouts, sending Switch commands to other decoders or to trigger routes, and generating general sensor messages that report the input change to any interested LocoNet device.

The *QuadLN\_S* has special features that allow the input lines to also drive LED indicators or other devices. Since each “input” also has an “output” capability, each connection is called an “IO” line in this manual (IO = Input / Output).



## 1.7 Addresses

### Device Address

The *QuadLN\_S* requires a Device Address so its features can be configured via LocoNet [Ops Mode](#) programming. This address is just for device programming, and is independent from the Turnout and Sensor addresses which are described below. The valid range for the Device Address is 0-16383 and it must be unique.

Typically a 5 digit extended address is used for the Device Address. This avoids conflict with locomotives and other devices when doing [Ops Mode](#) programming. The default Device Address is 11000. When first installing *QuadLN\_S*'s remember to connect just one unprogrammed unit at a time to LocoNet and change the Device Address to a unique address following the procedure in **Error! Reference source not found.** or 2.5.

### Turnout Start Address

The *QuadLN\_S* Turnout Outputs respond to LocoNet Switch commands at addresses starting at the Turnout Start Address. The *QuadLN\_S* Turnout Outputs use 4 to 16 consecutive switch addresses depending on the configuration. The Turnout Start Address can be from 1 to 2045. Avoid using addresses 1017-1020 for any Turnout if possible (those addresses are used by the LocoNet special interrogation commands).

### Lock Start Address

The *QuadLN\_S* Locks respond to LocoNet Switch commands at addresses starting at the Lock Start Address. The *QuadLN\_S* Locks use 4 to 16 consecutive switch addresses depending on the configuration. The Lock Start Address can be from 1 to 2045. Avoid using addresses 1017-1020 for any Lock if possible (those addresses are used by the LocoNet special interrogation command). If the Turnout and Lock address ranges overlap, any Lock with the same address as a Turnout will not be accessible using LocoNet Switch commands.

### Main IO Start Address

The *QuadLN\_S* reports the status of its Main inputs using LocoNet Sensor addresses starting at the Main IO Start Address. The *QuadLN\_S* uses 4 consecutive sensor addresses for Main IO1 – Main IO4. The Main IO Start Address can be from 1 to 4093. In general the Main IO address range should not overlap the Aux IO address range.

### Aux IO Start Address

The *QuadLN\_S* reports the status of its Aux inputs using LocoNet Sensor addresses starting at the Aux IO Start Address. The *QuadLN\_S* uses 4 consecutive sensor addresses for Aux IO1 – Aux IO4. The Aux IO Start Address can be from 1 to 4093. In general the Main IO address range should not overlap the Aux IO address range.

## 1.8 Groups

The *QuadLN\_S* has 1 functional Group for each Turnout output. Each Group consists of a Turnout and optionally a Main IO line and/or Aux IO line based on the Port configuration. As shipped, the IO lines in



each Group are configured for a momentary pushbutton and change the state of the Turnout on each button press.

Any IO Input can be configured to control any Turnout output. In fact any input can control as many of the *QuadLN\_S* Turnout outputs as desired, or it can serve other functions and not control any *QuadLN\_S* Turnout output.

## Panel Indicators

The *QuadLN\_S* can drive panel indicator LEDs connected to the Main IO and Aux IO lines. The panel indication shown on any specific IO line reflects the state of the Turnout output in the same group.

## 2 Getting Started

### 2.1 Connecting Power

The *QuadLN\_S* requires an external DC power supply between +7.5V and +18V. **Do not exceed +18V DC.** Typical current is 100-200 mA, but heavy servo mechanical loads can increase the current beyond that range. The power input is via the connector with two screw terminals near the upper left corner of the board. Connect the power supply **minus** lead to the **upper** terminal (the one closest to the corner of the board) and connect the power supply **plus** lead to the **lower** terminal (the one furthest from the corner of the board). If the leads are connected backwards, the *QuadLN\_S* will not function but will not be damaged.

### 2.2 Setup without JMRI

See the manual for information on configuring the board without JMRI.

### 2.3 Setup with JMRI

The *QuadLN\_S* template in JMRI provides the easiest and quickest way to configure the overall device. This section covers the basics needed to get the decoder up and running. Just the basics are covered here. The manual has all the details.

### 2.4 Minimum JMRI Version

The recommended version of JMRI is 4.26 or later. The minimum JMRI version is 4.22.

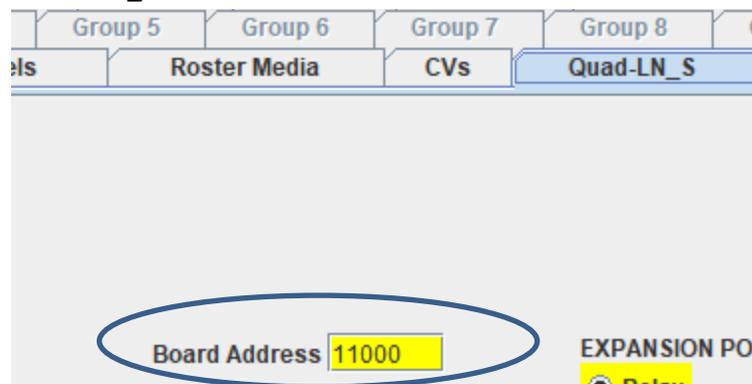
### 2.5 Create a roster entry and set the Device Address

Each decoder needs its own Roster entry so that there is a place to store the configuration settings that are unique to that decoder. In this step we will create the Roster entry for the decoder. We will also assign a unique Device Address to the decoder using the [Service-Mode/ Programming-Track Programmer](#) so that we can later alter its configuration whenever required without affecting any other devices. When setting all other parameters of the *QuadLN\_S* we will always use [Ops-Mode / Programming On Main](#). The [Service-Mode/Programming-Track Programmer](#) is only used in this step and when performing a Factory Reset.



The Device Address can be set using [Service Mode/Programming-Track](#) programming messages that are received by the *QuadLN\_S* over LocoNet. (No connection between the *QuadLN\_S* and the programming track is required.)

- **Remove all locomotives from the programming track.**
- In DecoderPro or PanelPro click the [Service-Mode](#) Programmer button or go to **Tools / Programmers** and select [Service-Mode](#) Programmer. In DecoderPro3 select the [Programming Track](#) option and then click the “+ New Loco” button.
- Scroll down the decoder list to **Tam Valley Depot**, expand it, select the **Quad-LN\_S** family and expand it, select **Quad-LN\_S\_v3** decoder and then click **Open Programmer**.
- On the **Roster Entry** tab, enter an ID for the device such as QLNNnnnn (where nnnnn is the 5-digit address for this device) or other unique identifier.
- Go to the *QuadLN\_S* tab.



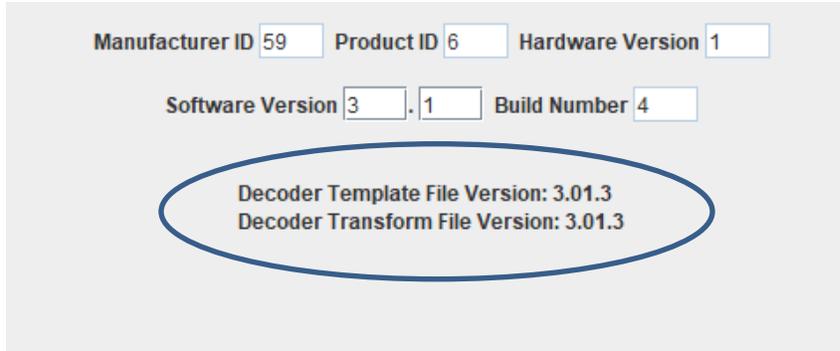
- Enter the desired Device Address in the **Board Address** field. Choose a unique address between 1 and 16383. See Section 1.7 for information about Device Addresses. A unique 5-digit address is recommended to avoid conflicts. (Do **NOT** click on any of the buttons at the bottom.)
- Click **Save** on the **File** menu to save the new roster entry.
- Go to the **CVs** tab.
- Install the **ADDR** jumper. The **ACTV** and **MSG** LEDs should start flashing alternately.
- **Write** CV17 and then **Write** CV18. (Ignore the “Programmer error” message, this is normal.) The LEDs should stop flashing.
- Remove the **ADDR** jumper.
- In DecoderPro or PanelPro **Close** the [Service-Mode](#) Programmer. In DP3 select the [Program on Main](#) option.

**REMINDER:** Remember to **remove** the **ADDR** jumper when finished. Failure to remove the **ADDR** jumper can result in unintended changes to the Turnout Start Address (see **Error! Reference source not found.**).

Note: If the **Tam Valley Depot / Quad-LN\_S** family or **Quad-LN\_S\_v3** decoder entry is missing, please update JMRI per the recommendations in Section 2.4.



If you are using *QuadLN\_S* Firmware Version 3.1 or later and the Decoder Template File Version is less than 3.01.3 or the Decoder Transform File version is less than 3.01.3 (shown towards the bottom of the Quad-LN\_S tab), please follow these steps to download and install the necessary template file.



Manufacturer ID  Product ID  Hardware Version

Software Version  .  Build Number

Decoder Template File Version: 3.01.3  
Decoder Transform File Version: 3.01.3

- Download the latest *QuadLN\_S* update package from <https://quadln.n3ix.com>.
- Place the new decoder files in the decoders subfolder under the User File Location specified in your JMRI Preferences File Locations.
- Place the TVD folder (if provided) in the xml/decoders subfolder under the User File Location specified in your JMRI Preferences File Locations. (Create this folder if it doesn't already exist.)
- **Close** the **Service-Mode Programmer** if it is still open.
- Go back to the first step in this section.

## 2.6 Turnout Start Address, Lock Start Address, Main and Aux IO Start Addresses

Now we are ready to enter all other parameters of the *QuadLN\_S*. To do this in JMRI we use

### [Ops-Mode / Programming On Main](#).

- In DecoderPro or PanelPro click the **[Ops-Mode/Main-Track Programmer](#)** button or go to **Tools / Programmers** and select **[Ops-Mode/Main-Track Programmer](#)**. In DecoderPro3 select the **[Programming On Main](#)** option.
- Select the *QuadLN\_S* entry you created above from the roster and Open it.
- Go to the *QuadLN\_S* tab.



Roster Media CVs **Quad-LN\_S** Gro

Board Address

Turnout Start Address  Mode

Lock Start Address

Main IO Start Address

Aux IO Start Address

EXPANSION PORT

Relay

Signaling

Turnout

MAIN and AUX IO PORTS

Both IO

- Enter the desired turnout start address in the **Turnout Start Address** field.
- (optional) Enter the desired lock start address in the **Lock Start Address** field.
- (optional) Enter the desired Main IO start address in the **Main IO Start Address** field.
- (optional) Enter the desired Aux IO start address in the **Aux IO Start Address** field.
- Click **Write changes on sheet** to update the *QuadLN\_S*.
- (optional) Click **Read full sheet** to read back the address values and confirm the settings.
- Click **Save** on the **File** menu to update the roster entry.

### 3 Remote Align Board for Adjustment of Travel and Speed

The travel endpoints and speed for each servo can be set manually using the **Select, Up** and **Down** buttons on the Remote Alignment Board, or you can use JMRI. Here is the manual adjustment procedure.

Connect the remote alignment board to the *QuadLN\_S*.

1. Hold the Select button down until a numeric selection LED turns on (about 1 second), indicating that you are in Turnout Selection mode and that Turnout is selected. (The initial Turnout selection will be the same as the one selected the last time alignment was performed.)
2. An LED on the Remote Align Board indicates the selected Turnout using the following method:

Turnout	Remote Align LED indication
1-8	0-7 steady
9-16	0-7 flashing

Use the Up and Down buttons to select the desired Turnout. Once the desired Turnout is indicated, press the Select button briefly.

3. The Closed LED is now flashing to indicate that the Turnout is in the CLOSED Position. For Servo outputs the Closed Position can be adjusted using the Up and Down buttons to move the Servo to the desired position. The servo position will change very slowly at first, so hold down the Up or Down button continuously when doing rough adjustment. When satisfied with the Closed Position, press the Select button briefly.



4. The Thrown LED is now flashing to indicate that the Turnout is in the THROWN Position. For Servo outputs the Thrown Position can be adjusted using the Up and Down buttons to move the Servo to the desired position. The servo position will change very slowly at first, so hold down the Up or Down button continuously when doing rough adjustment. When satisfied with the Thrown Position, press the Select button briefly.
5. The Speed LED is now flashing to indicate that the Speed is being adjusted. For Servo outputs the Up and Down buttons can be used to change the speed. The Servo will change position to demonstrate the new Speed. You can continue to adjust the speed while the Servo is moving if desired. When satisfied with the Speed, press the Select button briefly.
6. To readjust any of the parameters, press the Select button briefly to return to step 4.
7. (New) For Servo outputs a brief press of both the Select and Up buttons simultaneously will center a servo at any point in the Alignment process. LED 7 (Ctr) will flash while the servo is centered. Press Select when finished to resume normal Align modes.

To exit the Adjustment process at any point, hold the Select button until the remote align board LEDs turn off (about 1 second). The new settings are now saved and in use.

## 4 Next Steps

See the manual for detailed information on how to configure the many features of the *QuadLN\_S*. The *QuadLN\_S* is an extremely capable product so there is a lot to explore!