MagneMotion System Configurator User Manual

Bulletin Numbers MML, QS, QSHT

Allen-Bradley
by ROCKWELL AUTOMATION

User Manual

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

Additional Safety Information

Although every effort is made to keep this manual accurate and up-to-date, MagneMotion® and Rockwell Automation® assumes no responsibility for any errors, omissions, or inaccuracies. Information that is provided in this manual is subject to change without notice. Any sample code that is referenced in this manual or included with MagneMotion software is included for illustration only and is, therefore, unsupported.

ATTENTION: For additional safety notices and definitions, see the Notes, Safety Notices, and Symbols section and/or the Safety Notices section.

Contents

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About This Manual

Overview

This section provides information about the use of this manual, including the manual structure, related documentation, format conventions, and safety conventions.

Purpose

This manual explains how to install and use the MagneMotion® Configurator. This software is used to create and modify the Node Controller Configuration File to define the transport system. This file is used for all transport systems. For MagneMover® Lite™ systems, creation and maintenance of the graphical representation of the system in the Track Layout File, which is used to generate the Node Controller Configuration File, is also covered.

This manual is not intended to provide design guidelines for the installation or a reference for the operation of a transport system. Use this manual in combination with the other documentation that accompanies the transport system to install, configure, test, and operate a transport system.

Audience

This manual is intended for people who install, configure, and maintain the Node Controller Configuration File and the Track Layout File for the transport system.

Prerequisites

The information and procedures that are provided in this manual assume the following:

- Basic familiarity with general-purpose computers and with the Windows® operating system.
- Complete design specifications, including the physical layout of the transport system, are available.
- All personnel who configure, operate, or service the transport system are properly trained.

Notes, Safety Notices, and Symbols

Notes, Safety Notices, and Symbols that are used in this manual have specific meanings and formats. Examples of notes, the different types of safety notices and their general meanings, and symbols and their meanings are provided in this section. Adhere to all safety notices provided throughout this manual to help achieve safe installation and use.

Notes

Notes are set apart from other text and provide additional or explanatory information. The text for Notes is in standard type as shown in the following example.

NOTE: A note provides additional or explanatory information.

Safety Notices

Safety Notices are set apart from other text. The symbol on the left of the notice identifies the type of hazard. The text in the message panel identifies the hazard, methods to avoid the hazard, and the consequences of not avoiding the hazard.

Examples of the standard safety notices that are used in this manual are provided in this section. Each example includes a description of the hazard indicated. Labels may also be on or inside the equipment to provide specific precautions.

NOTICE	**Identifies an informational notice that indicates practices that are not related to personal injury that could result in equipment or property damage.**

IMPORTANT	**Identifies information that is critical for the successful application and understanding of the product.**

	**ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help to identify a hazard, avoid a hazard, and recognize the consequence.**

	**SHOCK HAZARD: Identifies information about practices or circumstances where a severe shock hazard is present that could cause personal injury or death.**

	**AUTOMATIC MOTION HAZARD: Identifies information about practices or circumstances where the possibility of machinery automatically starting or moving exists, which could cause personal injury.**

Related Documentation

These documents contain additional information concerning related products from Rockwell Automation. Before configuring or running the components, consult the other manuals listed in this document about support, installation, configuration, and operation of the transport system. You can view or download publications at rok.auto/literature.

Resource	Description
MagneMotion QuickStick and QuickStick HT Design Guide, publication MMI-RM001	This manual explains how to design and configure the track layout and transport system.
QuickStick Motor Technical Data, publication MMI-TD051	This manual includes technical specifications for the QuickStick 100 and QuickStick 150 motors.
MagneMotion Node Controller Interface User Manual, publication MMI-UM001	This manual explains how to use the supplied interfaces to configure and administer node controllers that are used with transport systems. This manual also provides basic troubleshooting information.
MagneMotion LSM Synchronization Option User Manual, publication MMI-UM005	This manual explains how to install, operate, and maintain the LSM Synchronization Option for use with transport systems.
MagneMotion NCHost TCP/IP Interface Utility User Manual, publication MMI-UM010	This manual explains how to use the NCHost TCP/IP Interface Utility to run a transport system for testing and debugging. This manual also explains how to develop Demo Scripts to automate vehicle motion for that testing.
MagneMotion Virtual Scope Utility User Manual, publication MMI-UM011	This manual explains how to install and use the MagneMotion Virtual Scope utility. This utility provides real-time feedback of the change in Linear Synchronous Motor (LSM) performance parameters.
MagneMotion Node Controller Hardware User Manual, publication MMI-UM013	This manual explains how to install and maintain the node controllers that are used with transport systems.
MagneMover LITE Ethernet Motor Configuration and Communication, publication MMI-UM031	This manual describes the network topologies for wiring MagneMover LITE Ethernet motors and for combining both RS-422 and Ethernet motors in the same transport system.
MagneMotion Host Controller TCP/IP Communication Protocol User Manual, publication MMI-UM003	This manual describes the communication protocols between the high level controller and a host controller. This manual also provides basic troubleshooting information.
MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual, publication MMI-UM004	
Power Supply Reference Manual 1606-XLS960F-3, publication 1606-RM032	The manual provides the specifications for the 1606 power supplies.
MagneMover LITE User Manual, publication MMI-UM002	This manual explains how to install, operate, and maintain the MagneMover LITE transport system. This manual also provides information about basic troubleshooting.
QuickStick 100 User Manual, publication MMI-UM006	This manual explains how to install, operate, and maintain the QuickStick 100 transport system. This manual also provides information about basic troubleshooting.

Resource	Description
QuickStick 150 User Manual, publication MMI-UM047	This manual explains how to install, operate, and maintain the QuickStick 150 motors and magnet arrays. This manual also provides information about basic troubleshooting.
QuickStick HT User Manual, publication MMI-UM007	This manual explains how to install, operate, and maintain the QuickStick High Thrust (QSHT) transport system. This manual also provides information about basic troubleshooting.
EtherNet/IP Network Devices User Manual, publication ENET-UM006	Describes how to configure and use EtherNet/IP devices to communicate on the EtherNet/IP network.
Ethernet Reference Manual, publication ENET-RM002	Describes basic Ethernet concepts, infrastructure components, and infrastructure features.
System Security Design Guidelines Reference Manual, publication SECURE-RM001	Provides guidance on how to conduct security assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment.
UL Standards Listing for Industrial Control Products, publication CMPNTS-SR002	Assists original equipment manufacturers (OEMs) with construction of panels, to help ensure that they conform to the requirements of Underwriters Laboratories.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

Introduction 1

Overview

This chapter provides an overview of the MagneMotion® Configurator, the transport system hardware and software, and the basic set of tasks for using the MagneMotion Configurator. Use this manual to configure and maintain the Track Layout File and the Node Controller Configuration File for a transport system.

This manual supports:

- MagneMover® Lite™ transport systems.
- QuickStick® transport systems.
- QuickStick HT transport systems.

NOTICE	**QS 100, QS 100 Plus, and QS 150 are in the QuickStick motor family and use similar screens.** **QSHT and QSHT 5700 are in the QuickStick HT motor family and use similar screens.**

Included in this chapter are overviews of:

- The MagneMotion Configurator.
- The transport system components.
- The transport system software.
- Getting started with the Configurator.

MagneMotion Configurator Overview

The MagneMotion Configurator is a Windows® .NET software application that is provided by Rockwell Automation. This application is used to create and edit the Track Layout File and the Node Controller Configuration File for the transport system. These files use text and XML to define the parameters for the components in the transport system.

The transport system is a configuration of linear synchronous motors that are placed end-to-end to form long chains, or paths. These chains are used to move and position vehicles in a controlled manner at various acceleration/deceleration and velocity profiles while

carrying a wide range of payloads with high precision. The transport system consists of the following components at a minimum:

- Motors.
- Vehicles with magnet arrays.
- Node controllers.
- Power supplies.
- Configuration file defining paths and nodes.
- User-supplied host controller (general-purpose computer or PLC).

Each of the components of the transport system must be defined in the Node Controller Configuration File for proper operation of the transport system. The MagneMotion Configurator allows creation or editing of the Node Controller Configuration File without having to access the XML directly.

NOTICE	**The Node Controller Configuration File can be viewed, and edited, in various applications such as web browsers, text editors, and XML editors. However, Rockwell Automation recommends using only the MagneMotion Configurator to make sure that the file is formatted correctly and contains the correct entries.**

The MagneMotion Configurator provides a graphical interface to define or modify the various elements of the Track Layout File. The Configurator also provides a tree-like structure to define or modify the various sections and elements of the Node Controller Configuration File. In the Configurator, each element in the Node Controller Configuration File is displayed in the Configuration Tree and has a related Properties page where the properties for that element can be defined or modified.

Transport System Components Overview

This section identifies the components of a transport system, see Figure 1-1 and described after the figure.

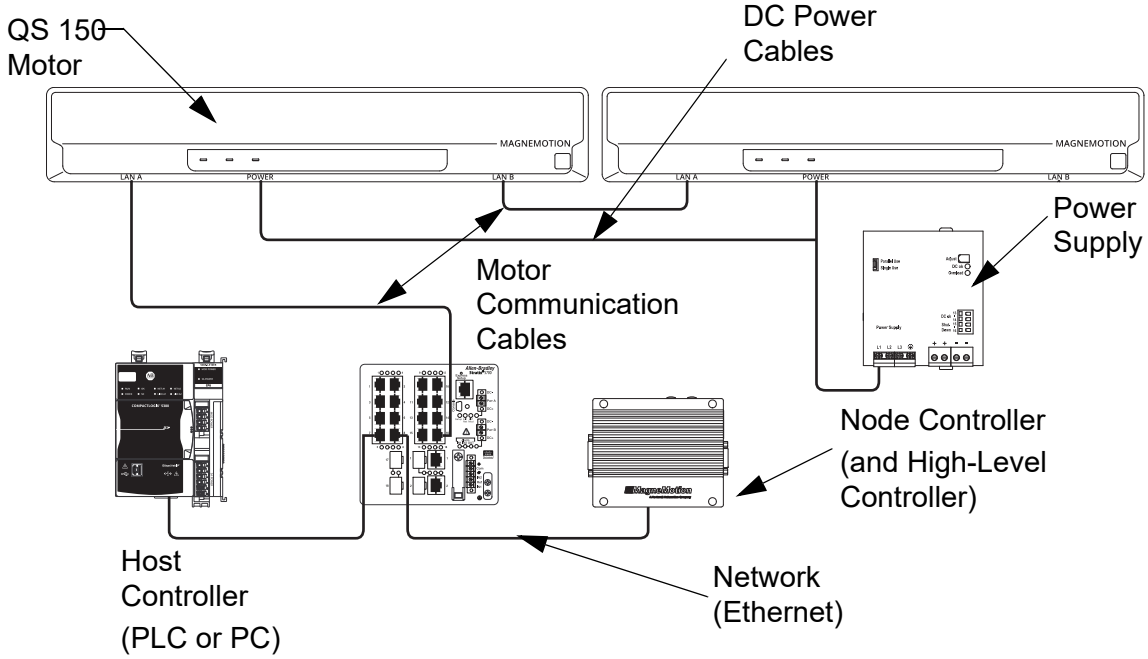

Figure 1-1: Simplified Example of Transport System using RS-422 Communication

- **DC Power Cables and Communication Cables** – Distributes DC power to the motors and carries communications, such as RS-422 or Ethernet, between the components of the transport system.
- **High-Level Controller** (HLC) – Software application that is enabled on one node controller. This application handles all communication with the user-supplied host controller and directs communication as appropriate to individual node controllers.
- **Host Controller** – User-supplied controller for control and monitoring of the transport system using either TCP/IP or EtherNet/IP™ communications.
- **Motor/Stator** – Refers to a linear synchronous motor (LSM).
- **Network** – Ethernet network providing communication (TCP/IP or EtherNet/IP) between the host controller and the HLC (TCP/IP is used between node controllers).
- **Node Controller** (NC) – Coordinates motor operations and communicates with the HLC. Several types of node controllers are available. All node controllers support Ethernet communication with the host controller and the motors.
- **Power Supply** – Provides DC power to the motors.
- **Vehicle with Magnet Array** – Carries a payload through the transport system as directed. The magnet array is mounted to the vehicle facing the motors and interacts with the motors, which move each vehicle independently.

Transport System Software Overview

Several software applications are used to configure, test, and administer a transport system, see Figure 1-2 and described after the figure. See *Related Documentation on page 11* for the reference manuals for these applications.

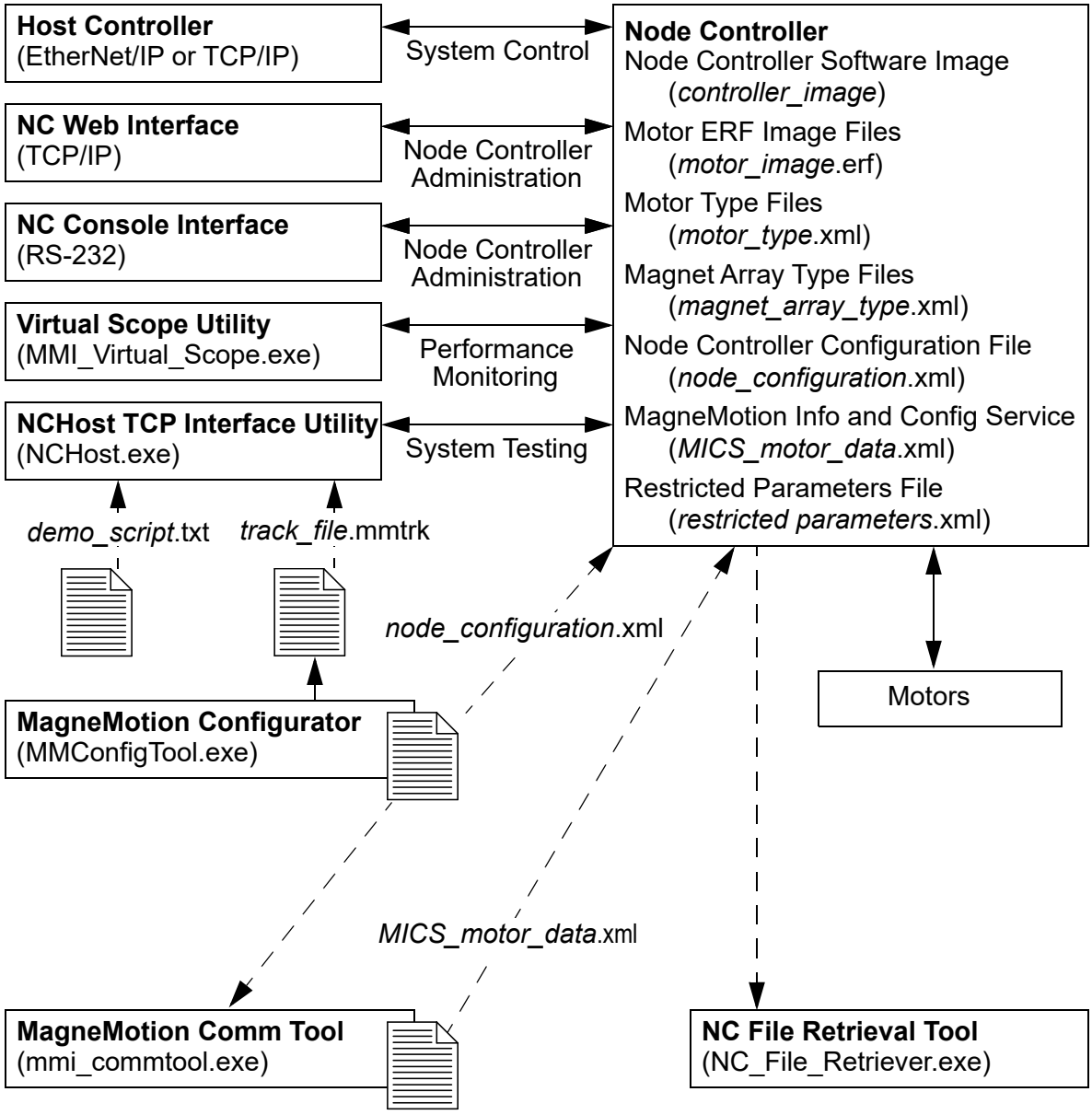

Figure 1-2: Simplified View of Transport System Software Organization

Utilities

- **NC Web Interface** – A web-based software application that is supplied by Rockwell Automation and resides on the node controllers, for administration of the transport system components.

- **NC Console Interface** – A serial communication software application that is supplied by Rockwell Automation and resides on the node controllers, for administration of the node controller.
- **Virtual Scope Utility** – A Windows software application that is supplied by Rockwell Automation to monitor and record the change of motor performance parameters. These parameters are displayed as waveforms to analyze the performance of the motors.
- **NCHost TCP Interface Utility** – A Windows software application that is supplied by Rockwell Automation to move vehicles for test or demonstration purposes. This application supports system testing without the host controller to verify that vehicles move correctly before integrating the transport system into a production environment.
- **MagneMotion Configurator** – A Windows software application that is supplied by Rockwell Automation to create or change the Node Controller Configuration File. This software supports all transport systems. For MM Lite™ systems, it is also used to create or change the Track File and Track Layout File.
- **Ethernet Motor Commissioning Tool** – A Windows software application that is supplied by Rockwell Automation to create and edit MagneMotion Information and Configuration Service (MICS) files.
- **NC File Retrieval Tool** – A Windows software application that is supplied by Rockwell Automation to download configuration and operation files from the specified HLC and all node controllers in the transport system.

File Types

- **Node Controller Software Image File** (IMG file) – The software file for the node controllers (*controller_image*), includes the node controller and HLC applications. The Node Controller Software Image file is uploaded to all node controllers in the transport system.
- **Motor ERF Image Files** (ERF file) – The software files for the motors (*motor_image*.erf). The Motor ERF Image files are uploaded to all node controllers in the transport system and then programmed into all motors.
- **Motor Type Files** – XML files (*motor_type*.xml) that contain basic information about the specific motor types being used. The Motor Type files are uploaded to all node controllers in the transport system.
- **Magnet Array Type File** – An XML file (*magnet_array_type*.xml) that contains basic information about the specific magnet array type that is used on the vehicles in the transport system. The Magnet Array Type file is uploaded to all node controllers in the transport system.
- **Node Controller Configuration Files** – An XML file (*node_configuration*.xml) that contains all the parameters for the components in the transport system. Multiple Node Controller Configuration Files can be uploaded to all node controllers in the transport system, but only one is active.

- **MagneMotion Information and Configuration Service (MICS) File** – An XML file (*MICS_motor_data*.xml) that contains the network topology parameters for the transport system when using Ethernet communication with the motors. The file includes the MAC address of each motor and the location of each motor on a path. The MICS file is uploaded to all node controllers in the transport system.
- **Restricted Parameters File** – An XML file (*restricted_parameters*.xml) that provides access to restricted configuration elements for specific transport systems. The Restricted Parameters file is uploaded to the HLC. For the development of a custom Restricted Parameters file for a specific transport system, see *Rockwell Automation Support*.
- **Demo Script** – A text file (*demo_script*.txt) uploaded to the NCHost TCP Interface Utility to move vehicles on the transport system for test or demonstration purposes.
- **Track File** – A text file (*track_file*.mmtrk) that contains graphical path and motor information about the transport system. The Track file is used by the NCHost TCP Interface Utility to provide a graphical representation of the transport system to monitor system operation. The Track file is created for MagneMover Lite transport systems using the MagneMotion Configurator. For the development of a custom Track File file for a specific QuickStick transport system, see *Rockwell Automation Support*.
- **Track Layout File** – An XML file (*track_layout*.ndx) that contains the parameters for the graphical representation of a MagneMover Lite transport system. The Track Layout file is used by the Configurator to generate the Node Controller Configuration File and the Track file for MagneMover Lite systems.

NOTICE	**Modifications to the Image or Type files could cause improper operation of the transport system.**

Getting Started with the MagneMotion Configurator

Use this manual as a guide and reference when using the MagneMotion Configurator. Follow the steps in this section to get the entire transport system operational quickly with the aid of the other manuals (see *Related Documentation* *on page 11*).

NOTE: Make sure that complete design specifications, including the physical layout of the transport system, are available before starting to configure the transport system.

Table 1-1: Menu Definitions and Short-cut Keys

Menu	Action	Short-cut
File	New XML Config	Ctrl+N
	Open XML Config	Ctrl+O
	Save XML Config	Ctrl+S

Table 1-1: Menu Definitions and Short-cut Keys

Menu	Action	Short-cut
Edit	Insert Before	Ctrl+Shift+I
	Insert After	Ctrl+I
	Add to End	Ctrl+E
	Cut	Ctrl+X
	Copy	Ctrl+C
	Paste	Ctrl+V
	Delete	Del (Delete)

To get started with the transport system:

1. Download the software for the appropriate transport system and the MagneMotion Utilities from rok.auto/pcdc.

   NOTE: The minimum requirements for running MagneMotion software applications are a general-purpose computer running Microsoft® Windows® 7 or later with .NET 4.0. An Ethernet port (web interface) and an optional RS-232 port (console interface) are required to connect to the node controllers.

2. Install the components of the transport system as described in the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013, the *MagneMover Lite User Manual,* publication MMI-UM002, the *QuickStick 100 User Manual,* publication MMI-UM006, the *QuickStick 150 User Manual*, publication MMI-UM047, or the *QuickStick HT User Manual,* publication MMI-UM007.

3. Install the MagneMotion Configurator on a computer for user access as described in *Install the MagneMotion Configurator* *on page 23*.

4. For MagneMover Lite systems, create a graphical representation of the transport system to define the components and their relationships in the system as described in the following sections of this manual and save it as a Track Layout File (*track_layout*.ndx).

   A. *Run the MagneMotion Configurator* *on page 26*.

   B. *Create and Save Track Layout Files* *on page 31*.

   C. Add required transport system components to the track layout:

   - *Layout the Motors and Switches* *on page 48*.
   - *Define the LSM Sync Option Motors* *on page 49*.
   - *Define the LSM Air Cooled Option Motors* *on page 51*
   - *Define the LSM High Payload Option Switches* *on page 51*

- *Locate and Define the Nodes* on page 52.

D. Add optional transport system components to the track layout:

- *Identify Direction of Forward Motion* on page 59.
- *Locate the Precision Locators* on page 59.
- *Define Vehicles* on page 60.
- *Locate Legs* on page 61.
- *Dimension the Layout* on page 63.
- *Add Descriptive Text* on page 64.
- *Select Save NDX Layout on the File menu in the Configurator Menu Bar to save all changes to the Track Layout File.* on page 65.

5. For MagneMover Lite systems, automatically create the Node Controller Configuration File (node_configuration.xml) from the Track Layout File to define the components and operating parameters of the transport system as described in *Automatically Create the Node Controller Configuration File* on page 55.

6. For all systems, edit and save the Node Controller Configuration File (node_configuration.xml) to define the components and operating parameters of the transport system as described in the following sections of this manual.

A. *Run the MagneMotion Configurator* on page 26.

B. *Create and Save Node Controller Configuration Files* on page 36.

C. *Set EtherNet/IP Settings* on page 80, when using EtherNet/IP communication (typically an Allen-Bradley® ControlLogix® controller) to control the transport system.

D. *Defining HLC Control Groups* on page 82, when the transport system is subdivided into smaller transport systems (HLC Control Groups) with multiple host controllers and multiple HLCs and where Gateway nodes are used to transfer vehicles from one HLC Control Group to another.

E. Define each transport system component that is used in the transport system:

- *View and Edit Functions* on page 75.
  - Set Configurator *View and Edit Functions* on page 75.
  - *European Number Formatting* on page 74.
- *Create and Edit Path* on page 89.
- *Define and Edit Motors and Vehicle Parameters* on page 93.
- *Show Per Motor Control Loop Parameters* on page 111.
- *Create and Edit Nodes* on page 119.
- *Define and Edit Node Controllers* on page 162.

- *Create and Edit Stations* *on page 167*.
- *Create and Edit Single Vehicle Areas* *on page 171*.
- *Create and Edit Simulated Vehicles* *on page 176*.
- *Define and Edit E-Stops* *on page 179*
- *Define and Edit Interlocks* *on page 181*.

7. Set the IP address for each node controller and specify the node controller to be used as the HLC (see the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001).

8. Upload the configuration, image, and type files to each node controller using the node controller web interface (see the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001).

9. When using motors with Ethernet communication, create the MICS file and provision the motors (see *MagneMover Lite Ethernet Motor Configuration and Communication*, publication MMI-UM031).

10. Program the motors using the Motor ERF Image Files (see the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001, and the *MagneMotion NCHost TCP Interface Utility User Manual,* publication MMI-UM010).

11. Test and debug the transport system by using the NCHost TCP Interface Utility and Demo Scripts (see the *MagneMotion NCHost TCP Interface Utility User Manual,* publication MMI-UM010). NCHost provides an easy method to verify proper operation and make adjustments such as refining the control loop tuning.

    NOTE: The NCHost TCP Interface Utility is for test and verification trials only. The host controller must be used to control the MM Lite transport system after verification of functionality.

12. Configure the host controller for transport system control as required to meet the material movement needs of the facility where the system is installed.

- When using TCP/IP communication, see the *MagneMotion Host Controller TCP/IP Communication Protocol User Manual,* publication MMI-UM003 and *MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual,* publication MMI-UM004.

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Use the MagneMotion Configurator 2

Overview

This chapter describes how to install and use the MagneMotion® Configurator to create and edit Node Controller Configuration Files for transport systems. This chapter also covers how to create and edit the Track Layout Files for MagneMover® Lite™ systems.

Included in this chapter are:

- Installing the MagneMotion Configurator.
- Running the Configurator.
- Track Layout File overview.
- Creating, editing, and saving Track Layout Files.
- Node Controller Configuration File overview.
- Creating, editing, and saving Node Controller Configuration Files.
- Overview of uploading the Node Controller Configuration File to the node controllers.

NOTE: The Node Controller Configuration File must be uploaded to each node controller in the transport system anytime changes are made to the file.

Install the MagneMotion Configurator

The MagneMotion Configurator that is supplied with the transport system must be installed. During the installation process, the computer is checked to make sure that all required software components are also installed. The minimum software requirements for installing and running the Configurator are:

- Microsoft® Windows® 7 or later, SP1.
- Microsoft .NET 4.0.

1. Access the folder where the software was copied and run MMConfigToolSetup.msi.

   NOTE: The permissions and security settings on the computer may need to be adjusted to allow this installation.

*The **MagneMotion Configurator Tool** setup wizard is opened, see Figure 2-1. If Microsoft .NET 4.0 is not installed on the computer where the MagneMotion Configurator is being installed an alert is displayed instead.*

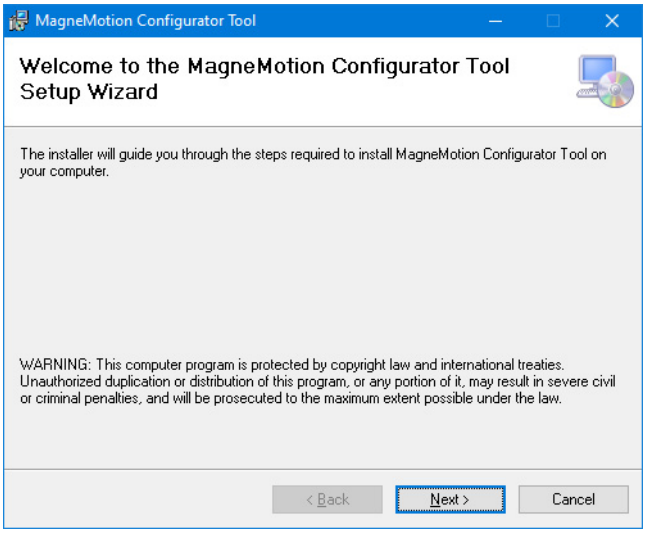


Figure 2-1: MagneMotion Configurator Tool Installer

A. If the .NET Framework alert is displayed, follow the directions to install Microsoft .NET 4.0.

B. After .NET 4.0 is installed, restart the installation process from Step 1.

2. Select **Next**.

*The **MagneMotion Configurator Tool** setup wizard prompts for an installation path and usage permissions, see Figure 2-2.*

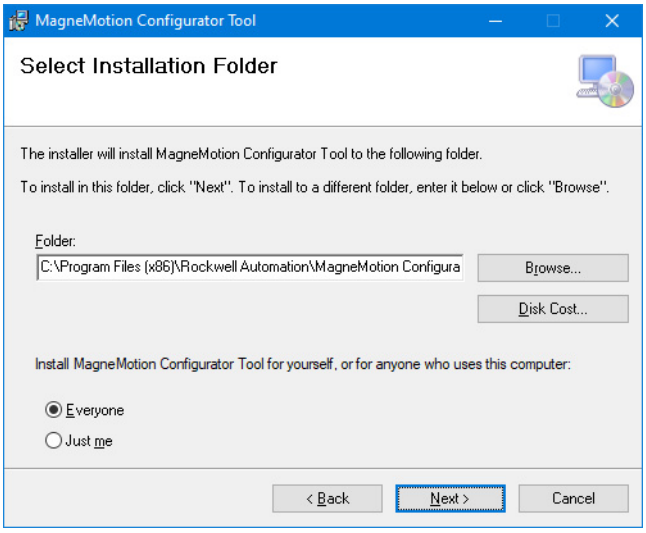


Figure 2-2: MagneMotion Configurator Tool Installation Setup

3. Accept the defaults and select **Next**.

   *The **MagneMotion Configurator Tool** setup wizard prompts for confirmation of the installation, see Figure 2-3.*

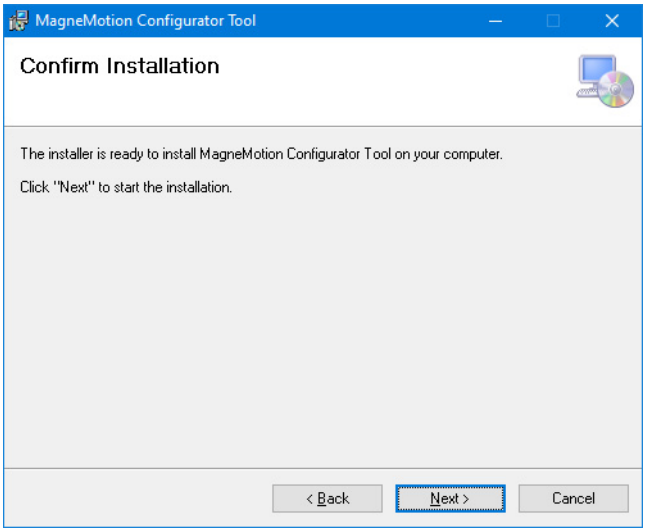


Figure 2-3: MagneMotion Configurator Tool Installation Confirmation

4. Select **Next**.

5. Adjust the security settings for this computer to allow this installation as necessary.

   *The **MagneMotion Configurator Tool** setup wizard installs the software, see Figure 2-4 and places an Icon for access on the desktop, see Figure 2-6.*

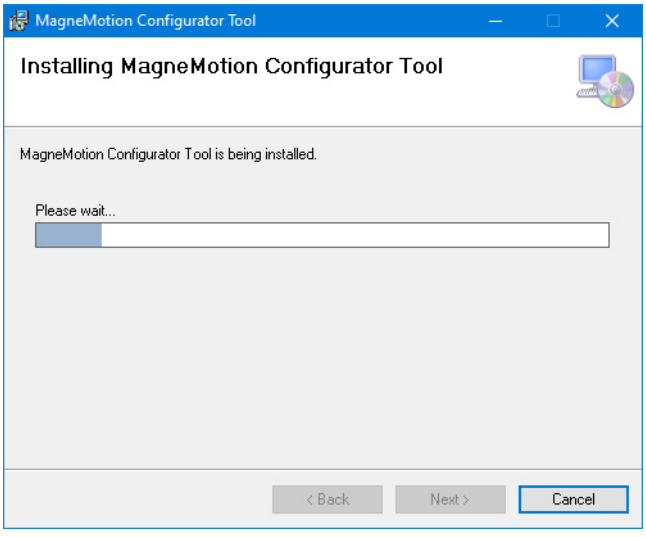


Figure 2-4: MagneMotion Configurator Tool Installation Progress

After the installation is complete, see Figure 2-5 the MagneMotion Configurator can be used as described in Run the MagneMotion Configurator on page 26.

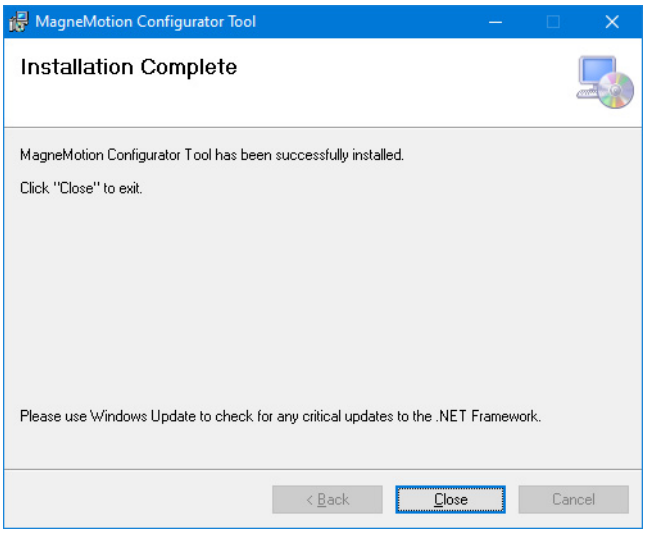


Figure 2-5: MagneMotion Configurator Tool Installation Complete

6. Select **Close**.

Run the MagneMotion Configurator

This section describes how to start and stop the MagneMotion Configurator. The Configurator is used to create and edit the Node Controller Configuration File, which contains the parameters for the components in the transport system. Always make sure to use the version of the Configurator that was supplied with the transport system.

1. Select the **MagneMotion Configurator Tool** icon, see *Figure 2-6*.

Figure 2-6: MagneMotion Configurator Tool Icon

NOTE: An alternative method is to start the program from the Windows **Start** icon; select **All Programs**, select **MagneMotion** from the folder list, then select **MagneMotion Configurator Tool**.

*The **MagneMotion Configurator** window opens with an empty Configuration Tree and the **Global Settings** page that is displayed in the Configuration Settings Pane, see Figure 2-8. For MagneMover Lite systems the **System Layout Pane** is displayed with a blank layout.*

*The first time the MagneMotion Configurator is started, the **Select System Type** dialog, see Figure 2-7. This configures the user interface to display only those functions appropriate to the selected motor type.*

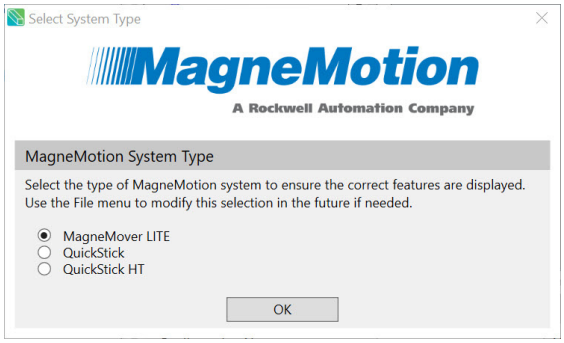
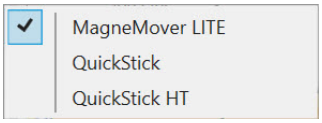


Figure 2-7: Select System Type

2. Select the type of motor type that this installation is being used with and select **OK**.

   This can be changed anytime when the Configurator is running, through the **System Type** option on the **File** menu.

   The dialog closes and the user interface is configured for the selected motor type.



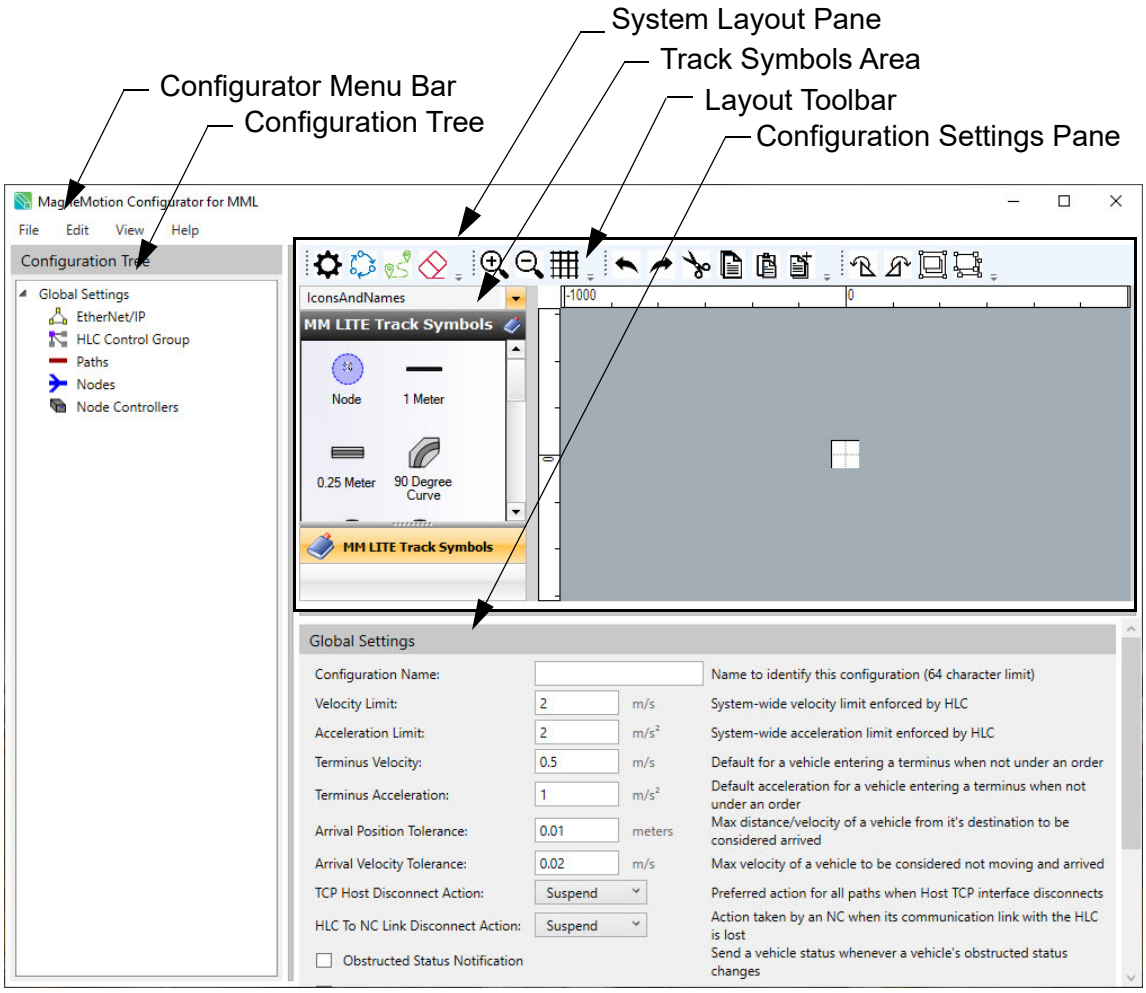
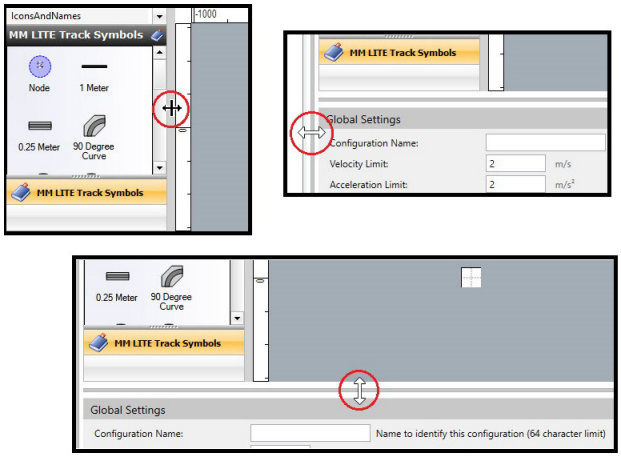


Figure 2-8: MagneMotion Configurator for MagneMover Lite

3. Move the bars that separate the panes in the window to access either the **System Layout Pane** or the **Configuration Settings Pane**, see Figure 2-9 and Figure 2-10. Use the scroll bars to see the text in the panes, or resize the window as necessary.

   NOTE: When the cursor is moved over the separator bars, it changes to either the **Horizontal Resize** cursor (⇔) or the **Vertical Resize** cursor (⇕).



Click-and-hold the left mouse button after the cursor changes to move the bars.

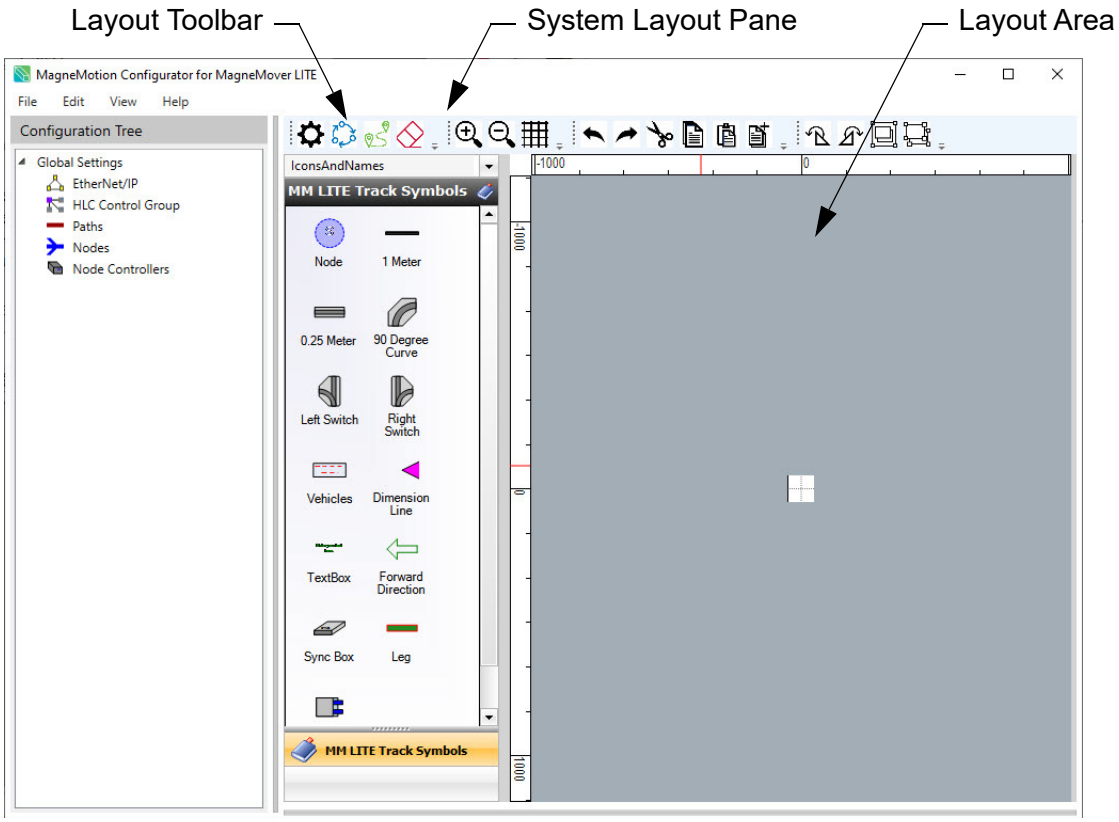


Figure 2-9: System Layout Pane Expanded

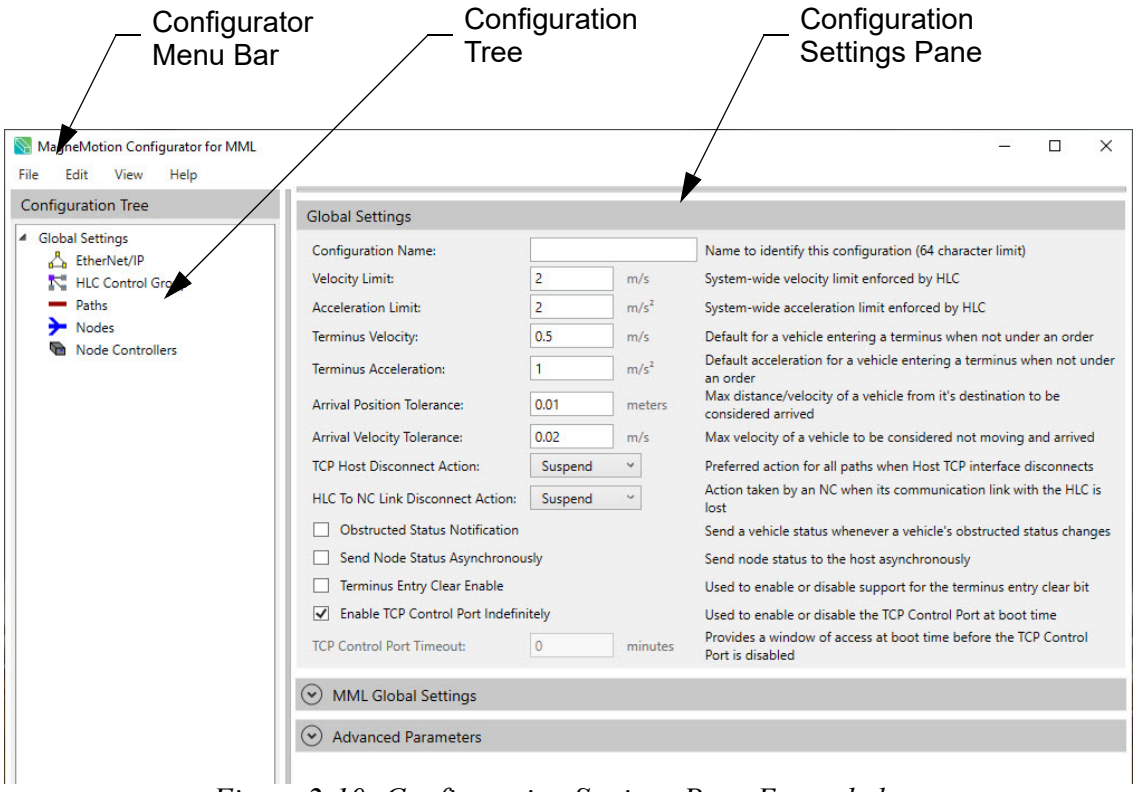


Figure 2-10: Configuration Settings Pane Expanded

4. Do one of the following:

   - If this transport system is new, see *Track Layout File Overview* *on page 30*. Then proceed to *Create and Save Track Layout Files* *on page 31* to create the Track Layout File. From the Track Layout File, see *Automatically Create the Node Controller Configuration File* *on page 57* to generate a Node Controller Configuration File.

     After the Node Controller Configuration File is created, see *Node Controller Configuration File Overview* *on page 34*. Then proceed to *Edit Existing Node Controller Configuration Files* *on page 38* to clean up the generated Node Controller Configuration File.
   - If this transport system was previously configured, see *Edit Existing Node Controller Configuration Files* *on page 38* to update the Node Controller Configuration File.
   - If this transport system is being reconfigured, see *Edit an Existing Track Layout File* *on page 33*.

Stop the MagneMotion Configurator

1. Make sure that all files (*node_configuration*.xml, *track_layout*.ndx, and *track_file*.mmtrk) are saved.

   NOTE: File types .ndx and .mmtrk are for MM Lite only.

2. Stop the MagneMotion Configurator:

   - From the **File** menu select **Exit**.
   - Select the **X** in the upper-right corner.

Track Layout File Overview

The Track Layout File (*track_layout*.ndx) is an XML file that defines the components of the MagneMover transport system for graphic display. The properties that are defined include the relationship of the motors to each other, the location and type of nodes, the direction of movement, and the quantity of vehicles. The MagneMotion Configurator provides a tool for editing this file graphically, which eliminates the need to either view or edit the XML directly. The file can have any name for convenient reference.

See the physical layout drawings of the transport system to determine the components and their configuration in the transport system.

Required Track Layout File Elements

Graphic symbols (icons) are used to represent the main elements of the transport system in the Track Layout File. These elements must be defined so the Track Layout File can be used to generate the Node Controller Configuration File (see *Generate Image Files on page 68*).

- **Motor Icons** – Provides motor symbols that can be positioned as required in the track layout. Right-click on the symbol after it is positioned to identify the motor as a Sync or Air Cooled version.
- **Switch Icons** – Provides left and right switch symbols that can be positioned as required in the track layout. Switches can be configured as either Merge, Diverge, or Merge-Diverge. Right-click on the symbol after it is positioned to identify the motor as a High-Payload version.
- **Node Icon** – Provides a node symbol that can be positioned as required in the track layout. After positioning the icon, the type of node must be specified. Right-click on the symbol after it is positioned to change the type of node.

Optional Track Layout File Elements

Additional graphic symbols are used to represent optional elements of the transport system in the Track Layout File. These elements can be defined to allow the Track Layout File to be sent to Rockwell Automation to create a Bill of Materials for the transport system.

For additional information and Track Layout definitions, see *Track Layout Options on page 192*.

Create and Save Track Layout Files

With the MagneMotion Configurator running (see *Run the MagneMotion Configurator on page 26*), create an initial Track Layout File. Save the new Track Layout File immediately so that there is a Track Layout File to work from.

Create a New Track Layout File

1. On the **File** menu, select **New NDX Layout**.

   NOTE: Make sure that any open Track Layout has been saved before selecting **New**.

2. Define the layout of the transport system (see *MM Lite Transport System Layout on page 41*).

Save a New Track Layout File

1. On the **File** menu, select **Save NDX Layout As...**.

*The **Save As** dialog box, see Figure 2-11, is displayed.*

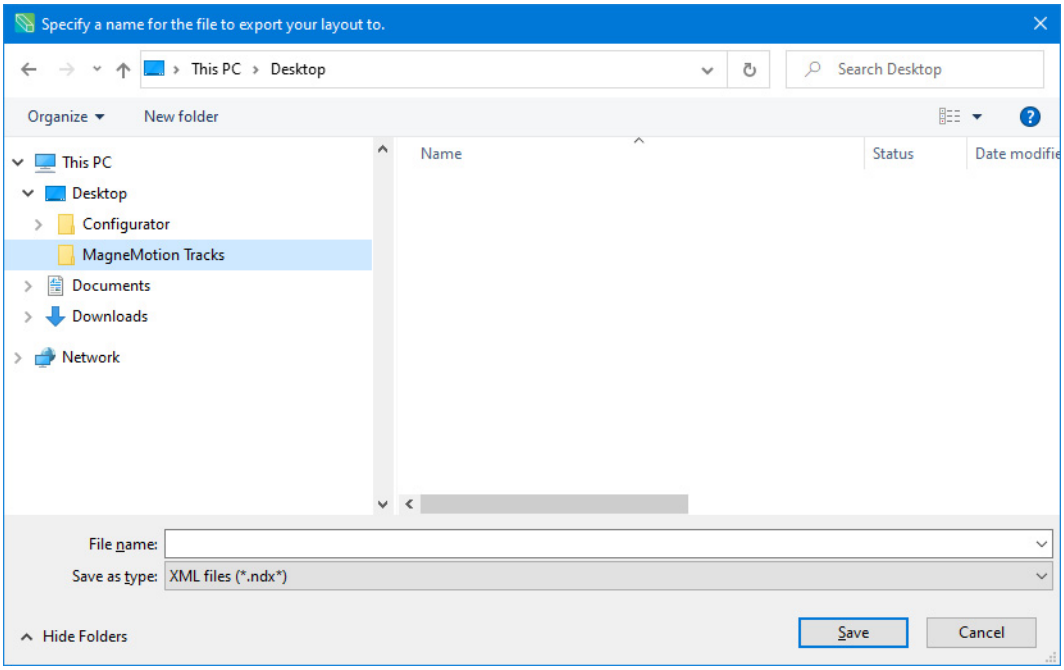


Figure 2-11: Save As Track Layout File Dialog

2. Browse to the appropriate location to save the file.

3. For **File name**, enter an appropriate descriptive name, and select **Save**. The extension for this file must be .ndx.

   The Track Layout File is saved.

4. From the **File** menu select **Exit**.

   - Select the **X** in the upper-right corner.

Edit an Existing Track Layout File

With the MagneMotion Configurator running (see *Run the MagneMotion Configurator* *on page 26*), open an existing Track Layout File. Edit the existing Track Layout File as required and then save all changes.

1. On the **File** menu, select **Open NDX Layout...**.

   *The **Load Track Layout File** dialog box, see Figure 2-12, is displayed.*

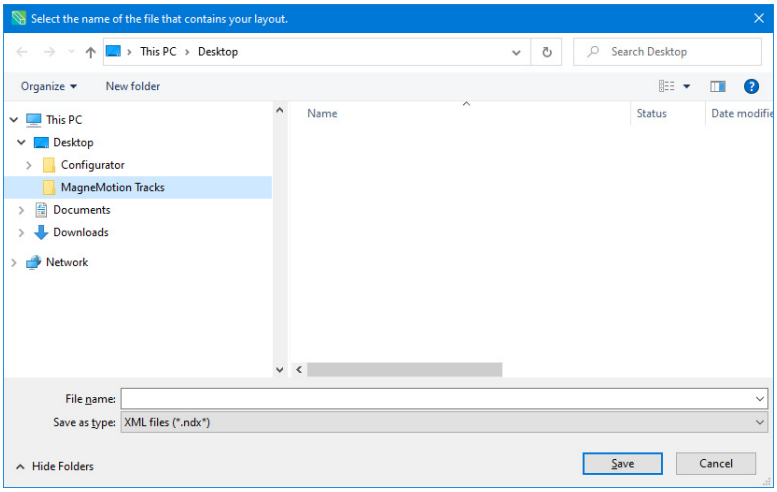


Figure 2-12: Load Track Layout File Dialog

2. Use the dialog box controls to select the Track Layout File that was previously created and select **Open**.

   *The Track Layout File is loaded and the file name (*track_layout*.ndx) is displayed at the top of the System Layout Pane.*

3. Edit the track layout as required to define the configuration of the transport system (see *MM Lite Transport System Layout* *on page 41*).

4. Save all changes to the file by selecting **Save NDX Layout** on the **File** menu.

5. From the **File** menu select **Exit or** select the **X** in the upper-right corner.

   *The **Exit MagneMotion Configurator** confirmation message, see Figure 2-13, is displayed.*

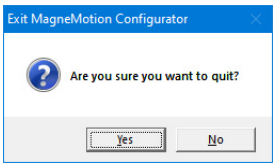


Figure 2-13: Exit MagneMotion Configurator Confirmation Message

6. Select **Yes** on the message to exit (any unsaved work is lost).

   The MagneMotion Configurator window closes.

Node Controller Configuration File Overview

The Node Controller Configuration File is an XML file that defines the elements and parameters of the transport system. The MagneMotion Configurator provides a tool for editing this file, which eliminates the need to either view or edit the XML directly. The file can have any name for convenient reference, but it must always have the .xml extension.

If the Node Controller Configuration File is uploaded through **Configuration Files**, it is renamed node_configuration.xml. If the Node Controller Configuration File is uploaded to the node controller through **Managed Configurations**, the file name is unchanged. In both cases, the file name on the computer remains unchanged. See the *MagneMotion Node Controller Interface User Manual*, MMI-UM001.

See the physical layout drawings of the transport system to determine the components and their configuration in the transport system.

Required Node Controller Configuration File Elements

The categories in the Node Controller Configuration File represent the main elements of the transport system. These elements must be defined for the proper operation of the transport system (see *Transport System Configuration on page 71*).

- **Global Settings** – Basic parameters that control how all vehicles behave when moving through the transport system, how the transport system reacts to loss of communication, and startup conditions. These parameters are used as default values for all paths, motors, and nodes unless override values are defined for specific path, motor, or node elements.
- **Paths** – Software components that define the route that a vehicle travels. Paths include one or more LSM motors arranged end to end. All paths connect to one node at the beginning of the path. Paths must connect to a second node at the end of the path if vehicles are to travel from the end of the path onto another path. Paths are unique and do not overlap. See *Create and Edit Path on page 87* for details.
- **Motors** – Hardware components that move the vehicle on the track, this component is a LSM motor. A motor is composed of a motor controller directing one or more drivers. See *Define and Edit Motors and Vehicle Parameters on page 91* for details. Motors are listed under the path that they are associated with.
  - All MagneMover Lite straight and curve motors have one driver internally, switch motors have two drivers internally. All control electronics for the MagneMover Lite motors are internal to the motor.
  - All QuickStick motors have one driver internally. All control electronics for the QuickStick motors are internal to the motor.
  - All QuickStick HT motors have one driver internally. All control electronics for the QSHT motors are external to the motor.

- **Nodes** – Software components that define the connections between paths. All paths have a node at the beginning of the path. Additional nodes provide junctions where two or more paths meet. Node types define their use, see *Create and Edit Nodes* *on page 117* for details.
- **Node Controllers** – Hardware components that provide monitoring and control of the components of the transport system. One node controller is designated as the high-level controller (HLC), which provides communication between all node controllers in the transport system and the host controller. The upstream end of a path must communicate with a node controller. See *Define and Edit Node Controllers* *on page 160* for details.

Optional Node Controller Configuration File Elements

Additional categories in the Node Controller Configuration File represent optional elements of the transport system. These categories can be defined to provide additional functionality.

- **EtherNet/IP™** – Provides communication configuration if the host controller uses EtherNet/IP communication (typically an Allen-Bradley® ControlLogix® controller).
- **HLC Control Group** – Provides structuring of the transport system as a set of smaller transport systems (control groups) with separate high-level controllers and separate host controllers for each HLC Control Group.
- **E-Stop** – Provides monitoring of a digital input on the NC to halt all motion on the specified paths. Requires a node controller that supports digital I/O. E-Stops are listed on the path that they are associated with. this is equivalent functionality to sending a suspend command from the host and is not a safety function.
- **Interlock** – Provides monitoring of a digital input on the NC to halt all motion on the specified paths. Requires a node controller that supports digital I/O. Interlocks are listed on the path that they are associated with. this is equivalent functionality to sending a suspend command from the host and is not a safety function.
- **Stations** – Specific, designated positions on a path to send a vehicle. Display of stations must be enabled on the **View** menu. Configuration defined stations are for use only when host defined stations are not an option. It is recommended that stations are assigned and managed in the host controller rather than defined here.
- **Single Vehicle Area** – A unidirectional area of a path where only one vehicle is allowed to move at any time. These areas allow one vehicle to move uninhibited along a portion of a path without interfering with any other vehicles. Display of single vehicle areas must be enabled on the **View** menu.
- **Simulated Vehicles** – Used to define simulated vehicles for use in software configuration testing. Display of simulated vehicles must be enabled on the **View** menu.

After creating the Node Controller Configuration File, upload the file to each node controller in the transport system. See *Upload the Node Controller Configuration File on page 39* for more details.

Create and Save Node Controller Configuration Files

With the MagneMotion Configurator running (see *Run the MagneMotion Configurator on page 26*), create an initial Node Controller Configuration File. Save the new Node Controller Configuration File immediately so that there is a Configuration file to work from.

NOTE: After the Node Controller Configuration File is created, make sure that all parameters are configured before uploading it to the node controllers.

Create a New Node Controller Configuration File

1. On the **File** menu, select **New XML Config**.

   *The **New Configuration** confirmation message, see Figure 2-14, is displayed.*

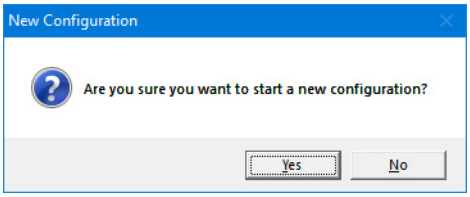


Figure 2-14: New Configuration Confirmation Message

2. Select **Yes** on the message to start a new configuration (any unsaved work is lost).

3. Define the configuration of the transport system (see *Transport System Configuration on page 69*).

Save a New Node Controller Configuration File

1. On the **File** menu, select **Save XML Config As...**.

   *The **Save XML Configuration file** dialog box, see Figure 2-15, is displayed.*

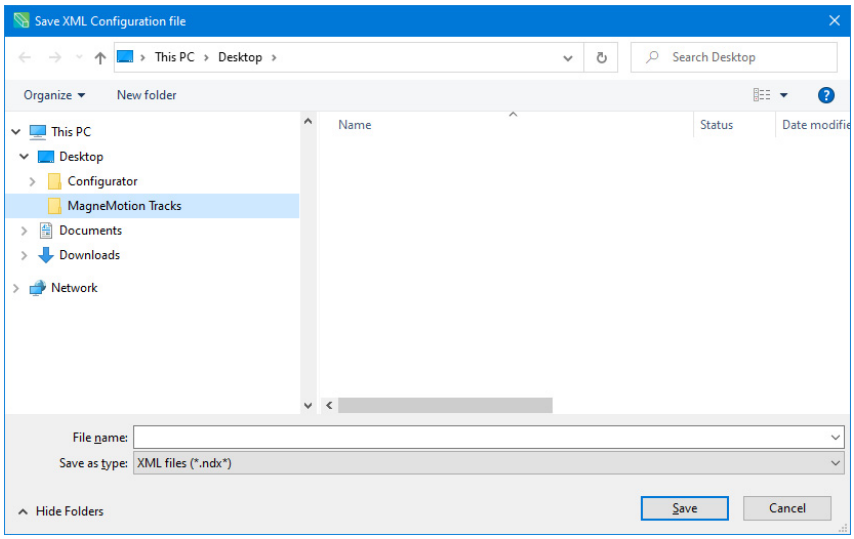


Figure 2-15: Save XML Configuration File Dialog

2. Browse to the appropriate location to save the file.

3. For **File name**, enter an appropriate descriptive name, and select **Save**.

   The Node Controller Configuration File is saved and the title of the Configurator window changes to MagneMotion Configurator – file_name.*xml.*

   NOTE: If the Node Controller Configuration File is uploaded to the node controller through the **Configuration Files** page, it is renamed node_ configuration.xml. If the Node Controller Configuration File is uploaded to the node controller through the **Managed Configurations** page, the file name is not changed. In both cases, the file name on the PC remains unchanged.

4. Continue to edit the Node Controller Configuration File or exit the MagneMotion Configurator.

5. Select **Exit** on the **File** men **or** select the **X** in the upper-right corner.

   *The **Exit MagneMotion Configurator** confirmation message is displayed, see Figure 2-13.*

6. Select **Yes** on the message to exit (any unsaved work is lost).

   The MagneMotion Configurator window closes.

Edit Existing Node Controller Configuration Files

With the MagneMotion Configurator running (see *Run the MagneMotion Configurator on page 26*), open an existing Node Controller Configuration File. Edit the Node Controller Configuration File as required and then save all changes.

1. On the **File** menu, select **Open XML Config...**.

   *The **Open XML Configuration File** dialog box, see Figure 2-16, is displayed.*

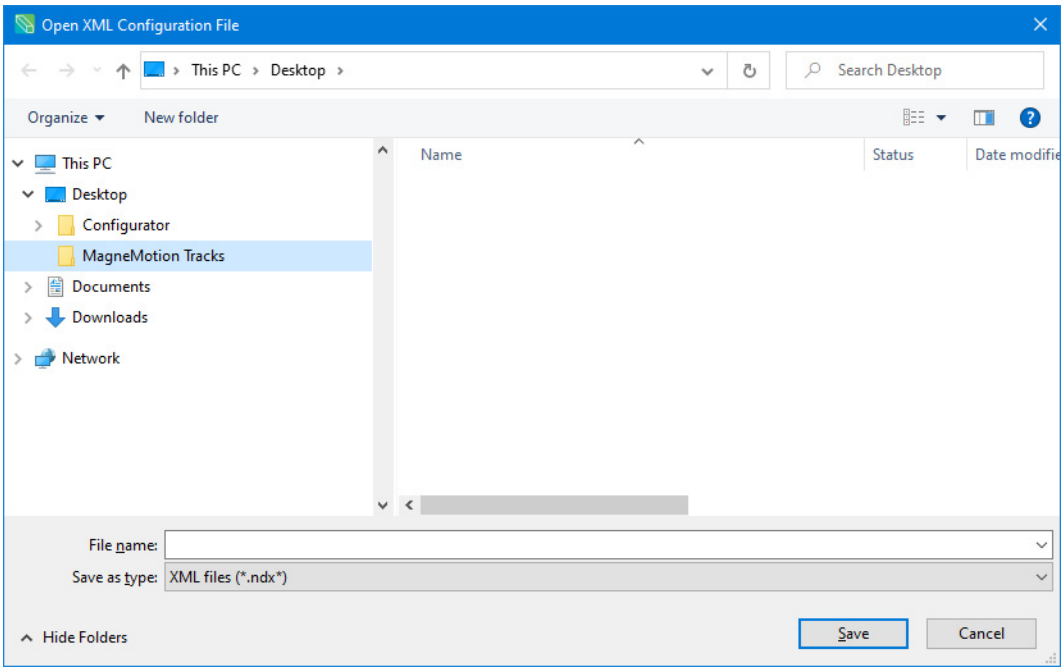


Figure 2-16: Open XML Configuration File Dialog

2. Use the dialog box controls to select the Node Controller Configuration File that was previously created and select **Open**.

   The Node Controller Configuration File is loaded and the title of the Configurator window changes to MagneMotion Configurator – file_name.*xml. The configuration information in the Node Controller Configuration File is available through the Configuration Tree on the left side of the window.*

   NOTE: If the Node Controller Configuration File contains any errors, when the file is opened an error message is displayed, see Figure 2-17. The error that is displayed in Figure 2-17 indicates that parameters were found in the XML that are not present in the Configurator. This can be true for obsolete parameters and can be disregarded if those parameters are not in use.

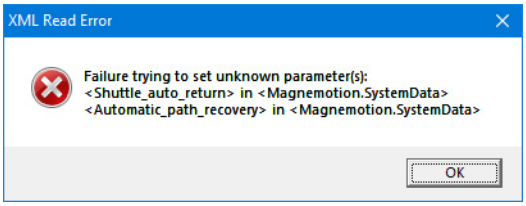


Figure 2-17: Load Node Configuration – XML Read Error

3. Select **OK** to close the message.

4. Edit the file as required to define the configuration of the transport system (see *Transport System Configuration* *on page 69*).

5. Save all changes to the file by selecting **Save XML Config** on the **File** menu.

6. From the **File** menu select **Exit or** select the **X** in the upper-right corner.

   *The **Exit MagneMotion Configurator** confirmation message, see Figure 2-18, is displayed.*

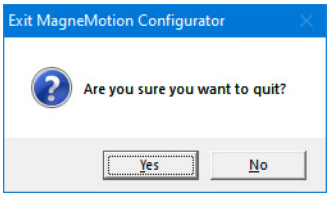


Figure 2-18: Exit MagneMotion Configurator Confirmation Message

7. Select **Yes** on the message to exit (any unsaved work is lost).

   The MagneMotion Configurator window closes.

NOTE: The updated Node Controller Configuration File must be uploaded to all node controllers in the transport system (see *Upload the Node Controller Configuration File* *on page 39*).

Upload the Node Controller Configuration File

A Node Controller Configuration File for the specific configuration of the transport system must be uploaded to every node controller in the transport system using the node controller web interface (see the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001). If a Node Controller Configuration File for the transport system has not been created, see *Create and Save Node Controller Configuration Files* *on page 36*.

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MM Lite Transport System Layout 3

Overview

NOTE: The Node Controller Configuration File defines the parameters of the transport system and is used by all node controllers in the transport system.

This chapter provides step-by-step procedures and examples for defining the Track Layout File (*track_layout*.ndx) for MagneMover® LITE™. The Track Layout File provides a graphical representation of the transport system. The Track Layout File can then be used to generate the Node Controller Configuration File. The graphical layout interface is available for the MagneMover LITE system only.

Included in this chapter are:

- Graphical Editing of the track layout.
- Required track layout elements, including:
  - Motors and switches.
  - Nodes.
- Optional track layout elements, including:
  - Dimension lines.
  - Text.
  - Direction of forward motion.
  - Legs.
  - Sync option.
  - Air Cooled option.
  - High Payload option.
  - Precision Locators.
  - Vehicles.
- Generating files from the track layout, including:
  - Node Controller Configuration File.
  - PDF and bitmap graphic files.

Track Layout

This section describes how to define the Track Layout File. The Track Layout File can be used to generate the Node Controller Configuration File (node_configuration.xml). The Track Layout File is created and edited using the System Layout Pane in the MagneMotion Configurator.

1. Run the MagneMotion Configurator. See *Run the MagneMotion Configurator* *on page 26* for details.

2. Expand the System Layout Pane.

3. Open the Track Layout File (*track_layout*.ndx). See *Edit an Existing Track Layout File* *on page 33* for details.

   The selected Track Layout File is displayed in the System Layout Pane, see Figure 3-1.

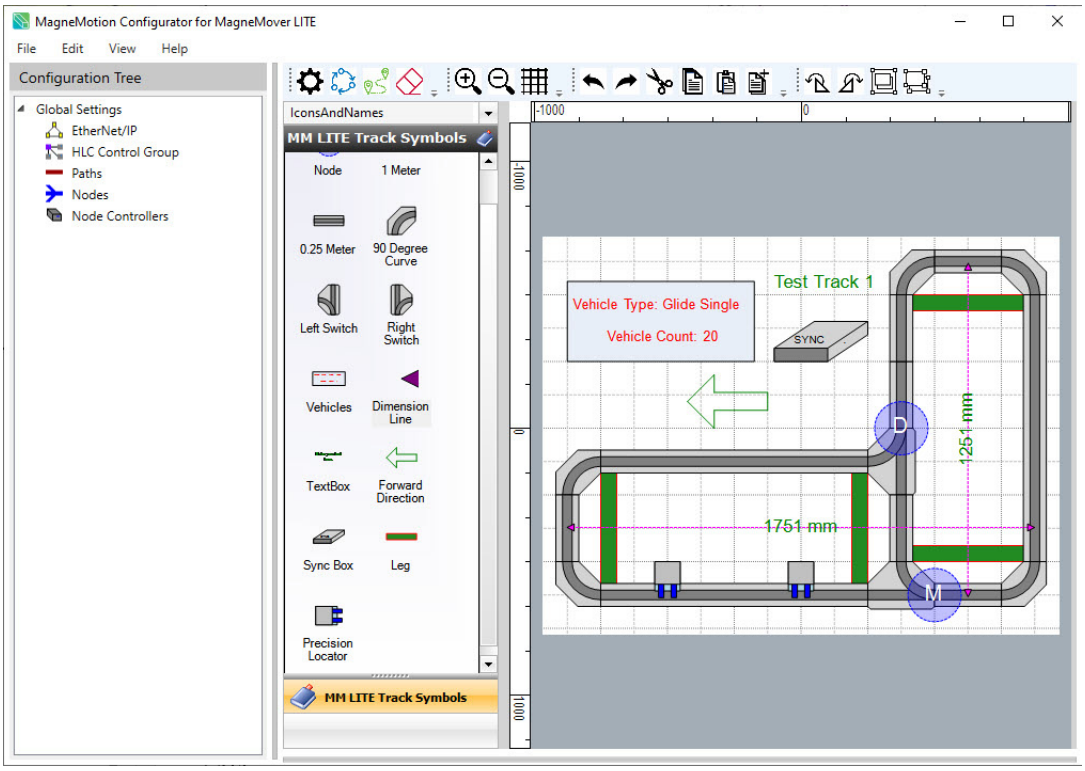

Figure 3-1: System Layout Pane with Existing Track Layout

4. Create or edit the required features of the track layout.

   A. Layout all motors and switches of the transport system as described in *Place Motors and Switches* *on page 48*.

   B. Specify the location and type of nodes being used as described in *Locate and Define the Nodes* *on page 52*.

5. Create or edit the optional features of the track layout.
   A. Specify the motors that use the LSM Sync Option as described in *Sync Motor Identification* *on page 49*.
   B. Specify the controllers and cables for the LSM Sync Option as described in *Place Sync Controllers* *on page 50*.
   C. Specify *Air Cooled Motor Identification* *on page 51*.
   D. Specify *High Payload Switch Identification* *on page 52*.
   E. Show the location of the Precision Locators as described in *Locate the Precision Locators* *on page 59*.
   F. Show the direction of forward motion as described in *Identify Direction of Forward Motion* *on page 59*.
   G. Show the number and type of vehicles as described in *Define Vehicles* *on page 60*.
   H. Show the location of Legs as described in *Locate Legs* *on page 61*.
   I. Dimension the track layout as described in *Dimension the Layout* *on page 63*.
   J. Add text to the track layout as described in *Add Descriptive Text* *on page 64*.
6. Generate files from the track layout as described in *Generate Image Files* *on page 66*.
7. Select **Save NDX Layout** for all changes on the **File** menu in the Configurator Menu Bar.

Editing the Track Layout

The track layout can be edited at any time.

- Any symbol can be selected and repositioned at any time by selecting it and dragging it to its new position. When repositioning motors, make sure that they snap into place.
- The properties for any symbol that has additional properties can be updated by right-clicking on the symbol to reopen their properties dialog box.

Editing Functions

There are several editing functions available through the **Layout Toolbar**. See *Layout Toolbar* *on page 190* for details on all editing functions.

Graphical Editing

The System Layout Pane, see Figure 3-2, provides a method for graphically configuring the transport system layout. The pane is divided into three sections; the Layout Toolbar, Track Symbols Area, and the Layout Area.

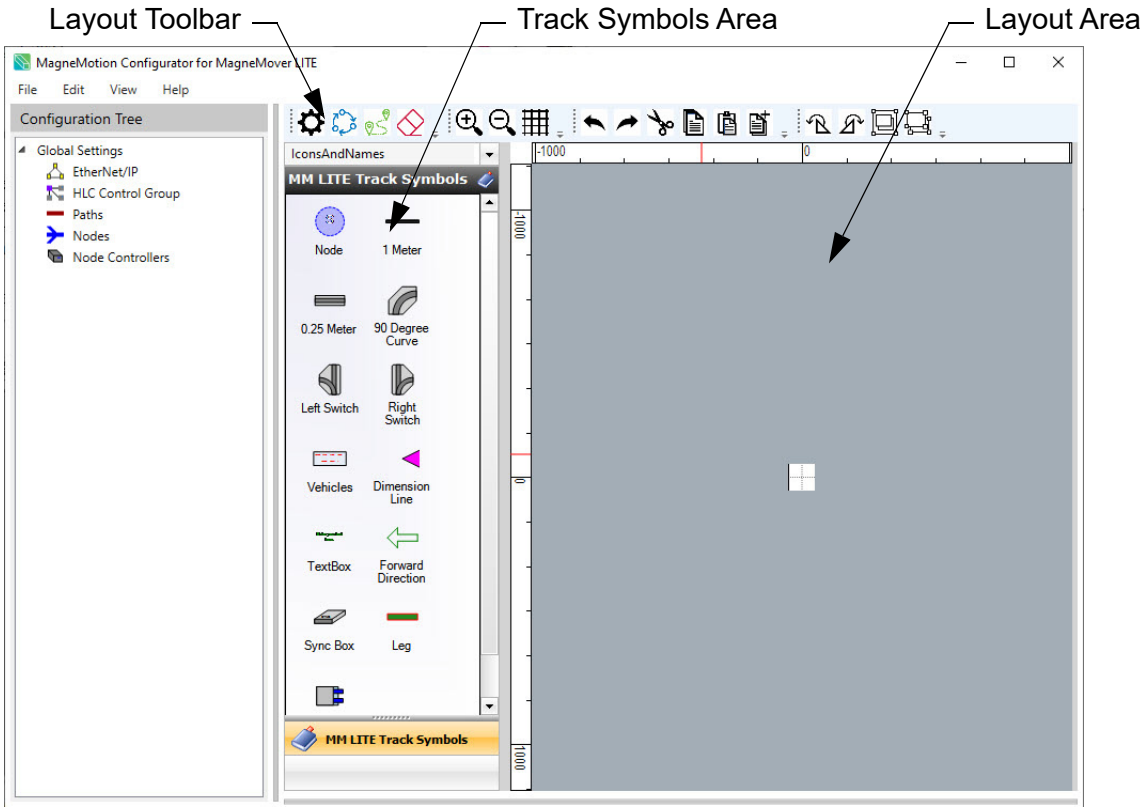

Figure 3-2: MagneMotion Configurator – System Layout Pane

Global Settings

Select Global Settings from the Layout Toolbar to open the Global Layout Settings dialog to specify the type of motors and node controllers being used in the transport system layout.

These parameters are used to *Automatically Create the Node Controller Configuration File* *on page 55*.

1. Select the appropriate motor type (**Ethernet** or **Serial**) for the MM Lite system. This helps ensure that the correct motor types are populated in the configuration file.

2. Select **NC Type** for the node controllers used on the system. This helps ensure that the appropriate quantity of nodes are automatically assigned to each node controller.

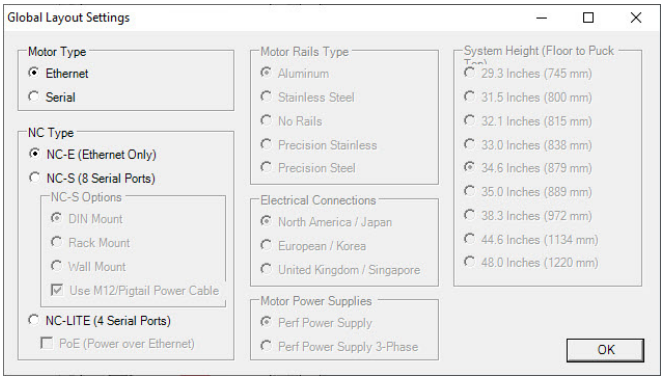

Figure 3-3: MagneMotion Configurator – Global Layout Settings

Track Layout Guides

Track layout guides can be positioned in the Layout Area to aid in symbol positioning when creating a large track layout. All symbols snap to the guides when they get close to the guide.

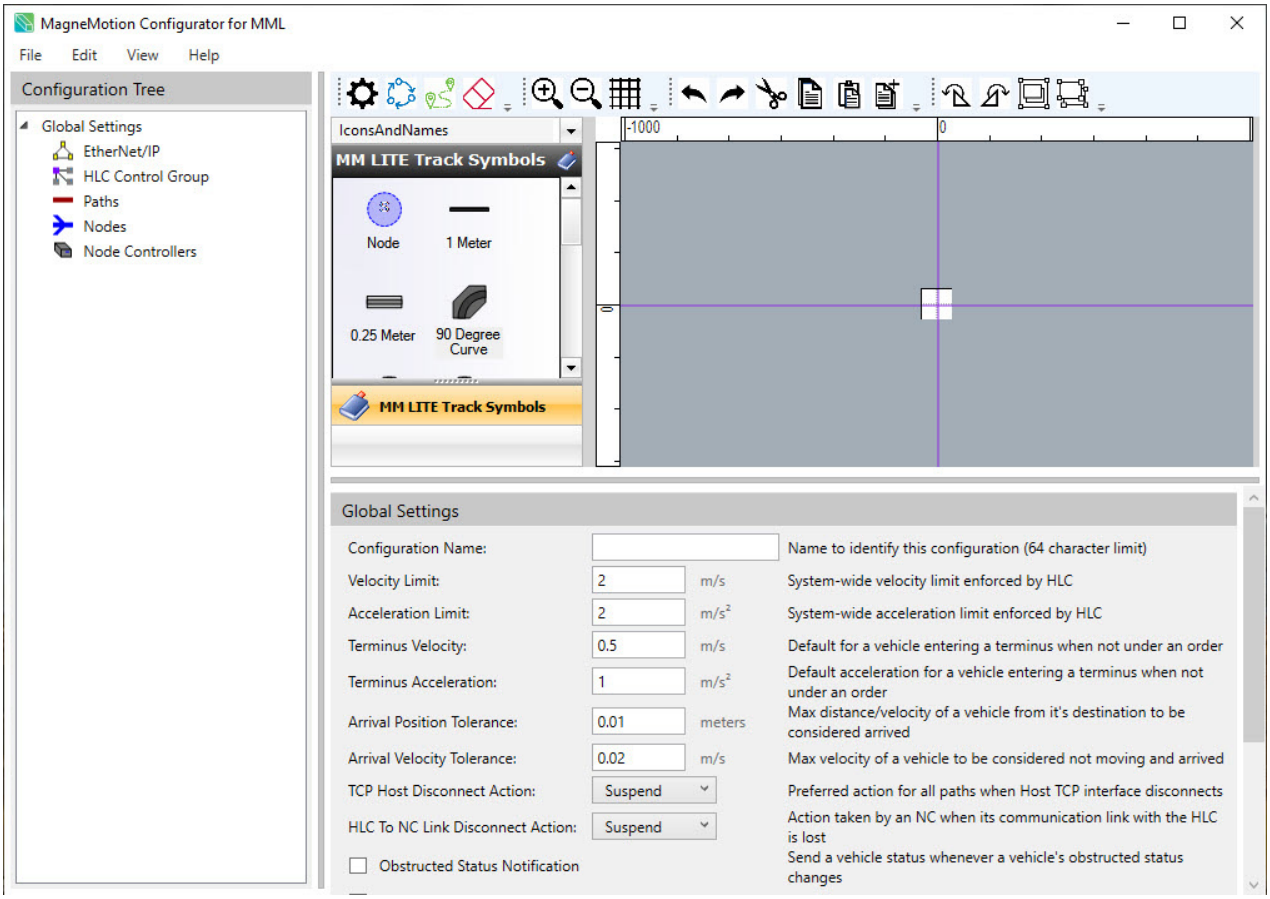

Figure 3-4: Layout Guides

- Guides can be positioned in the Layout Area by moving the cursor over one of the rulers, which causes it to change to the Resize cursor (⇔ or ⇕). Click-and-hold the left mouse button and drag the guide onto the Layout Area.
- Guides can be repositioned by placing the cursor over the guide, then click-and-hold the left mouse button and drag the guide to its new position.
- Guides can be deleted by selecting the guide (the guide changes color) and then pressing <Delete>.

Positioning Symbols

To locate a symbol in the Layout Area, use the scroll bars in the Track Symbols Area to display the symbols. To drag a symbol, position the cursor over it then click-and-hold the left mouse button and move the cursor with the symbol to the required location in the Layout Area. For track layout symbols (motors, switches, and nodes), a red box indicates the position where the symbols can join, see Figure 3-5. After the symbol is located appropriately, release the mouse button.

The background automatically expands to include the new symbol if necessary.

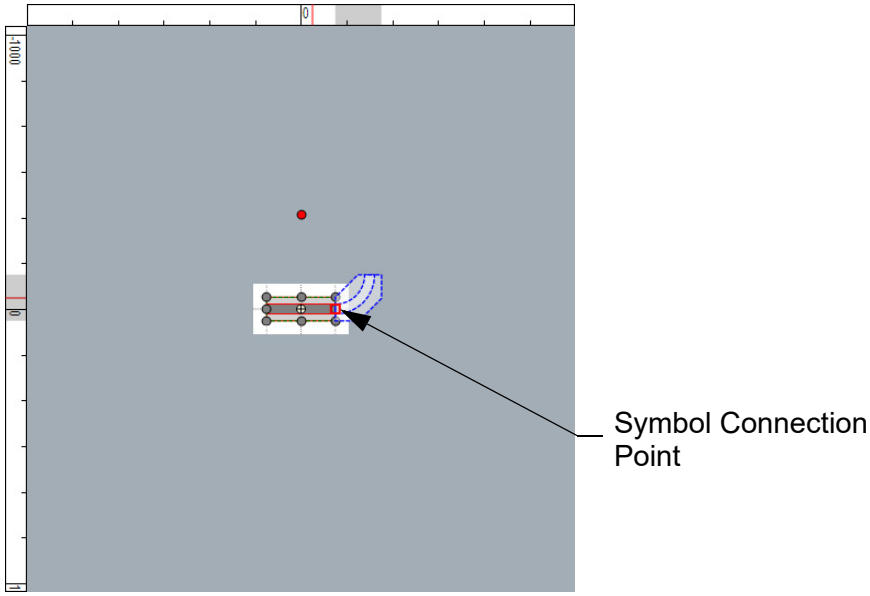

Figure 3-5: Track Layout – Snapping Symbol Into Position

If the symbol snaps into location in the wrong orientation, drag it away from all other symbols and rotate it by dragging the red handle that is displayed outside the shape. After a symbol is positioned, it cannot be rotated until it is ‘unsnapped’ from any other symbols.

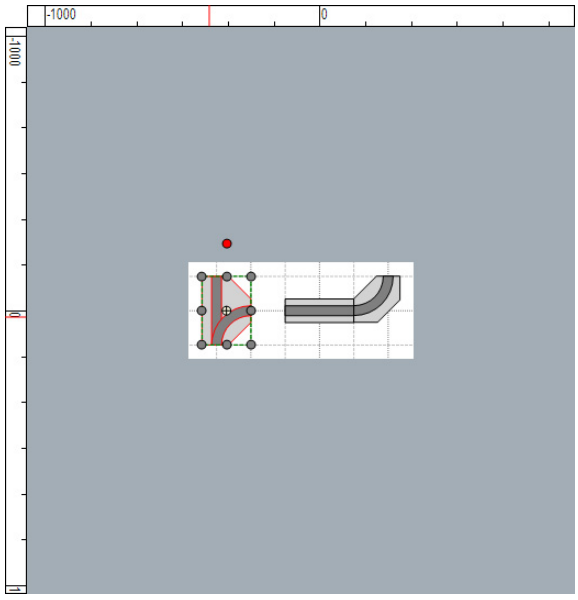

Figure 3-6: Track Layout – Repositioning Symbol

Layout the Motors and Switches

This section describes how to define and place motors in the Layout Area. Motors are used to move the vehicles on the transport system. A motor must be defined in the Track Layout File for each motor in the transport system. See *Define and Edit Motors and Vehicle Parameters on page 91* for descriptions of all motor and switch types.

Place Motors and Switches

1. Drag straight, curve, and switch LSM symbols from the **Track Symbols Area** into the **Layout Area** and position them as required. As the symbols are being positioned, they orient and ‘snap’ together at the vehicle transport positions. The background automatically expands to include the new symbol if necessary.

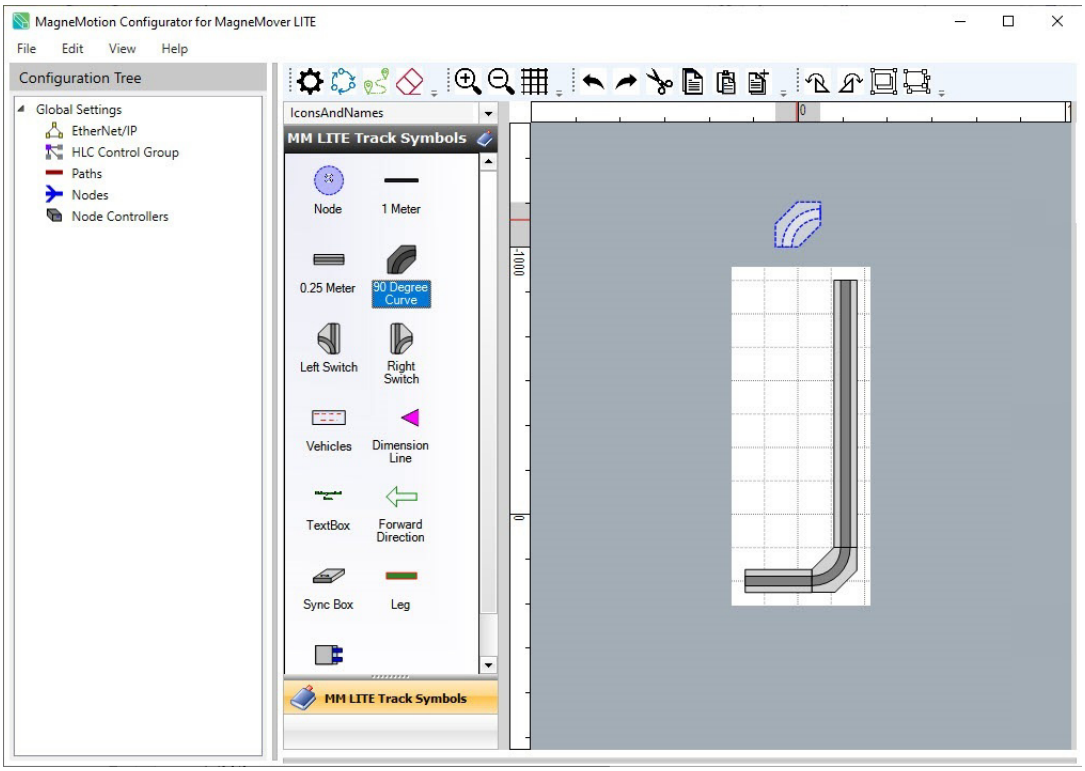

Figure 3-7: Track Layout – Place Motors

2. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Define the LSM Sync Option Motors

Identify curve and straight motors where synchronization of vehicle movement on the motor with an external mechanism for material processing or transfer is required. Synchronization is not required if vehicles are stopped at predefined stations for material processing or transfer.

NOTE: Identifying motors as using the LSM Sync option is for reference only and does not affect the track layout or any generated files. However, when this information is included, it can be used to help develop a Bill of Materials for the system if necessary.

Sync Motor Identification

1. Right-click on the motor that uses the **Sync IT**.

   *The **Motor Type** dialog is displayed, see Figure 3-8.*

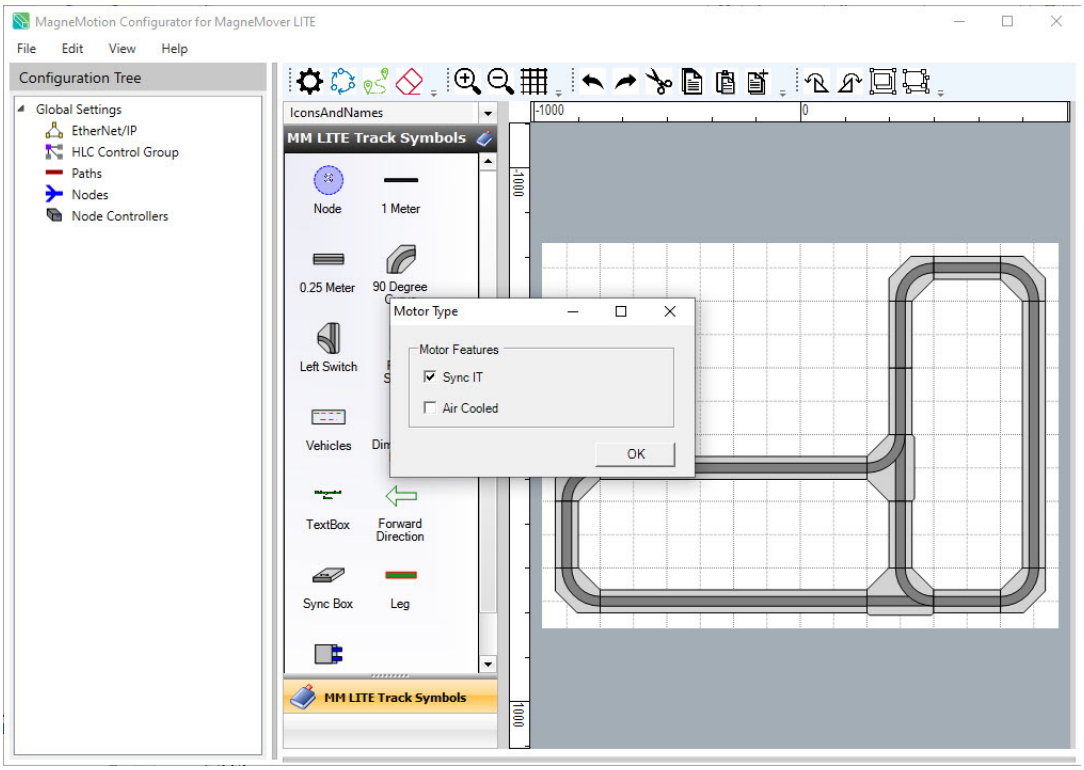

Figure 3-8: Define Motors Using the LSM Sync Option

2. Select **Sync It** in the **Motor Type** dialog and select **OK**.

   The motor is labeled 'Sync'.

Place Sync Controllers

One Sync IT controller is required for every three motors that use the sync option.

NOTE: Defining Sync IT controllers is for reference only and does not affect the track layout or any generated files. However, when this information is included, it can be used to help develop a Bill of Materials for the system if necessary.

1. Drag the **Sync Box** symbol from the **Track Symbols Area** into the **Layout Area** and position it as required.

   *The **Sync Cable Count** dialog is displayed, see Figure 3-9.*

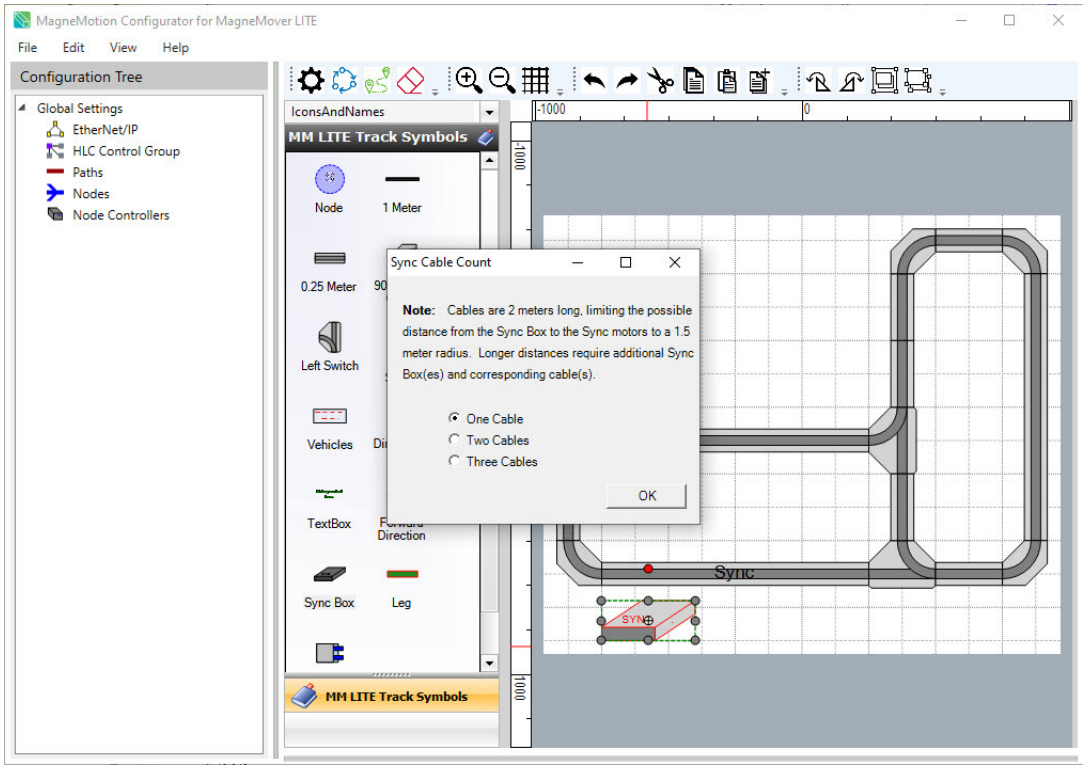

Figure 3-9: Sync Cable Count Dialog Box

2. Select the quantity of cables running from the Sync IT controller to Sync motors in the dialog box and select **OK**.

   NOTE: The quantity of cables can be changed at any time by right-clicking on the **Sync Box** symbol.

3. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Define the LSM Air Cooled Option Motors

Identify curve and straight motors where air cooling is required. Air cooling may be required for sections of track where vehicles are indexing quickly or with heavy payloads. All air cooled motors also have the LSM Sync option.

NOTE: Identifying motors as using the LSM Air Cooled option is for reference only and does not affect the track layout or any generated files. However, when this information is included, it can be used to help develop a Bill of Materials for the system if necessary.

Air Cooled Motor Identification

1. Right-click on the motor that uses the LSM **Air Cooled** option.

   *The **Motor Type** dialog is displayed, see Figure 3-10.*

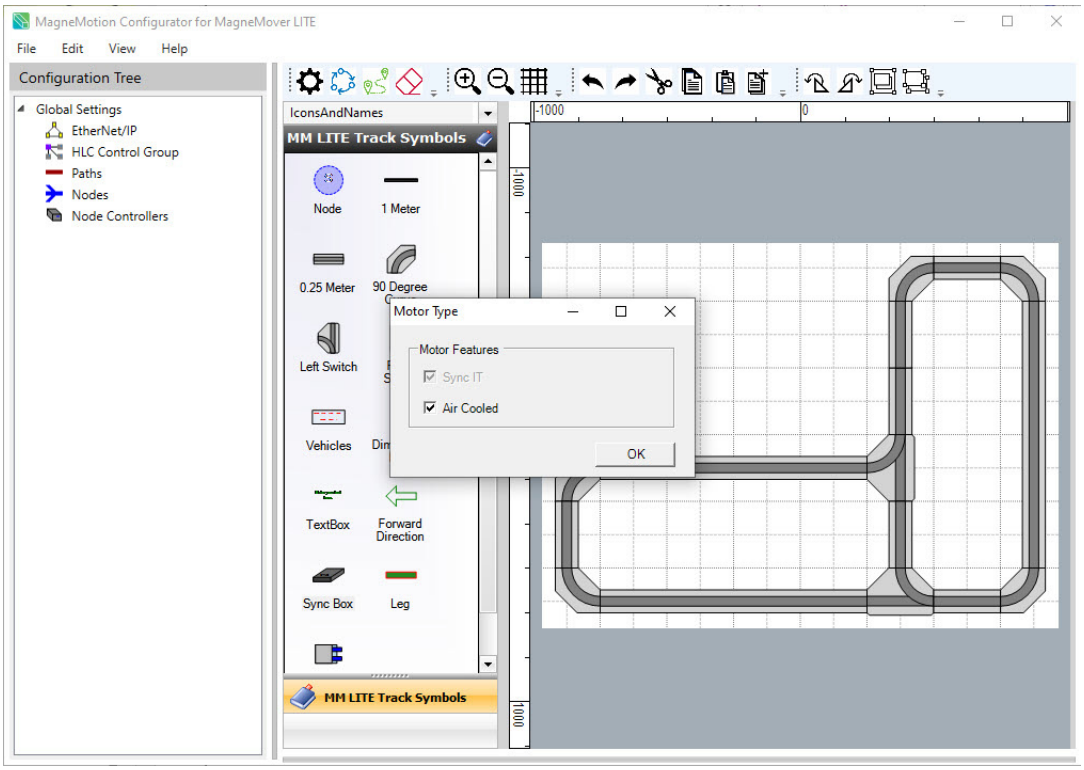

Figure 3-10: Define Motors Using the LSM Air Cooled Option

2. Select **Air Cooled** in the **Motor Type** dialog and select **OK**.

   The motor is labeled 'Sync AC'.

Define the LSM High Payload Option Switches

Identify the High Payload switches on the track. High Payload switches are required for systems using Wheeled Vehicles (single or tandem).

NOTE: Identifying motors that use the LSM High Payload option is required to generate the correct configuration file, because the High Payload switches use a different motor type. When this information is included, it is also used to help develop a Bill of Materials for the system if necessary.

High Payload Switch Identification

1. Right-click on the switch that uses the LSM High Payload option.

   *The **Switch Type** dialog is displayed, see Figure 3-10.*

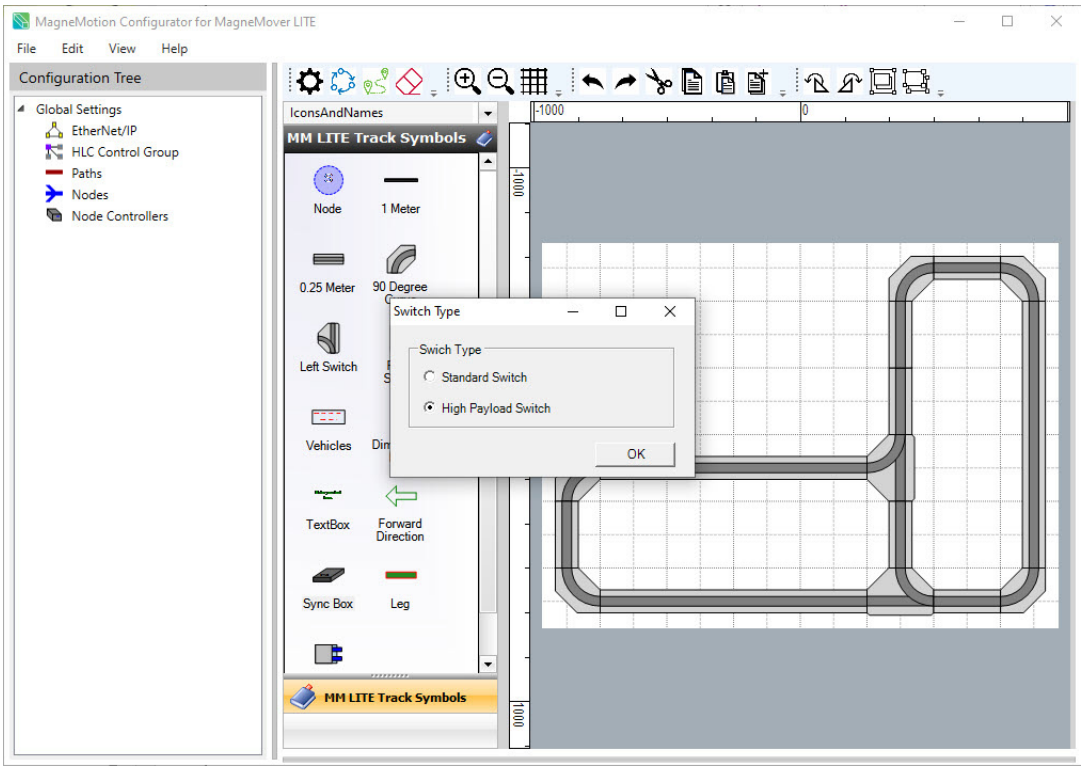

Figure 3-11: Define Switches Using the LSM High Payload Option

2. Select **High Payload Switch** in the **Switch Type** dialog and select **OK**.

   The switch is labeled 'HP'.

Locate and Define the Nodes

Nodes are junctions that are defined as the beginning, end, or intersection of paths (strings of motors). A node must be defined in the Track Layout File for each path junction. Every path must begin at a node and those paths that connect to other paths must terminate at a node. See *Create and Edit Nodes on page 117* for descriptions of available node types.

Manual Node Placement

A node symbol must be placed at the beginning of each path and at the end of paths that require a node (such as a Terminus node) in the track layout.

1. Drag the node symbol onto the **Layout Area** and position it at the beginning or end of a path, see Figure 3-12.

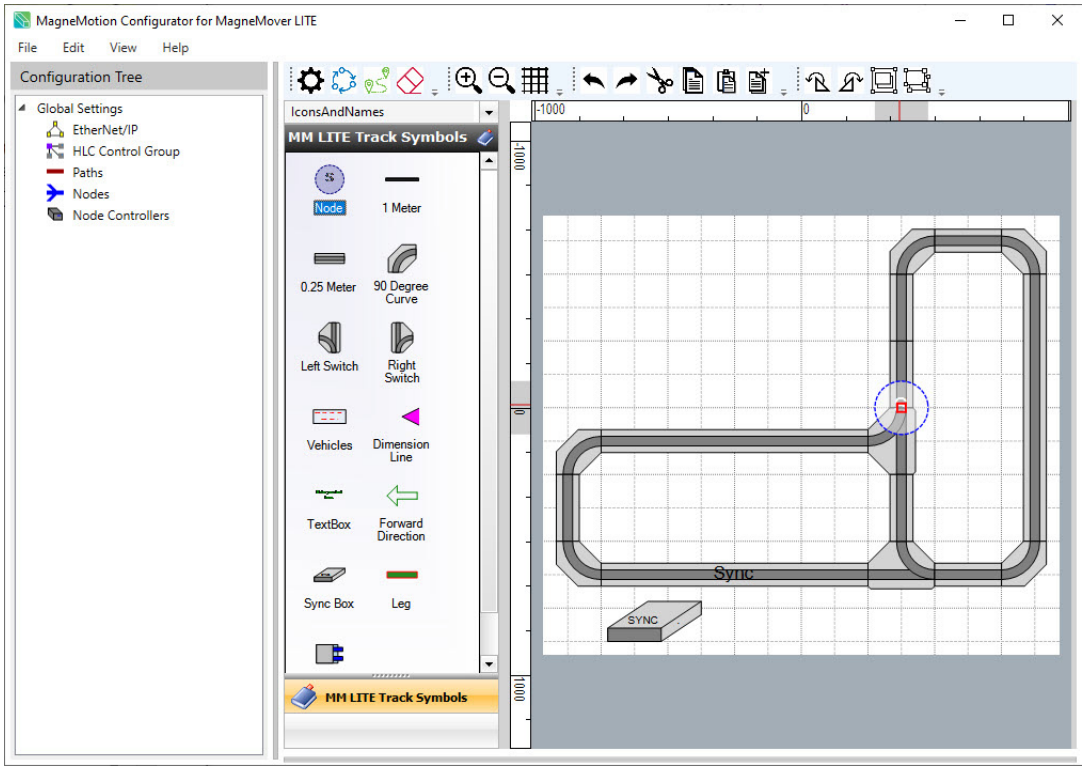

Figure 3-12: Define Nodes

*The **Node Type Selection** dialog box, see Figure 3-13, is displayed when the mouse button is released to position the node.*

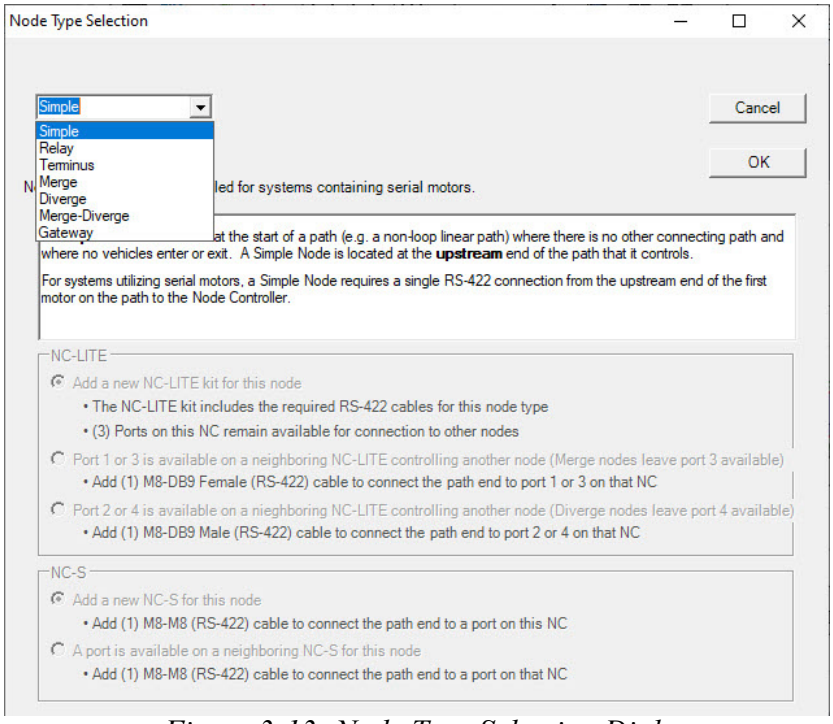

Figure 3-13: Node Type Selection Dialog

2. Select the appropriate node from the **Node Type Selection**, see Figure 3-13.

3. For Serial motors, select the appropriate Port option, and select **OK**.

   The letter in the node symbol is updated to show the node type. Port options are not required for Ethernet motors.

4. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Automatically Place Nodes

Automatically places Merge, Diverge, Merge-Diverge, Simple, and Terminus nodes based on the manual placement of one Merge, Diverge, Relay, Simple, or upstream Terminus node (see *Locate and Define the Nodes on page 52*).

NOTE: Automatic placement of the nodes requires that all track components (motors and switches) are connected to each other, see *Positioning Symbols on page 46*.

1. Place a **Merge**, **Diverge**, **Relay**, **Simple**, or upstream **Terminus** node at the appropriate location in the track layout (see *Locate and Define the Nodes on page 52*).

   NOTE: When using a **Simple** or **Terminus** node as the starting point for automatic node placement, they are assumed to be placed at the upstream end of the path. Any automatically placed **Simple** nodes are assumed to be at the start of a path. Any automatically placed **Terminus** nodes are assumed to be at the end of a path.

2. Place all **Relay** nodes at the appropriate locations on the track if **Relay** nodes are desired.

   NOTE: **Relay** nodes are not automatically placed as they are not always required for the track layout. Manually placed **Relay** nodes are detected during automatic placement.

3. Select the **Merge**, **Diverge**, **Relay**, **Simple**, or upstream **Terminus** node (see the simplified representation in Figure 3-14).

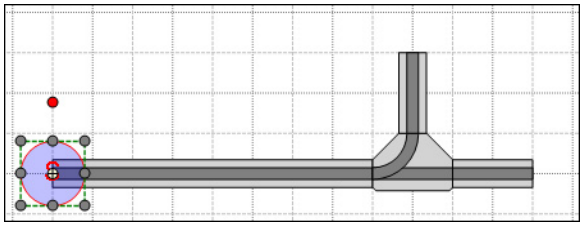

Figure 3-14: Node Selected to Start Automatic Node Placement

4. Select **Place the Nodes** from the Layout Toolbar.

   ***Merge**, **Diverge**, **Merge-Diverge**, **Simple**, and **Terminus** nodes are automatically placed in the track layout based on the position of switches and path ends (see the simplified representation in Figure 3-15).*

   NOTE: **Gateway** nodes must be placed manually. Automatically assigned **Terminus** and **Simple** nodes can be manually assigned as **Gateway** nodes if desired.

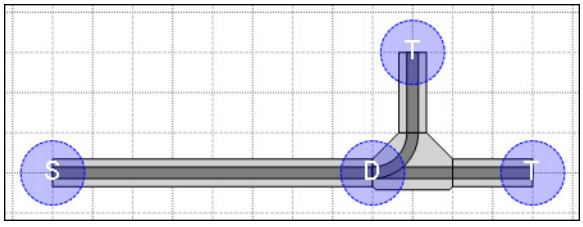

Figure 3-15: Nodes Placed Automatically

5. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Automatically Create the Node Controller Configuration File

A preliminary Node Controller Configuration File can be automatically generated from the completed track layout. After the Node Controller Configuration File is created, it must be reviewed to make sure the correct number and type of node controllers are being used. Check to make sure that the ports on the node controllers are assigned to the correct paths (if making changes to the node controllers) and any additional settings are defined.

NOTE: Automatic creation of the Node Controller Configuration File requires that all track components (motors and switches) are connected to each other, see *Positioning*

Symbols on page 46. Confirm that any High Payload switches are indicated to help ensure that proper motor types are used upon export.

Any components added to the track layout for reference only (SYNC IT controllers, Precision Locators, Forward Direction, Vehicles, Legs, Dimension Lines, and Text Boxes) are not added to the Node Controller Configuration File. However, when this information is included, it can be used to help develop a Bill of Materials for the system if necessary.

1. Make sure that no Node Controller Configuration File is open in the Configuration Tree (see *Transport System Configuration on page 69*).

   NOTE: Any configuration information in the Configuration Tree is automatically deleted and replaced when the new Configuration is generated.

2. Select the beginning point of a path.

   All Nodes Placed

   A. In the track layout, make sure that all nodes are placed (see *Locate and Define the Nodes on page 52*).

   B. Select either a **Merge**, **Diverge**, **Simple**, or **Terminus** node for the starting point for the automatic path generation (see the simplified representation in Figure 3-16).

      NOTE: When using a **Simple** or **Terminus** node as the starting point for automatic configuration, they are assumed to be placed at the upstream end of the path.

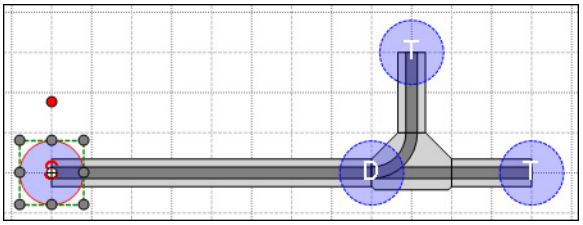

Figure 3-16: Node Selected to Start Automatic Configuration

   One Node Placed

   A. Place a **Merge**, **Diverge**, **Simple**, or **Terminus** node at the appropriate location in the track layout (see *Locate and Define the Nodes on page 52*).

      NOTE: When using a **Simple** or **Terminus** node as the starting point for automatic node placement and configuration, they are assumed to be placed at the upstream end of the path.

B. Select the node (see the simplified representation in Figure 3-17).

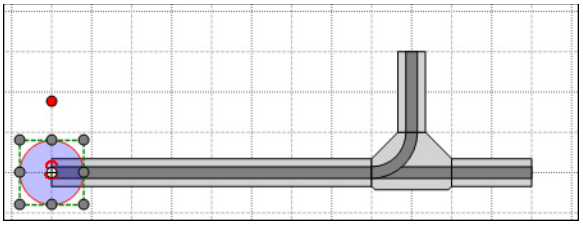

Figure 3-17: Node Placed and Selected to Start Automatic Node Placement

3. Select **Walk the Paths** from the Layout Toolbar.

   Any existing elements and settings in the Configuration Tree are cleared. Nodes (if starting with only one node) and path indicators are added to the track layout, see Figure 3-18. Paths with motors, nodes, and node controllers are added to the Configuration Tree.

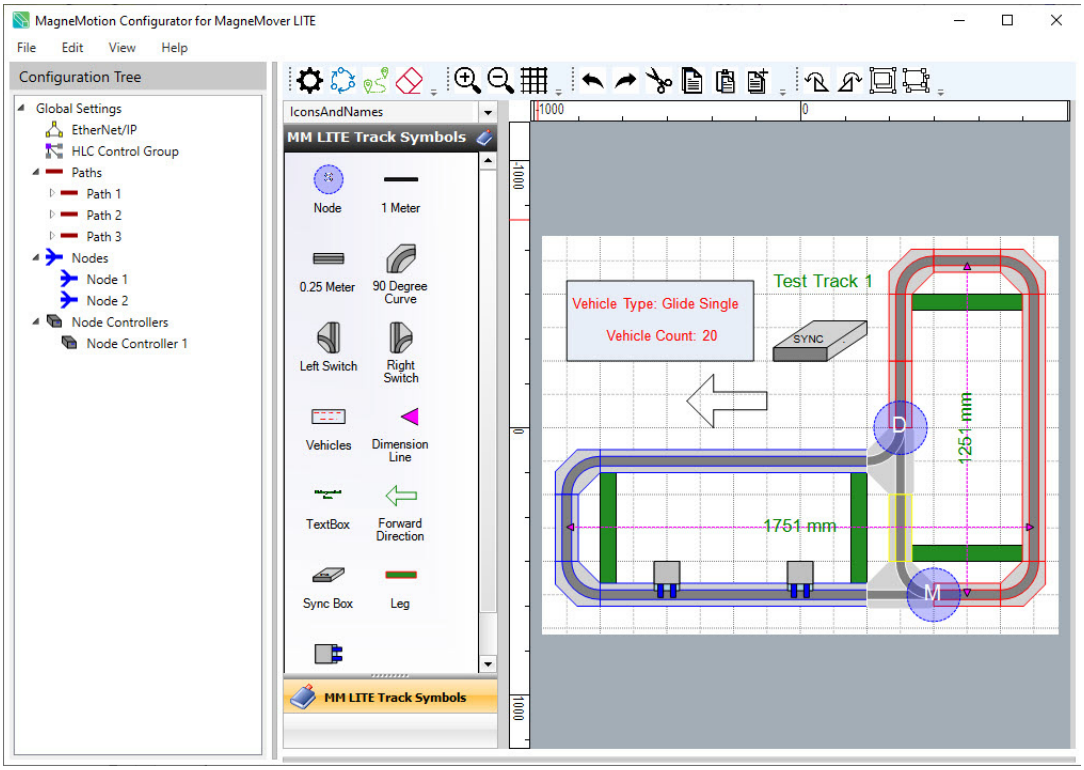

Figure 3-18: Track Layout Showing Path Indicators

4. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

5. Save all changes to the Node Controller Configuration File by selecting **Save XML Config** on the **File** menu in the Configurator Menu Bar (see *Create and Save Node Controller Configuration Files on page 36*).

6. See *Edit Existing Node Controller Configuration Files on page 38* and *Transport System Configuration on page 69* to edit the Node Controller Configuration File.

   NOTE: Edit the Node Controller Configuration File through the Configuration Tree (see *Transport System Configuration on page 69*) to make sure that any automatically placed nodes are defined correctly. Also, verify the correct number and type of node controllers are being used and the ports on the node controllers are assigned correctly. Define any stations, single vehicle areas, simulated vehicles, E-Stops, and interlocks. Additionally, reference names can be assigned to paths, nodes, and node controllers.

   Selecting a path in the Configuration Tree highlights the path in the Layout Area. Selecting a motor in the Configuration Tree highlights the motor in the Layout Area. Selecting a motor in the Layout Area highlights the motor in the Configuration Tree.

Clear Path Indications

If changes are made to the track layout, it is necessary to clear the path indicators that were previously added by **Walking the Paths**.

1. Select **Clear Path Indicators** from the **Layout Toolbar**.

   The path indicators are removed from the track layout. Any information in the Configuration Tree (paths with motors, nodes, and node controllers, and so on) is not changed.

2. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

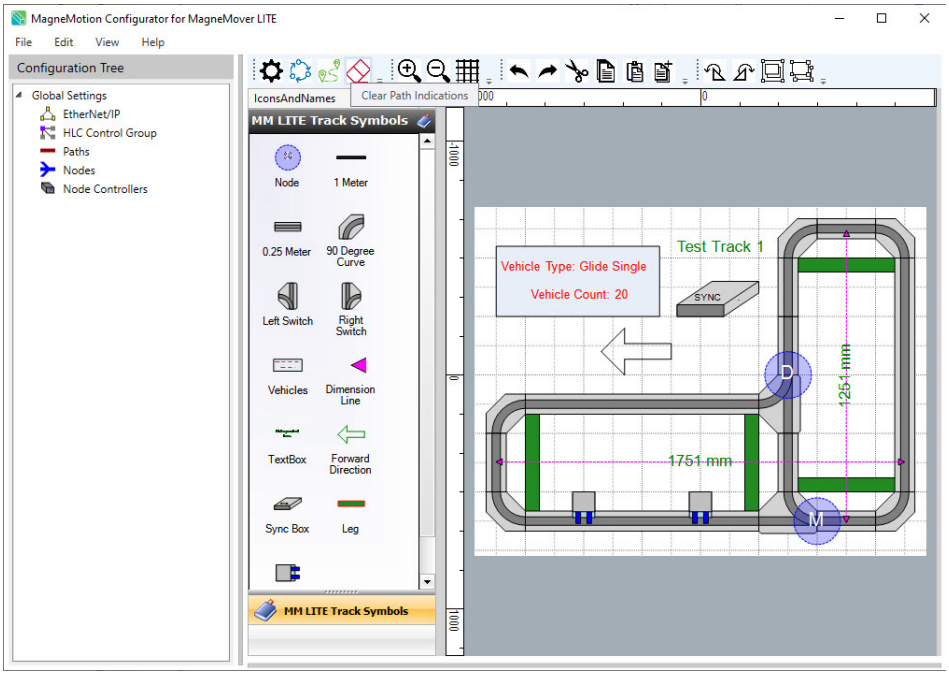

Figure 3-19: Clear Path Indicators

Identify Direction of Forward Motion

Use the Forward Direction symbol to provide a visual identification of the direction of forward movement after all motors and switches are positioned.

NOTE: Showing the direction of motion is for reference only and does not affect the track layout or any generated files. The actual direction of forward motion is determined by the placement of Merge, Diverge, Simple, or Terminus nodes.

1. Drag the **Forward Direction** symbol onto the **Layout Area**, position it next to a section of motors in the track layout, and rotate it by dragging the red handle, see Figure 3-20.

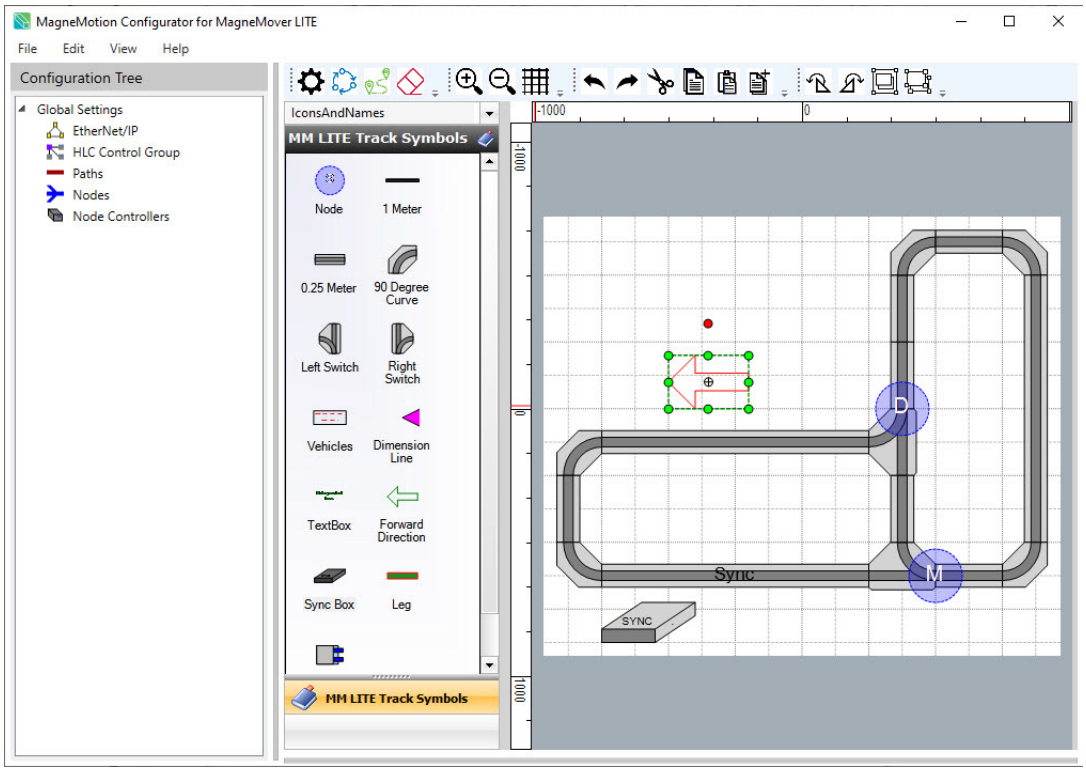

Figure 3-20: Identify Direction of Forward Motion

2. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Locate the Precision Locators

This section describes how to define the Precision Locators in the Layout Area. The Precision Locator provides a method to secure a pallet that is mounted to an MM Lite vehicle to a specific location. The standard motor and rail configuration must be used when using this option.

NOTE: Defining the Precision Locators is for reference only and does not affect the track layout or any generated files. However, when this information is included, it can be used to help develop a Bill of Materials for the system if necessary.

1. Drag the **Precision Locator** symbol onto the **Layout Area** and release the mouse buton.

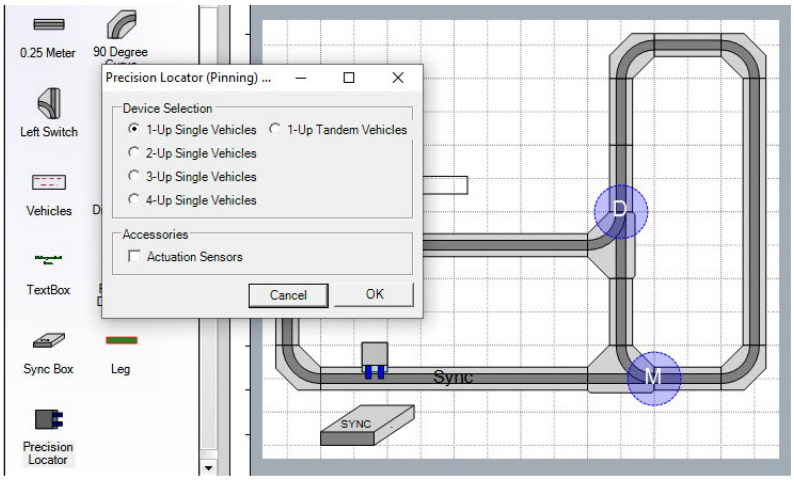

Figure 3-21: Define Precision Locator Locations

*The **Precision Locator (pinning) device** dialog box, see Figure 3-21, is displayed.*

- Select **Cancel** to close the dialog box without changing the current selections. Select **OK** to accept any changes.
- In the section **Device Selection**, select **1-Up** through **4-Up single** or **1-up tandem vehicles** to specify if the quantity of Precision Locators mounted to the same stand, the default is **1-Up**.
- In the section **Accessories**, select **Actuation Sensions** to specify if the Precision Locator is supplied with actuation sensors, the default is **No**.

  *The **Precision Locator** is labeled 'S' if it is supplied with sensors.*
- After the dialog box is closed, right-click on the Precision Locator to redisplay the dialog box.

2. Rotate and position the **Precision Locator** symbol as required.

3. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Define Vehicles

This section describes how to define the vehicles in the Layout Area. Vehicles are the moving element in a transport system. The vehicle consists of a platform that carries the payload and a passive magnet array that interacts with the motors to provide the necessary propulsion and position sensing.

NOTE: Identifying the quantity and type of vehicles is for reference only and does not affect the track layout or any generated files. However, when this information is included, it can be used to help develop a Bill of Materials for the system if necessary.

1. Drag the **Vehicles** symbol onto the **Layout Area**.

   When the mouse button is released, the Vehicle Count dialog box, see Figure 3-22, is displayed.

2. Enter the **Number of Vehicles/Kits** and **Vehicle Type** that are required in the transport system, and select **OK**.

   NOTE: Only one vehicle family (Glide, Wheeled, Precision Rail, Precision Locator) and only one vehicle type from that family (single, tandem) can be used at a time on a transport system. If using disjointed tracks, you can have multiple vehicle types in the track layout. Repeat Step 1 and Step 2 to add additional vehicles into the disjointed tracks.

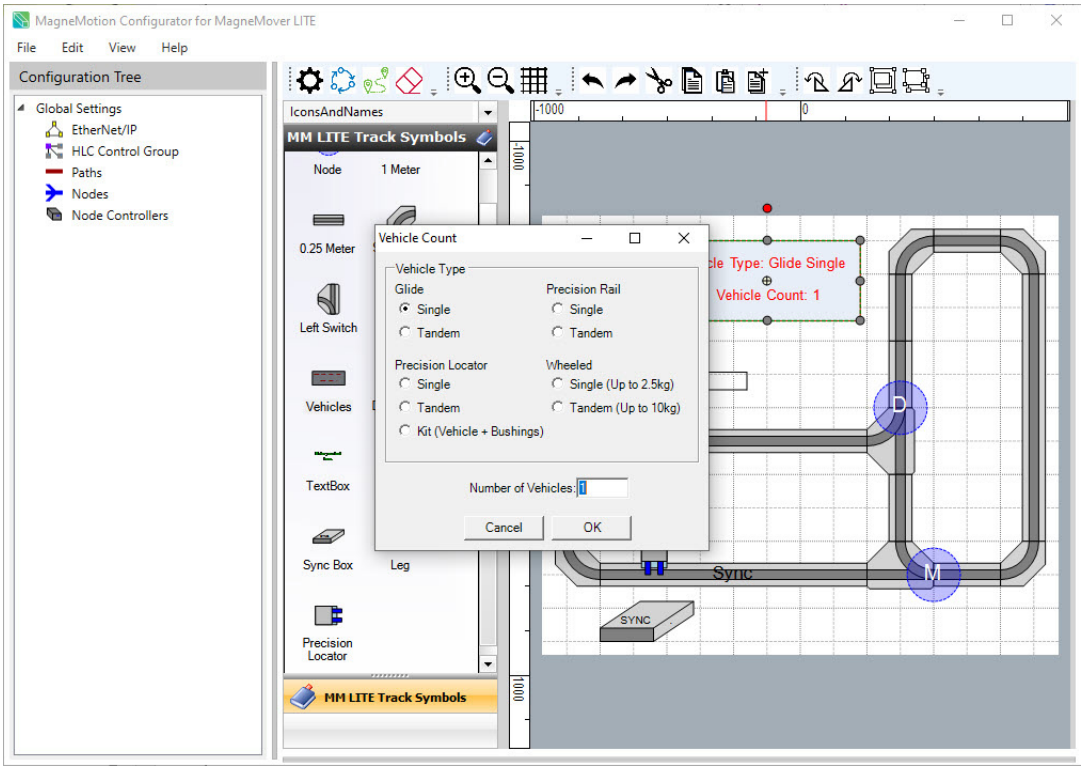

Figure 3-22: Define Vehicle Type and Quantity

3. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Locate Legs

This section describes how to define the locations for the Legs in the Layout Area. Legs should be located every two motor joints or 1.5 meters (4.92 ft), whichever is less (Figure 3-23 shows a typical leg installation for a small system). Use tighter leg spacing as

required by the system. Use spanning Legs that support multiple parallel motors where possible (see Figure 3-23) since they increase system stability.

NOTE: Defining Legs is for reference only and does not affect the track layout or any generated files. However, when this information is included, it can be used to help develop a Bill of Materials for the system if necessary.

1. Drag the **Leg** symbol onto the **Layout Area**. Position the symbol at the appropriate location in the track layout and rotate it by dragging the red handle.

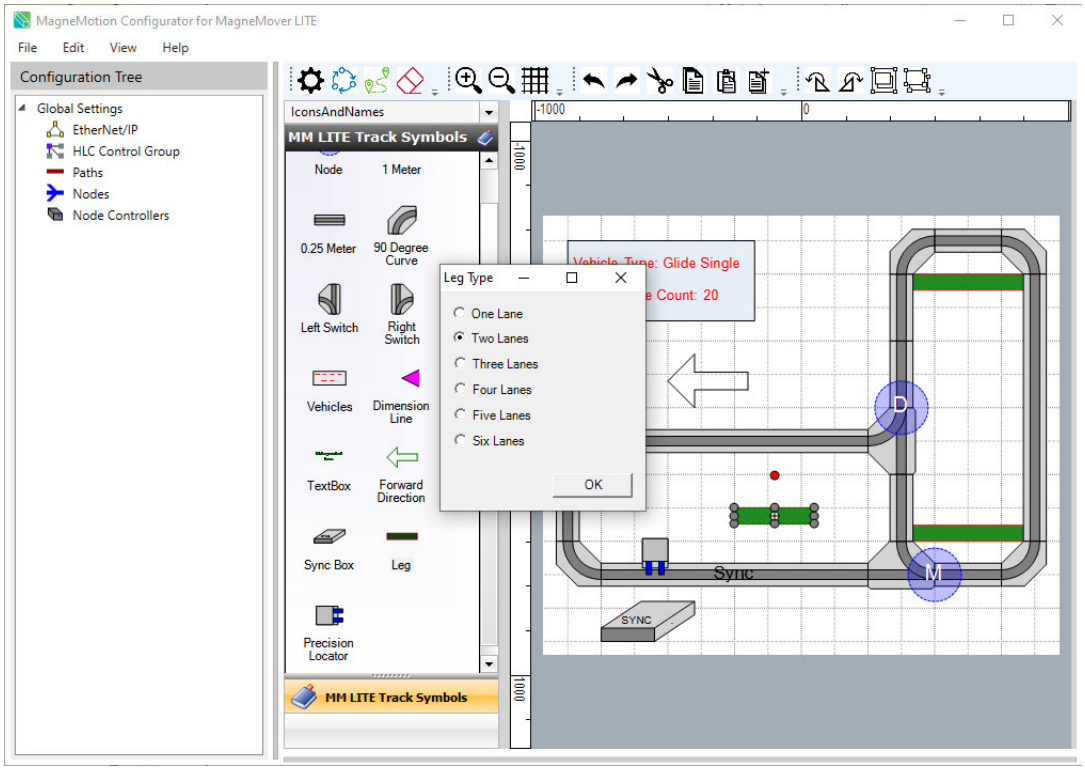

Figure 3-23: Leg Type Dialogue Box

2. Right-click on the **Leg** and select the **Leg Type** that is needed at that location, see Figure 3-23.

3. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Dimension the Layout

This section describes how to dimension the track or other elements of the Layout Area.

NOTE: Dimensioning the transport system layout is for reference only and does not affect the track layout or any generated files.

1. Drag the **Dimension Line** symbol onto the Layout Area if dimensioning is required.

2. Drag the handle at each end of the line to position it (zoom in on the Layout Area to make sure that the handle is positioned correctly).

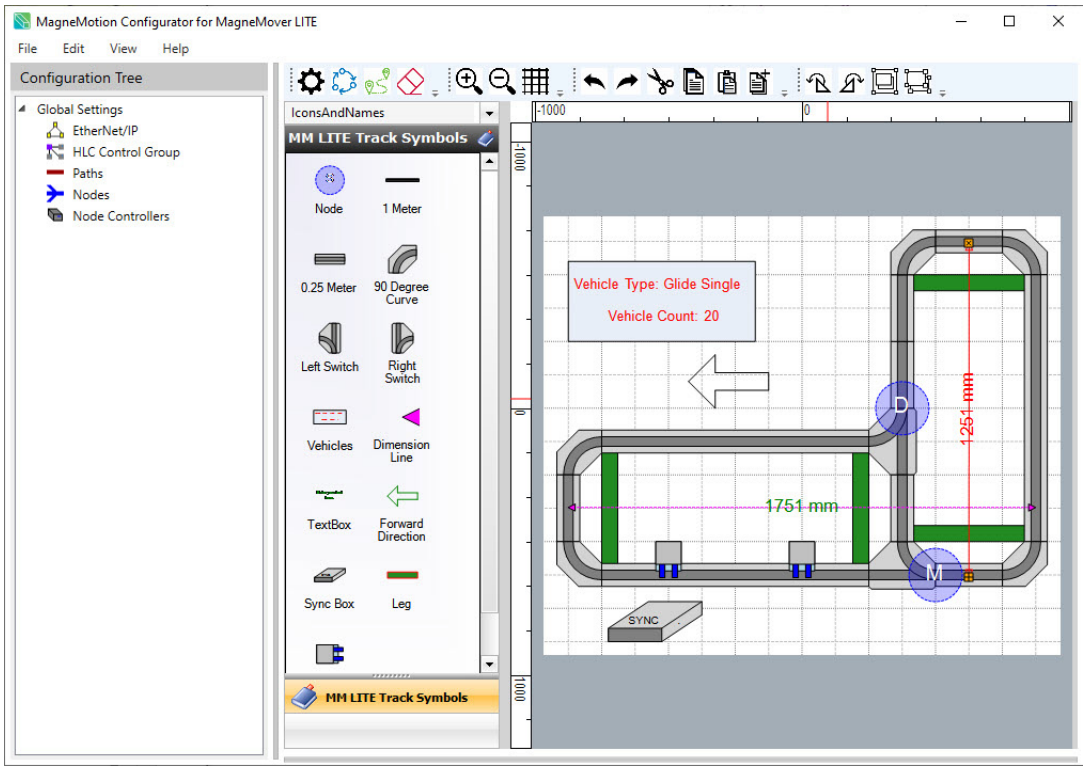

Figure 3-24: Dimensioning the Track Layout

3. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Add Descriptive Text

This section describes how to add and format text in the Layout Area.

NOTE: Adding descriptive text is for reference only and does not affect the track layout or any generated files.

1. Drag the **Text Box** symbol onto the **Layout Area** to add descriptive text. Position the **Text Box** at the appropriate location in the **Layout Area** and rotate it by dragging the red handle.

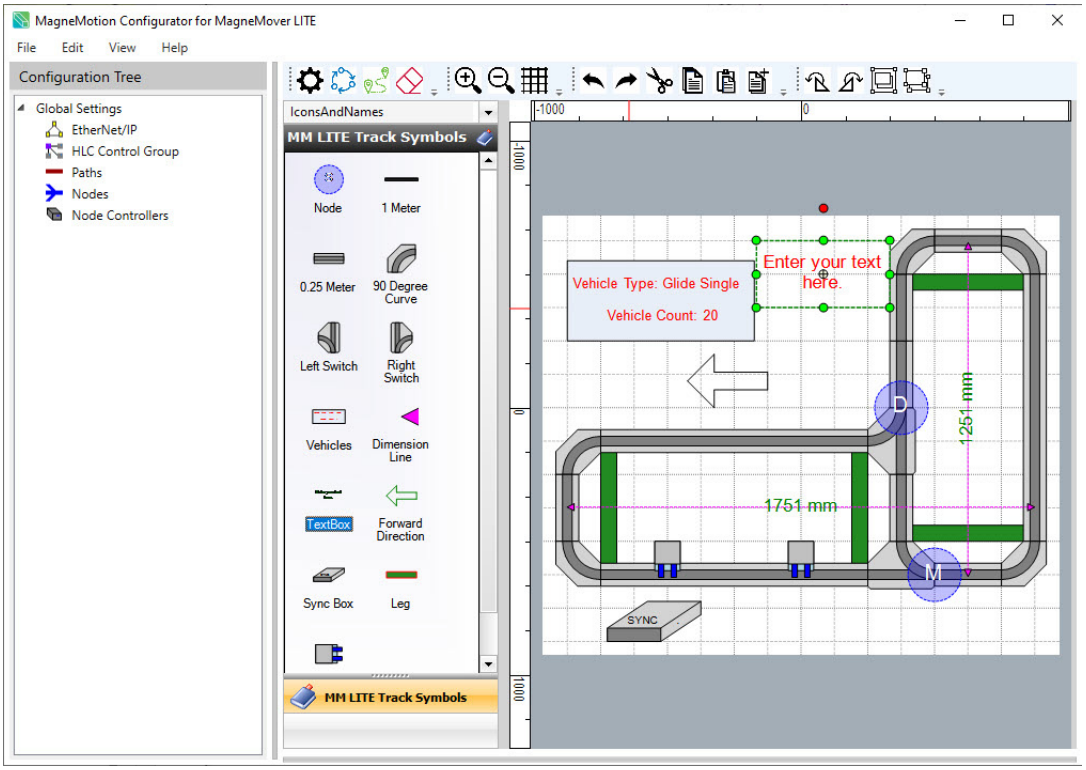

Figure 3-25: Adding Text to the Track Layout

2. Double-click the **Text Box** to enter or edit the text.

3. Right-click on the **Text Box** to open the **Text Style Editor,** see Figure 3-26, and change the text properties as desired then select **OK**.

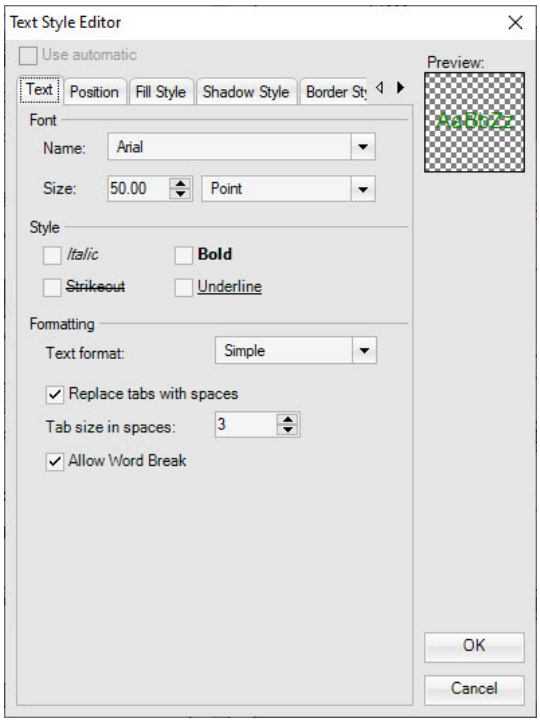

Figure 3-26: Text Style Editor

4. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar to save all changes to the Track Layout File.

Generate Image Files

Different images files can be created from the System Layout Pane. These include PDF (vector image), BMP (bit-mapped image), and graphic files.

NOTE: Select **Toggle Grid Lines** in the **Layout Toolbar** to remove the grid lines from the image before export if desired.

Create PDF Files

A PDF file of the graphical track layout can be created as a reference document. The PDF is Version 1.4 (compatible with Acrobat 5.x and later). The track layout image in the PDF is a vector image, which allows editing in applications such as Adobe® Illustrator.

1. Select **Create PDF File** using **File > Export** menu in the Configurator Menu Bar.

   The PDF Exporter is displayed, see Figure 3-27.

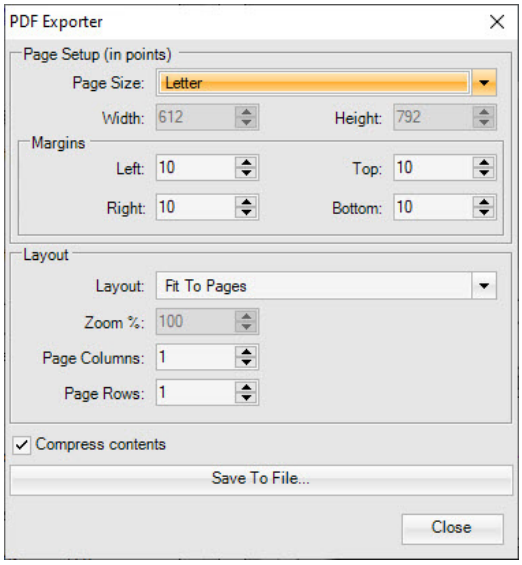

Figure 3-27: PDF Exporter Dialog Box

2. Accept the defaults or change the options for the PDF file if desired and select **Save To File...**.

   The Save As dialog box is displayed.

3. Browse to the appropriate location to save the file.

4. For **File name**, enter an appropriate descriptive name, and select **Save**.

5. Close the PDF Exporter dialog box by selecting **Close**.

Create Bitmap Image Files

A bitmap image file of the graphical track layout can be created for use in system documentation. The track layout image is saved in BMP format, which is a bit-mapped image. This format allows editing in applications such as Adobe® Photoshop.

1. Select **Create Image File** using **File > Export** menu in the Configurator Menu Bar.

   The bitmap image is created and saved in the same folder as the Track Layout File and the alert, see Figure 3-28, is displayed.

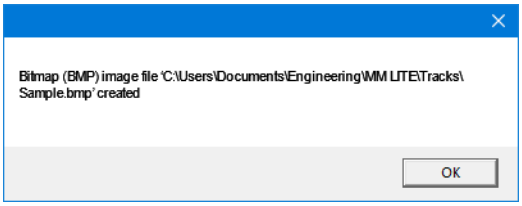

Figure 3-28: BMP Creation Alert

2. Select **OK** to close the message.

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Transport System Configuration 4

Overview

This chapter provides step-by-step procedures and examples for manually defining or editing each section of the Node Controller Configuration File for transport systems using the MagneMotion® Configurator. The Node Controller Configuration File defines the parameters of the transport system and is used by all node controllers in the transport system. The Node Controller Configuration File is also used to create the Track File, which is used by the NCHost TCP Interface Utility to provide a graphical representation of the transport system to monitor the transport system.

NOTE: The Node Controller Configuration File must be uploaded to all node controllers in the transport system each time changes are made to it.

Included in this chapter are:

- Configuration Tree overview.
- Advanced Parameters
- European Number Formatting
- View and Edit Functions, including:
  - Copy, Add, and Delete Configuration Settings.
- Configuration settings, including:
  - Global Settings.
  - EtherNet/IP™.
  - HLC Control Group.
  - Nodes.
  - Node Controllers.
  - Paths, Motors, Stations, Single Vehicle Areas, Simulated Vehicles, E-Stops, and Interlocks.
- Optional configuration settings, including:
  - Control Loop Parameters.

Configuration Tree

The Configuration Tree that is displayed on the left side of the MagneMotion Configurator provides categories for each type of component in the transport system. Each category can be expanded to display the individual elements of that component type. The parameters for each element, and those categories that do not have elements, can be displayed on the right side of the Configurator by selecting the element, or category, in the Configuration Tree.

Table 4-1 provides an overview of the Configuration Tree and identifies those categories and elements that have Property pages that are associated with them. Options that are not currently supported are not listed in the table.

Table 4-1: Configuration Tree Overview

Configuration Tree	Description	Parameters	Page
Node Configuration (Global Settings)	Category	Y	75
EtherNet/IP	Category	Y	78
HLC Control Group	Category	Y	80
Paths	Category		87
Path *n*	Element	Y	
Motors	Category		91
Motor Defaults	Element	Y	
Motor *n*	Element	Y	
Stations	Category		165
Station *n*	Element	Y	
Single Vehicle Areas	Category		169
Single Vehicle Area *n*	Element	Y	
Simulated Vehicles	Category		72
Simulated Vehicle *n*	Element	Y	
Nodes	Category		117
Node *n*	Element	Y	
Node Controllers	Category		160
Node Controller *n*	Element	Y	
All Stations	Category		168
Station *n*	Element	Y	

NOTICE **Fields containing invalid or improperly formatted values are outlined in red. If you hover over an invalid field, the error message appears.**

Define Advanced Parameters

For all sections, the Advanced Parameters are only visible when the Advanced Parameters pane is expanded. To expand the Advanced Parameters pane, select the down arrow in the Advanced Parameters title bar. To collapse the Advanced Parameters, select the up arrow in the Advanced Parameters title bar.

NOTE: QuickStick® and QuickStick HT motor families use different Advanced Parameters than MM Lite™. The configurator only shows parameters that are available for the active system configuration.

1. Update the advanced parameter settings as required for the path (see *Advanced Parameters* *on page 243* for detailed descriptions of all parameters).

2. To access the advanced motor settings, expand the **Advanced Parameters** dialogue box within the Configuration Properties Pane.

   *The **Motor Details** page that is displayed in the Configuration Settings Pane is updated with the advanced parameters, see Figure 4-1.*

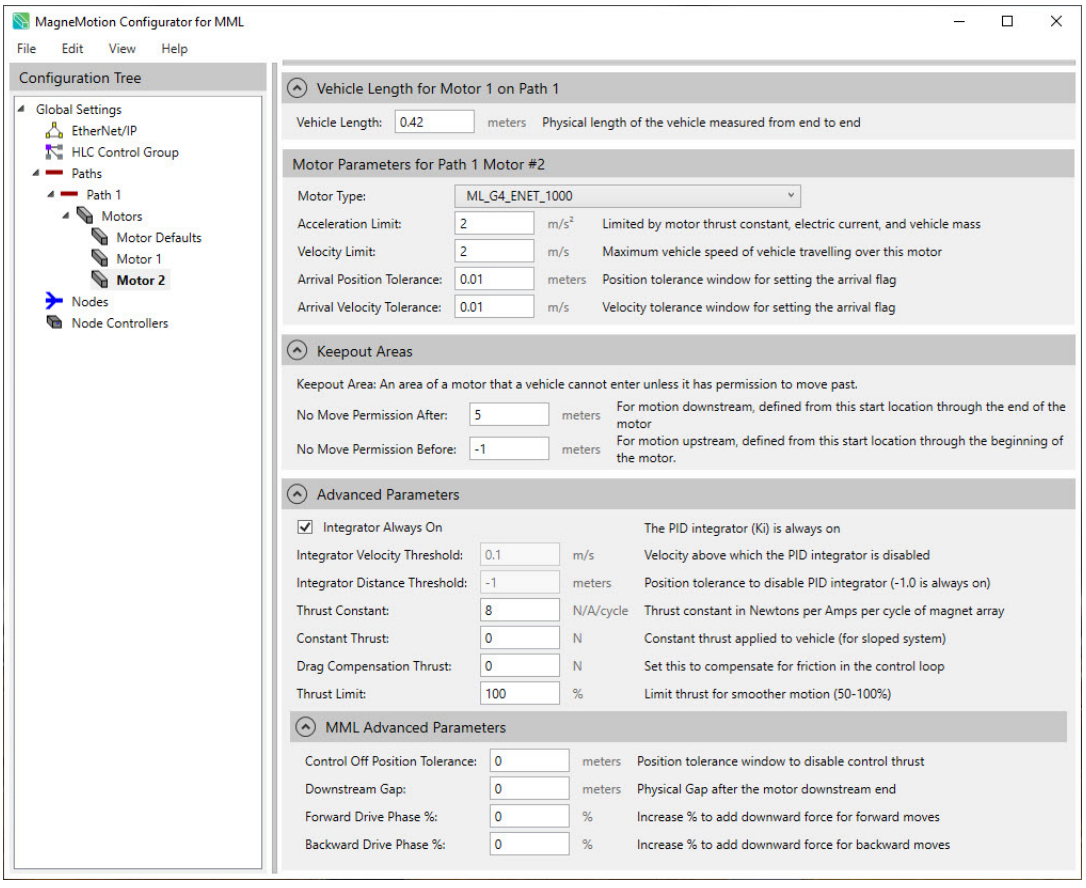


Figure 4-1: Example Motor Details Page with Advanced Parameters

3. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

European Number Formatting

This section describes how to show/hide European Number Formatting for the display and entry of numbers in all pages.

The US number format uses a point as the decimal mark in a number and a comma as the delimiter between groups. The European number format uses a comma as the decimal mark in a number and a point as the delimiter between groups. See Figure 4-2 for examples of both number formats where the number displayed is one thousand.

`1,000.00`	`1.000,00`
US Formatting	EU Formatting

Figure 4-2: Number Formatting Conventions

NOTE: The use of group separators is optional when using either style of number formatting.

Show European Number Formatting

1. Enable the **European Number Formatting** option by selecting the **European Number Formatting** option in the **View** menu in the Configurator Menu Bar.

   *A check mark is displayed before the **European Number Formatting**, see Figure 4-3, to indicate it is selected and all current values are reformatted, see Figure 4-2.*

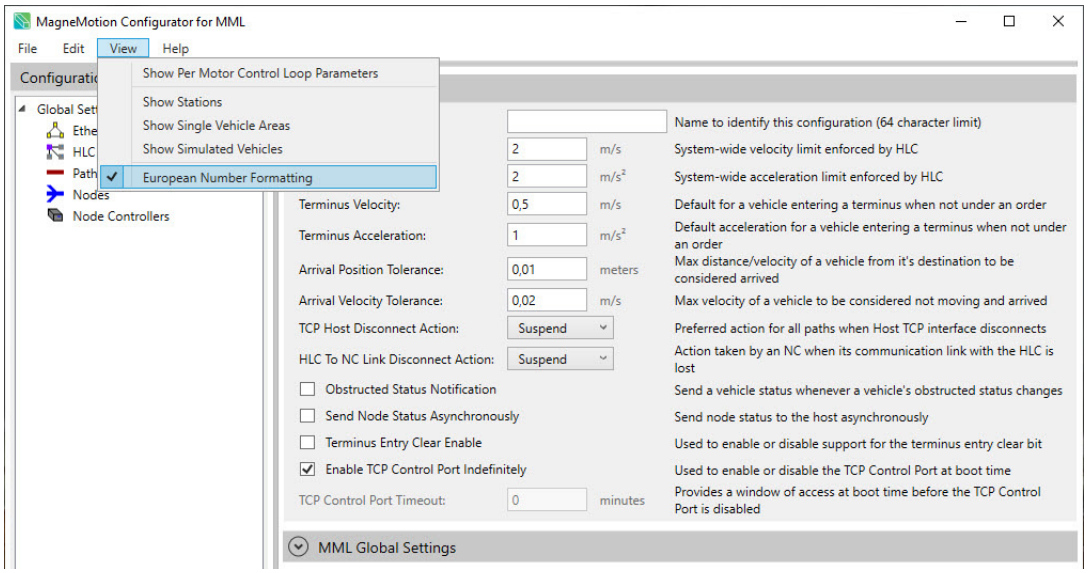


Figure 4-3: European Number Formatting Option Selected

View and Edit Functions

There are several functions available through the **View** menu in the Configurator Menu Bar at the top of the MagneMotion Configurator window that can be selected at any time. See *Configurator Menus* *on page 197* for available functions.

There are several editing functions available through the **Edit** menu in the Configurator Menu Bar at the top of the MagneMotion Configurator window. These functions are also available through the context-sensitive shortcut menus that are displayed by right-clicking on the categories and elements in the Configuration Tree.

Copy Configuration Settings

Configuration information can be copied from any element and pasted into another element of the same type. It is not necessary for the elements to be on the same path, but they must be in the same Node Controller Configuration File. The values of all parameters are copied. Motor configuration information can also be copied from the Motor Defaults, and pasted into any motor or the Motor Defaults on another path.

NOTE: When a copy operation is performed, the source element is preserved in the Configuration Tree.

Cutting configuration information copies the information from the selected element, temporarily stores it, and then deletes the element from the Configuration Tree. The stored information can then be pasted into the target element (the same as a copy operation).

If the copy operation creates a duplicate ID number (nodes, node controllers, stations) or if a duplicate ID number is manually entered, an alert similar to the one shown in Figure 4-4 is displayed. Change the ID number of the element to a number that is not being used.

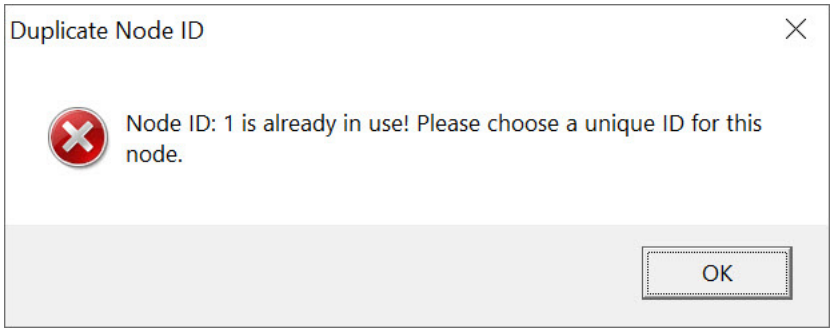


Figure 4-4: Duplicate ID Alert

1. Expand the element list in the Configuration Tree by selecting the symbol in front of the category or double-clicking the category name.

   The element list is expanded and displayed below the category in the Configuration Tree.

2. Right-click on the element to be copied and select **Copy...** from the shortcut menu. Or, select the element to be copied and select **Copy** on the **Edit** menu in the Configurator Menu Bar.

   The parameters of the selected element are copied to an internal clipboard.

3. Right-click on the element to be updated and select **Paste...** from the shortcut menu. Or, select the element to be updated and select **Paste** on the **Edit** menu in the Configurator Menu Bar.

   The copied parameters are pasted from the internal clipboard into the selected element.

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar to save all changes to the Node Controller Configuration File.

Add Configuration Elements

Additional elements can be added to any category in several ways. The typical method is to add the new element to the end of the list of existing elements by right-clicking on the category and selecting **Add To End...**. However, new elements can be added anywhere in the list of elements by right-clicking on an existing element and selecting either **Insert Before...** or **Insert After...**.

Table 4-1: Menu Definitions and Short-cut Keys

Menu	Action	Short-cut
File	New XML Config	Ctrl+N
	Open XML Config	Ctrl+O
	Save XML Config	Ctrl+S
Edit	Insert Before	Ctrl+Shift+I
	Insert After	Ctrl+I
	Add to End	Ctrl+E
	Cut	Ctrl+X
	Copy	Ctrl+C
	Paste	Ctrl+V
	Delete	Del (Delete)

1. Expand the element list in the Configuration Tree by selecting the symbol in front of the category or double-clicking the category name.

   The element list is expanded and displayed below the category in the Configuration Tree.

2. Right-click on the element in the list where the insertion is going to be and select either **Insert Before...** or **Insert After...** from the shortcut menu. Or, select the element where the insertion is needed, then select either **Insert Before...** or **Insert After...** on the **Edit** menu in the Configurator Menu Bar.

   A new, unconfigured, element is added to the element list before or after the selected element depending on the menu selection and numbered with the next available element number in the sequence for that element.

   When a new motor is inserted, the motor list is automatically renumbered, and the path length is updated to include the new motor.

   When a new station is inserted, the station list is renumbered.

3. Configure the new element as required.

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar to save all changes to the Node Controller Configuration File.

Delete Configuration Elements

Extra elements can be deleted at any time by right-clicking on them in the Configuration Tree and selecting **Delete**.

1. Expand the element list in the Configuration Tree by selecting the symbol in front of the category or double-clicking the category name.

   The element list is expanded and displayed below the category in the Configuration Tree.

2. Right-click on the element to be deleted and select **Delete** from the shortcut menu. Or, select the element to be deleted and select **Delete** on the **Edit** menu in the Configurator Menu Bar.

   The selected element is deleted from the element list.

3. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar to save all changes to the Node Controller Configuration File.

Configure Global Settings

This section describes how to set the Global Settings in the Node Controller Configuration File. Global Settings control how all vehicles behave when moving through the transport system, how the transport system reacts to loss of communication, and startup conditions. The Global Settings that are specified, are used for all paths, motors, and nodes throughout the system, unless override values are defined for specific path, motor, or node elements.

1. In the Configuration Tree, select **Global Settings**.

   *The **Global Settings** page, see Figure 4-5…Figure 4-8, is displayed in the Configuration Settings Pane.*

2. Update the global settings for the transport system as required (see *Global Settings on page 201* for detailed descriptions of all parameters).

3. To access the advanced global settings, expand the **Advanced Parameters** dialogue box within the Configuration Settings Pane.

   *The **Global Settings** page that is displayed in the Configuration Settings Pane is updated with the advanced parameters, see Figure 4-5…Figure 4-8.*

4. Update the advanced global settings for the transport system as required (see *Global Settings on page 201* for detailed descriptions of all parameters).

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

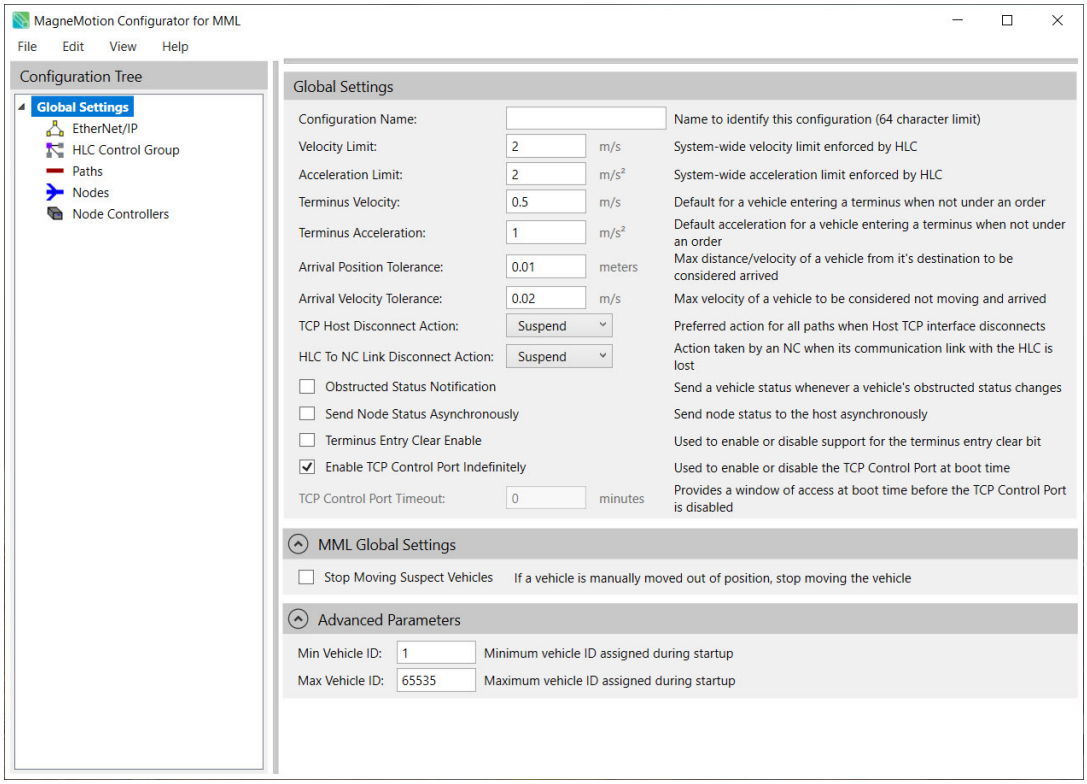


Figure 4-5: Global Settings Page with Advanced Parameters (MM Lite™)

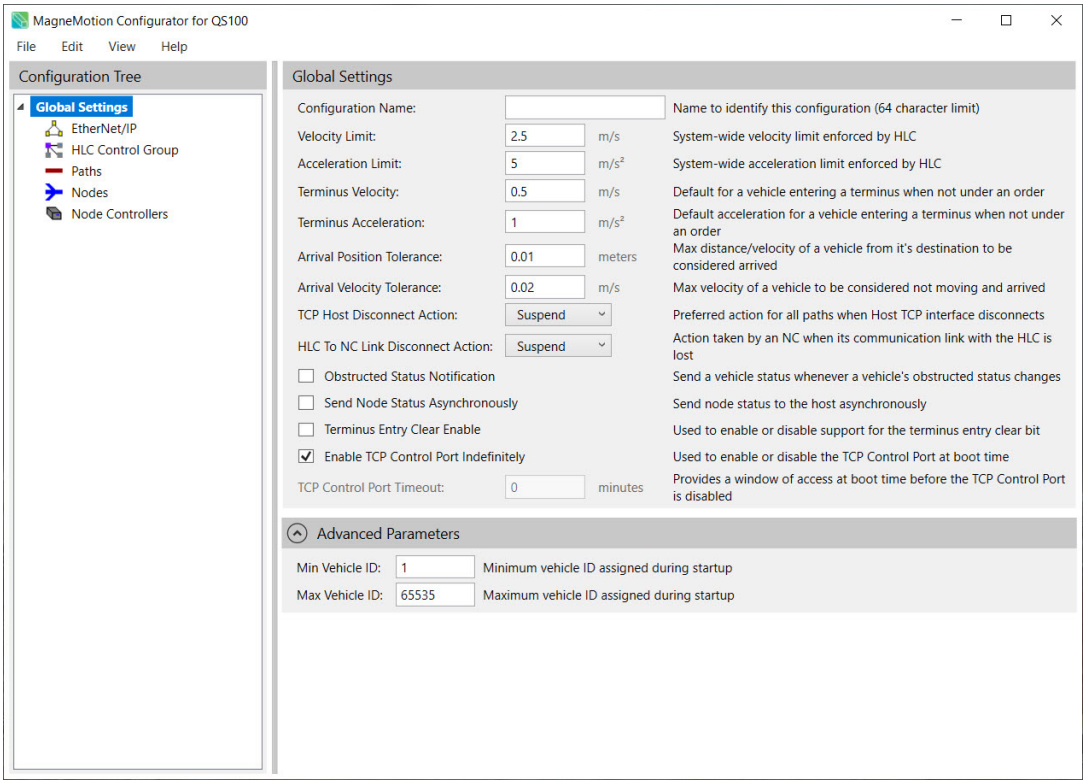


Figure 4-6: Global Settings Page with Advanced Parameters (QuickStick)

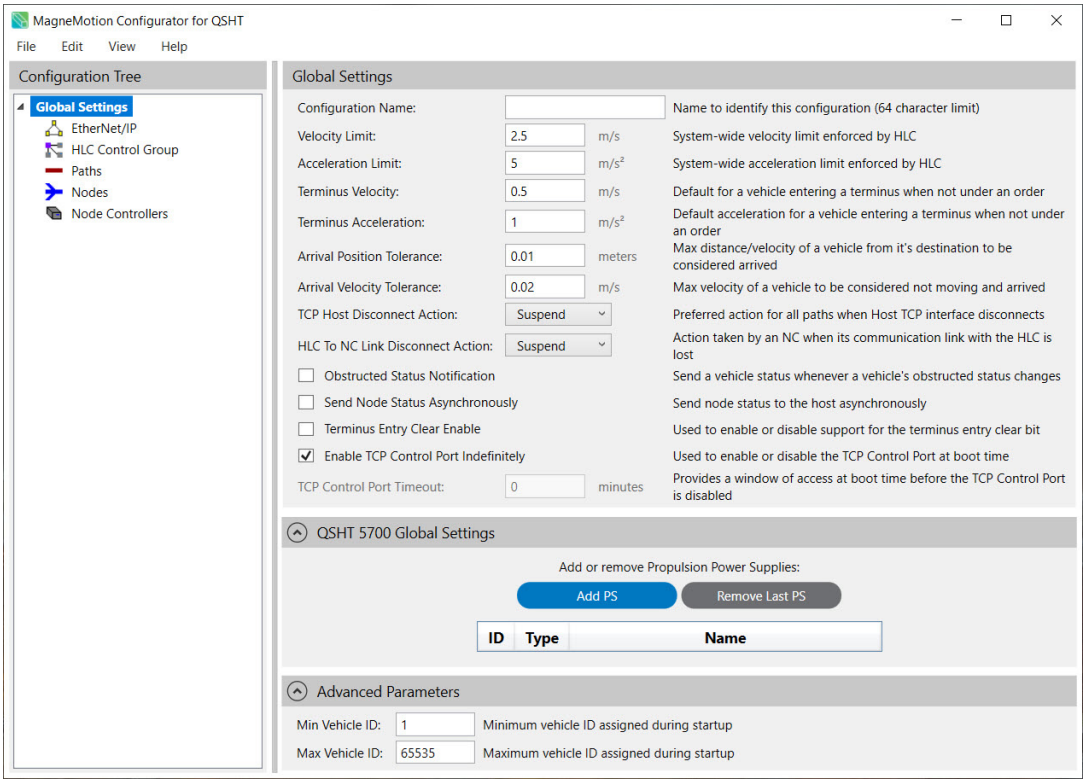


Figure 4-7: Global Settings Page with Advanced Parameters (QSHT)

Set EtherNet/IP Settings

This section describes how to set the EtherNet/IP settings in the Node Controller Configuration File. EtherNet/IP is only used when the host controller, typically a ControlLogix® controller, is communicating with the transport system using the EtherNet/IP interface. If TCP/IP is being used for communication between the host controller and the HLC for the transport system, do not enable or change the EtherNet/IP settings. See *EtherNet/IP Settings* *on page 208* for parameter descriptions.

1. In the Configuration Tree, select **EtherNet/IP**.

   *The **EtherNet/IP Settings** page, see Figure 4-8, is displayed in the Configuration Settings Pane.*

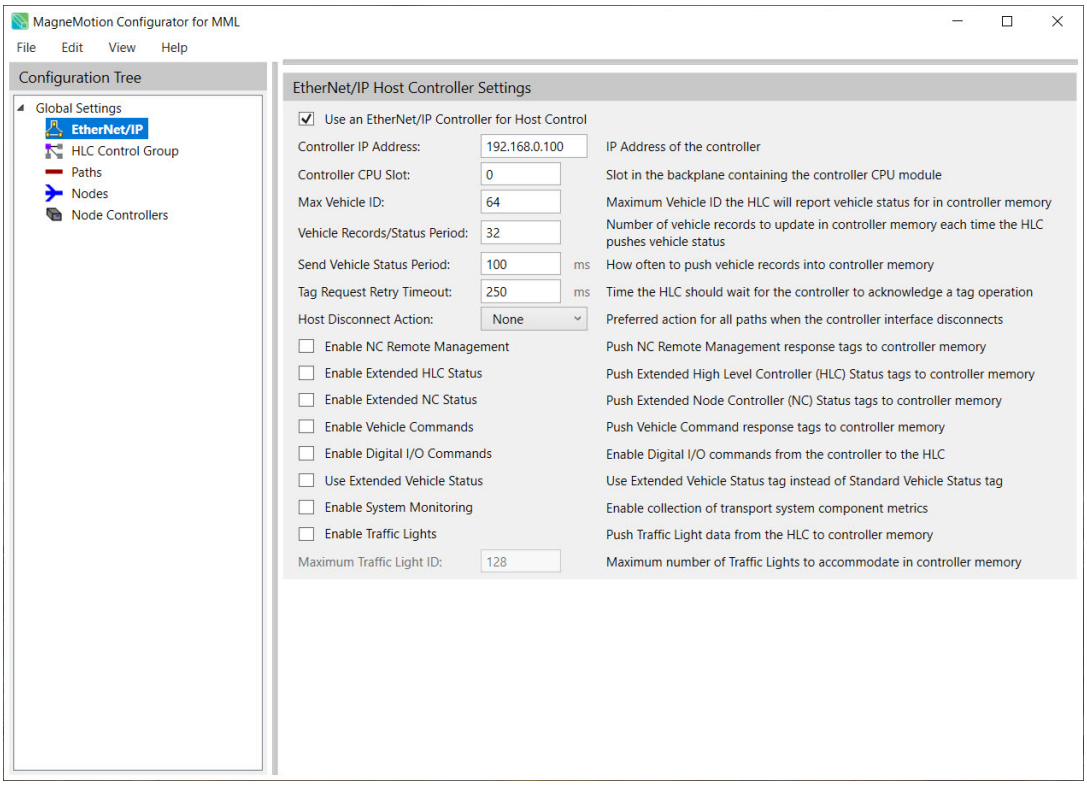


Figure 4-8: EtherNet/IP Host Controller Settings for MagneMover Lite

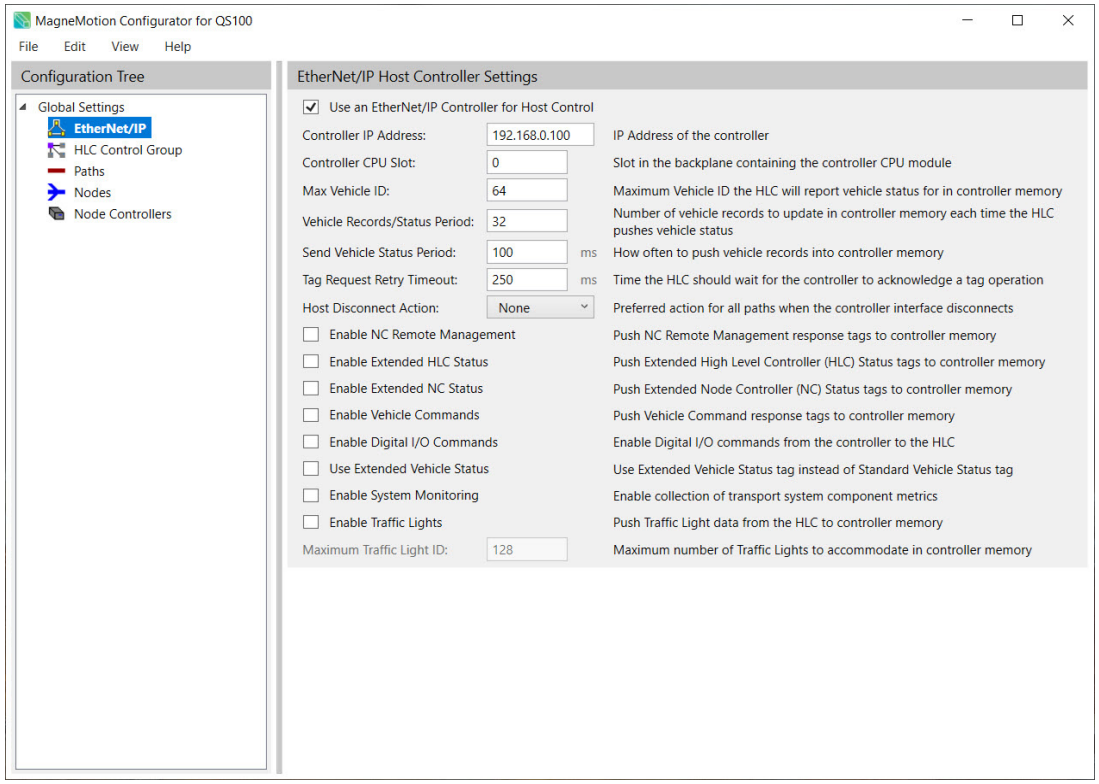


Figure 4-9: EtherNet/IP Host Controller Settings for QuickStick

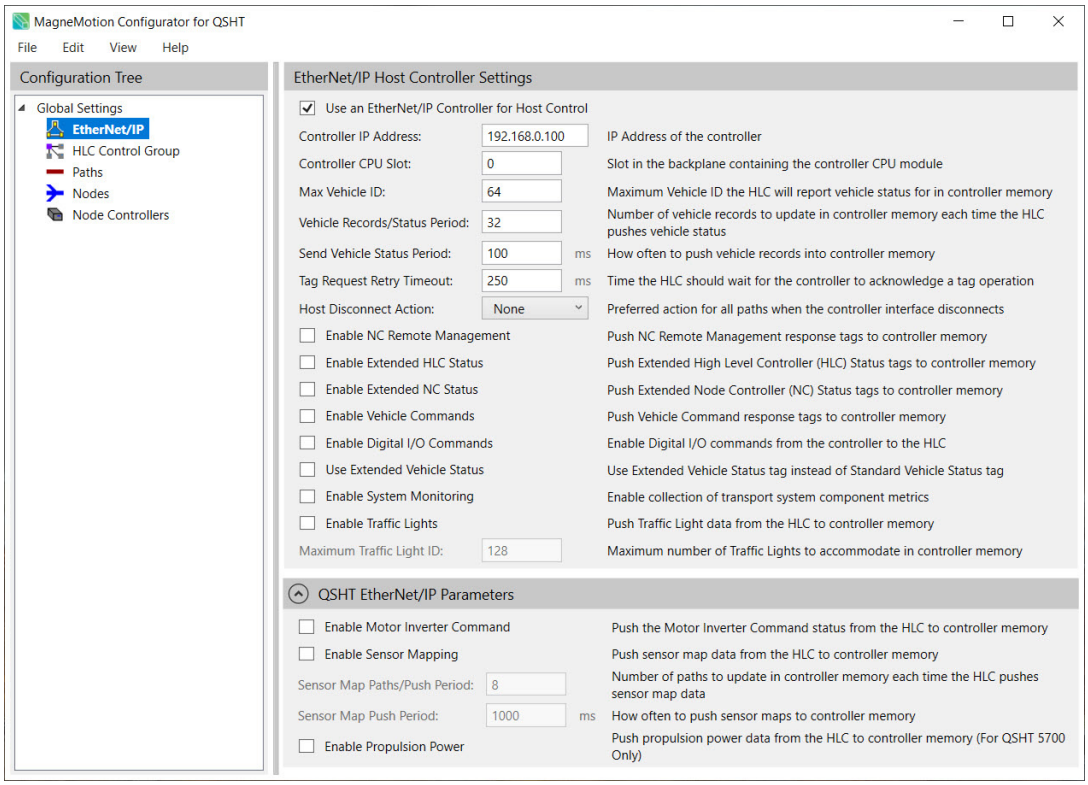


Figure 4-10: EtherNet/IP Host Controller Settings and Parameters for QuickStick HT

2. Select **Use an EtherNet/IP Controller for Host Control** to enable the use of EtherNet/IP communications.

   *The **EtherNet /IP™ Settings** page shows the default settings.*

3. Update the EtherNet/IP settings as required for the transport system (see *EtherNet/IP Settings* *on page 208* for detailed descriptions of all parameters). See the *MagneMotion Host Controller TCP/IP Communication Protocol User Manual,* publication MMI-UM003 or the *MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual,* publication MMI-UM004, for descriptions of the tag memory.

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Defining HLC Control Groups

This section describes how to configure the HLC Control Group in the Node Controller Configuration File. With large or complex transport systems, it is sometimes more practical or necessary to divide the system into smaller subsystems. These subsystems can be linked using an HLC Control Group (see Figure 4-84 on page 137). In order to maintain a single pool of vehicle IDs and maintain the vehicle ID as it travels between subsystems. Each of these systems has its own HLC and host controller. The primary function of the HLC Control Group is to manage the Vehicle ID across a transport system with multiple HLCs. These settings control how the HLCs are organized and how the Vehicle ID is tracked. When an HLC Control Group is used, Gateway nodes must be configured at path ends between subsystems to enable vehicles to pass freely within the HLC Control Group.

To support an HLC Control Group, each subsystem must have one node controller that is configured as an HLC. Each subsystem has its own unique Node Controller Configuration File, which defines all components within that subsystem and the role of that subsystem's HLC within the HLC Control Group.

The Node Controller Configuration File for the system acting as the Vehicle ID Server includes the IP addresses of the Vehicle ID Server HLC and each Vehicle ID Client HLC in the HLC Control Group. The Node Controller Configuration File for each Vehicle ID Client HLC contains only the role of the HLC as a client within the HLC Control Group.

After the roles are established, the Vehicle ID Server HLC is responsible for the overall management and tracking of the Vehicle ID throughout the entire transport system. During operation, the Vehicle ID Server HLC periodically exchanges messages with all Vehicle ID Client HLCs as part of the Vehicle ID management process.

NOTE: There is a maximum of 64 node controllers per subsystem and a maximum of 16 HLCs in an HLC Control Group.

NOTE: Gateway nodes can be used without an HLC Control Group to manage systems with higher Vehicle ID counts, see Gateway Nodes without and HLC Control Group.

Configuring an HLC Control Group

1. In the Configuration Tree, select **HLC Control Group**.

   The HLC Control Group Settings page is displayed in the Configuration Settings Pane..

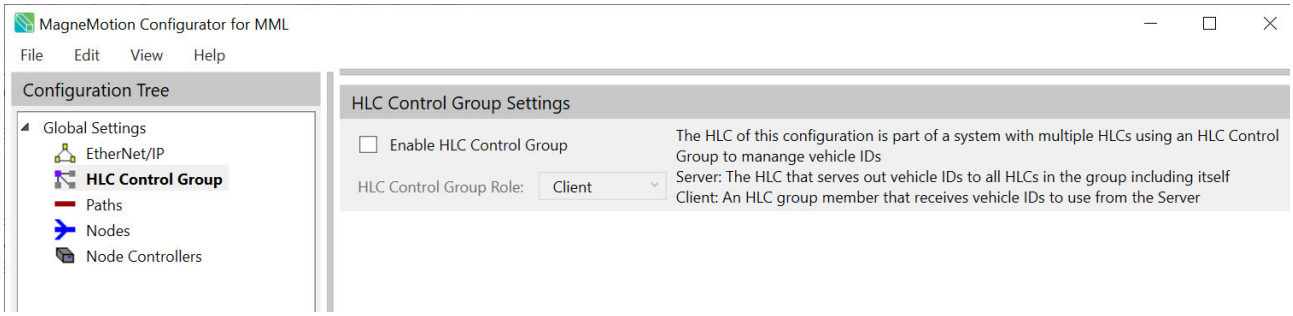


Figure 4-11: HLC Control Group Settings Page

2. Select **Enable HLC Control Group**.

   The HLC Control Group Settings page shows the default settings.

3. Update the HLC Control Group settings as required for the transport system (see *HLC Control Group Settings* *on page 215* for detailed descriptions of all settings).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Example

If the configuration of the transport system contains two HLCs (the same as the configuration shown for the Gateway node see Figure 4-84 on page 137), the Node Controller Configuration File for Subsystem 1 is configured as the Vehicle ID Server HLC, see Figure 4-12 upper

example. The Node Controller Configuration File for Subsystem 2 is configured as a Vehicle ID Client HLC, see Figure 4-12 lower example..

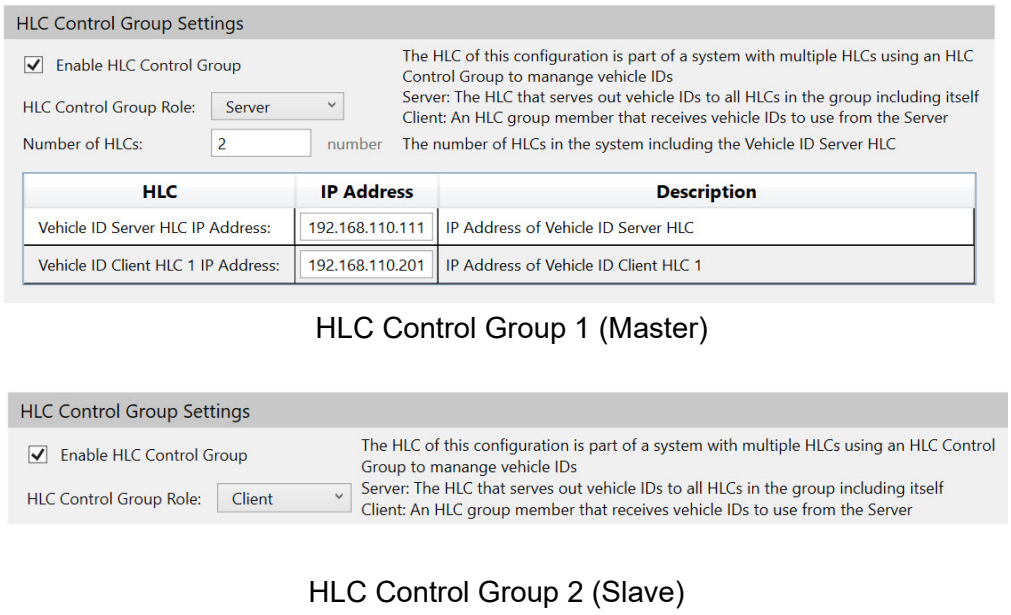


Figure 4-12: HLC Control Group Example

Gateway Nodes with an HLC Control Group

In transport systems that utilize an HLC Control Group to manage multiple subsystems, Gateway nodes are configured at the path ends that make the connection between subsystems. This enables the host controllers to pass vehicles freely between subsystems while maintaining the Vehicle ID assigned to the vehicles the last time the system started up or the vehicles entered the system. To send a vehicle between subsystems, a host controller orders the vehicle to a location past the Gateway node at the end of its local path. Node controllers in each subsystem control the handoff of vehicles between subsystems within the HLC Control Group to make sure that the Vehicle ID is preserved across the adjoining subsections. For a graphical description, see Figure 4-84 on page 137, Gateway node.

NOTE: There is a maximum of two Gateway nodes per node controller, one upstream and one downstream. The Gateway nodes do not need to be on the same path.

- The upstream Gateway node in a gateway pair has a corresponding downstream node on another node controller belonging to another subsystem of the HLC Control Group.
- The downstream Gateway node in a gateway pair has a corresponding upstream node on another node controller belonging to another subsystem of the HLC Control Group.

Gateway Nodes without an HLC Control Group

It is possible to utilize Gateway nodes to send vehicles between HLCs without the use of an HLC Control Group. This results in the loss and reassignment of the Vehicle ID when driving between subsystems. This may be desirable for large systems where the total number of vehicles exceeds the Transport System Limits (see *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013) or generates too much load for the HLC to Host communication connection under a single HLC.

To utilize this architecture, configure they Gateway nodes as shown in Figure 4-84 on page 137 and described in the example in Figure 4-86 on page 138. Do not enable the HLC Control Group.

NOTE: There is a maximum of two Gateway nodes per node controller, one upstream and one downstream. The Gateway nodes do not need to be on the same path.

- The upstream Gateway node in a gateway pair has a corresponding downstream node on another node controller belonging to another subsystem of the transport system.
- The downstream Gateway node in a gateway pair has a corresponding upstream node on another node controller belonging to another subsystem of the transport system.

Vehicle ID Management

Depending on size, track layout, and configuration, transport systems often require several node controllers to manage system operation. One node controller in the transport system must also be configured to operate as the HLC. The HLC is an application responsible for facilitating communication between the host controller and all other node controllers in the system. When using an HLC Control Group, the HLC along with all node controllers it communicates with are referred to as a subsystem of an HLC Control Group.

In addition to operating as a communications server, the HLC manages the assignment of unique Vehicle ID numbers for all vehicles in the system. The HLC assigns a Vehicle ID to vehicles when the transport system first starts up and whenever a vehicle enters the system via a Terminus node. An assigned Vehicle ID is maintained from the time a Vehicle ID is assigned, until one of the following occurs:

- The vehicle leaves the system.
- The path where the vehicle is located is reset.
- The host controller issues a Delete Vehicle command.

To make sure that the vehicle identification across the HLC Control Groups are unique, the Vehicle ID Server HLC must know the status of all vehicles in the system. The Vehicle ID Server HLC does not allocate a Vehicle ID until every Vehicle ID Client HLC in the system has reported the Vehicle ID for all vehicles under its local control. As the Vehicle ID Client

HLCs report vehicle information to the Vehicle ID Server HLC, the server updates the Vehicle ID status. When the Vehicle ID Server HLC has received information from every Vehicle ID Client HLC, each Vehicle ID is placed in one of the following states:

- **Active** - An HLC reports that a vehicle is already active on the system.
- **Allocated** - A Vehicle Client HLC reports that a Vehicle ID from an earlier Vehicle ID server run has been assigned, or it is available to be allocated by that HLC to a newly discovered vehicle (for example, during path start up).
- **Available** - The Vehicle ID is available to be allocated when an HLC requests additional vehicle identification numbers.

When an HLC starts up, other HLCs in the HLC Control Group can be in any state. During start up, each Vehicle ID Client HLC reports a list of all active Vehicle ID numbers to the Vehicle ID Server HLC.

During operation, the Vehicle ID Client HLCs periodically request additional blocks of available vehicle identification numbers from the Vehicle ID Server HLC to assign to newly discovered vehicles. At any given time, each Vehicle ID Client HLC attempts to maintain a pool of at least 100 vehicle identification numbers to assign to newly discovered vehicles.

Vehicle ID Range Minimum and Maximum

When an HLC Control Group is configured, set the vehicle range defaults to:

- minimum equals 1
- maximum equals 65535

Do not change these values from the defaults.

Terminus Node Vehicle ID Assignment

If Terminus nodes are used to bring vehicles into a subsystem of a HLC Control Group, all entry requests must use a Vehicle ID of zero. This allows the HLC of the subsystem to assign the Vehicle ID of the new vehicle, which helps prevent a duplicate Vehicle ID from existing within the HLC Control Group. The host controller can determine the assigned Vehicle ID by examining the node status for that Terminus node.

Startup Considerations

The startup process for the HLC in each subsystem is independent and does not assume the operational state of the HLC in any other subsystem of the HLC Control Group. There are two start up cases, a Vehicle ID Server HLC start and a Vehicle ID Client HLC start.

Vehicle ID Server HLC Start or Restart

The following conditions must be met for 10 seconds before the Vehicle ID Server HLC comes out of its initialization state and is available to allocate any Vehicle ID numbers. During those 10 seconds, information about previously active or allocated Vehicle ID numbers are reported to the Vehicle ID Server HLC.

- All Vehicle ID Client HLCs under the control of the Vehicle ID Server HLC must communicate with the Vehicle ID Server HLC and be in the operational state.
- All node controllers in the subsystem are in an operational state, which indicates all motors under their control have been successfully configured.

Vehicle ID Client HLC Start or Restart

If the system is operational and a Vehicle ID Client HLC is reset, the rest of the system continues to run. Restarting a Vehicle ID Client HLC causes the HLC to clear all vehicle records. The Vehicle ID Client HLC must report vehicle information to the Vehicle ID Server HLC before restarting to recover the Vehicle ID numbers in use. After restart, the Vehicle ID Client HLC reports the restart to the Vehicle ID Server HLC, which redelivers the Vehicle ID numbers that were allocated before the restart. The Vehicle ID Client HLC then assigns identifications to all active vehicles. The Vehicle ID that was assigned to a specific vehicle before the restart may not be reassigned to that same vehicle.

Cautions

System Startup

During transport system startup, the Vehicle ID Server HLC remains in the initialization state for 10 seconds after all Vehicle ID Client HLCs are in the operational state. During this time Vehicle ID Client HLCs report allocated Vehicle ID status to the Vehicle ID Server.

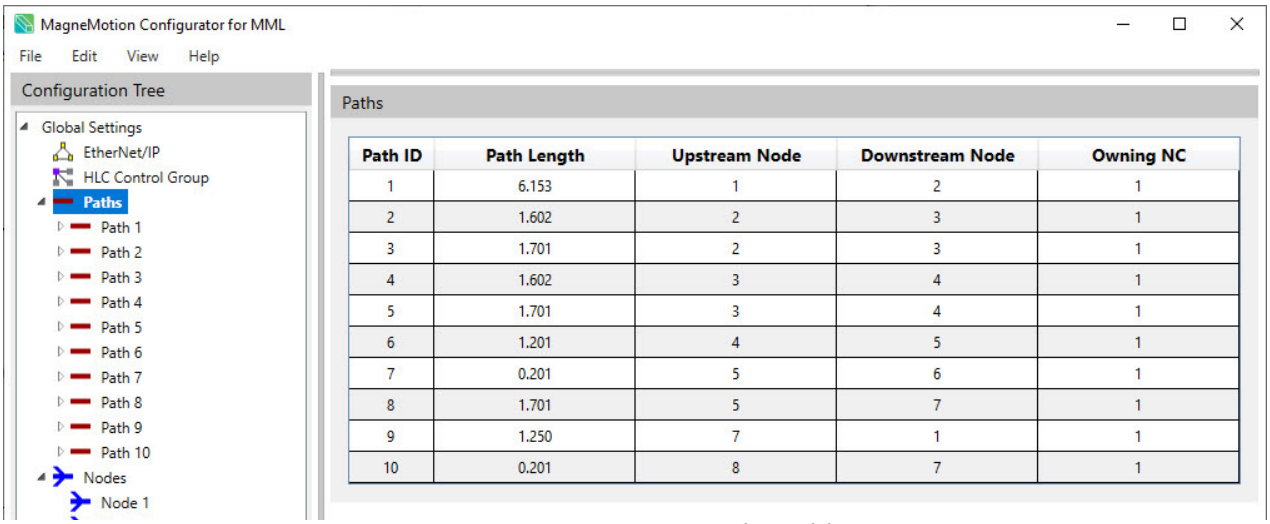
If a client HLC is stuck in the initialization state, it cannot report its allocated Vehicle ID status to the server HLC. In this case, the server HLC remains in the initialization state.

When the Vehicle ID Server HLC is stuck in the initialization state, client HLCs can fail a path startup attempt if those clients HLCs have not been allocated vehicle identifications to use during startup. In this case, the startup process times out and fails. A log message is placed in the log for the client HLC stating that there are no vehicle records available.

View Paths Table

Selecting **Paths** from the Configuration Tree displays a table of information about all paths that are defined in the configuration, see Figure 4-13 on page 86. The table provides a view only overview for the defined paths. There are links to the associated components for an alternate navigation through the file. The following information is defined for each path:

- **Path ID:** Unique ID number of the path. Click the Path ID to view the path parameters page.
- **Path Length:** Length of the path in meters.
- **Upstream Node:** The Node ID of the node at the upstream end of the path or "Not set" if a node has not been associated with the path end. Hover over the node to see the node type, see Figure 4-14 on page 87. Click the Upstream Node to view the node parameters page.
- **Upstream Node:** The Node ID of the node at the downstream of the path or "Not set" if a node has not been associated with the path end. Hover over the node to see the node type. Click the Downstream Node to view the node parameters page.
- **Owning NC:** The Node Controller ID of the node controller that owns the Upstream Node or "Not set" if the node is not owned by a node controller. Hover over the node controller to see the IP address of the node controller. Click the Owning NC to view the node controller parameters page.



Path ID	Path Length	Upstream Node	Downstream Node	Owning NC
1	6.153	1	2	1
2	1.602	2	3	1
3	1.701	2	3	1
4	1.602	3	4	1
5	1.701	3	4	1
6	1.201	4	5	1
7	0.201	5	6	1
8	1.701	5	7	1
9	1.250	7	1	1
10	0.201	8	7	1

Figure 4-13: Paths Table

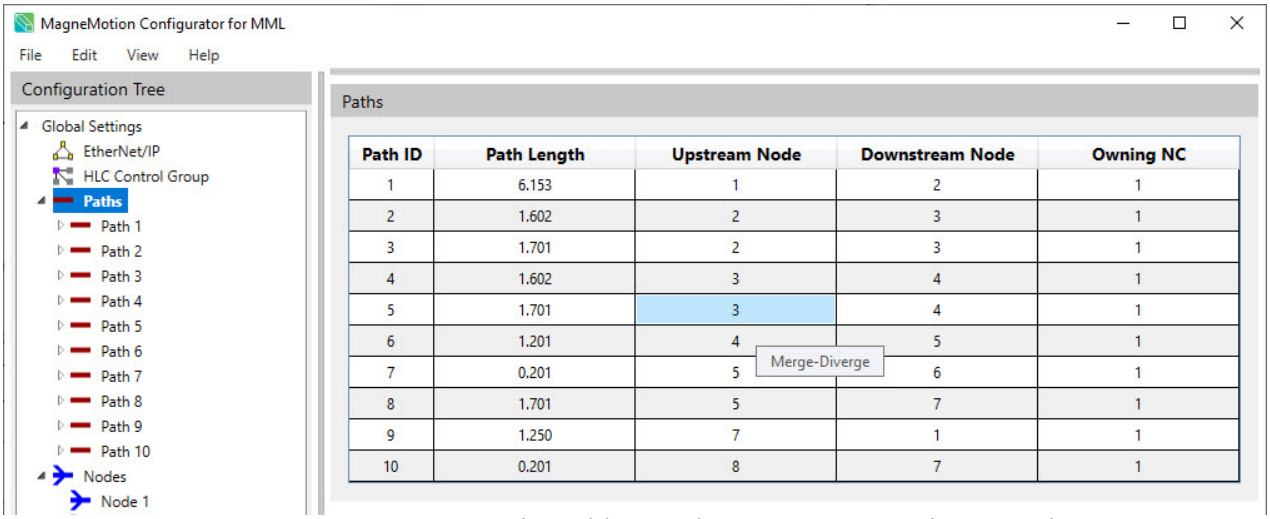


Figure 4-14: Paths Table - Link to Upstream Node Example

Create and Edit Path

This section describes how to create and edit paths in the Node Controller Configuration File. The beginning of a path is the zero point for vehicle positioning on that path and must originate at a node. The end of a path must terminate in a node if vehicles are going to move beyond the end of the path.

Typically, vehicles enter a path on the upstream end, and exit on the downstream end (this represents motion in the default forward direction). The motor at the upstream end of a path must communicate with a node controller. The downstream end of a path must communicate with a node controller if vehicles are going to move beyond that end of the path. See Figure 4-15 for an overview of a path and the nodes and motors that are associated with it.

NOTE: There is a maximum of two nodes per path. Each path must have one node defined at the upstream end, all nodes must be associated with a node controller. The maximum quantity of nodes associated with a node controller is node controller-dependent, see *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013.

Paths must be defined before motors can be defined.

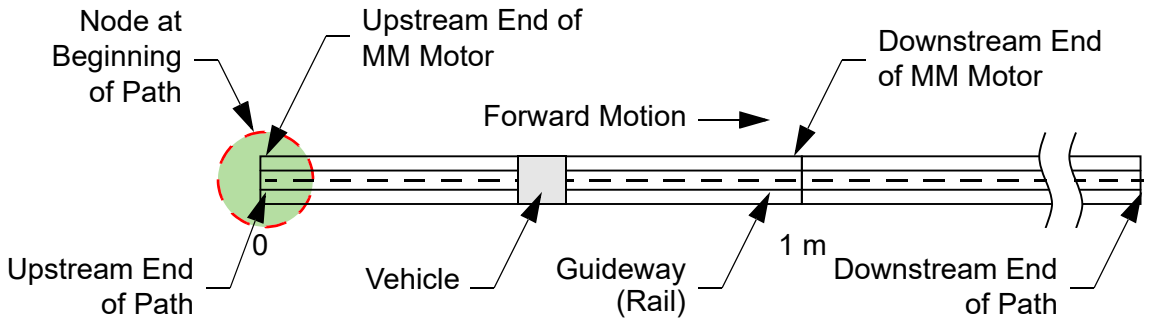


Figure 4-15: Path Overview

Create a Path

Each path in the transport system must be defined.

NOTE: The maximum quantity of paths is system-dependent, see *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013.

1. In the Configuration Tree, select **Paths**, see Figure 4-16.

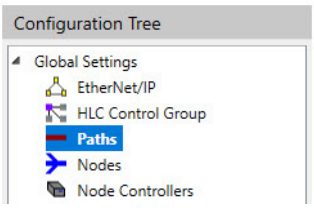


Figure 4-16: Configuration Tree with Paths Selected

2. On the **Edit** menu in the Configurator Menu Bar, select **Add To End...** (or right-click on **Paths** and select **Add To End...**).

   NOTE: Right-click on an existing path to open the **Edit** shortcut menu to insert the new path before or after the selected path.

*The list of paths is expanded and displayed below **Paths** in the Configuration Tree, see Figure 4-17 with the new path added to the list. The path is automatically numbered with the next available **Path ID**.*

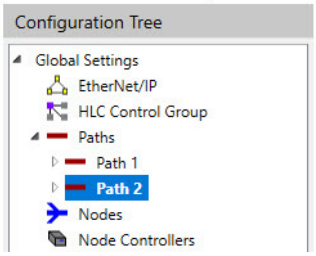


Figure 4-17: Configuration Tree Showing Path Added

Edit a Path

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Open the path to be edited by selecting the **Path ID**.

   *The selected path is highlighted and the **Path Details** page, see Figure 4-18, is displayed in the Configuration Settings Pane.*

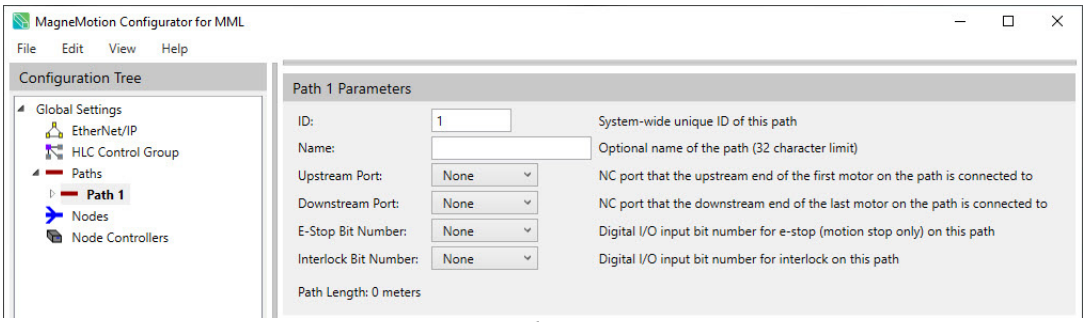


Figure 4-18: Path Parameters Page

3. Update the path parameters as required (see *Paths on page 217* for detailed descriptions of all parameters).

4. To access the advanced path parameters, expand the **Advanced Parameters** panel within the Configuration Settings Pane.

*The **Path Details** page that is displayed in the Configuration Settings Pane is updated with the advanced parameters, see Figure 4-19.*

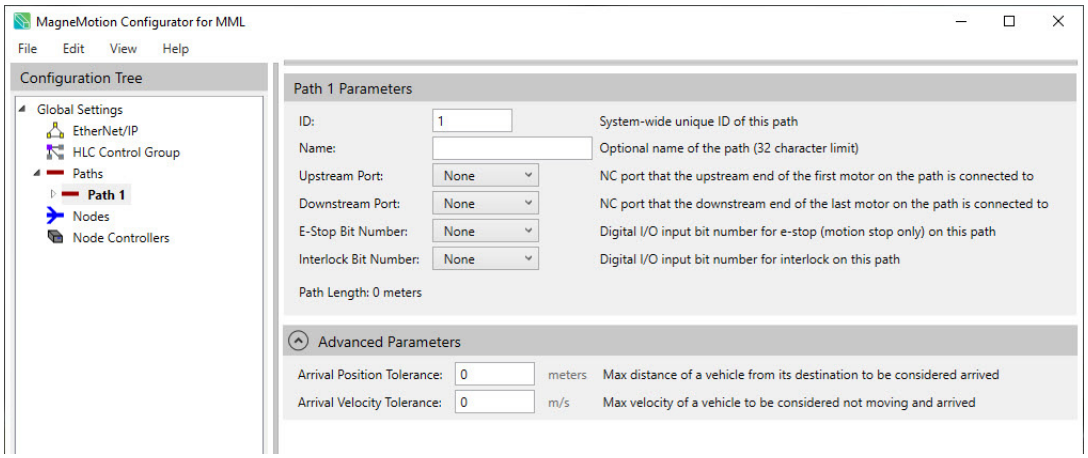


Figure 4-19: Path Parameters Page with Advanced Parameters

5. Update the advanced parameters for the path as required (see *Paths on page 217* for detailed descriptions of all parameters).

6. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Define and Edit Motors and Vehicle Parameters

This section describes how to define and edit motors in the Node Controller Configuration File. Motors are used to move the vehicles on the transport system. A motor must be defined in the Node Controller Configuration File for each motor in the transport system. All MagneMover Lite straight and curve motor modules have one motor, switch modules have two motors (one curve and one straight).

View or Edit Motor Defaults and Parameters

The default motor parameters for a path define the initial parameter values that are applied to all motors as they are added to a path. Change the motor parameters that apply to all motors in the Motor Defaults section. After motors are added to a path, changes to the Motor Defaults for that path are reflected in the parameters for all motors.

NOTE: Any parameter that has been changed for a specific motor is not affected if changes are made to the Motor Defaults.

Defaults are automatically added when you add the first motor. Any updates to the Motor Defaults must be completed through the parameter pages.

Unless the motor is different than the type of motor that is specified in the Motor Defaults, or the motor type is being used in a special way, there is no need to change the configuration from the assigned defaults.

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Expand the path where the motors are located by selecting the symbol in front of the **Path ID** or double-clicking the **Path ID**.

   *The selected path is highlighted and expands to show **Motors**, **Stations**, and other items related to that path.*

3. Expand the motors section by selecting the symbol in front of **Motors** or double-clicking **Motors**.

The list of motors is expanded to show the Motor Defaults, and any configured motors, see Figure 4-20.

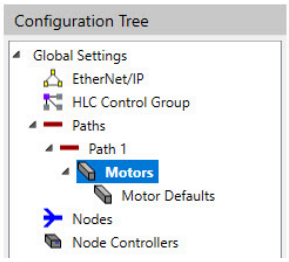


Figure 4-20: Configuration Tree Expanded with Motors Selected

4. Select **Motor Defaults**, see Figure 4-21.

   *The **Motor Defaults** page, see Figure 4-22, is displayed in the Configuration Settings Pane. This page identifies the path that the motor defaults are associated with at the top of the page. The defaults that are shown are applied to all motors when they are initially defined in the path indicated.*

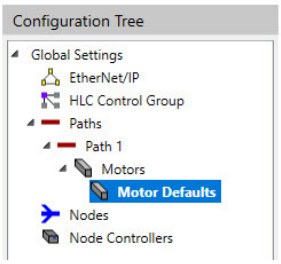


Figure 4-21: Configuration Tree Expanded with Motor Defaults Selected

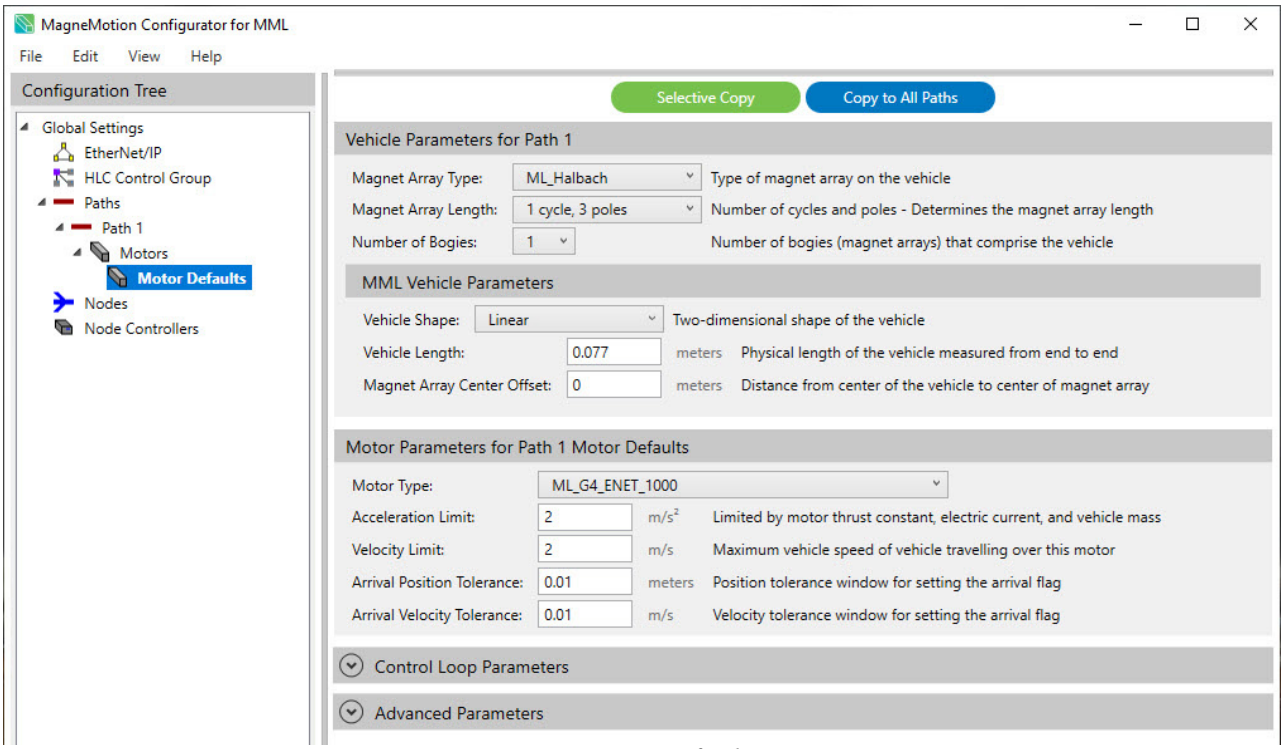


Figure 4-22: Motor Defaults Page - MagneMover Lite

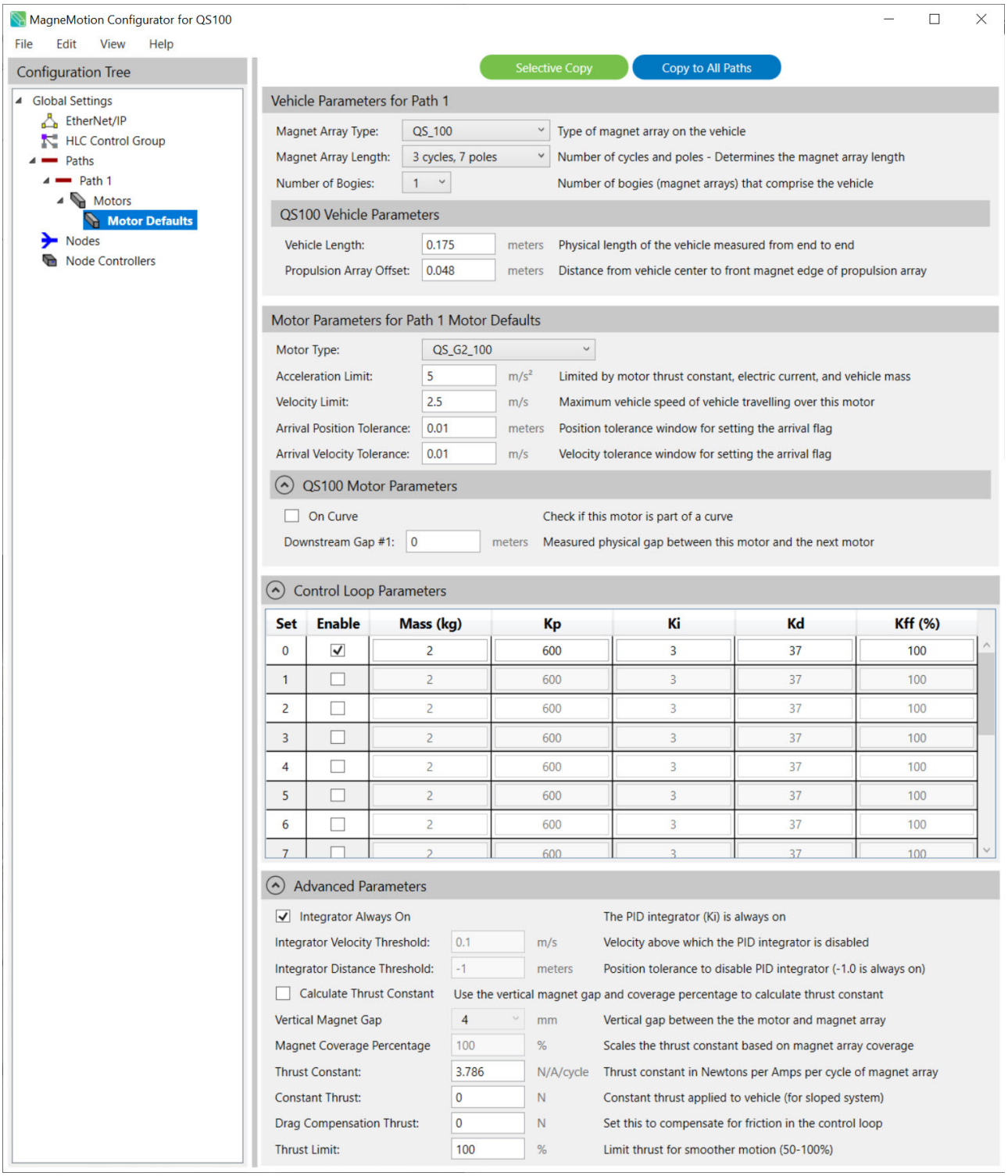


Figure 4-23: Motor Defaults Page - QuickStick 100

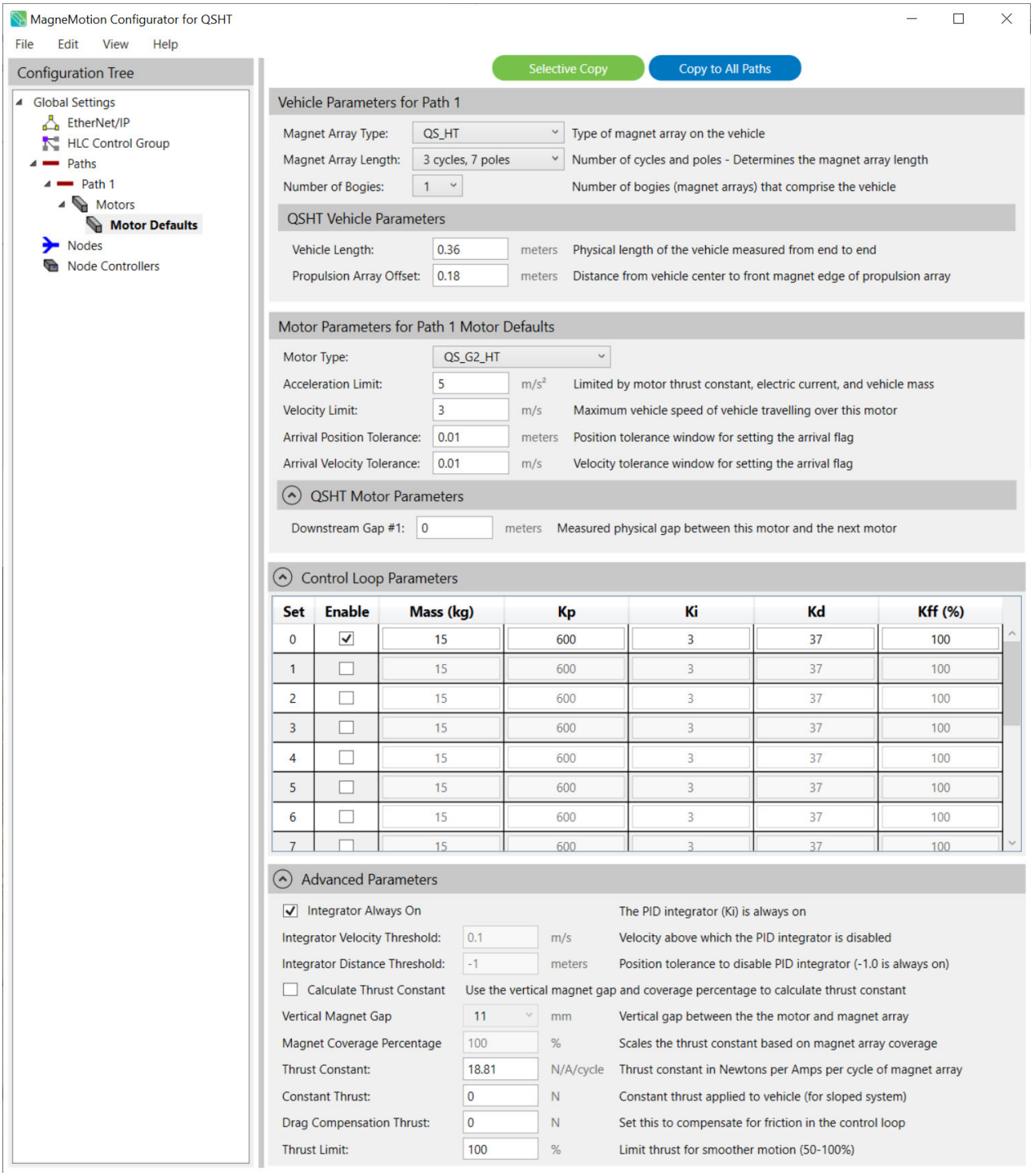


Figure 4-24: Motor Defaults Page - QuickStick HT

5. Update the default motor parameters as required for the transport system (see *Motors on page 220* for detailed descriptions of all parameters).
   - To define the vehicles, magnet arrays, motors, and vehicle motion parameters that are used on the path, see *Vehicle and Motor Parameters on page 227*.
   - Update the parameters that are related to the Control Loops, including the PID settings and the PID integrator, as required (see *Control Loop Parameters on page 241* for detailed descriptions of all parameters).
   - To access the advanced motor parameters, expand the **Advanced Parameters** dialogue box within the Configuration Settings Page. Update the advanced parameters for the motor as required (see Table 5-8 on page 243 for detailed descriptions of all parameters).
   - Update the parameters that are related to Keepout Areas as required (see *Keepout Area Parameters on page 247* for detailed descriptions of all parameters).
6. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Define Vehicle Defaults for MM Lite™

The vehicle parameters in the Motor Defaults for a path define the vehicle and the magnet array that is used on the path. These parameters are applied to all motors as they are added to the path. Typically, all paths in the transport system use the same vehicle.

NOTE: The vehicle parameters, except for vehicle length, are not available on the individual motor pages because the vehicle definition must be the same for the entire path.

1. For MagneMover Lite, the magnet array type must be ML_Halbach and the magnet array length must be 1 cycle, 3 poles. To convert cycles to millimeters use the following formula.

   High flux magnet array: *MagnetArrayLength* = (*Cycles* x 54.5) + 7.7 mm

2. From the **Number of Bogies** drop-down list, select the quantity of magnet arrays on the vehicle. Use 1 bogie for single arrays, or 2 bogies for tandem arrays.

3. Update the vehicle settings for the transport system (see *Vehicle and Motor Parameters on page 227* for detailed descriptions of all parameters) by selecting the vehicle type from the **Vehicle shape** drop-down list.

   A. When the vehicle shape is set to **Linear**, configure the **Vehicle Length** and the **Magnet Array Center Offset**.

      NOTE: The **Vehicle Length** is used to calculate the amount of space that is required between vehicles. To make sure that vehicles do not contact each other while moving, the vehicle length in the configuration must be based on the longest dimension of the vehicle, see Figure 4-25.

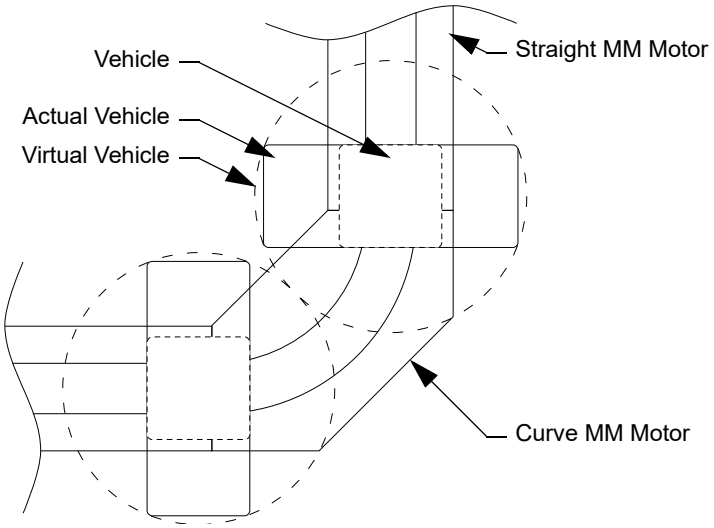


Figure 4-25: Vehicle Length in Curves

- In the **Magnet Array Center Offset** field, enter the distance from the physical center of the vehicle to the physical center of the magnet array.
  - For a vehicle with a standard payload that is centered on either a single vehicle or a tandem vehicle this distance is zero.
  - For a vehicle with a non-standard payload that the vehicle can support without tipping, see Figure 4-26, this distance is the offset from the center of the vehicle to the center of the magnet array.
  - When a tandem vehicle is being used, this is the distance from the center of the vehicle to the mid-point between the two magnet arrays. A positive value specifies the magnet array is downstream from the center of the vehicle (that is, at the vehicle front). A negative value specifies the magnet array is upstream from the center of the vehicle (that is, at the vehicle rear).
  - If the payload is large enough to cause the vehicle to tip, a second vehicle without a magnet array can be added to the vehicle to provide additional support for the vehicle, see Figure 4-27 and Figure 4-28.
  - When adding a second vehicle to the vehicle, both vehicles must be the same style and be connected to the vehicle through pivots to allow each vehicle to rotate independently under the vehicle while moving through curves.

NOTE: Make sure that the supporting vehicle does not have a magnet array.

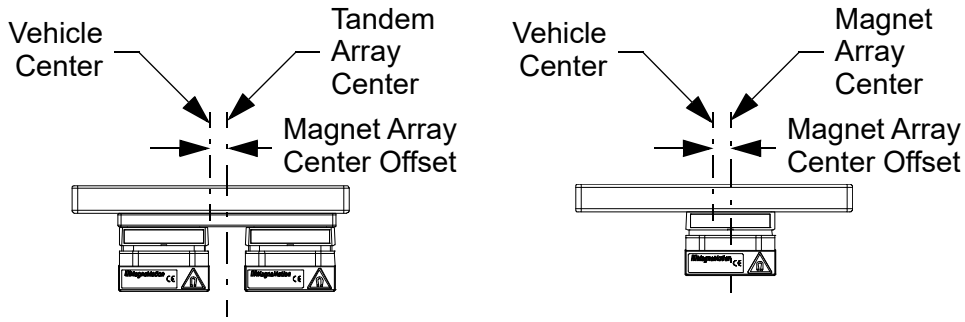


Figure 4-26: Magnet Array Center Offset, Single Vehicles

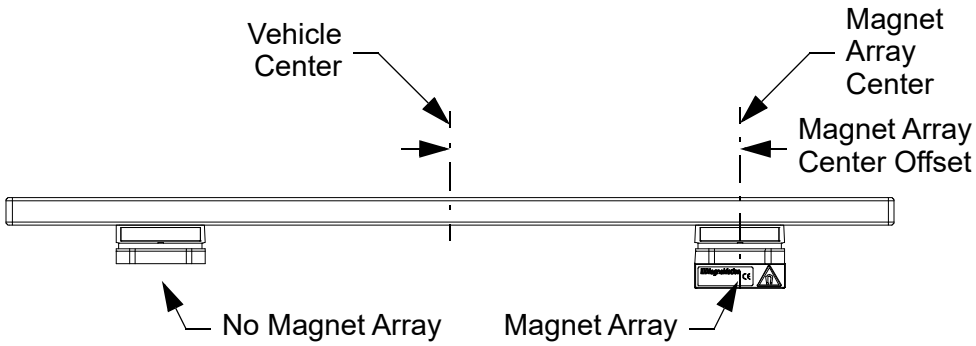


Figure 4-27: Magnet Array Center Offset, Two Single Vehicles

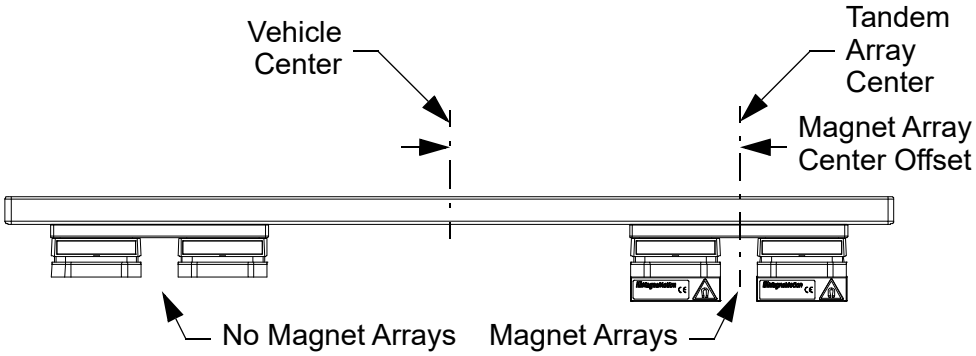


Figure 4-28: Magnet Array Center Offset, Two Tandem Vehicles

B. When the vehicle shape is set to **Rectangular**, configure the following items (see Figure 4-29 for definition of terms).

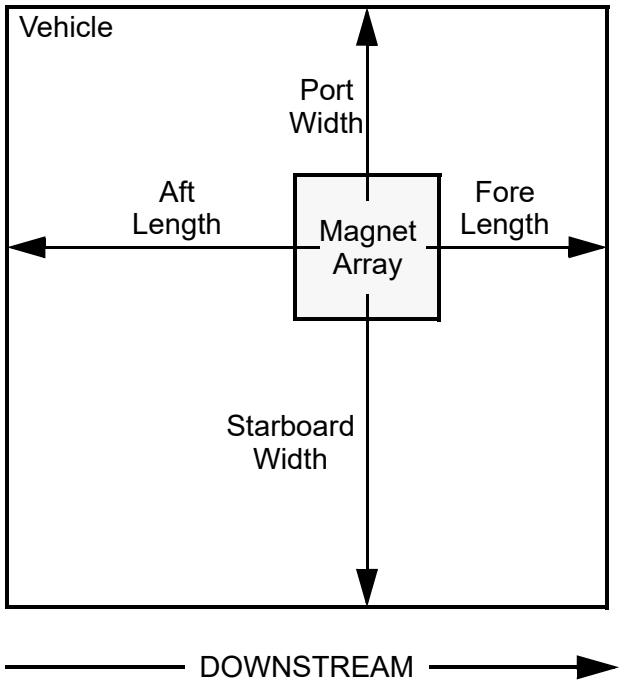


Figure 4-29: Rectangular Vehicle Sizing

- In the **Fore Length** field, enter the distance from the center of the magnet array to the front of the vehicle and any additional overhang that is attributed to the payload the vehicle is transporting.
- In the **Aft Length** field, enter the distance from the center of the magnet array to the back of the vehicle and any additional overhang that is attributed to the payload the vehicle is transporting.
- In the **Starboard Width** field, enter the distance from the center of the magnet array to the right side of the vehicle and any additional overhang that is attributed to the payload the vehicle is transporting.

  If the value entered is larger than the radius of a curve motor, the Configurator displays a warning similar to Figure 4-30. This notice is displayed as a reminder to verify the spacing of parallel paths to make sure that vehicles do not collide.

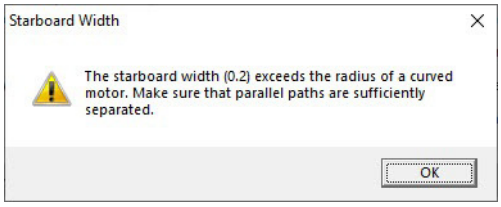


Figure 4-30: Vehicle Width Warning Alert

- In the **Port Width** field, enter the distance from the center of the magnet array to the left side of the vehicle and any additional overhang that is attributed to the payload the vehicle is transporting.

  If the value entered is larger than the radius of a curve motor, the Configurator displays a warning similar to the one that is shown in Figure 4-30.

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Define Vehicle Defaults for QuickStick and QSHT

The vehicle parameters in the Motor Defaults for a path define the vehicle and the magnet arrays as they are added to the path. Typically, all paths in the transport system use the same vehicle.

NOTE: The vehicle parameters, except for vehicle length, are not available on the individual motor pages because the vehicle definition must be the same for the entire path.

1. Update the vehicle magnet array settings as required for the transport system (see *Vehicle and Motor Parameters on page 227* for detailed descriptions of all parameters).

2. From the **Magnet Array Length** drop-down list, select the length of the magnet array that is attached to the vehicles (the default is 3 cycle, 7 poles). The length is described in cycles – to convert to millimeters use the following formula.

   QuickStick: Standard magnet array: MagnetArrayLength = (Cycles x 48)

   QuickStick HT: High flux magnet array: MagnetArrayLength = (Cycles x 120)-2 mm

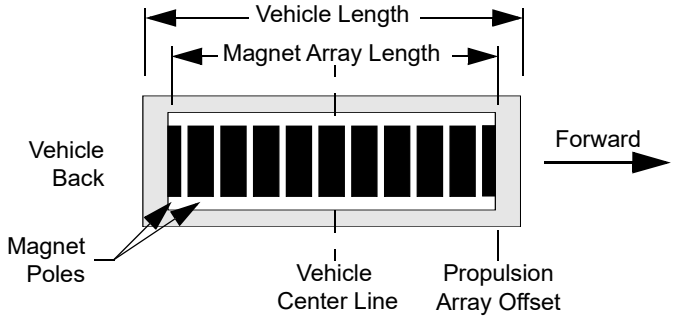


Figure 4-31: Vehicle and Magnet Array Length

3. In the **Vehicle Length** field, enter the length of the vehicle. Included in the vehicle length should be any corrections for vehicle geometry and any additional overhang that is attributed to the payload the vehicle is transporting.

   If the track has curves in it, the vehicle length should be configured so that it is equal to the longest dimension of the vehicle. This helps prevent vehicles from hitting each other when moving through curves (see to Figure 4-32).

NOTE: Only the **Vehicle Length** is used to calculate the amount of space required between vehicles. To help ensure that vehicles do not contact each other while moving, the **Vehicle Length** in the configuration should be based on the vehicle's longest dimension.

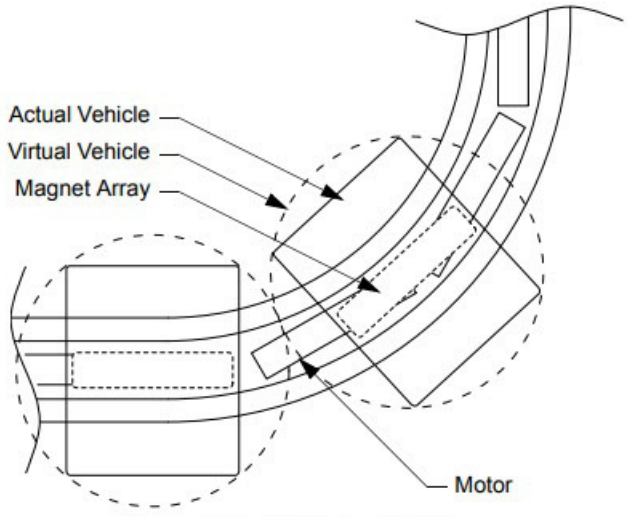


Figure 4-32: Vehicle Length in Curves

4. From the **Number of Bogies** drop-down list, choose the quantity of bogies. Single bogie vehicles contain one fixed magnet array. Double bogie vehicles contain two magnet arrays. Typically each magnet array is fixed to a pivoting vehicle section with a linkage that connects those vehicles to each other. Double bogies are used to provide additional thrust or movement of larger loads.

   NOTE: If the quantity of bogies chosen = 2, the **Propulsion Array Offset**, **Gap Between Bogies**, and **Interbogie Position Correction** also need to be set. See *Vehicle and Motor Parameters* *on page 227* for parameter descriptions.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

   See *Define Motor Defaults* *on page 100* for additional configuration information.

Define Motor Defaults

The motor parameters in the Motor Defaults for a path define the default motor parameters that are applied to all motors as they are added to the path. After a motor is added, the settings for that specific motor can be edited as required.

NOTE: The parameters for specific motors can be updated as required after the individual motors are added.

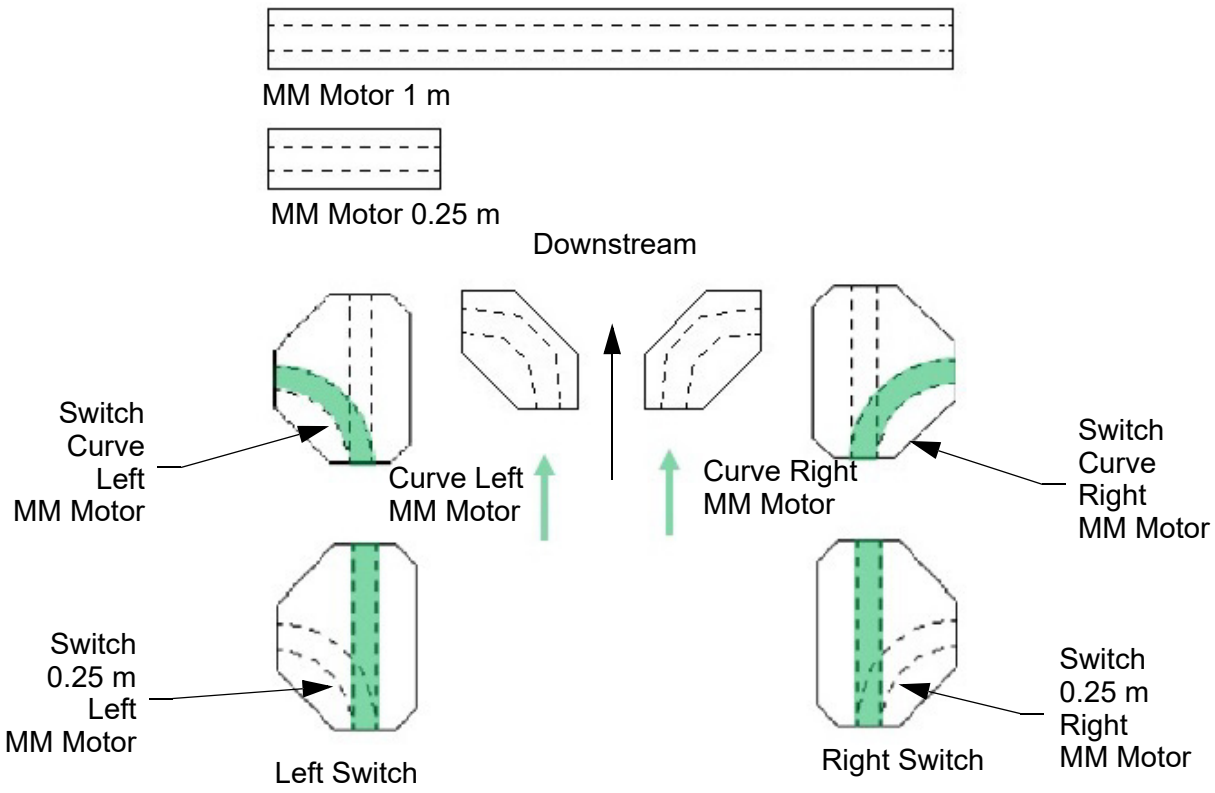


Figure 4-33: Motor Types MM Lite

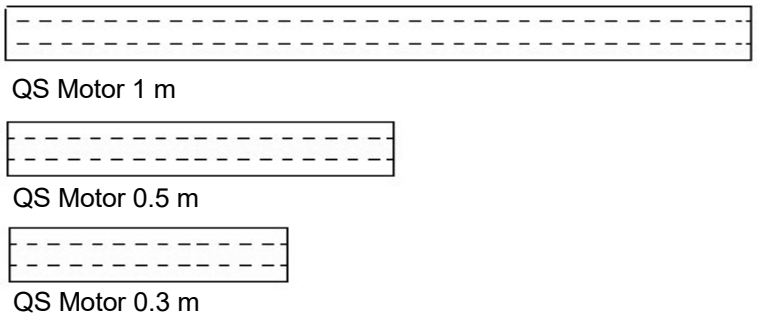


Figure 4-34: Motor Types QuickStick

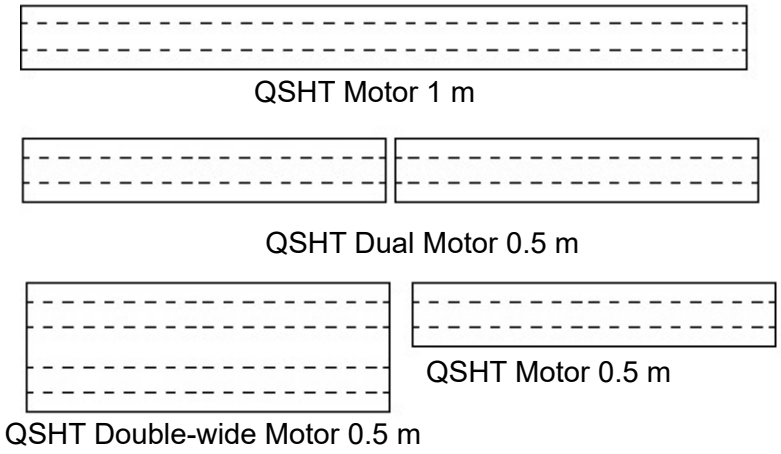


Figure 4-35: Motor Types QSHT

1. Update the motor default settings as required for the path (see *Vehicle and Motor Parameters* *on page 227* for detailed descriptions of all parameters).

2. From the **Motor Type** drop-down list, select the motor type that is most common on this path (see Figure 4-33). The **Motor Defaults** automatically populate.

Table 4-2: Motor Types

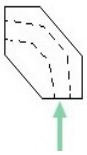
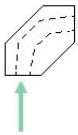
Motor Type	Description	
MagneMover Lite Motors see Figure 4-33 on page 101		
ML_G4_1000 ML_G4_ENET_1000	A 1m (one meter) MM Lite motor.	
ML_G4_250 ML_G4_ENET_250	A 0.25 m (quarter meter) MM Lite motor.	
ML_G4_CURVE_LEFT ML_G4_ENET_CURVE_LEFT		A 90° Curve MM Lite motor. A “left” curve indicates that when traveling in the forward direction along the path, this curve creates a left turn.
ML_G4_CURVE_RIGHT ML_G4_ENET_CURVE_RIGHT		A 90° Curve MM Lite motor. A “right” curve indicates that when traveling in the forward direction along the path, this curve creates a right turn.

Table 4-2: Motor Types (Continued)

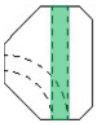
Motor Type	Description	
ML_G4_SWITCH_CURVE_LEFT ML_G4_ENET_SWITCH_CURVE_LEFT ML_G4_ENET_HIGH_PAYLOAD_ SWITCH_CURVE_LEFT		A Left Switch MM Lite motor. MM Lite switch motors can be treated as a curve motor and a quarter meter motor overlaid. The curve part of the switch is defined on one path, while the quarter meter part of the switch is defined on another path. The “Switch Curve Left” should be defined on the path where a curved part of a Left Switch is present. A way to distinguish between Left Switches and Right Switches is the curve part of a Left Switch diverts to the left.
ML_G4_SWITCH_250_LEFT ML_G4_ENET_SWITCH_250_LEFT ML_G4_ENET_HIGH_PAYLOAD_ SWITCH_250_LEFT		A Left Switch MM Lite motor. MM Lite switch motors can be treated as a curve motor and a quarter meter motor overlaid. The curve part of the switch is defined on one path, while the quarter meter part of the switch is defined on another path. The “Switch 250 Left” should be defined on the path where a quarter meter part of a Left Switch is present. A way to distinguish between Left Switches and Right Switches is the curve part of a Left Switch diverts to the left.
ML_G4_SWITCH_CURVE_RIGHT ML_G4_ENET_SWITCH_CURVE_ RIGHT ML_G4_ENET_HIGH_PAYLOAD_ SWITCH_CURVE_RIGHT		A Right Switch MM Lite motor. MM Lite switch motors can be treated as a curve motor and a quarter meter motor overlaid. The curve part of the switch is defined on one path, while the quarter meter part of the switch is defined on another path. The “Switch Curve Right” should be defined on the path where a curved part of a Right Switch is present. A way to distinguish between Right Switches and Left Switches is the curve part of a Right Switch diverts to the right.

Table 4-2: Motor Types (Continued)

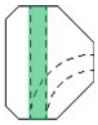
Motor Type	Description	
ML_G4_SWITCH_250_RIGHT ML_G4_ENET_SWITCH_250_RIGHT ML_G4_ENET_HIGH_PAYLOAD_SWITCH_250_RIGHT		A Right Switch MM Lite motor. MM Lite switch motors can be treated as a curve motor and a quarter meter motor overlaid. The curve part of the switch is defined on one path, while the quarter meter part of the switch is defined on another path. The “Switch 250 Right” should be defined on the path where a quarter meter part of a Right Switch is present. A way to distinguish between Left Switches and Right Switches is the curve part of a Right Switch diverts to the right.
QuickStick Motors see Figure 4-34 on page 101		
QS_G2_100 QS_G2_100_PLUS	1 m QuickStick 100 A linear synchronous motor	
QS_150_1000	1 m QuickStick 150 linear synchronous motor	
QS_G2_100_HALF QS_G2_100_PLUS_HALF	0.5 m QuickStick 100 A linear synchronous motor	
QS_150_500	0.5 m QuickStick 150 linear synchronous motor	
QS_150_300	0.3 m QuickStick 150 linear synchronous motor	
QuickStick HT Motors see Figure 4-35 on page 102		
QS_G2_HT	1 m QuickStick High Thrust linear synchronous motor (standard and submersible). One motor that is connected to one QSMC motor controller.	
QS_G2_HT_5700	1 m QuickStick High Thrust linear synchronous motor (standard and submersible). One motor that is connected to one QuickStick HT 5700 Inverter.	
QS_G2_HT_HALF	0.5 m QuickStick High Thrust linear synchronous motor (standard and submersible). One motor that is connected to one QSMC-2 motor controller.	
QS_G2_HT_5700_HALF	0.5 m QuickStick High Thrust linear synchronous motor (standard and submersible). One motor that is connected to one QuickStick HT 5700 Inverter.	

Table 4-2: Motor Types (Continued)

Motor Type	Description
QS_G2_HT_DUAL_HALF	Two 0.5 m QuickStick High Thrust linear synchronous motors (standard and submersible). Two contiguous motors that are connected to one QSMC-2 motor controller.
QS_G2_HT_5700_DUAL_HALF	Two 0.5 m QuickStick High Thrust linear synchronous motors (standard and submersible). Two contiguous motors that are connected to one QuickStick HT 5700 Inverter.
QS_G2_HT_HALF_DW	0.5 m QuickStick High Thrust double wide linear synchronous motor (standard and submersible). One motor that is connected to one QSMC motor controller.
QS_G2_HT_5700_DW	0.5 m QuickStick High Thrust double wide linear synchronous motor (standard and submersible). One motor that is connected to one QuickStick HT 5700 Inverter.

3. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Define Downstream Gaps for QuickStick and QSHT

QuickStick and QuickStick HT systems use the Downstream Gap motor parameter to define the physical space between motors. This is used by the collision avoidance system to confirm that vehicles do not collide over the motor gaps. The Downstream Gap #1 and Downstream Gap #2 parameters are used to enter the downstream gaps of different motor types, see Figure 4-36.

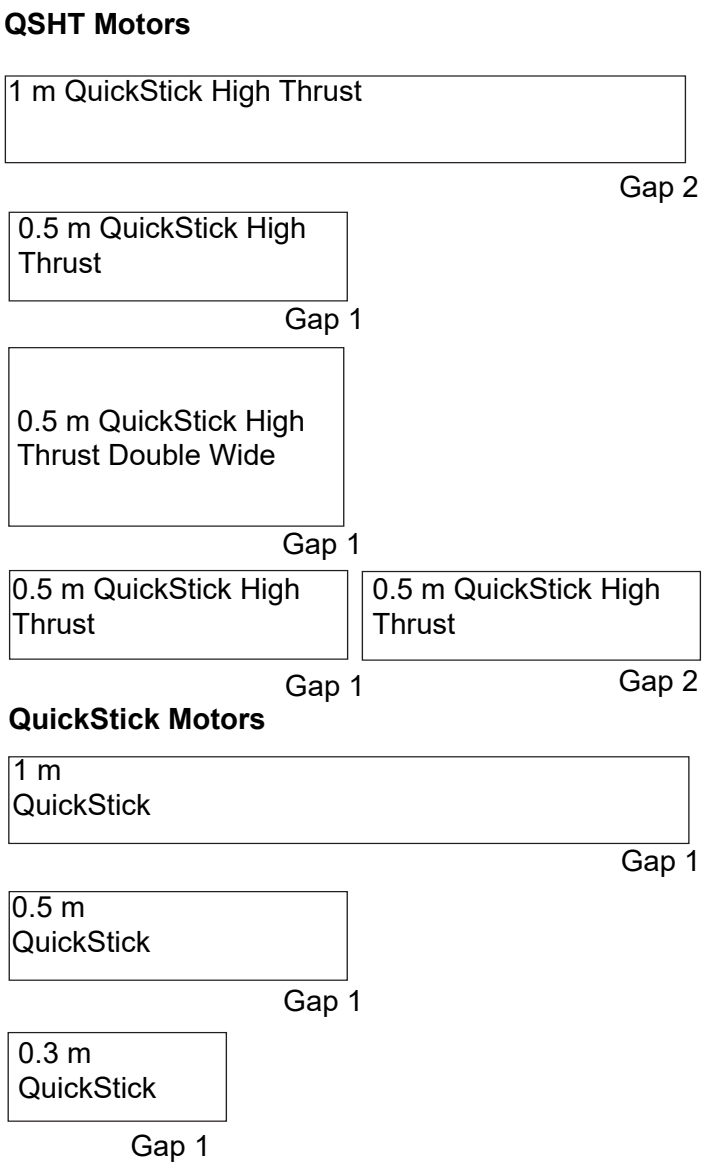


Figure 4-36: QuickStick Gap Definitions for Downstream Gap #1 and Downstream Gap #2

When entering the downstream gaps, use the measured distance between the motor casings. The internal gaps are added by the Configurator automatically based on the defined motor types. See *Internal Motor Gaps on page 159* for more information.

The Node Controller Web Interface can be used to detect precise motor gaps in a running QuickStick or QSHT system. It is advised to include the gap errors that are detected as the level of precision that is provided by the Web Interface can improve vehicle motion across gaps. See the *MagneMotion Node Controller Interface User Manual*, publication MMI-UM001 Motor Gap Information section for details on how to access the Motor Gap Information page.

Downstream Gap Error Adjustment

To input the gap errors for a Downstream Gaps:

1. Create and upload the complete Node Configuration File for the system layout using the physical measured gaps for all **Downstream Gaps** in the system.

2. Command a vehicle to drive over all motor gaps in the system.

3. See the *MagneMotion Node Controller Interface User Manual*, publication MMI-UM001 **Motor Gap Information** section, to obtain the detected **Gap Errors**.

   The Motor Gap Information page is shown in Figure 4-37.

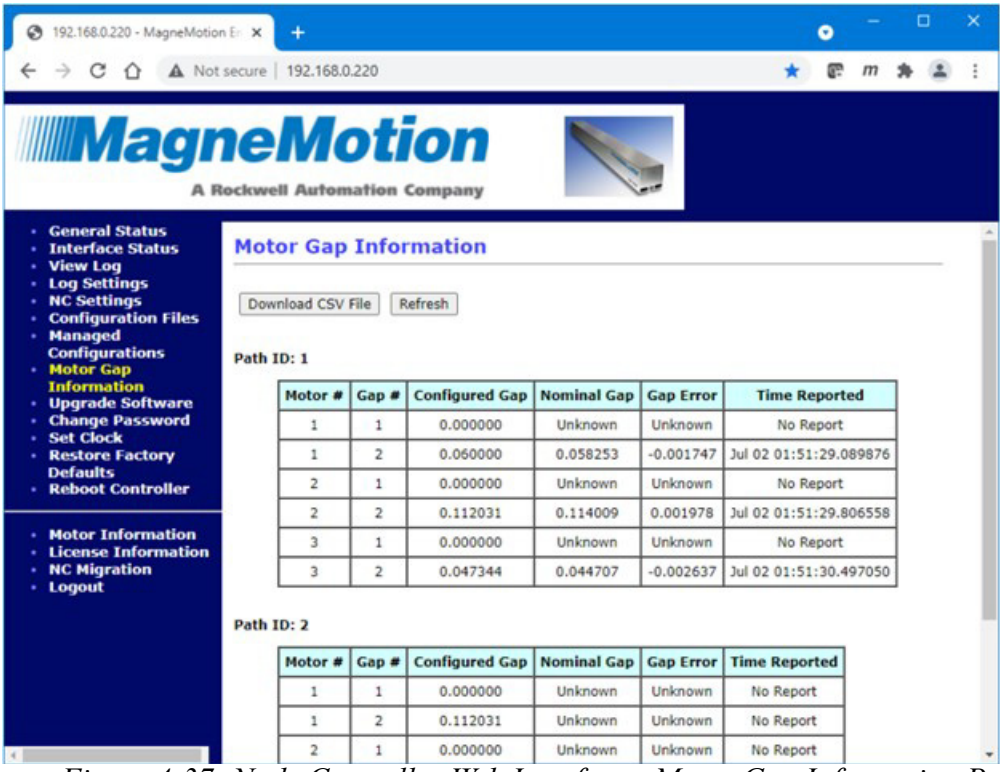


Figure 4-37: Node Controller Web Interface - Motor Gap Information Page

4. From any motor page, select the **Input Gap Errors** button on the top-right, see Figure 4-38.

   *The Downstream Gap Error Adjustment window that is shown in Figure 4-39 appears. The **Downstream Gaps** for all motors on the path are displayed.*

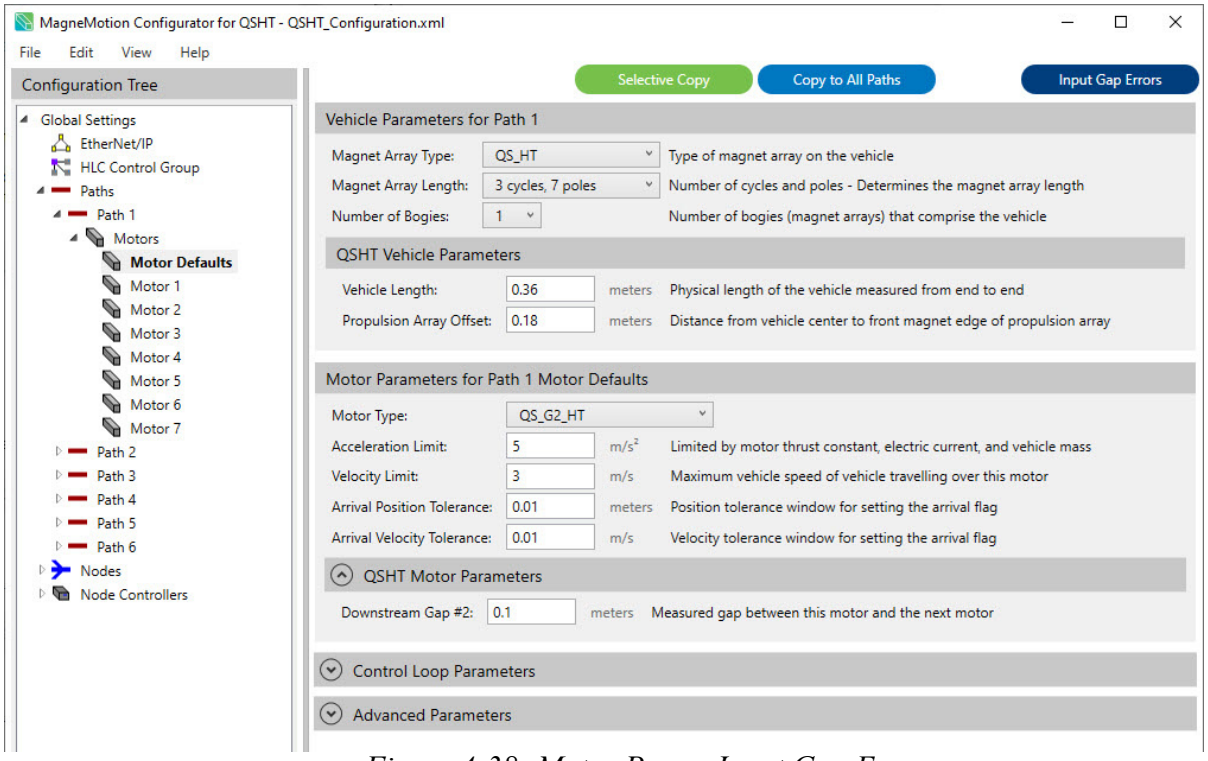


Figure 4-38: Motor Page - Input Gap Errors

5. Input the **Gap Errors** from the Motor Gap Information page into the appropriate **Gap Error** field for each motor on the path. The Gap # is populated based on the motor types, see Figure 4-36 on page 106.

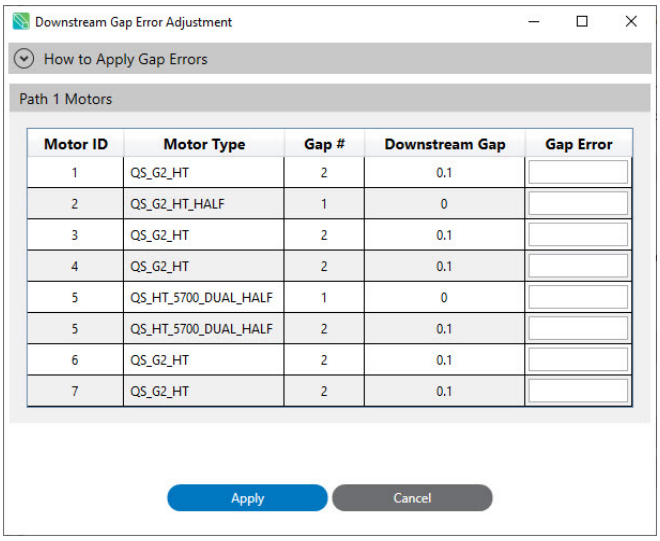


Figure 4-39: Downstream Gap Error Adjustment Window

6. Select **Apply** to apply all **Gap Errors**.

7. Repeat for all Paths in the system.

8. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Define Control Loop Parameters

1. Update the control loop default settings of each PID Set as required for the path (see *Control Loop Parameters on page 240* for detailed descriptions of all parameters).

2. To access the Per Motor Control Loop Parameters, see *Show Per Motor Control Loop Parameters*.

3. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Show Per Motor Control Loop Parameters

This section describes how to show/hide the motor Control Loop parameters for individual motor pages. This is typically used if one or two motors on a path require different PID settings to control vehicle motion that is based on some action being taken while the vehicle is on those specific motors.

1. Enable the Per Motor Control Loop Parameters option by selecting the **Show Per Motor Control Loop Parameters** option in the **View** menu in the Configurator Menu Bar.

   *The **Motor Details** page that is displayed in the Configuration Settings Pane is updated with the control loop parameters, see Figure 4-1 on page 71.*

   *A check mark is displayed before the **Show Per Motor Control Loop Parameters**, see Figure 4-40, to indicate it is selected.*

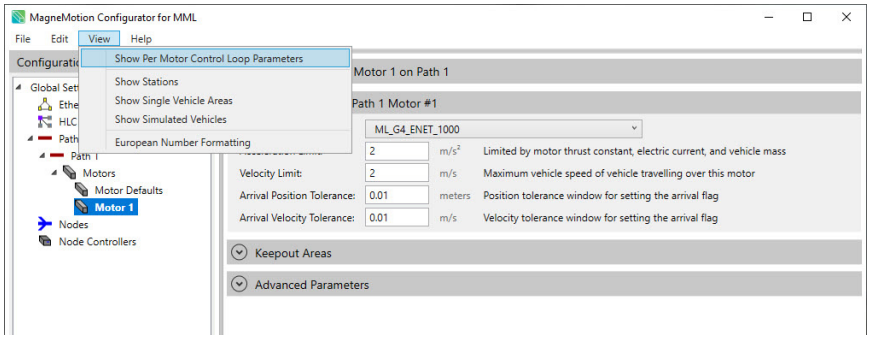


Figure 4-40: Show Per Motor Control Loop Parameters Option Selected

2. Edit the Control Loop parameters for specific motors as required.

3. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

NOTE: The **Show Per Motor Control Loop Parameters** selection is not saved in the Node Controller Configuration File and always defaults to cleared (unchecked) when the Configurator is started.

Configure Keepout Areas

The Keepout Area allows the definition of certain areas on a path where the motors can help prevent vehicles from entering unless they have permission to pass completely through the area.

NOTE: These are no longer default values and must be configured on each individual motor page. Keepout Areas can start anywhere on a motor but must always end at the end of a motor.

- A vehicle with a final destination beyond the Keepout Area moving in the direction of the Keepout Area is not allowed to enter the area until it has acquired movement permission beyond the Keepout Area.
- A vehicle with a final destination in the Keepout Area moving in the direction of the Keepout Area is not allowed to enter and stop in the area until it has acquired movement permission beyond the area. That is, there are no vehicles between it and the area just past the Keepout Area.
- A vehicle entering a Keepout Area in the direction of the Keepout Area takes ownership of all motor blocks inside the Keepout Area.
- A Keepout Area in one direction does not affect the motion of vehicles moving in the other direction unless there is a vehicle inside the Keepout Area moving in the direction of the Keepout Area.

4. If vehicle movement is suspended, meaning an E-Stop, interlock, Suspend, or FastStop command is issued:
    - Any vehicle in the Keepout Area moving in the direction of the Keepout Area moves beyond the Keepout Area and then decelerates to a stop.
    - Any vehicle in the Keepout Area moving in the opposite direction of the Keepout Area immediately decelerates to a stop.

Examples

For vehicle motion downstream, if the configuration of the Keepout Area is the same as the configuration shown in Figure 4-41, set the **No Move Permission After** values for the motors as shown in Figure 4-41. See *Keepout Areas on page 247* for detailed descriptions of the parameters.

- MM Motor 1: 5.0 m (not in Keepout Area)
- MM Motor 2: 0.25 m
- MM Motor 3: (minus) -0.75 m
- MM Motor 4: (minus) -1.75 m

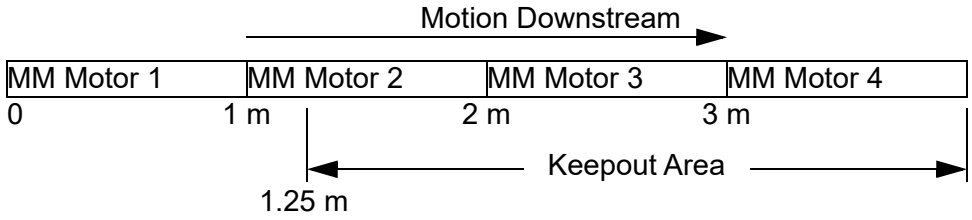


Figure 4-41: Keepout Area, Downstream Vehicle Motion

For vehicle motion upstream, if the configuration of the Keepout Area is the same as the configuration shown in Figure 4-42, set the **No Move Permission Before** values for the motors as shown in Figure 4-42. See *Keepout Areas on page 247* for detailed descriptions of the parameters.

- MM Motor 1: -1.0 m (not in Keepout Area)
- MM Motor 2: 2.25 m
- MM Motor 3: 1.25 m
- MM Motor 4: 0.25 m

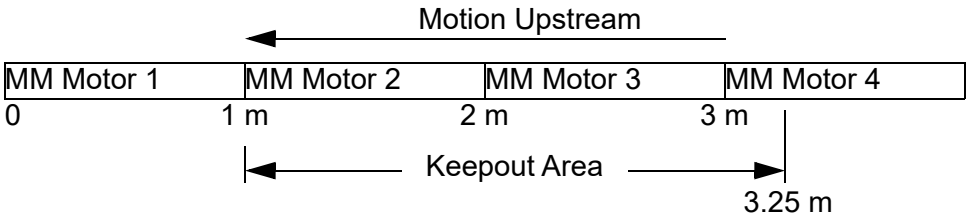


Figure 4-42: Keepout Area, Upstream Vehicle Motion

Define Keepout Areas

1. Update the **Keepout Area** settings as required for the path (see *Keepout Areas on page 247* for detailed descriptions of all parameters).

2. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Copy Motor Defaults

For many system configurations, it is desirable to use the same Motor Defaults parameters on multiple paths in the system. For example, it is common to use the same Vehicle Parameters for all paths in a system. The Selective Copy and Copy to All Paths options are available on the Motor Defaults page of every path. This allows easy configuration of the Motor Defaults in one place and distribute them to the rest of the paths in the configuration.

Copy to All Paths

The Copy to All Paths button copies all motor default parameters to all paths defined in the configuration.

1. Navigate to the **Motor Defaults** page of any path.

2. Define the motor default parameters as desired for all paths.

3. Select **Copy to All Paths**. See the second button along the top of the Configuration Settings Pane in Figure 4-43.

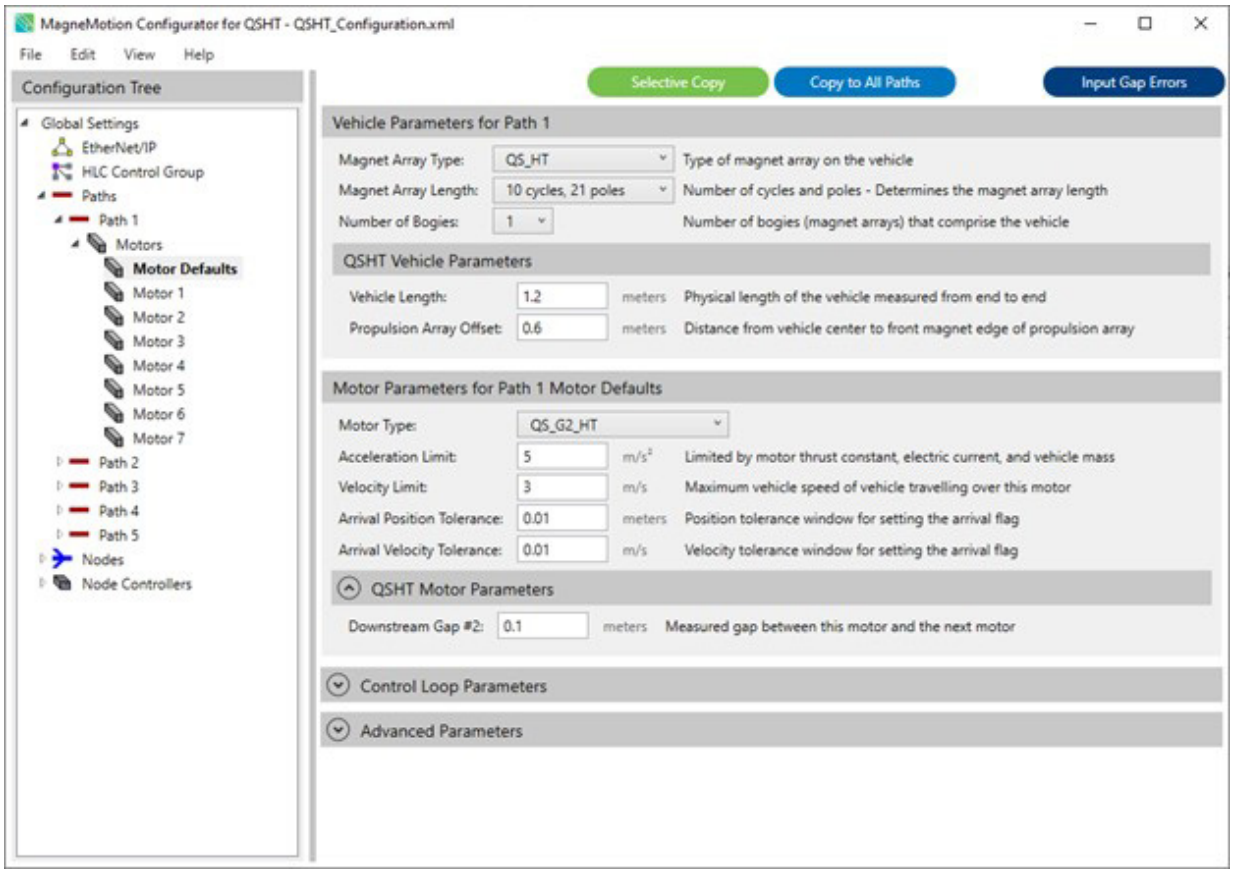


Figure 4-43: Copy to All Paths

4. Select **OK** to copy all motor default parameters to all **Paths**. Select **Cancel** to cancel.

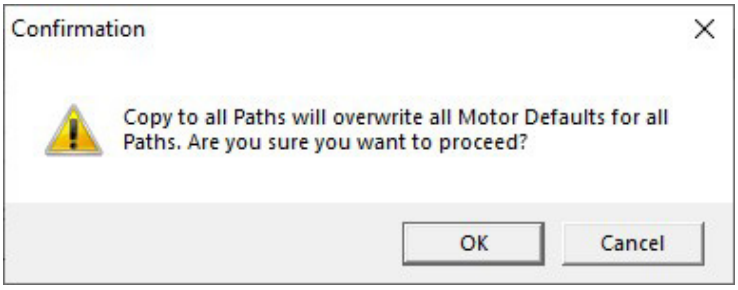


Figure 4-44: Copy to All Paths Confirmation

5. Select **OK** on Copy Complete.

   All parameters from the starting path have been copied to all paths.

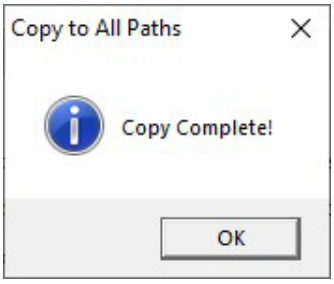


Figure 4-45: Copy Motor Defaults Complete

6. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Selective Copy

The Selective Copy button displays a window, that allows the selection of which motor default parameters to copy and specify which paths to copy to.

1. Navigate to the **Motor Defaults** page of a path where parameters need to be changed.
2. Define the motor default parameters as desired.
3. Select **Selective Copy.** See the first button along the top of the Configuration Settings Pane in Figure 4-46.

   The Copy Motor Defaults window (Figure 4-47) appears.

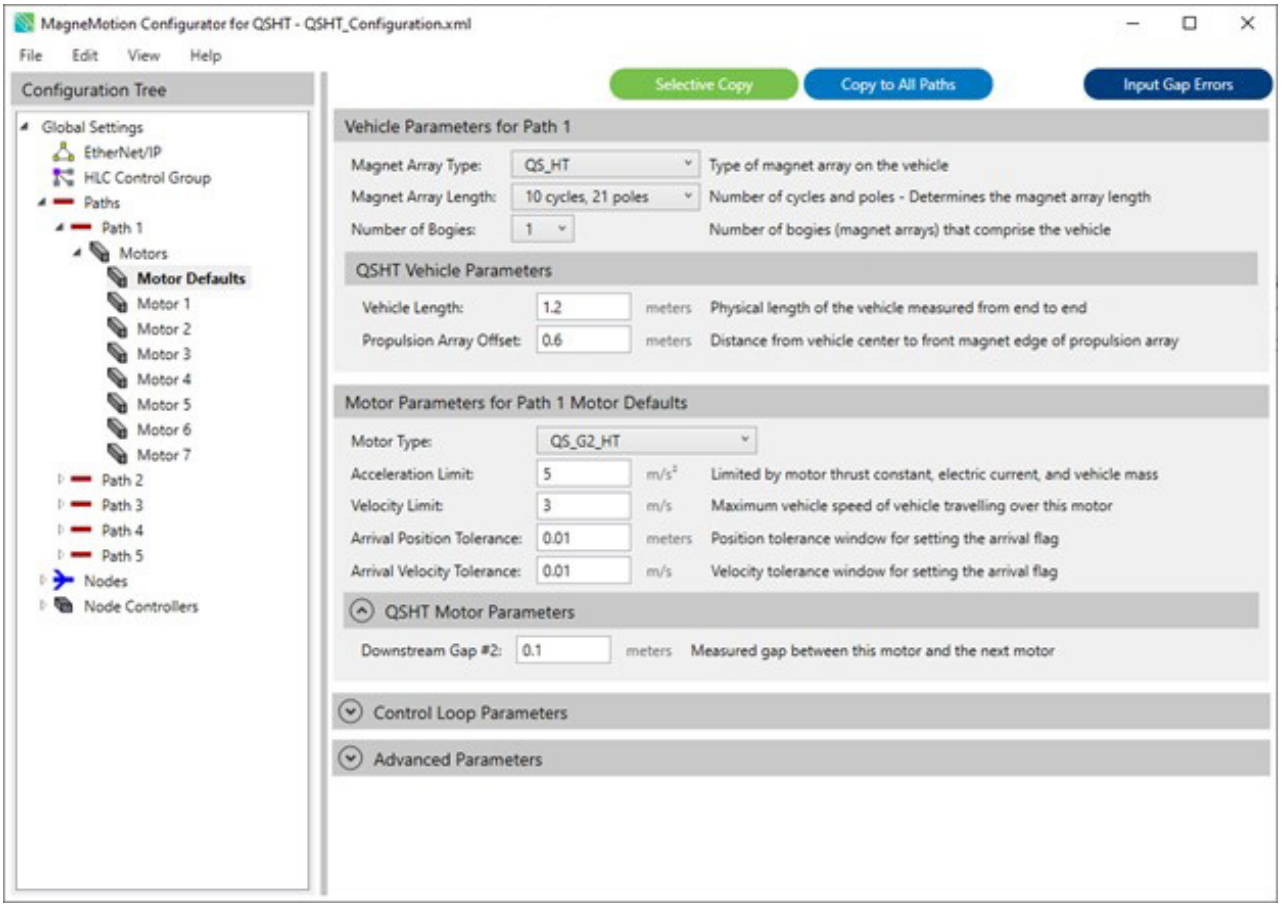


Figure 4-46: Motor Defaults Page - Selective Copy Button

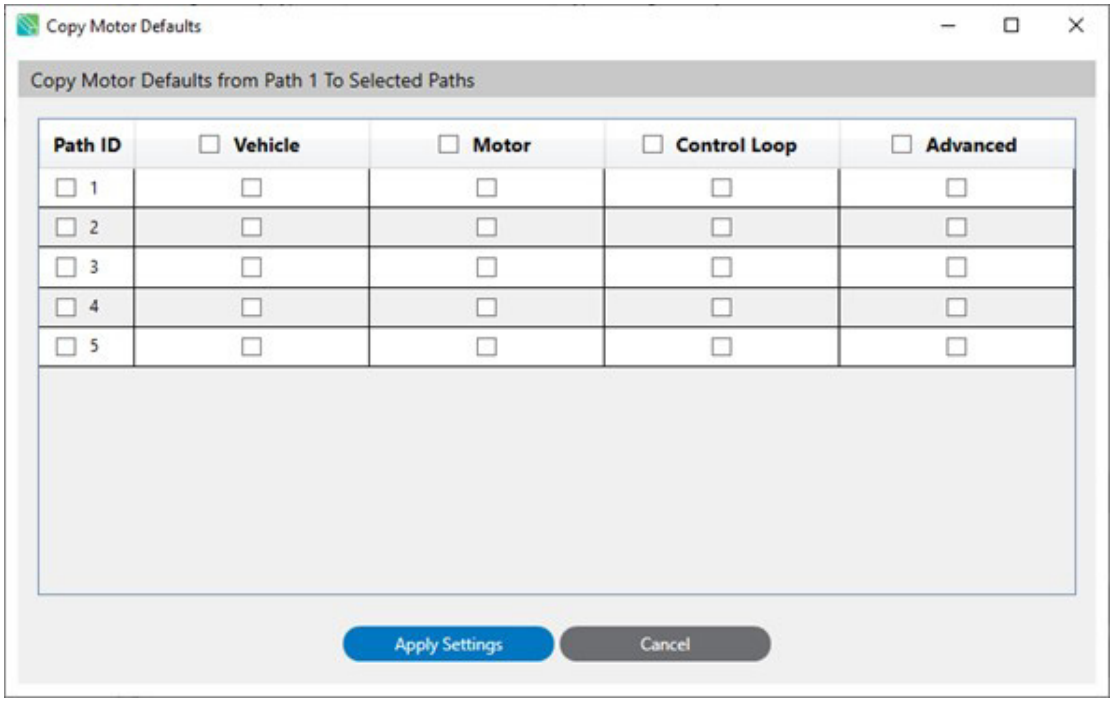


Figure 4-47: Copy Motor Defaults

4. In the **Copy Motor Defaults** window, check the boxes individually or use the row or column headers to select which parameter groups and paths to copy to.

   In this example, the **Vehicle** column header checkbox was used to select the vehicle parameters for all paths.

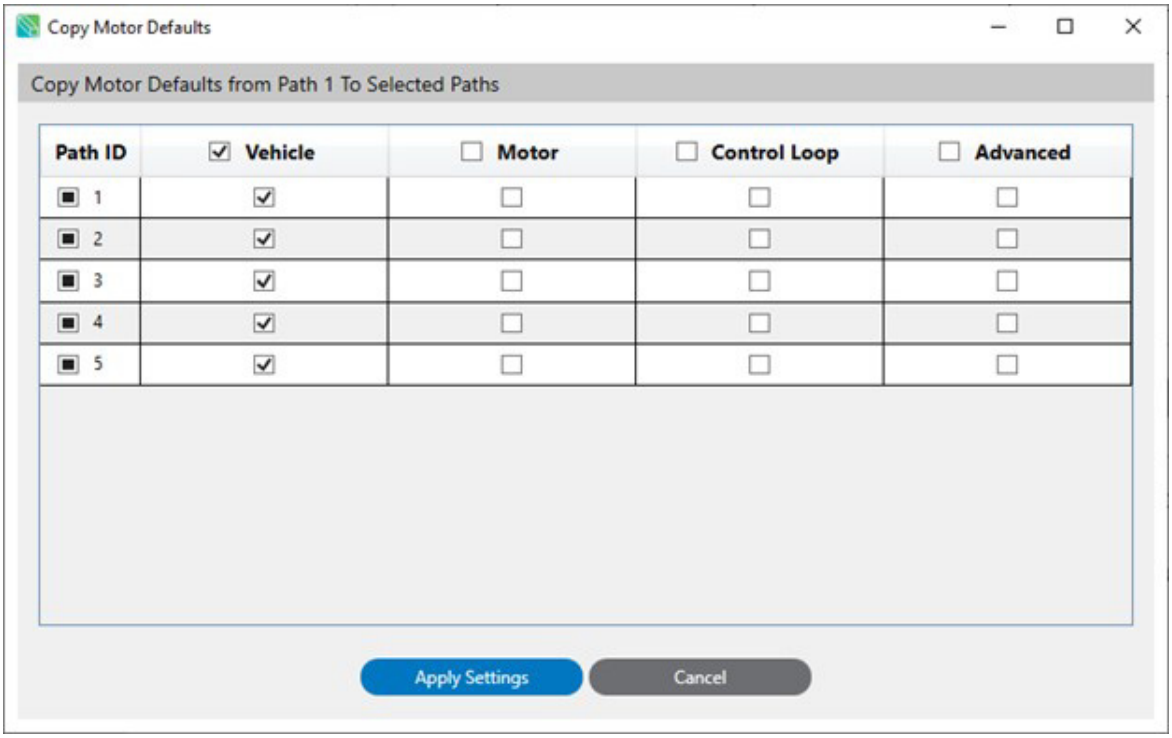


Figure 4-48: Copy Motor Defaults Window - Copy Vehicle Parameters

5. Select **Apply Settings** to copy the selected parameters. Select **Cancel** to cancel.

6. Select **OK** on Copy Complete.

   The selected parameters have been copied to the selected paths.

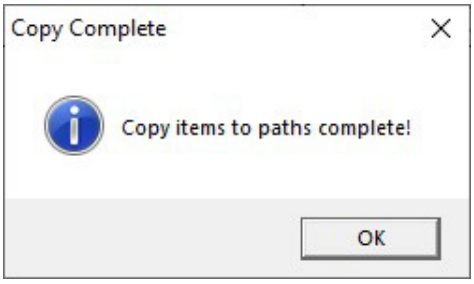


Figure 4-49: Copy Motor Defaults Complete

7. Select **Save XML Config** on the **File m**enu in the Configurator Menu Bar.

Create and Edit Nodes

This section describes how to create and edit all node types in the Node Controller Configuration File. Nodes define the beginning, end, and intersection of paths and are an important element of a transport system configuration.

NOTE: There is a maximum of two nodes per path. The maximum quantity of paths per transport system is system-dependent, see *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013.

The maximum quantity of paths per node is dependent on the node type. The ends of all paths that meet in a node must be connected to the same node controller.

Table 4-3: Menu Definitions and Short-cut Keys

Menu	Action	Short-cut
File	New XML Config	Ctrl+N
	Open XML Config	Ctrl+O
	Save XML Config	Ctrl+S
Edit	Insert Before	Ctrl+Shift+I
	Insert After	Ctrl+I
	Add to End	Ctrl+E
	Cut	Ctrl+X
	Copy	Ctrl+C
	Paste	Ctrl+V
	Delete	Del (Delete)

Node Types

The transport systems support the following types of nodes. All node types that support motion through the node, support bidirectional motion. Not all systems support all node types. See *Node Parameters* *on page 249* for parameters descriptions.

- *Simple Node* *on page 119*
- *Relay Node* *on page 121*
- *Terminus Node* *on page 122*
- *Merge Node* *on page 124*
- *Diverge Node* *on page 128*
- *Merge-Diverge Node* *on page 132*
- *Gateway Node* *on page 136*

- *Overtravel Node* *on page 138*
- *Moving Path Node* *on page 141*

See the *MagneMotion Node Controller Hardware User Manual*, publication MMI-UM013 for information on how to install and maintain the node controllers that are used with the transport systems. Node controllers are used to monitor vehicles and control the motors of a transport system based on the commands from the host controller.

Create a Node

Each node in the transport system must be defined.

1. In the Configuration Tree, select **Nodes**, see Figure 4-50.

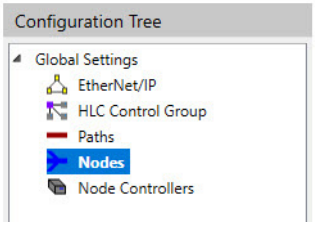


Figure 4-50: Configuration Tree with Nodes Selected

2. On the **Edit** menu in the Configurator Menu Bar, select **Add To End...** (or right-click on **Nodes** and select **Add To End...**).

   NOTE: Right-click on an existing node to open the **Edit** shortcut menu insert a node before or after the selected node.

   *The list of nodes is expanded and displayed below **Nodes** in the Configuration Tree, see Figure 4-51 with the new node added to the list. The node is automatically numbered with the next available **Node ID**.*

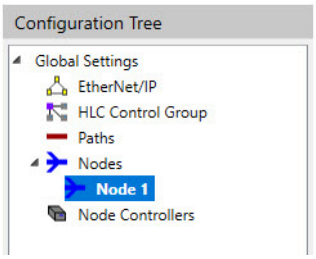


Figure 4-51: Configuration Tree Showing Node Added

Edit a Node

1. Expand the list of nodes in the Configuration Tree by selecting the symbol in front of **Nodes** or double-clicking **Nodes**.

   *The list of nodes is expanded and displayed below **Nodes** in the Configuration Tree.*

2. Open the node to be edited by selecting the **Node ID** for that node.

   *The **Node Details** page for the selected node, see Figure 4-52, is displayed in the Configuration Settings Pane.*

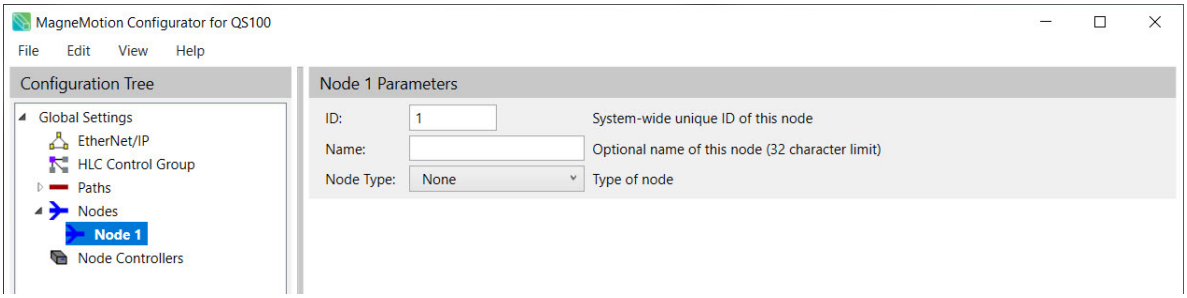


Figure 4-52: New (Undefined) Node Page

3. Update the node parameters as required (see *Nodes on page 248* for detailed descriptions of all parameters).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Simple Node

A Simple node is used to begin a path that is not connected to anything else at the upstream end. No vehicles can be commanded to enter or exit the path through a Simple node. The upstream end of the path where the node is located requires one connection to the node controller. See Figure 4-53, where the shaded circle represents the Simple node. Paths can begin at other node types.

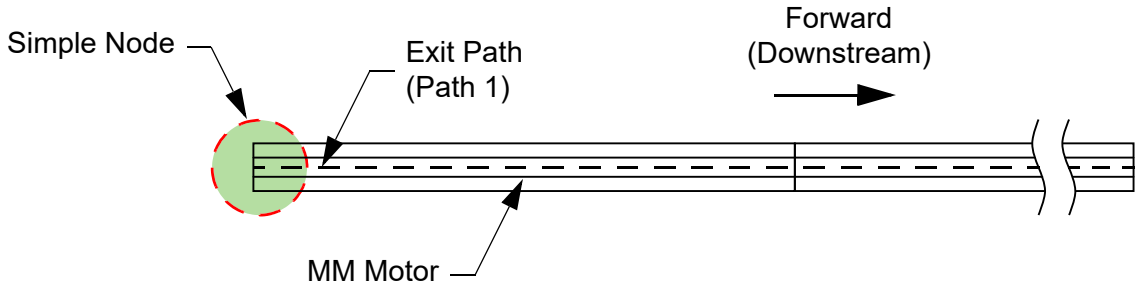


Figure 4-53: Simple Node

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Simple**.

   *The **Node Details** page is updated to show the Simple node parameters, see Figure 4-54.*

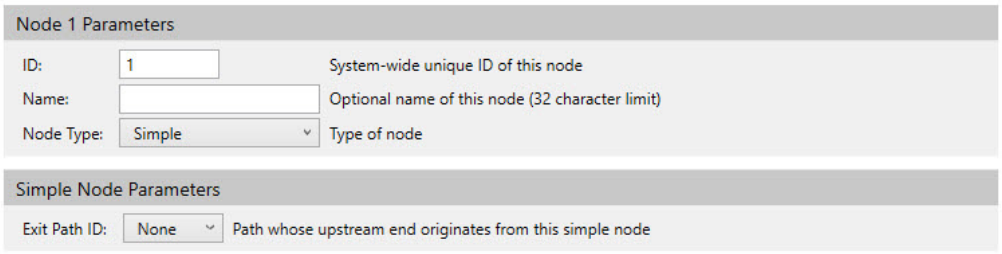


Figure 4-54: Simple Node Parameters

3. Update the node parameters as required (see *Simple Node on page 250* for detailed descriptions of all parameters).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Example

If the configuration of the node is the same as the configuration shown in Figure 4-53, set **Exit Path ID** to **1**, see Figure 4-55.

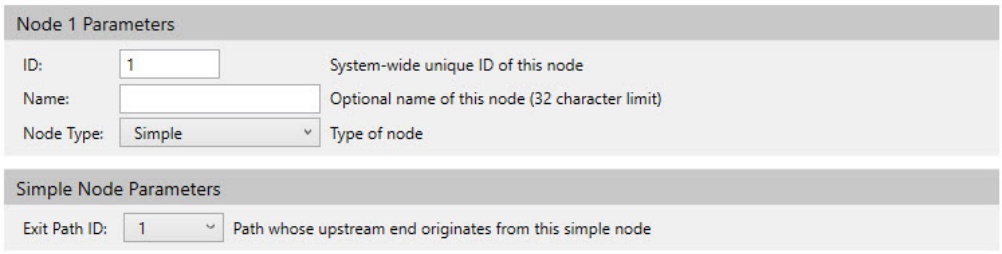


Figure 4-55: Simple Node Example

Relay Node

A Relay node is used to connect the downstream end of a path and the upstream end of a path. Relay nodes are used to connect two paths when the maximum quantity of motors on the first path is reached. Relay nodes are also used to join the downstream and upstream ends of the same path, which creates a simple loop. See Figure 4-56, where the shaded circle represents the Relay node.

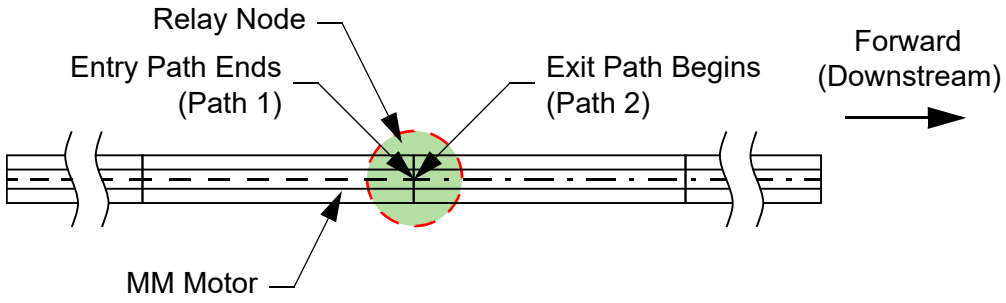


Figure 4-56: Relay Node

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Relay**.

   *The **Node Details** page is updated to show the Relay node parameters, see Figure 4-57.*

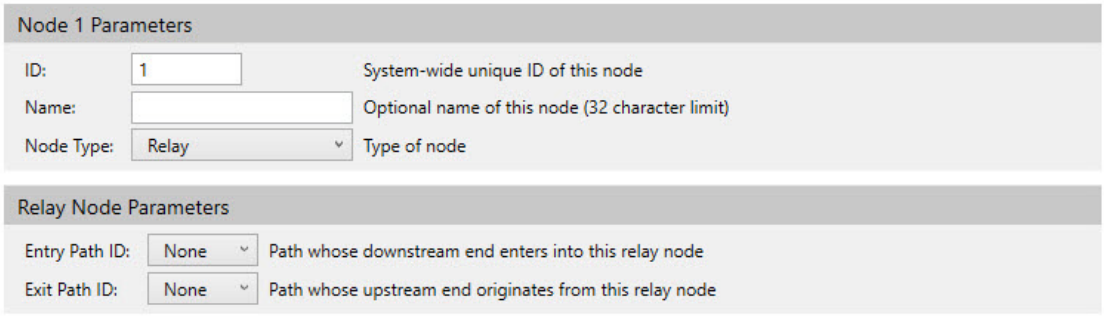


Figure 4-57: Relay Node Parameters

3. Update the node parameters as required (see *Relay Node on page 251* for detailed descriptions of all parameters).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Example

If the configuration of this node is the same as the configuration shown in Figure 4-56, set **Entry Path ID** to **1** and **Exit Path ID** to **2**, see Figure 4-58.

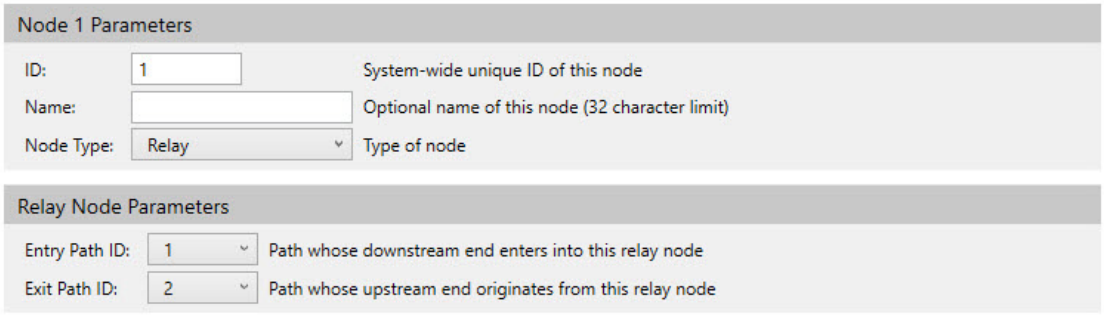


Figure 4-58: Relay Node Example

Terminus Node

A Terminus node is used on a path where vehicles move to or from remote equipment. Terminus nodes can be placed at either the upstream or downstream end of the path. The upstream end of the path where the node is located requires one connection to the node controller. See Figure 4-59, where the shaded circle represents the Terminus node at the downstream end of the path.

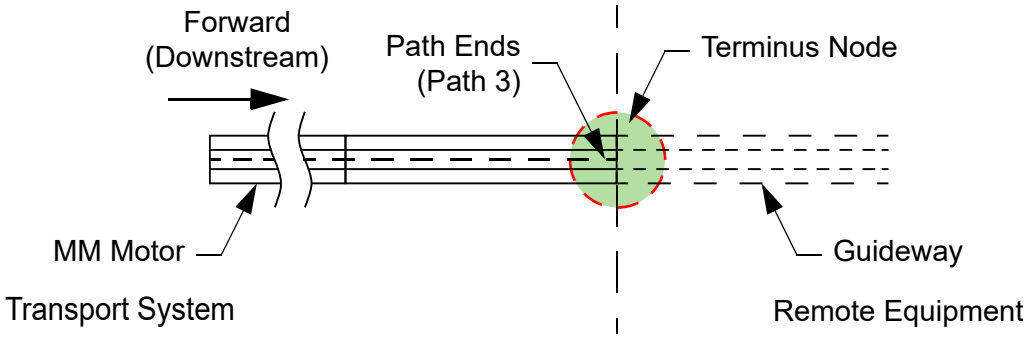


Figure 4-59: Terminus Node

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Terminus**.

*The **Node Details** page is updated to show the Terminus node parameters, see Figure 4-60.*

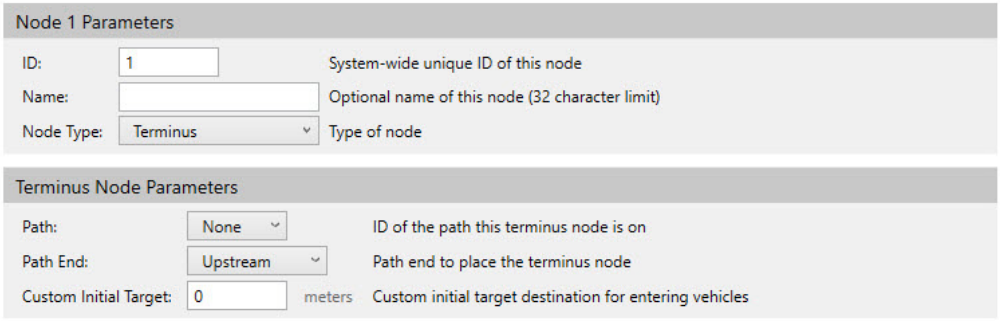


Figure 4-60: Terminus Node Parameters

3. Update the node parameters as required (see *Terminus Node on page 251* for detailed descriptions of all parameters).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Example

If the configuration of this node is the same as the configuration shown in Figure 4-59, set **Path** to **3** and **Path End** to **Downstream**, see Figure 4-61.

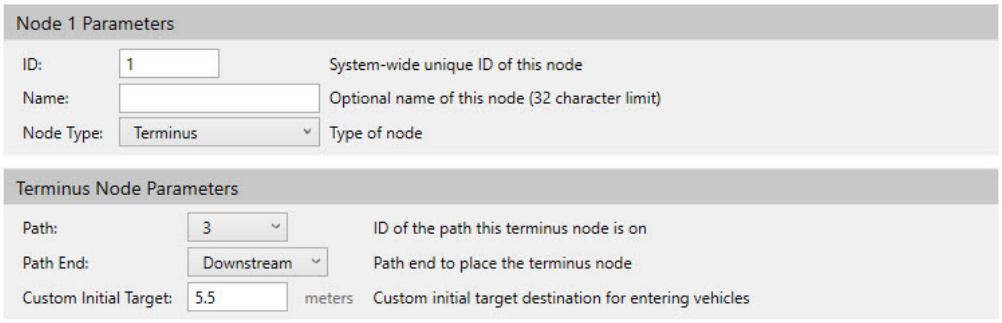


Figure 4-61: Terminus Node Example

Merge Node

A Merge node is used where the downstream ends of two paths connect to the upstream end of a third path. A merge can be created using either a Right Switch or a Left Switch. See Figure 4-62, where the shaded circle represents the Merge node that uses a Left Switch.

NOTE: Merge nodes are only available for MagneMover Lite.

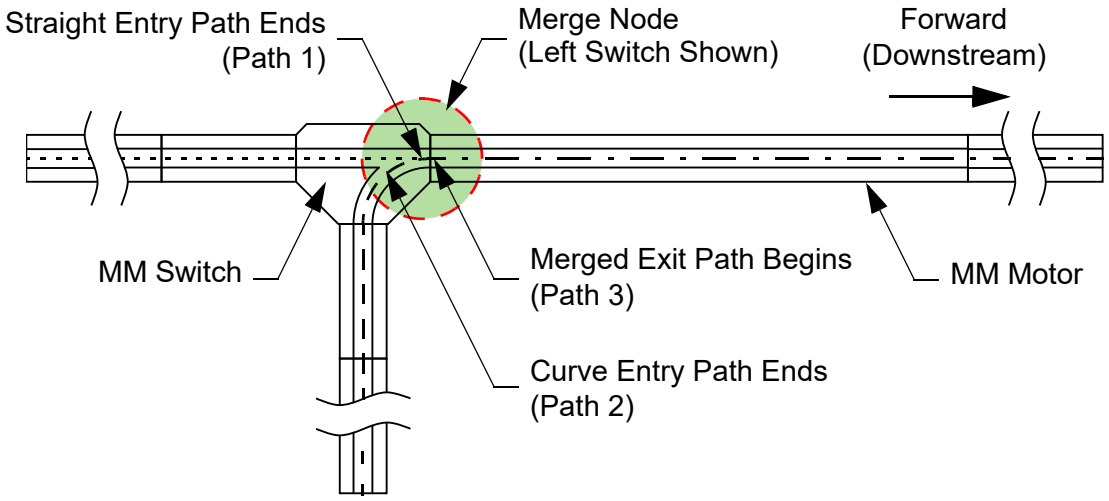


Figure 4-62: Merge Node

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Merge**.

   *The **Node Details** page is updated to show the Merge node parameters, see Figure 4-63.*

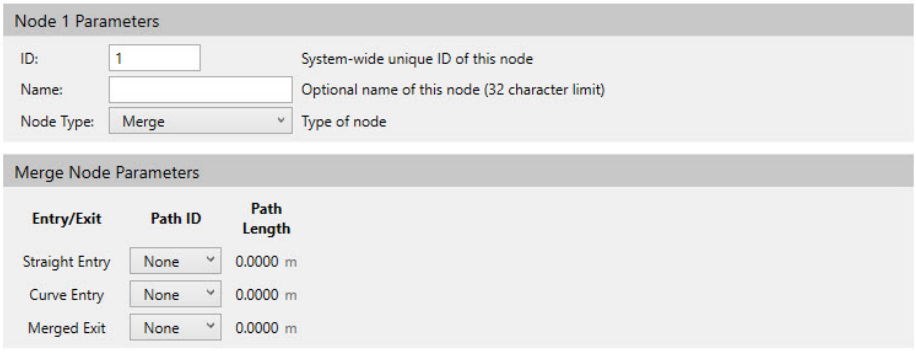


Figure 4-63: Merge Node Parameters - No Path Selected

3. For each entry or exit path that is identified under **Entry/Exits**, select the number of the path that is connected to this node from the appropriate **Path** drop-down list.

   Default values are entered in the Clearance Distance, Entry Gate ID, Entry Gate Distance, and Consecutive Vehicle Limit fields.

A. If the **Vehicle Shape** in the **Motor Defaults** for all paths in the node is **Linear**, the Merge node page displays, see Figure 4-64.

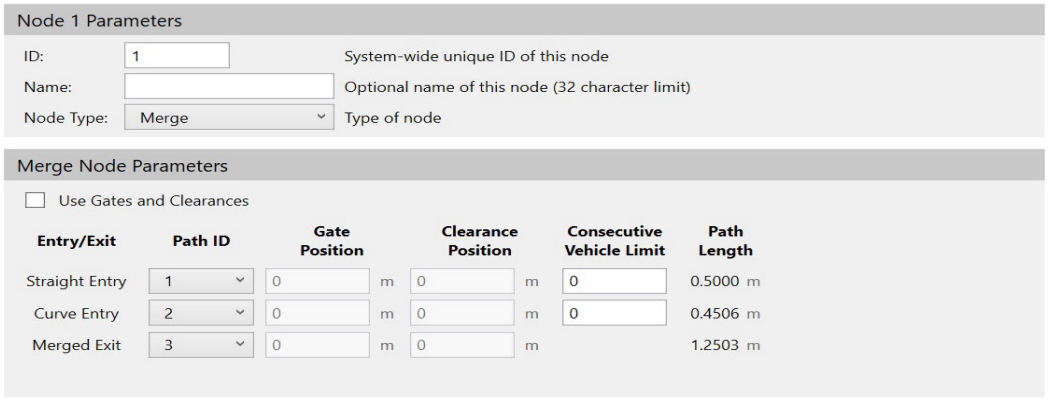


Figure 4-64: Merge Node Parameters - Linear Vehicle Shape on Paths

B. If the **Vehicle Shape** in the **Motor Defaults** for all paths in the node is **Rectangular**, the Merge node page displays, see Figure 4-65.

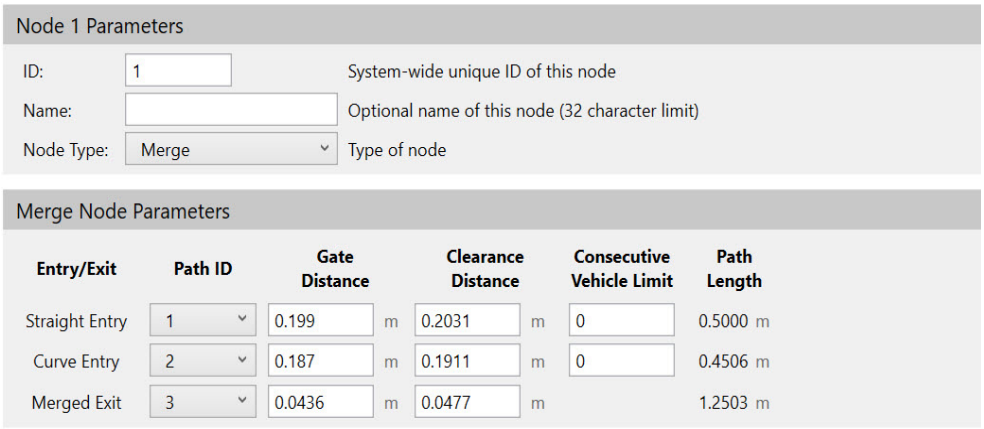


Figure 4-65: Merge Node Parameters - Rectangular Vehicle Shape

C. If the **Vehicle Shape** in the **Motor Defaults** is not the same for all paths in the node, the Merge node page displays, see Figure 4-66. A **Path Vehicle Shape Mismatch** error (Figure 4-67) notifies you of a vehicle shape mismatch within a node. This is an invalid configuration as all paths in a node must use the same vehicle shape. Use the **Vehicle Shape** column to determine which paths need to be corrected.

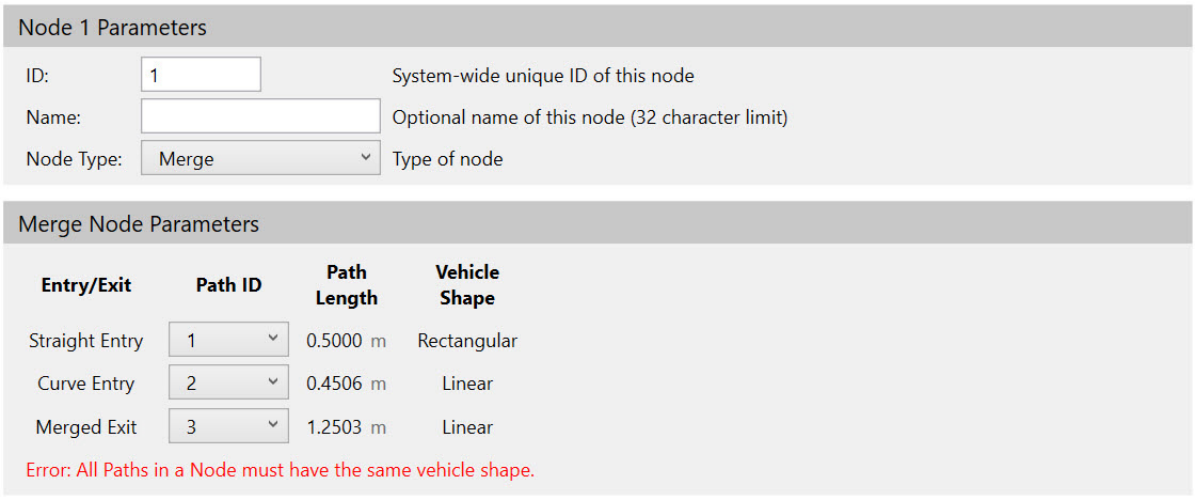


Figure 4-66: Merge Node Parameters - Vehicle Shape Mismatch

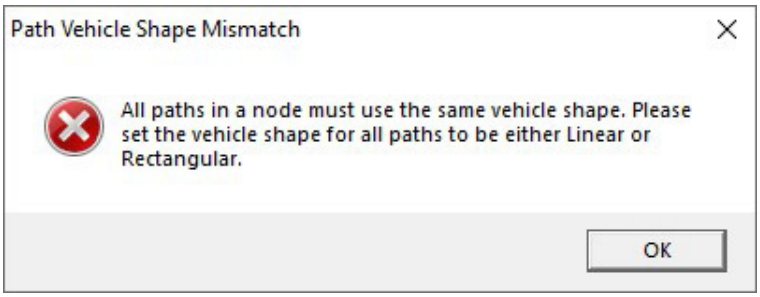


Figure 4-67: Vehicle Shape Mismatch Error

4. For each entry or exit path that is identified under **Entry/Exits**, adjust the node parameters if necessary (see *Merge Node* *on page 254* for detailed descriptions of all parameters; see *Node Gates and Clearances* *on page 147*).

   A. For a Merge node with a **Linear Vehicle Shape**, select the **Use Gates and Clearances** checkbox to enable the use of the **Gate Position** and **Clearance Position**. The use of gates and clearances is not required for systems using linear vehicles.

      NOTE: Once the **Use Gates and Clearances** checkbox is checked, data validation runs on the **Gate Position** and **Clearance Position** fields. Update the values position to be the minimum distance from the node to confirm a valid configuration.

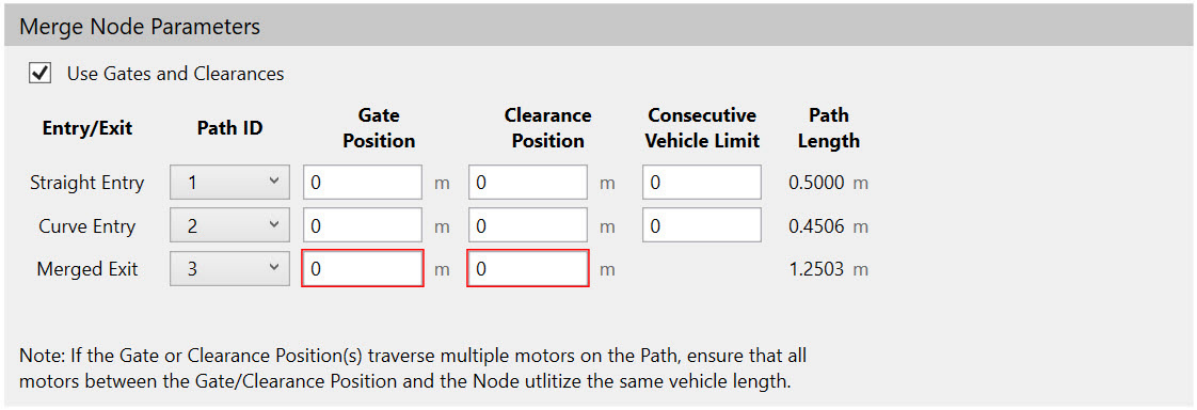


Figure 4-68: Merge Node Parameters – Use Linear Gates and Clearances

B. For a Merge node with a **Rectangular Vehicle Shape**, the **Gate Distance** and **Clearance Distance** are displayed, see *Figure 4-65*. These values are calculated based on the system layout and vehicle dimensions. There is no need to modify these values when using the rectangular vehicle option. The use of gates and clearances is required for systems using rectangular vehicles.

C. Both linear and rectangular style Merge nodes use the **Consecutive Vehicle Limit** parameter to manage traffic through the switch.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Linear Example

If the configuration of this node is the same as the configuration shown in Figure 4-62, set **Straight Entry** to **1**, **Curve Entry** to **2**, and **Merged Exit** to **3**, see Figure 4-69.

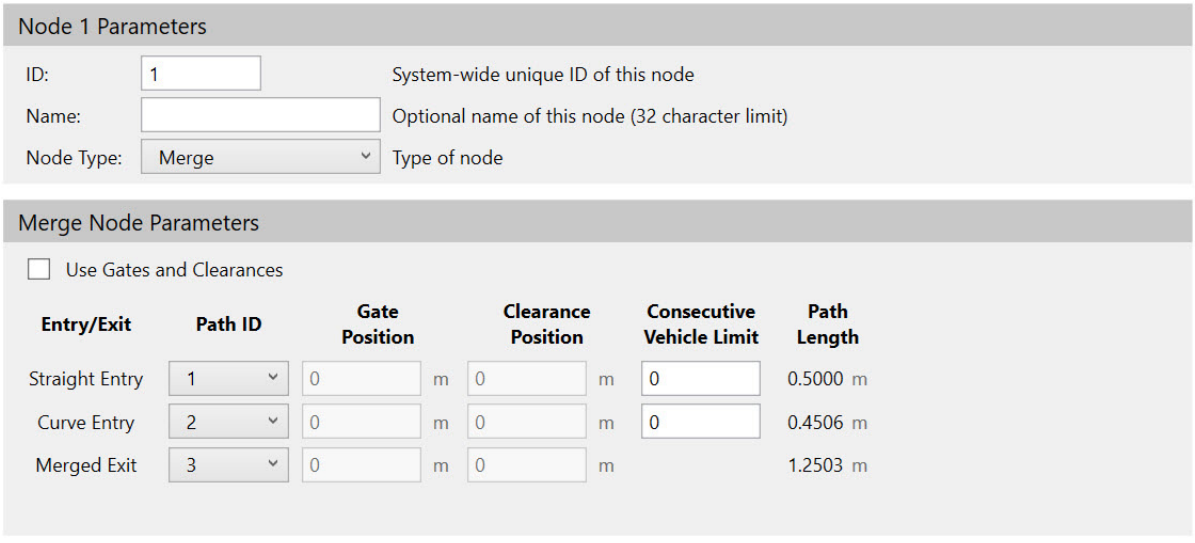


Figure 4-69: Merge Node Example — Linear

Diverge Node

A Diverge node is used where the downstream end of one path connects to the upstream ends of two paths. A diverge can be created using either a Right Switch or a Left Switch. See Figure 4-70, where the shaded circle represents the Diverge node that uses a Right Switch.

NOTE: Diverge nodes are only available for MagneMover Lite.

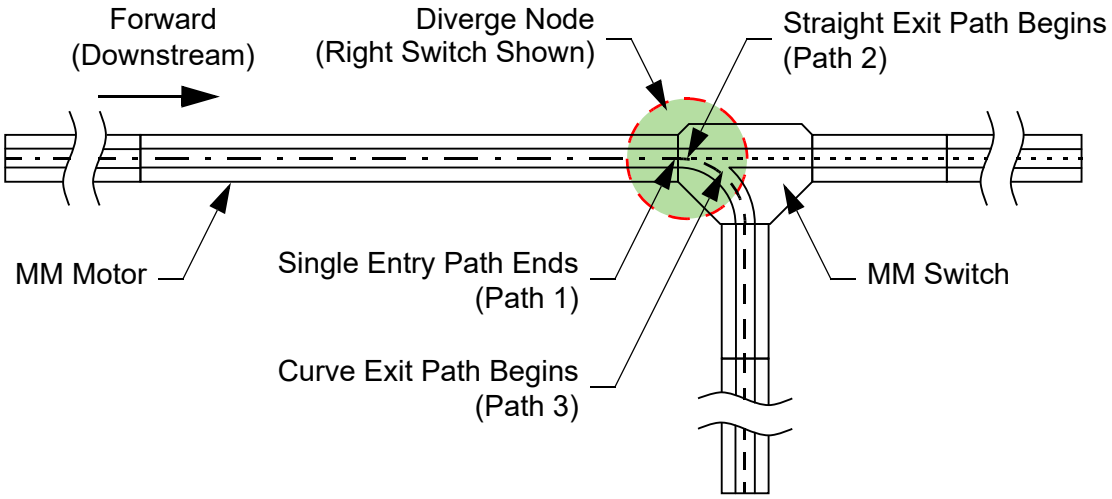


Figure 4-70: Diverge Node

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Diverge**.

   *The **Node Details** page is updated to show the Diverge node parameters, see Figure 4-71.*

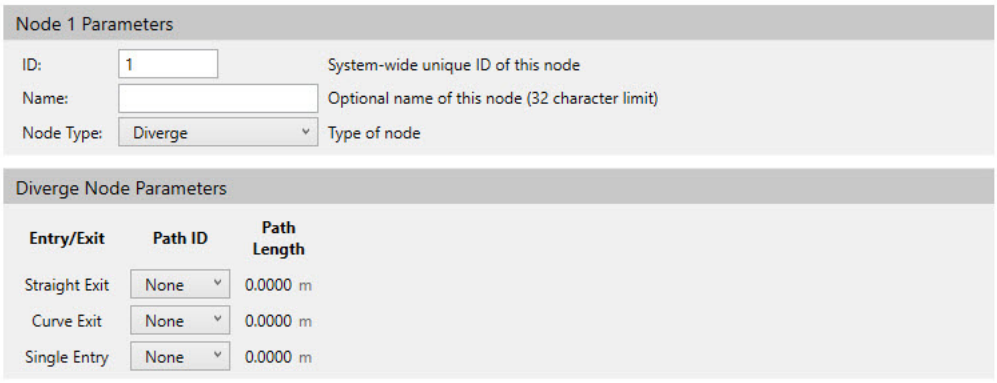


Figure 4-71: Diverge Node Parameters - No Paths Selected

3. For each entry or exit path that is identified under **Entry/Exit**, select the Path ID of the path that is connected to this node from the appropriate **Path** drop-down list.

   A. If the **Vehicle Shape** in the **Motor Defaults** for all paths in the node is **Linear**, the Diverge node page displays, see Figure 4-72.

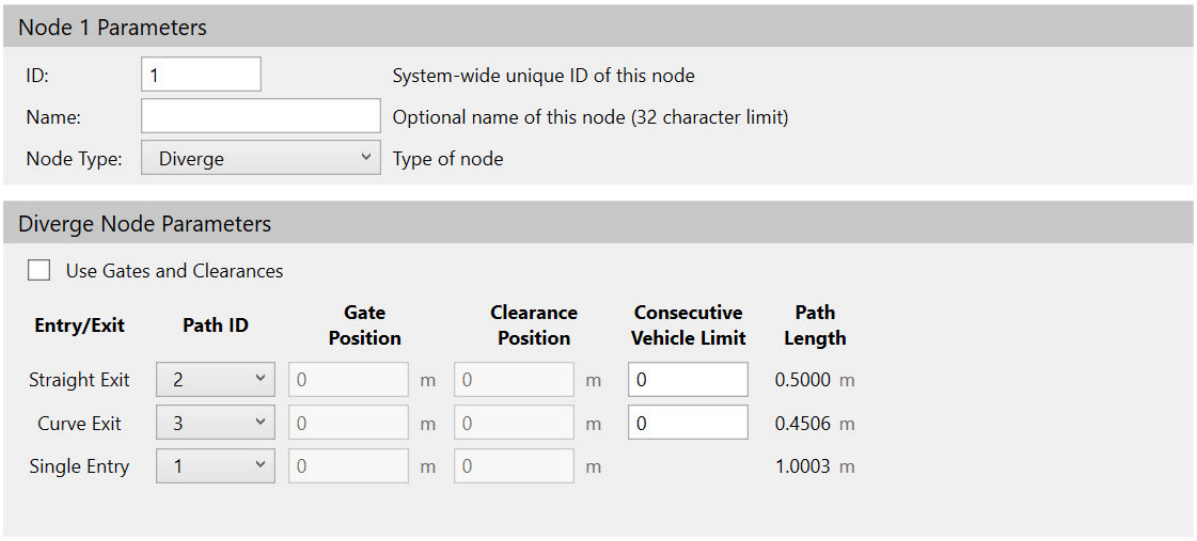


Figure 4-72: Diverge Node Parameters - Linear Vehicle Shape

   B. If the **Vehicle Shape** in the **Motor Defaults** for all paths in the node is **Rectangular**, the Diverge node page displays, see Figure 4-73.

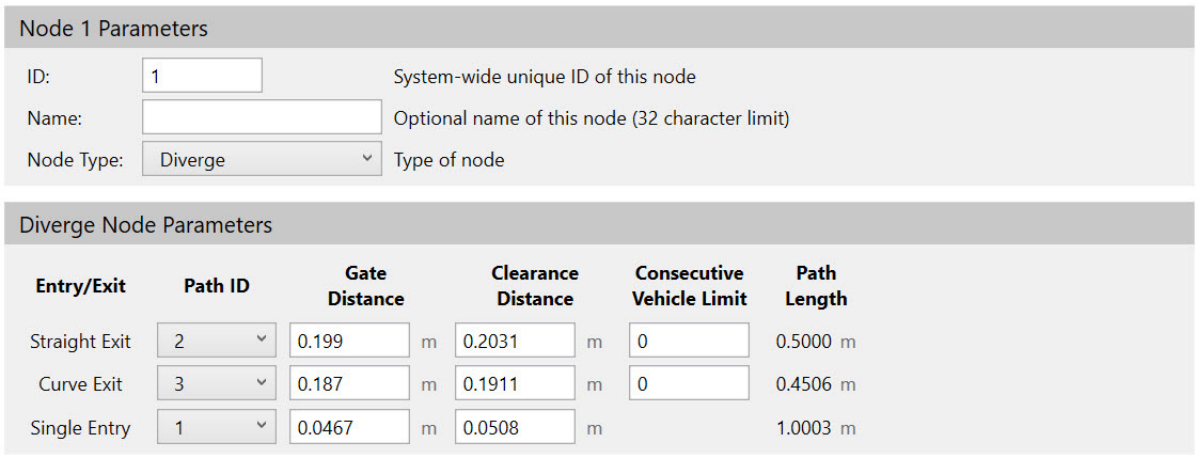


Figure 4-73: Diverge Node Parameters - Rectangular Vehicle Shape

C. If the **Vehicle Shape** in the **Motor Defaults** is not the same for all paths in the node, the Diverge node page displays, see Figure 4-74. A vehicle shape mismatch error (Figure 4-67) notifies you of a vehicle shape mismatch within a node. This is an invalid configuration as all paths in a node must use the same vehicle shape. Use the **Vehicle Shape** column to determine which paths need to be corrected.

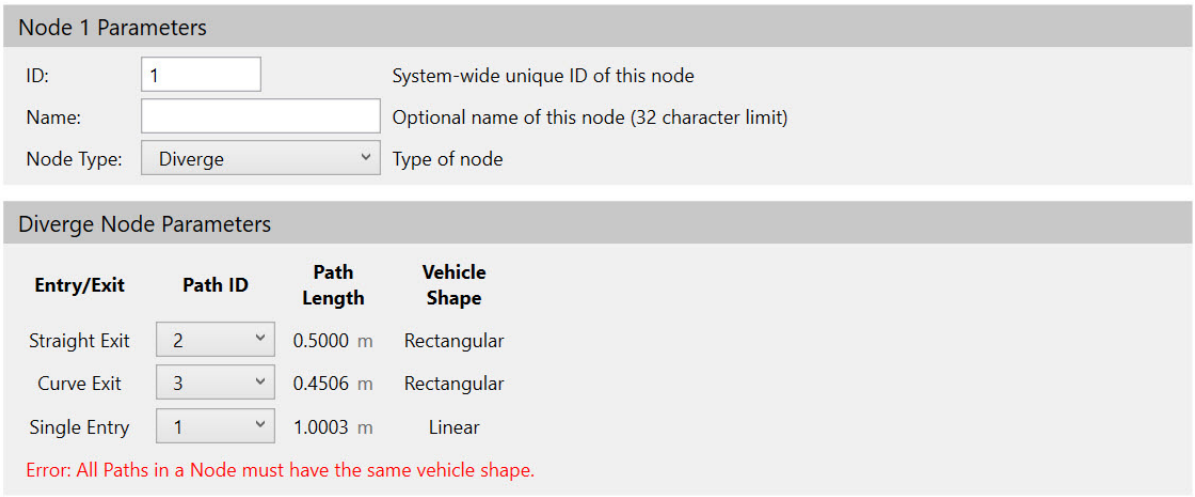


Figure 4-74: Diverge Node Parameters - Vehicle Shape Mismatch

4. For each entry or exit path that is identified under **Entry/Exits**, adjust the node parameters if necessary (see *Diverge Node on page 256* for detailed descriptions of all parameters, see *Node Gates and Clearances on page 147* for additional information about gates and clearances).

   A. For a Diverge node with a **Linear Vehicle Shape**, select the **Use Gates and Clearances** checkbox to enable the use of the **Gate Position** and **Clearance Position**. The use of gates and clearances is not required for systems using linear vehicles.

NOTE: Once the **Use Gates and Clearances** checkbox is checked, data validation is run on the **Gate Position** and **Clearance Position** fields. Update the values position to the minimum distance from the node to confirm a valid configuration. For each entry or exit path that is identified under **Entries and Exits**, select the number of the path that is connected to this node from the appropriate **Path** drop-down list.

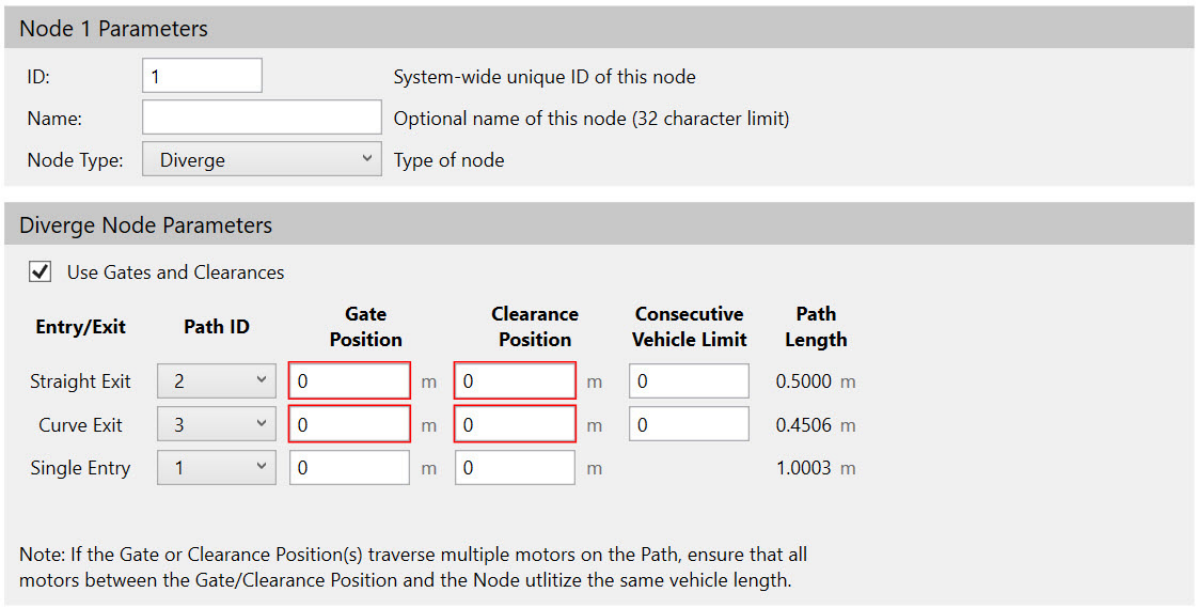


Figure 4-75: Diverge Node Parameters - Use Linear Gates and Clearances

B. For a Diverge node with a **Rectangular Vehicle Shape**, the **Gate Distance** and **Clearance Distance** are displayed, see *Figure 4-65*. These values are calculated based on the system layout and vehicle dimensions. There is no need to modify these values when using the rectangular vehicle option. The use of gates and clearances is required for systems using rectangular vehicles.

C. Both linear and rectangular style Diverge nodes use the **Consecutive Vehicle Limit** parameter to manage traffic through the switch.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Linear Example

If the configuration of this node is the same as the configuration shown in Figure 4-70, set **Straight Exit** to **2**, **Curve Exit** to **3**, and **Single Entry** to **1**, see Figure 4-76.

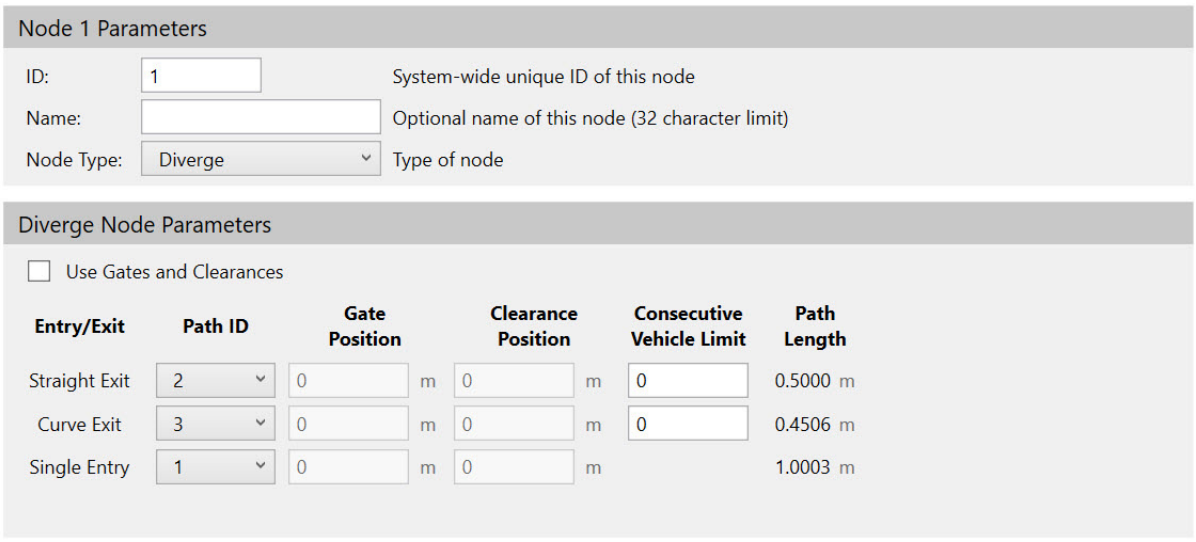


Figure 4-76: Diverge Node Example - Linear

Merge-Diverge Node

A Merge-Diverge node is used where the downstream ends of two paths connect to the upstream ends of two other paths. A merge-diverge is created using a Right Switch and a Left Switch. See Figure 4-77, where the shaded circle represents the Merge-Diverge node.

NOTE: Merge-Diverge nodes are only available for MagneMover Lite.

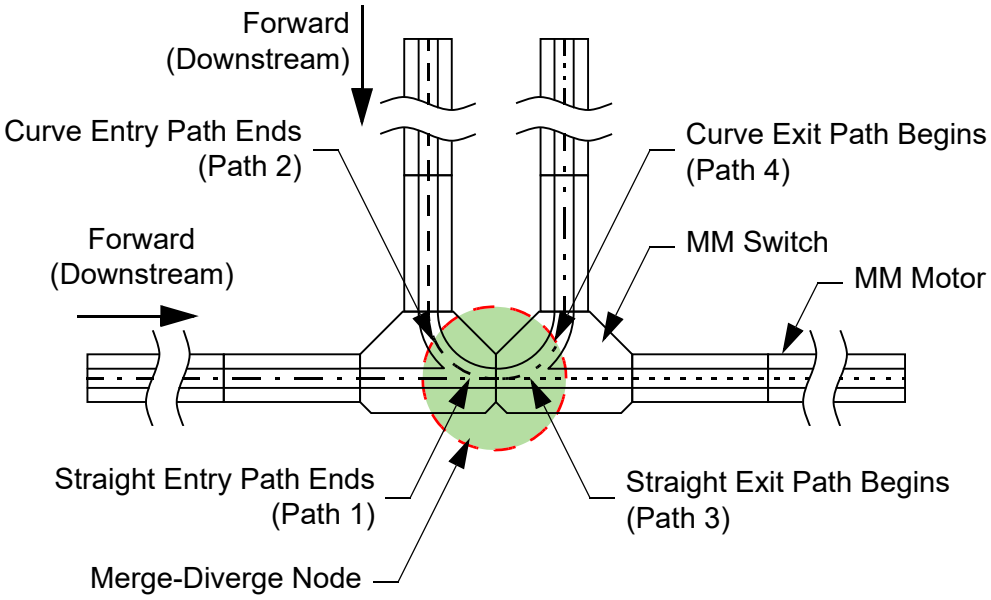


Figure 4-77: Merge-Diverge Node

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Merge-Diverge**.

*The **Node Details** page is updated to show the Merge-Diverge node parameters, see Figure 4-78.*

Figure 4-78: Merge-Diverge Node Parameters - No Paths Selected

3. For each entry or exit path that is identified under **Entry/Exits**, select the **Path ID** that is connected to this node from the appropriate **Path** drop-down list.

   A. If the **Vehicle Shape** in the **Motor Defaults** for all paths in the node is **Linear**, the Merge-Diverge node page displays, see Figure 4-79.

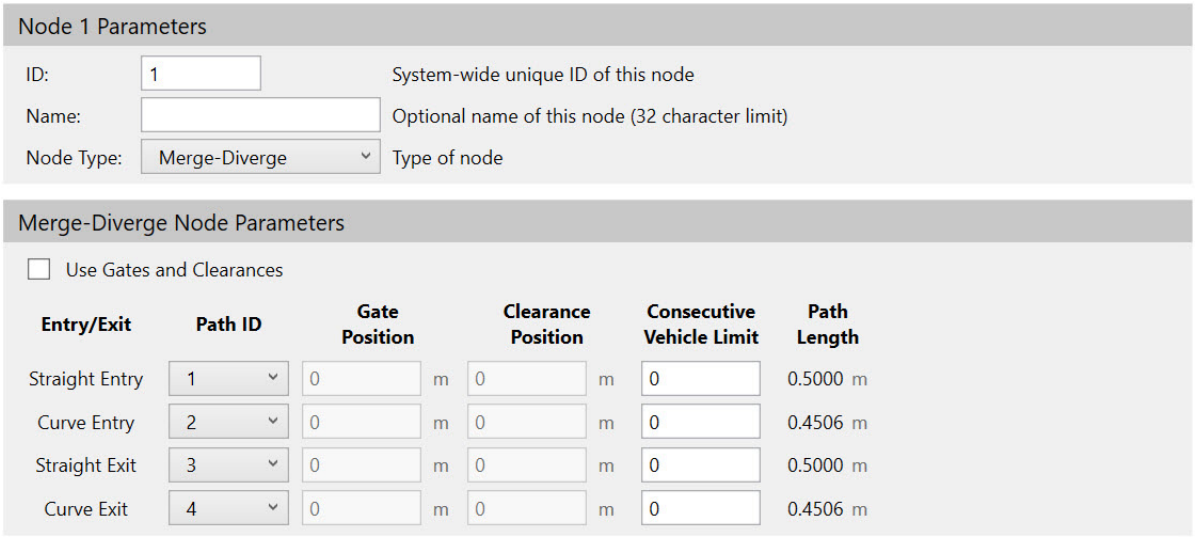


Figure 4-79: Merge-Diverge Node Parameters - Linear Vehicle Shape

   B. If the **Vehicle Shape** in the **Motor Defaults** for all paths in the node is **Rectangular**, the Merge-Diverge node page displays, see Figure 4-80.

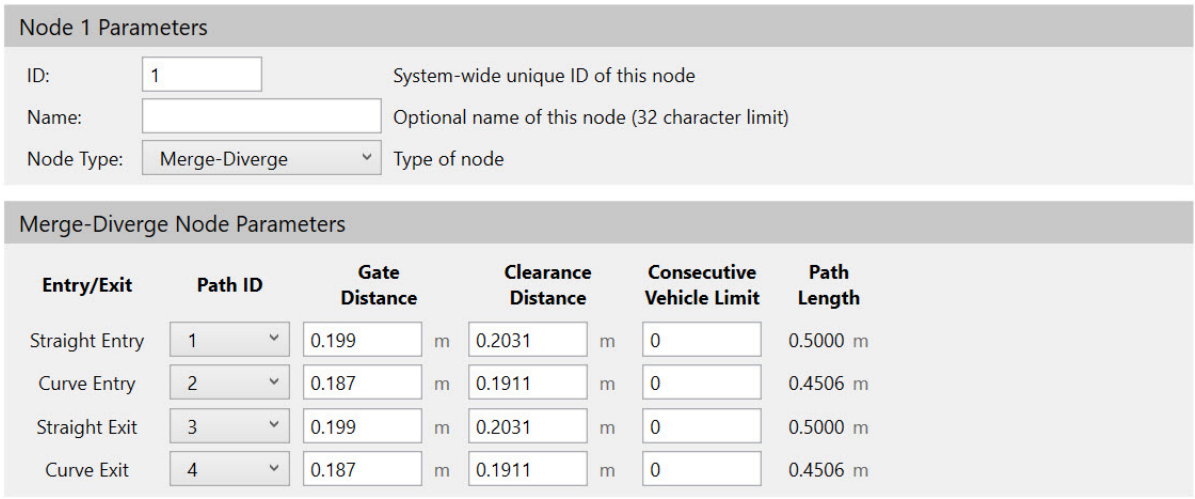


Figure 4-80: Merge-Diverge Node Parameters - Rectangular Vehicle Shape

C. If the **Vehicle Shape** in the **Motor Defaults** is not the same for all paths in the node, the Merge-Diverge node page displays, see Figure 4-81. A vehicle shape mismatch error (Figure 4-67) notifies you of a vehicle shape mismatch within a node. This is an invalid configuration as all paths in a node must use the same vehicle shape. Use the **Vehicle Shape** column to determine which paths need to be corrected.

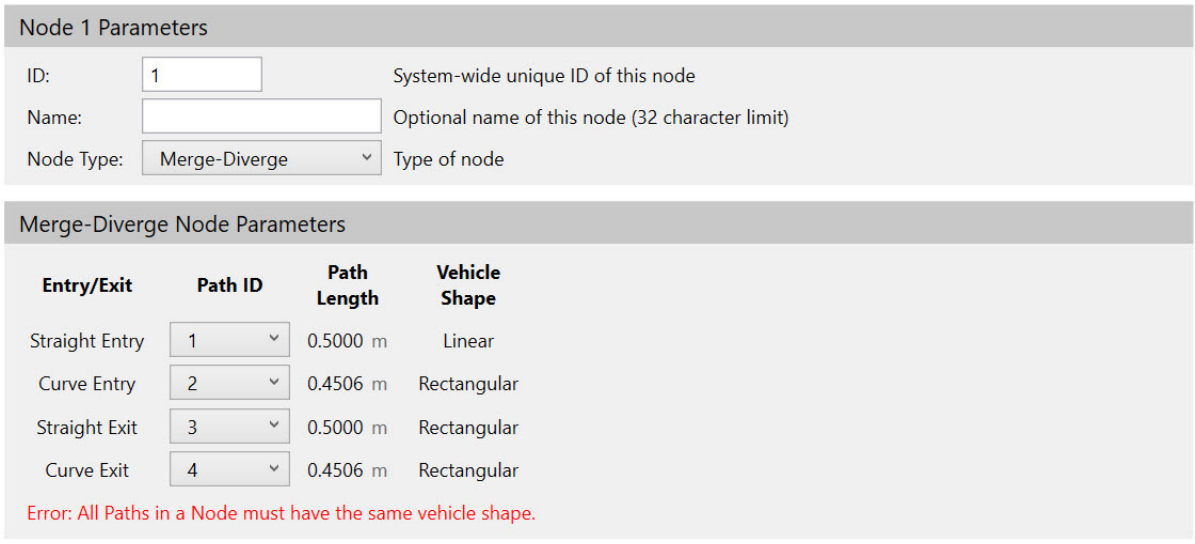


Figure 4-81: Merge-Diverge Node Parameters - Vehicle Shape Mismatch

4. For each entry or exit path that is identified under **Entry/Exits**, adjust the node parameters if necessary (see *Merge-Diverge Node on page 259* for detailed descriptions of all parameters, see *Node Gates and Clearances on page 147* for additional information about gates and clearances).

   A. For a Merge-Diverge node with a **Linear Vehicle Shape**, select the **Use Gates and Clearances** checkbox to enable the use of the **Gate Position** and **Clearance Position**. The use of gates and clearances is not required for systems using linear vehicles.

NOTE: Once the **Use Gates and Clearances** checkbox is checked, data validation is run on the **Gate Position** and **Clearance Position** fields. Update the values position to be the minimum distance from the node to confirm a valid configuration.

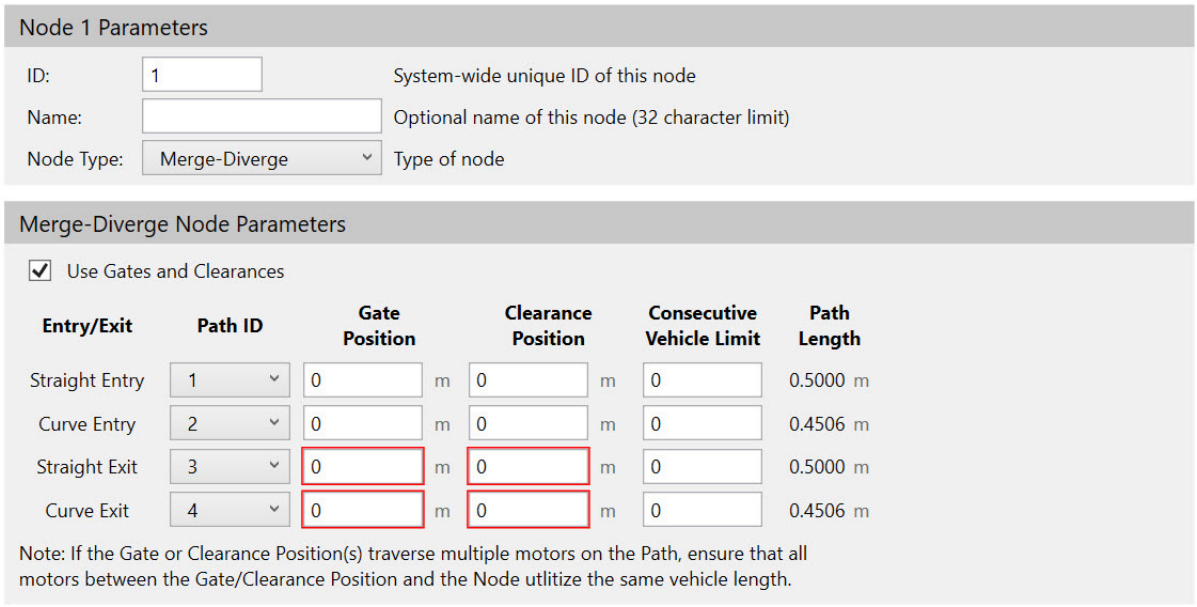


Figure 4-82: Merge-Diverge Node Parameters - Use Linear Gates and Clearances

B. For a Merge-Diverge node with a **Rectangular Vehicle Shape**, the **Gate Distance** and **Clearance Distance** are displayed, see *Figure 4-82*. These values are calculated based on the system layout and vehicle dimensions. There is no need to modify these values when using the rectangular vehicle option. The use of gates and clearances is required for systems using rectangular vehicles.

C. Both linear and rectangular style Merge-Diverge nodes use the **Consecutive Vehicle Limit** parameter to manage traffic through the switch.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Linear Example

If the configuration of this node is the same as the configuration shown in Figure 4-77, set **Straight Exit** to **2**, **Curve Exit** to **3**, and **Single Entry** to **1**, see Figure 4-83.

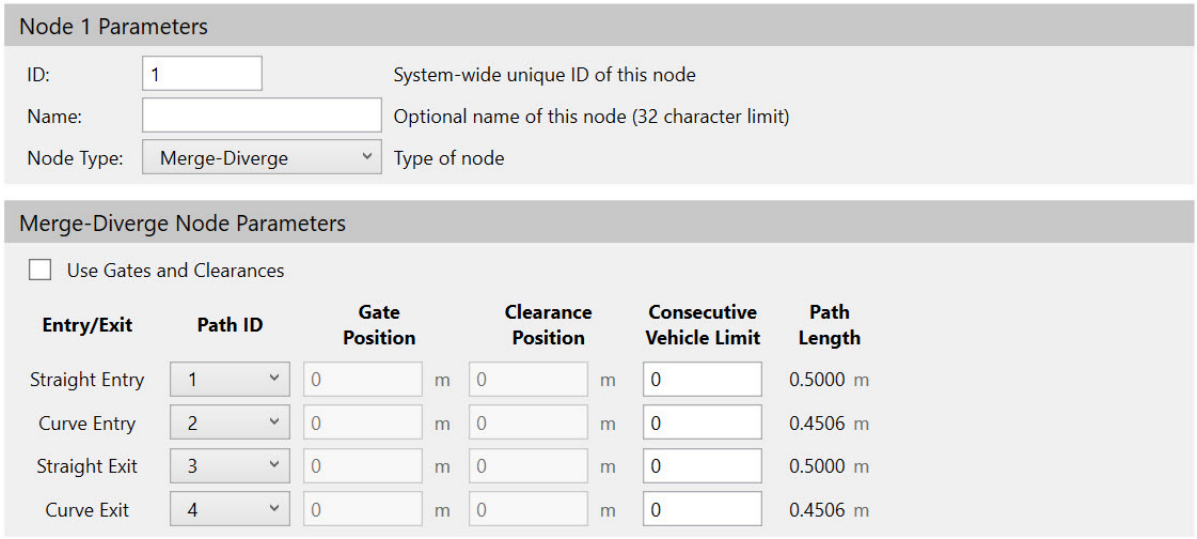


Figure 4-83: Merge-Diverge Node Example — Linear

Gateway Node

A Gateway node is used to connect a path end on one transport system to a path end on another transport system. Gateway nodes can be used either with or without the use of an HLC Control Group to manage vehicle IDs across subsystems of a larger transport system. See Figure 4-84, where the shaded circles represent the Gateway nodes. Each transport system has its own HLC and Node Controller Configuration File. If using an HLC Control Group, the HLC Control Group Settings must be configured in each Node Controller Configuration File (see *Defining HLC Control Groups* *on page 80*).

NOTE: There is a maximum of two Gateway nodes per node controller, one upstream and one downstream. The Gateway nodes do not need to be on the same path.

- The upstream Gateway node in a gateway pair has a corresponding downstream node on another node controller belonging to another subsystem of the HLC Control Group.
- The downstream Gateway node in a gateway pair has a corresponding upstream node on another node controller belonging to another subsystem of the HLC Control Group.

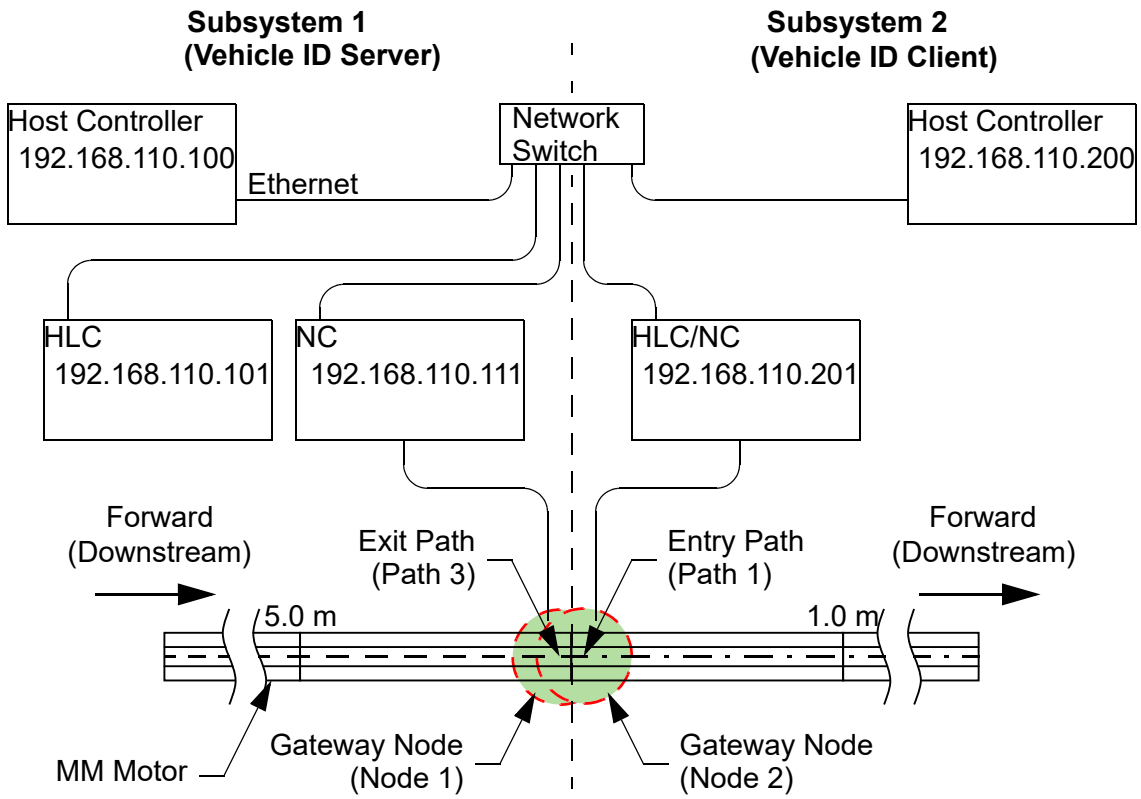


Figure 4-84: Gateway Node

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Gateway**.

   *The **Node Details** page is updated to show the Gateway node parameters, see Figure 4-85.*

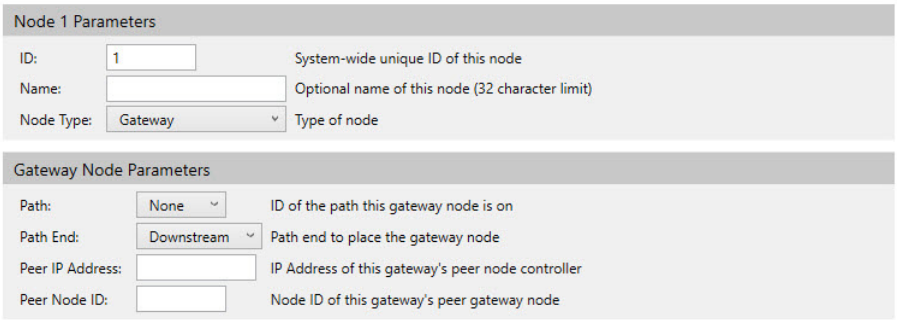


Figure 4-85: Gateway Node Parameters

3. Update the required node parameters in the Node Controller Configuration Files for each transport system (see *Gateway Node on page 252* for detailed descriptions of all parameters).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Example

If the configuration of this node is the same as the configuration shown in Figure 4-84, the Node Controller Configuration File for HLC Control Subsystem 1 contains the Gateway node definition that is shown in the upper example of Figure 4-86. The Node Controller Configuration File for HLC Control Subsystem 2 contains the Gateway node definition that is shown in the lower example of Figure 4-86. If using an HLC Control Group, it must be configured as shown in Figure 4-12 on page 82 for this example.

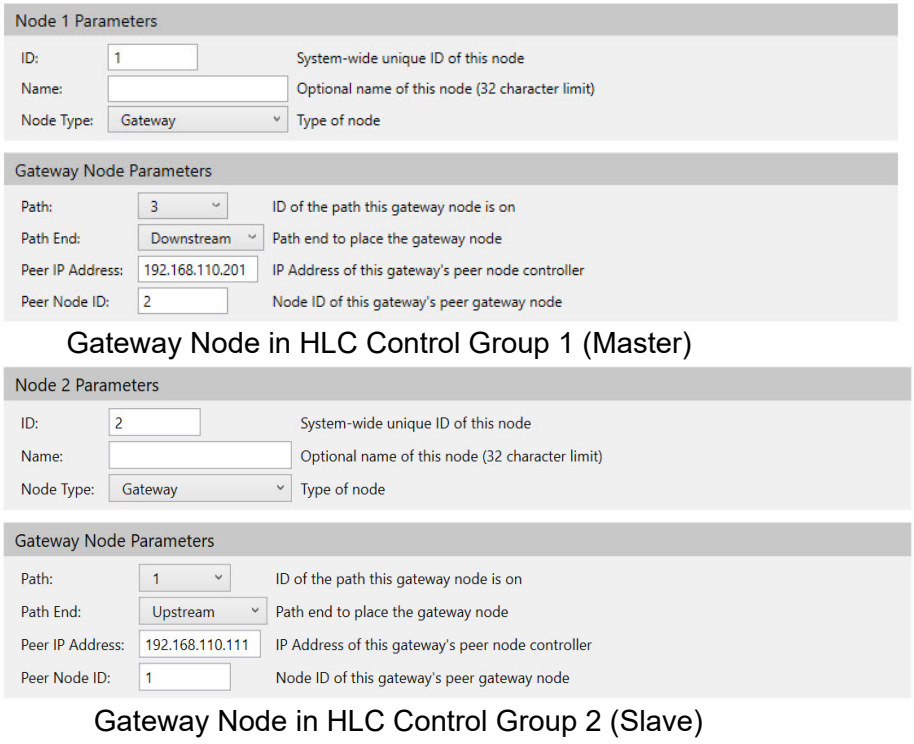


Figure 4-86: Gateway Node Example

Overtravel Node

NOTE: Overtravel nodes are only available for QuickStick and QuickStick HT.

An Overtravel node is used to permit part of a vehicle to move past the end of the motor at the end of a path. Additional support structure (guideway) for the vehicle must be provided, or the vehicle's supports (wheels) must not be allowed to move past the end of the path. See Figure 4-87 and Figure 4-88, where the shaded area represents Overtravel nodes.

NOTICE	**If appropriate cautions are not taken for the vehicle, it can fall off of the guideway or get caught on the end of the guideway preventing further movement.**

NOTE: There is only a certain amount of thrust and attractive force available per magnet array cycle. Make sure the magnet array on the vehicle covers enough of the motor to allow the motor to exert force on the vehicle to move it.

The overtravel feature can be used for the following applications:

- Providing space for vehicle movement during startup (Figure 4-87).
- Allowing movement of a vehicle that is longer than the motor(s) on the path (Figure 4-88).

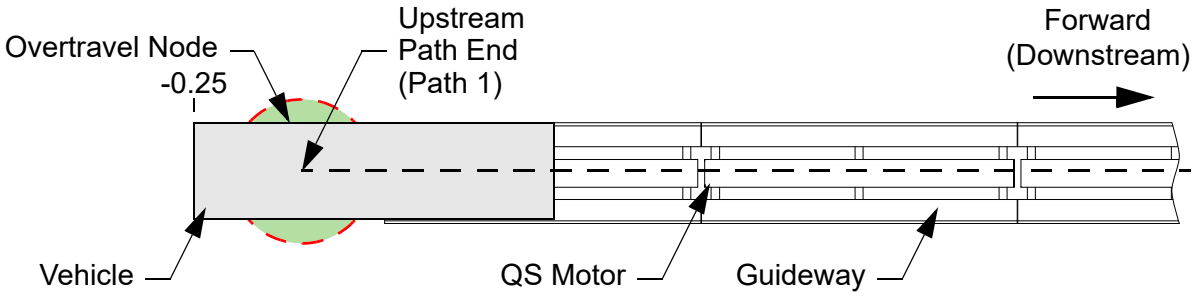


Figure 4-87: Overtravel Node, Startup Top View

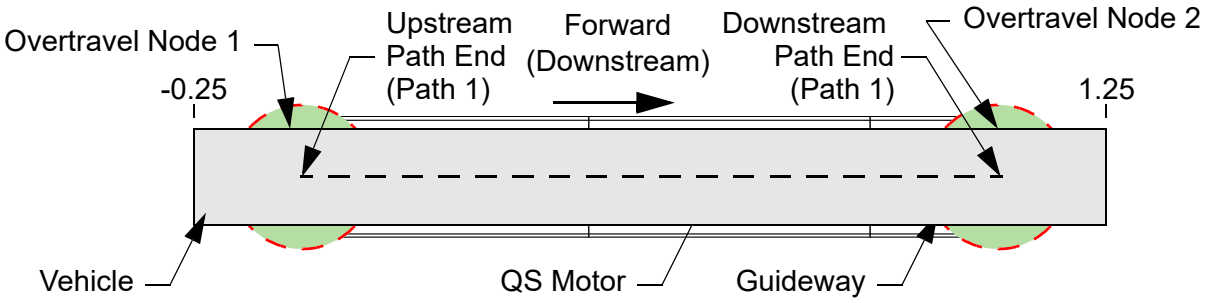


Figure 4-88: Overtravel Node, Extended Vehicle Top View

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Overtravel**.

   *The **Node Details** page is updated to show the Overtravel node properties, see Figure 4-89.*

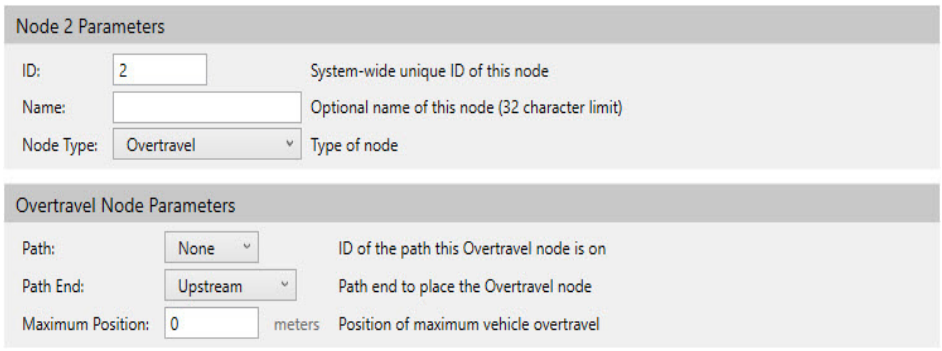


Figure 4-89: Overtravel Node Properties

3. Update the node properties as required (see *Overtravel Node Parameters* *on page 262* for detailed descriptions of all properties).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Examples

If the configuration of this node is the same as the configuration shown in Figure 4-87, configure the node, see Figure 4-90.

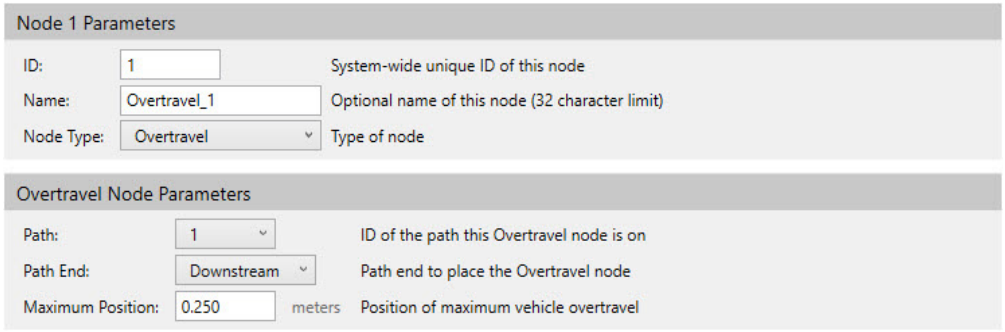


Figure 4-90: Overtravel Node Example, Startup

If the configuration of this node is the same as the configuration shown in Figure 4-88, two Overtravel nodes are required. Configure the nodes, see Figure 4-91.

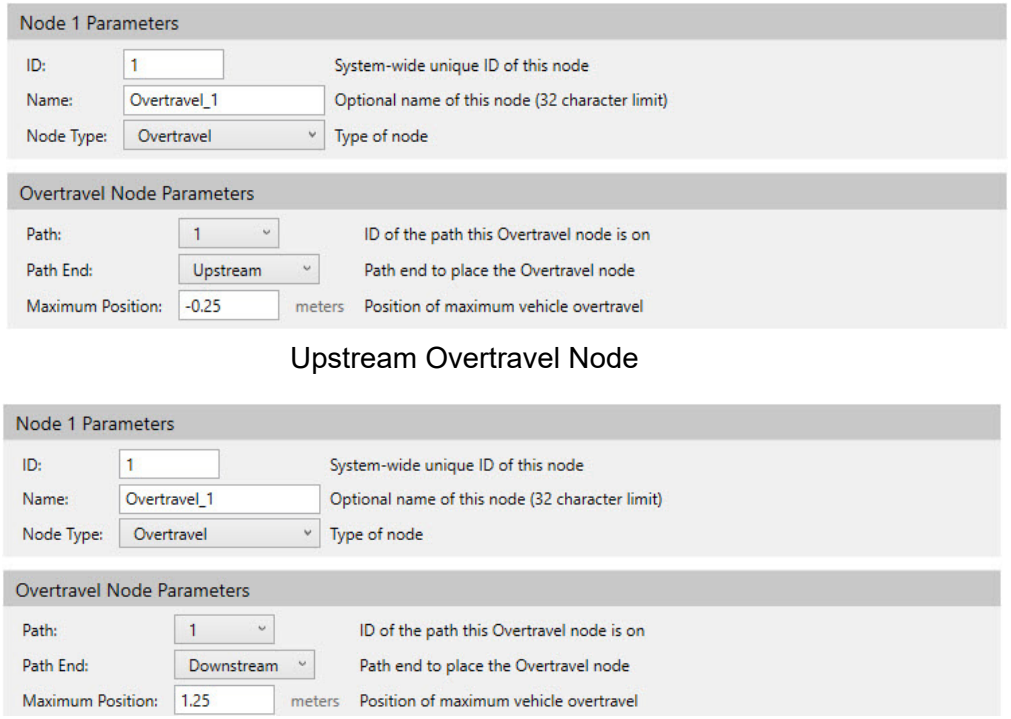


Figure 4-91: Overtravel Node Example, Extended Vehicle

Moving Path Node

NOTE: Moving Path nodes are only available for QuickStick and QuickStick HT.

A Moving Path node is used to connect the ends of multiple paths using a path being moved by a Host-controlled mechanism. This mechanism may be any user-supplied mechanism, including a QuickStick path. The Moving Path node enables vehicles to move between multiple guideways. The paths in the Moving Path node are called entry and exit paths. Either type of path may be moved but the connecting paths must all be of the other type (that is, entry paths move and all exit paths are fixed). Up to 12 paths can be configured as either entry paths or exit paths. See Figure 4-92, where the shaded area represents the Moving Path node.

Use of the Moving Path node requires the host controller to command the drive mechanism to position one of the moving paths so that it aligns with one of the fixed paths. The host controller must then issue a Link command (see the *MagneMotion Host Controller TCP/IP Communication Protocol User Manual,* publication MMI-UM003 or the *MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual,* publication MMI-UM004.) to connect the two paths to allow vehicle movement. After the vehicle has moved beyond the node, the host controller must issue an Unlink command before the Moving Path may be moved to a new position.

Figure 4-92 shows a single Moving Path node configuration where vehicles can move between the three exit paths using either of the two entry Moving Paths.

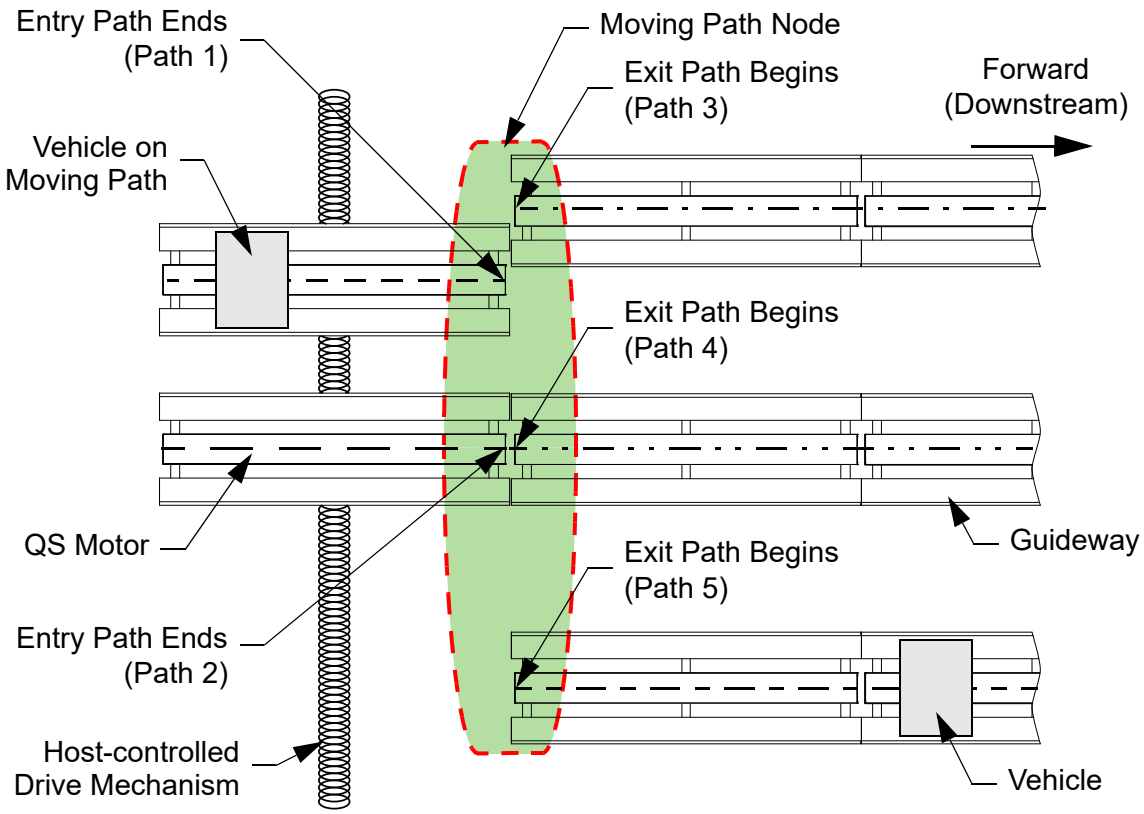


Figure 4-92: Moving Path Node Single Node

Figure 4-93 shows a dual Moving Path node configuration where vehicles can move from either of the two entry paths in Moving Path Node 1 to any of the exit paths in Moving Path Node 2 using either of the two Moving Paths. In this type of configuration, the Moving Paths are associated with both Moving Path nodes. For Moving Path Node 1, these paths are exit paths. For Moving Path Node 2, these paths are entry paths.

In Figure 4-93 if the vehicle is moving from Moving Path Node 1 Entry Path 1 to Moving Path Node 2 Exit Path 5 the Moving Path does not need to move.

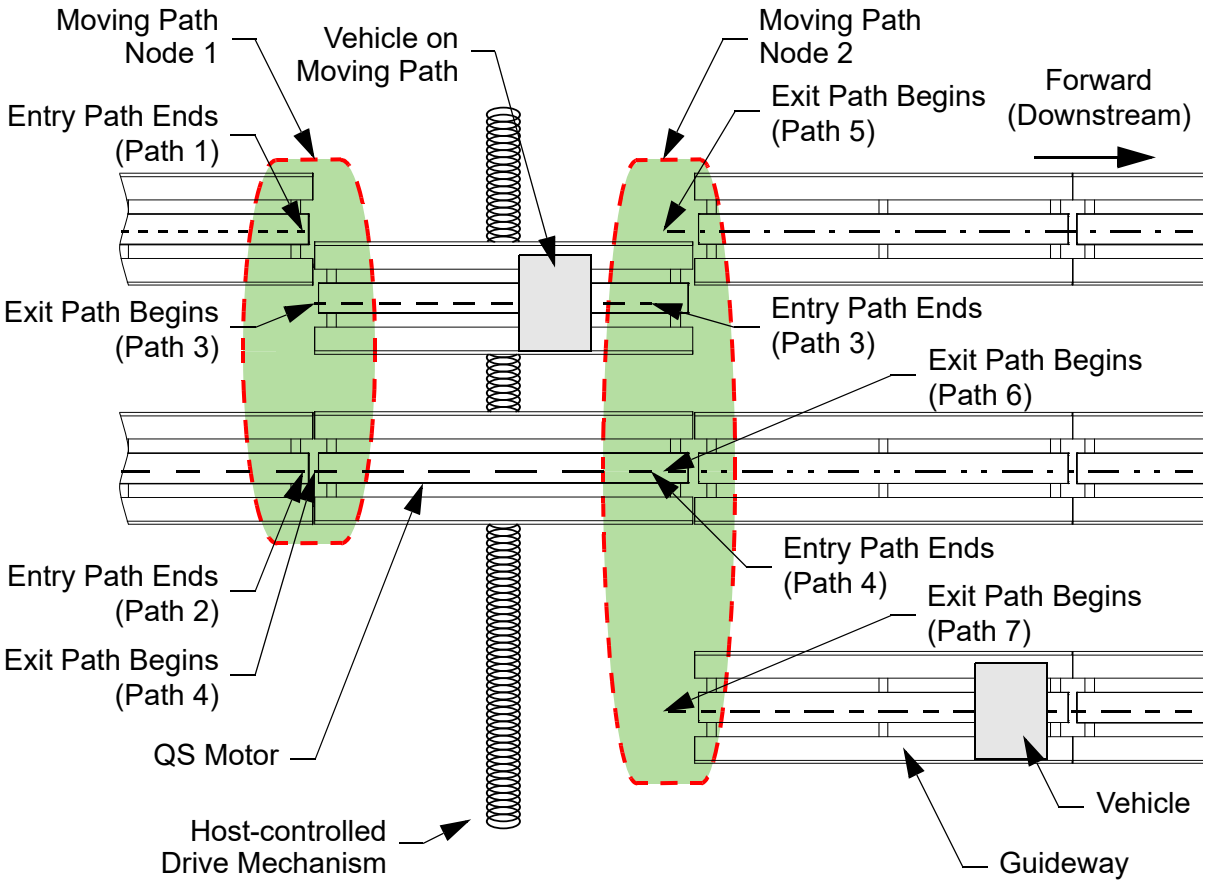


Figure 4-93: Moving Path Node Dual Nodes

1. Open the node to be edited by selecting the **Node ID** for that node in the Configuration Tree.

2. From the **Node Type** drop-down list, select **Moving Path**.

   *The **Node Details** page is updated to show the Moving Path Node properties, see Figure 4-94.*

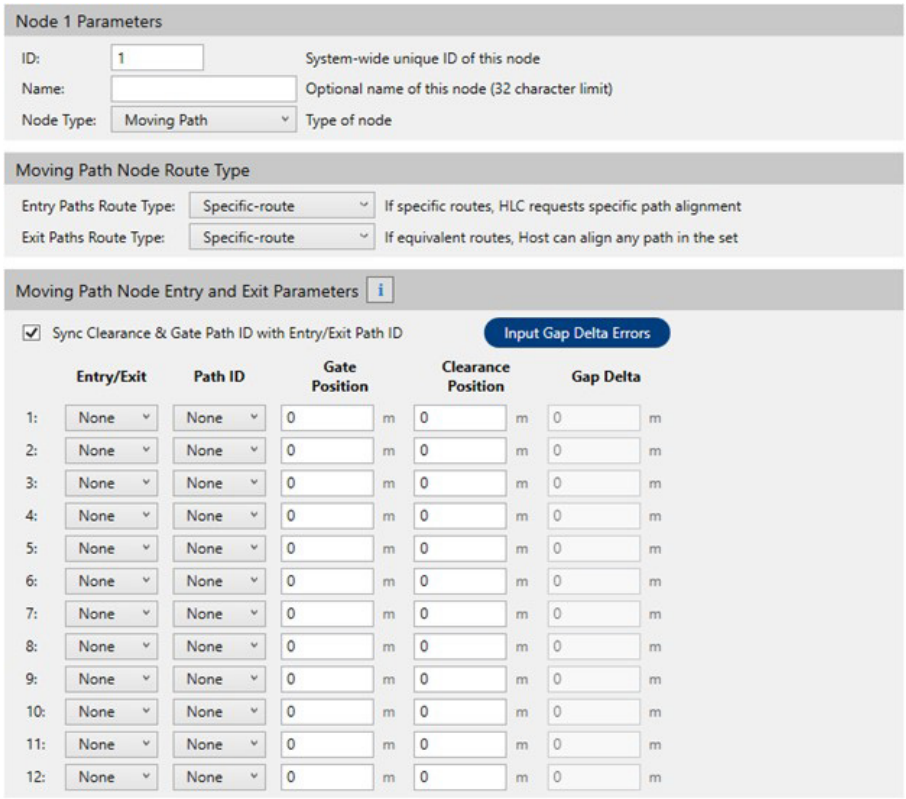


Figure 4-94: Moving Path Node Properties

3. Select the appropriate route type for the **Entry Paths Route Type** and **Exit Paths Route Type** from the drop-down list. Select **Specific-route** if a specific Moving Path in the node is used to satisfy the route (specified by the HLC), see Figure 4-92 or **Equivalent-route** if any Moving Path in the node can satisfy the route (specified by the host controller), see Figure 4-93.

4. For each entry or exit path that is involved in the Moving Path node, select the path direction under **Entry/Exit**.

5. For each entry or exit path that is identified select the **Path ID** of the path that is connected to this node from the appropriate **Path** drop-down list.

6. For each entry or exit path that is identified under **Entry/Exits**, adjust the node parameters if necessary. See *Moving Path Node Parameters on page 263* for detailed descriptions of all properties. See *Node Gates and Clearances on page 147* for a detailed description of the gate and clearance parameters. Select the info button next too **Moving Path Node Entry and Exit Parameters** in Figure 4-94 for additional help with gates, clearances, and gap deltas.

   A. For a Moving Path node where the **Gate Position** or **Clearance Position** of the **Entry/Exits** is on a neighboring path, uncheck **Sync Clearance & Gate Path ID with Entry/Exit Path ID** (see Figure 4-95)**.** Unsyncing the **Path ID** provides the option to specify a gate or clearance position on a different path.

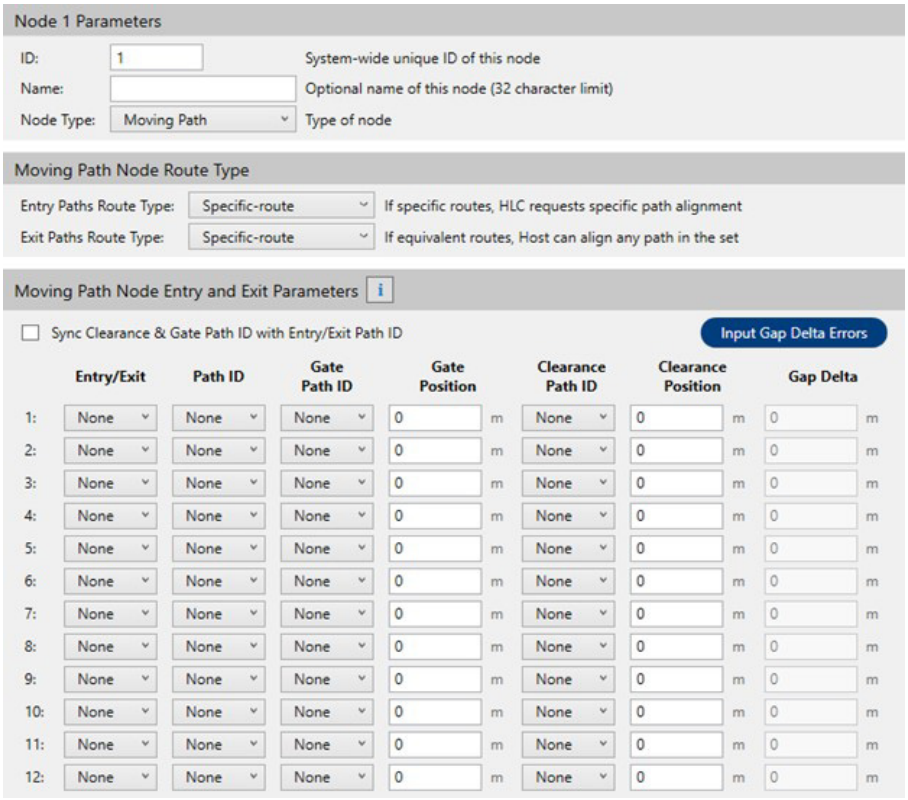


Figure 4-95: Moving Path Node Properties, Unsync Paths

B. After a configuration file has been created and the system has ran, the **Input Gap Delta Errors** button can be used to adjust the **Gap Deltas** by the **Gap Errors** detected by the system. These **Gap Errors** can be found in the Node Controller Web Interface. *See Define Downstream Gaps for QuickStick and QSHT on page 105 for more information*.

7. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Examples

If the configuration of this node is the same as the configuration shown in Figure 4-92, configure the node, see Figure 4-96.

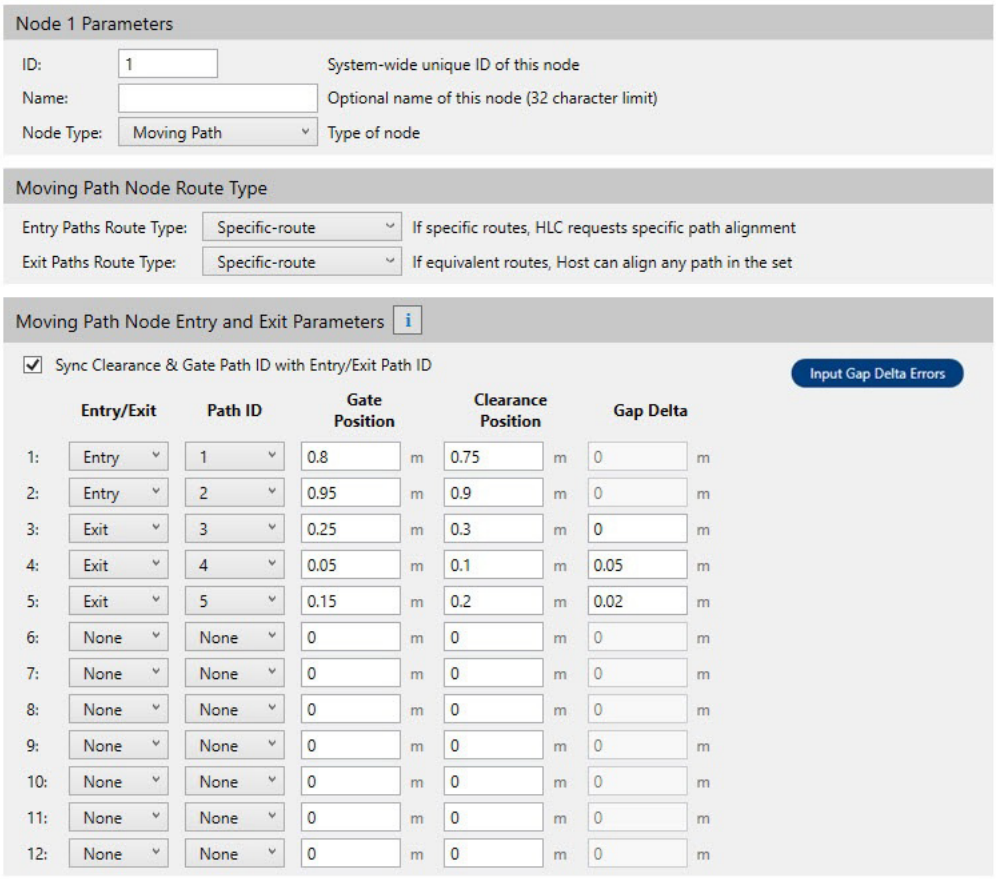


Figure 4-96: Moving Path Node, Single Node Example

If the configuration of this node is the same as the configuration shown in Figure 4-93, configure the nodes, see Figure 4-97.

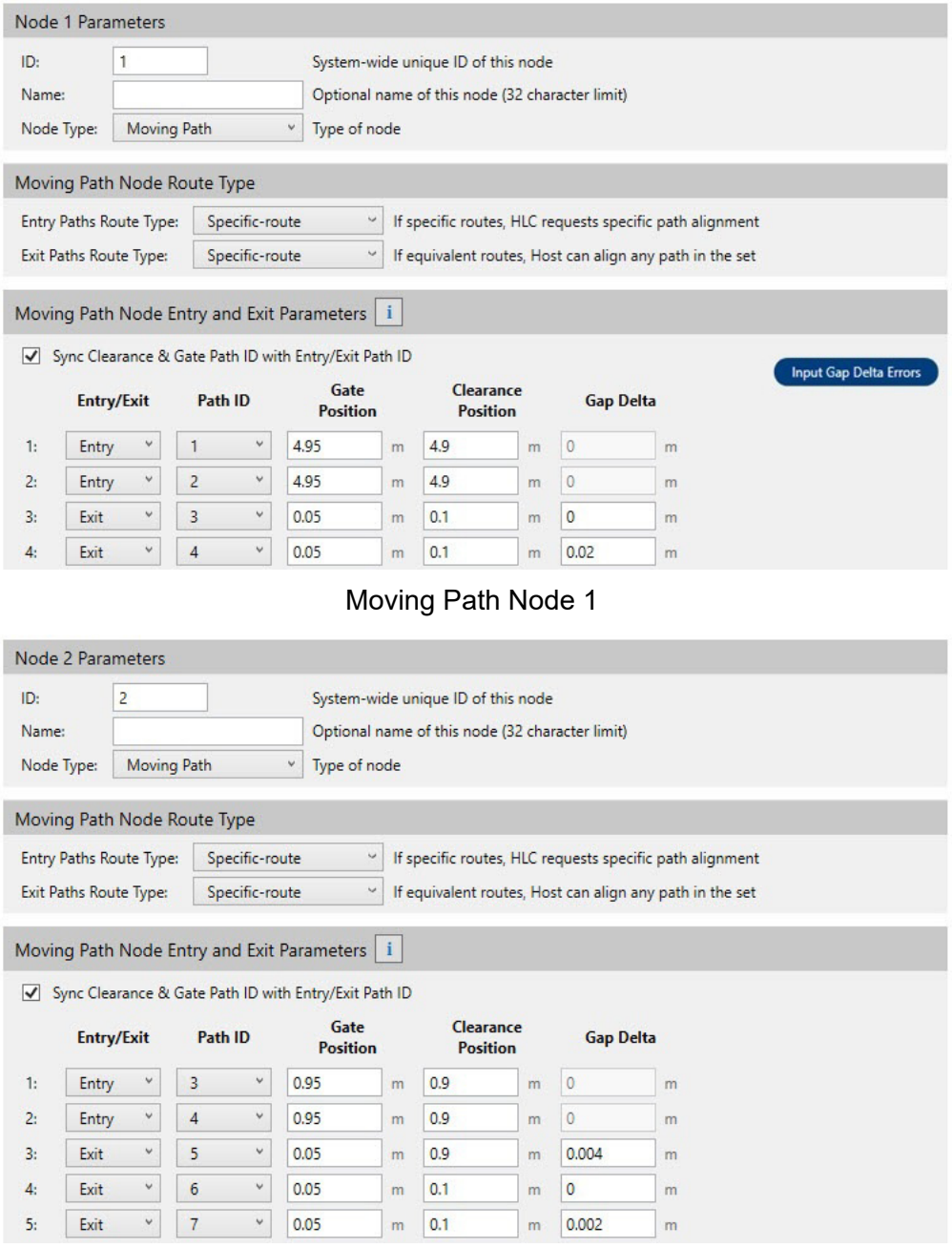


Figure 4-97: Moving Path Node, Dual Nodes Example

Node Parameters

Nodes are used to define the connections between paths. The Node page is accessed by expanding the Nodes List in the Configuration Tree and selecting the appropriate node.

Node Gates and Clearances

This section discusses the common traits and differences that are used between all kinds of gates and clearances. Node gates and clearances are used with switching nodes (Merge, Diverge, and Merge-Diverge) on MM Lite and Moving Path nodes on QuickStick and QSHT. These are anti-collision parameters that define where vehicles enter and exit the node.

For MM Lite switching nodes using rectangular vehicles, the following parameters are used:

- Gate Distance
- Clearance Distance

For MM Lite switching nodes using linear vehicles, the following parameters are used:

- Gate Position
- Clearance Position

For QuickStick and QSHT systems using Moving Path nodes, the following parameters are used:

- Gate Path ID
- Gate Position
- Clearance Path ID
- Clearance Position

The Gate Distance, Gate Position, and Gate Path ID & Gate Position are referred to as the "gate location".

The gate is used to hold vehicles before the node until the node is available for the next vehicle to enter. The gate location defines a location on an entry or exit path that is associated with a node where the vehicle (single or tandem) can safely avoid vehicles on other paths. This location is such that the leading edge of the vehicle (including payload), regardless of vehicle movement direction, is safely located to avoid collisions with vehicles on adjoining paths.

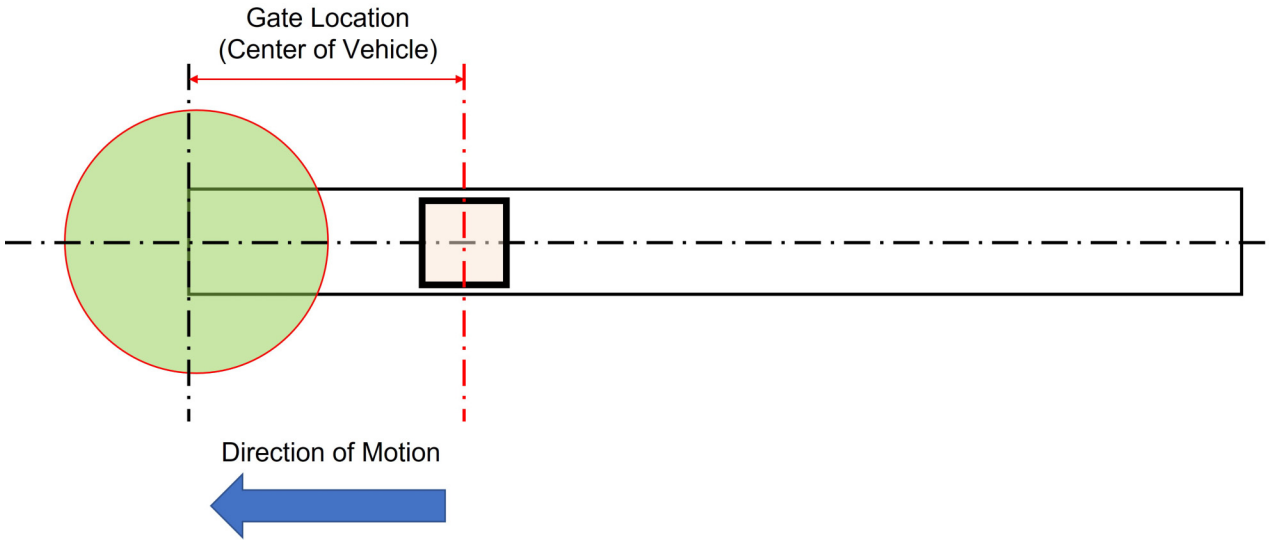


Figure 4-98: Gate Location

The Clearance Distance, Clearance Position, and Clearance Path ID & Clearance Position, are referred to as the "clearance location".

The clearance location is the safety zone which queues vehicles until the vehicle in the node has reached a location where it avoids collisions with other vehicles on adjoining paths or with any mechanisms that are related to the node. The clearance location defines a location on an entry or exit path that is associated with a node where the vehicle (single or tandem) can safely avoid vehicles on other paths. This location has the trailing edge of the vehicle (including payload), regardless of vehicle movement direction, safely located to avoid collisions with vehicles on adjoining paths.

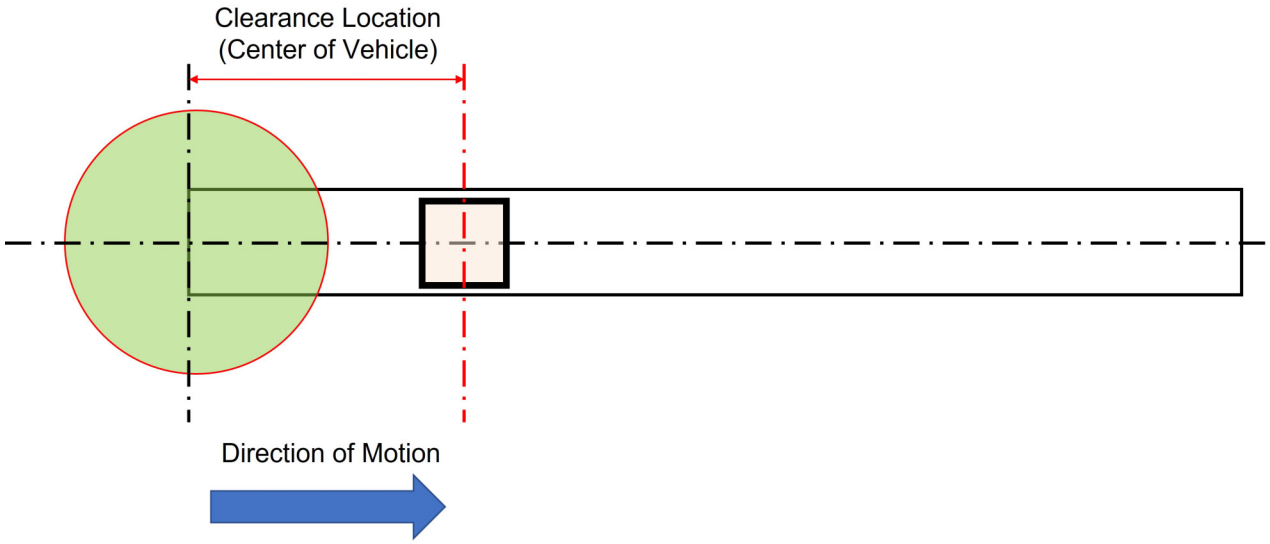


Figure 4-99: Clearance Location

Gate and clearance locations must be defined for both forward and backward motion through the node. Figure 4-100 shows for forward motion through a Diverge node, that the following values are used:

- Single Entry Path (Path 1): Gate Location
- Curve Exit Path (Path 2): Clearance Location
- Straight Exit Path (Path 3): Clearance Location

A vehicle transiting the Diverge node in Figure 4-100 in the forward direction queues up at the gate on Path 1 until the node is available for entry. The vehicle in the node owns the node until it passes the clearance distance on either Path 2 or Path 3, allowing the next vehicle waiting at the gate to enter.

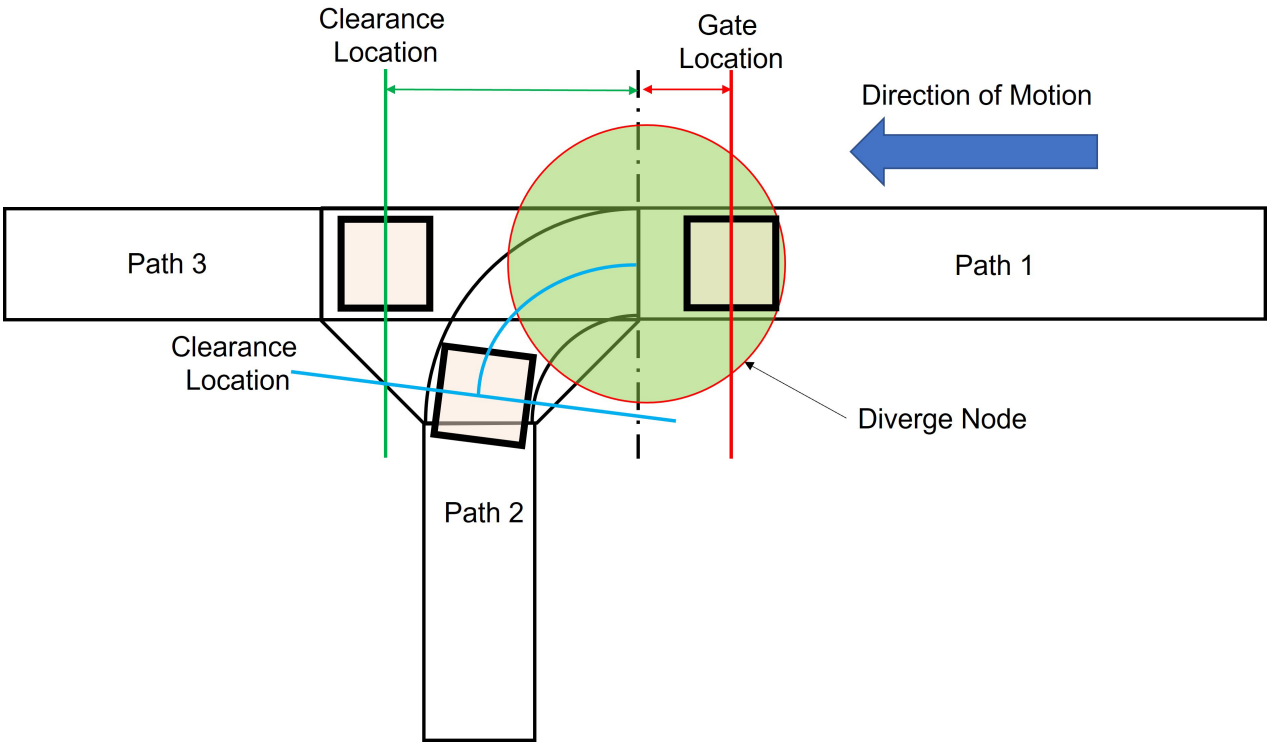


Figure 4-100: Gate and Clearance Locations - Forward

Figure 4-101 shows for backward motion through a Diverge node, that the following values are used:

- Single Entry Path (Path 1): Clearance Location
- Curve Exit Path (Path 2): Gate Location
- Straight Exit Path (Path 3): Gate Location

Vehicles transiting the Diverge node in Figure 4-101 in the backward direction queues up at the gates on Paths 2 and 3 until the node is available for entry. The vehicle in the node owns the node until it passes the clearance distance on Path 1, allowing the next vehicle waiting at the gate to enter.

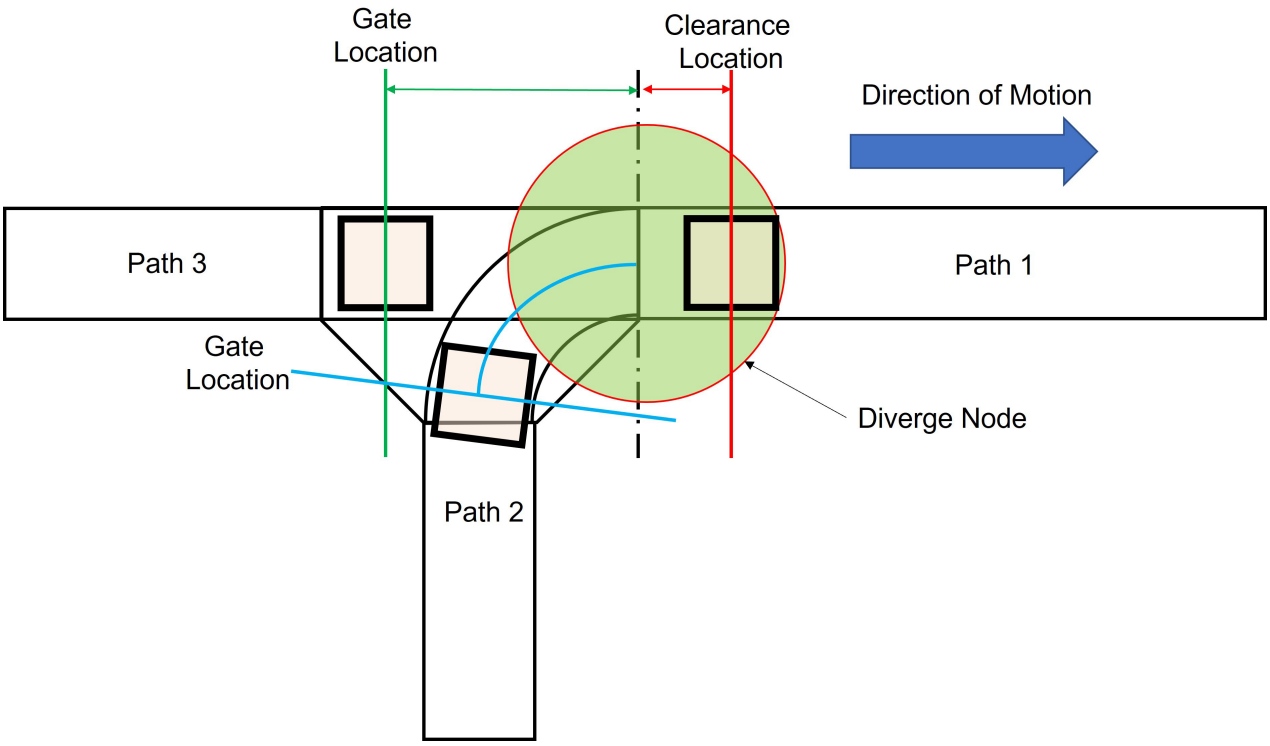


Figure 4-101: Gate and Clearance Locations - Backward

The gate and clearance locations on a path should not be in the same location, see Figure 4-102. The clearance should be farther from the node than the gate. If these positions are set the same or if the clearance location is set closer than the gate in the Configurator, then the node controller recalculates the clearance location, so it is valid.

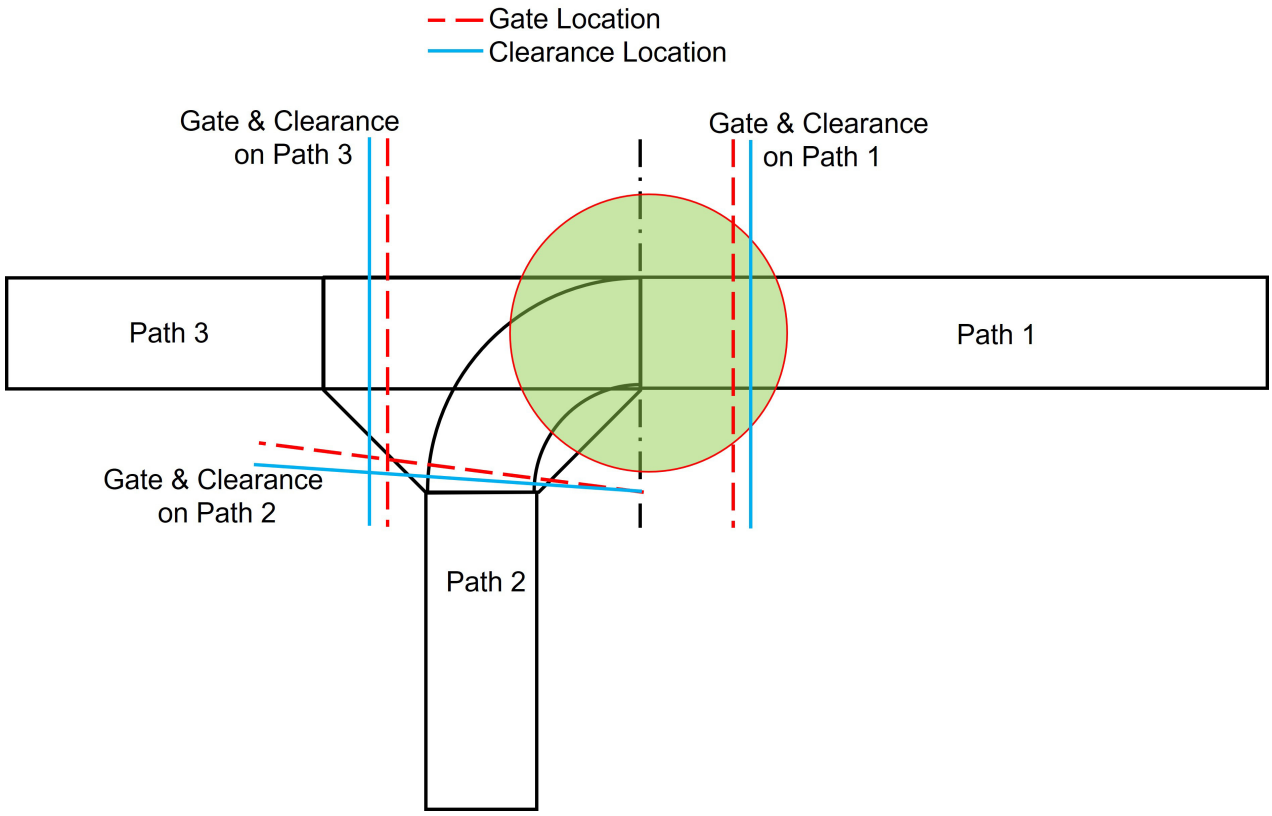


Figure 4-102: Gate and Clearance Locations

MM Lite Rectangular Gates and Clearances

For MM Lite systems using a Rectangular Vehicle Shape (see *Vehicle and Motor Parameters on page 227*) the gates and clearances are defined using the Gate Distance and Clearance Distance.

When using MM Lite rectangular vehicles, the gate location (see Figure 4-98) is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle, called the Gate Distance. The clearance location (see Figure 4-99) is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle, called the Clearance Distance.

Figure 4-103 shows a Diverge node using a Rectangular Vehicle Shape. In this transport system, the entry is Path 1 and the exit is Path 2 and Path 3.

When using MM Lite rectangular vehicles, the MagneMotion Configurator automatically generates the Gate Distance and Clearance Distance for Merge, Diverge, and Merge-Diverge nodes. These distances are generated based on the defined vehicle parameters (Fore Length, Aft Length, Port Length, and Starboard Length see *Vehicle and Motor Parameters on page 227* for details) and the configuration the motors around the node.

Large gate and clearance distances may be needed for wide vehicles or layouts with many curves and switches. The automatically generated values should not be modified for rectangular gates and clearances.

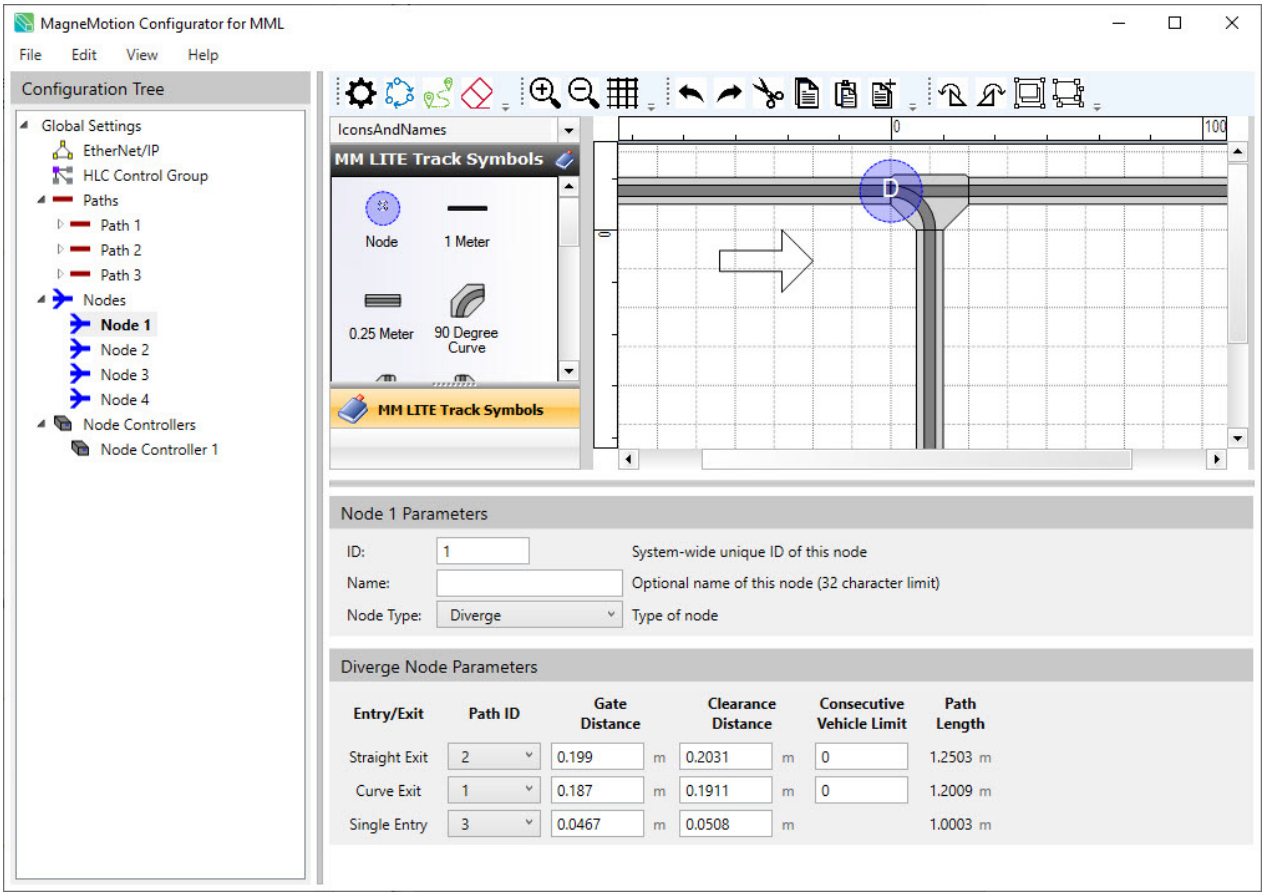


Figure 4-103: Diverge Node (Rectangular) with Auto-generated Gate and Clearance Distances

MM Lite Linear Gates and Clearances

For MM Lite systems using a Linear Vehicle Shape (see *Vehicle and Motor Parameters on page 227*) the gates and clearances are defined using the Gate Position and Clearance Position.

When using MM Lite linear vehicles, the gate location (see Figure 4-98) is defined as the position of the center of the vehicle (in meters) from the start of the entry or exit path, called the Gate Position. The Gate Position cannot be defined on a neighboring path; it must be defined as a position on the entry or exit path. For the system in Figure 4-100 if Path 1 is 3 meters long, the Gate Position would be somewhere near the end of the path, like position 2.8 meters on Path 1.

The clearance location (see Figure 4-99) is defined as the position on the center of the vehicle (in meters) from the start of the entry or exit path, called the Clearance Position. The Clearance Position cannot be defined on a neighboring path; it must be defined as a position on the entry or exit path. For the system in Figure 4-101, if Path 1 is 3 meters long, the Gate

Position would be somewhere near the beginning of the path, like position 0.2 meters on Path 1.

Vehicle Length

When using linear MM Lite vehicles, it is advised to set the Vehicle Length as the length of the longest diagonal of the vehicle to confirm that vehicles do not collide through curves and switches. Measure the payload width from the front left corner of the payload to the rear right corner of the payload to account for vehicle movement around curves and corners.

How to Find Positions

For best results when defining the gates and clearances:

1. With the system in a Reset state, position one vehicle with its payload on each of the paths in the node at the **Clearance Position** and **Gate Position**.
2. Adjust the vehicle locations if necessary to obtain satisfactory clearance distances and gate distances between the vehicles on each path.
3. Startup the system to capture the vehicle positions at the **Clearance Position** and the **Gate Position** for each path.
4. Enter the measured values in the corresponding fields in the node configuration page.

MM Lite Protected Area

The protected area around an MM Lite switch is the area where a vehicle on one switch path may collide with a vehicle on the other path of the switch, or collide with the switch flipper mechanism. The protected area sizer differs for standard versus high payload switches. Minimum values for gate and clearance locations are set to confirm that gate and clearance locations are outside of the protected areas.

QuickStick and QSHT Gates and Clearances

For QuickStick and QSHT systems using Moving Path nodes, the gates and clearances are defined using the Gate Path ID, Gate Position, Clearance Path ID, and Clearance Position.

When using QuickStick and QSHT Moving Path nodes, the gate location (see Figure 4-98) is defined as the position on the center of the vehicle (in meters) from the start of the Gate Path ID at the Gate Position. If Sync Clearance and Gate Path ID with Entry/Exit Path ID is checked, then the Gate Path ID is not displayed, and sets to the Entry/Exit Path ID, see Figure 4-104.

The clearance location (see Figure 4-98) is defined as the position on the center of the vehicle (in meters) from the start of the Clearance Path ID at the Gate Clearance. If Sync Clearance and Gate Path ID with Entry/Exit Path ID is checked, then the Clearance Path ID is not displayed, and sets to the Entry/Exit Path ID, see Figure 4-104.

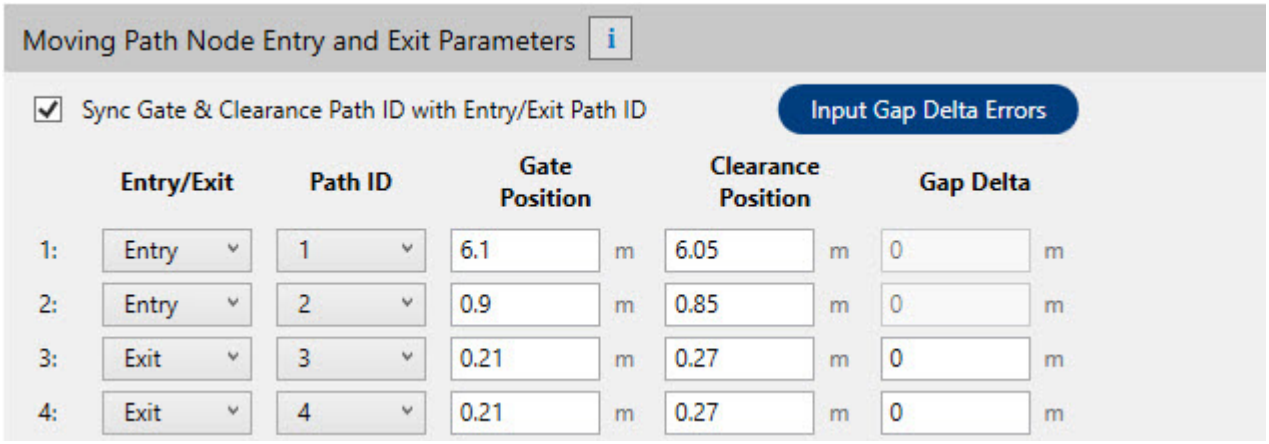


Figure 4-104: Gate and Clearance Synced Path IDs

In the Moving Path node example that is shown in Figure 4-105, all gate and clearance locations are on the specified Entry/Exit Path IDs. This is when Sync Clearance and Gate Path ID with Entry/Exit Path ID should be checked (see Figure 4-104) since no neighboring paths are involved in the gate and clearance locations for the node.

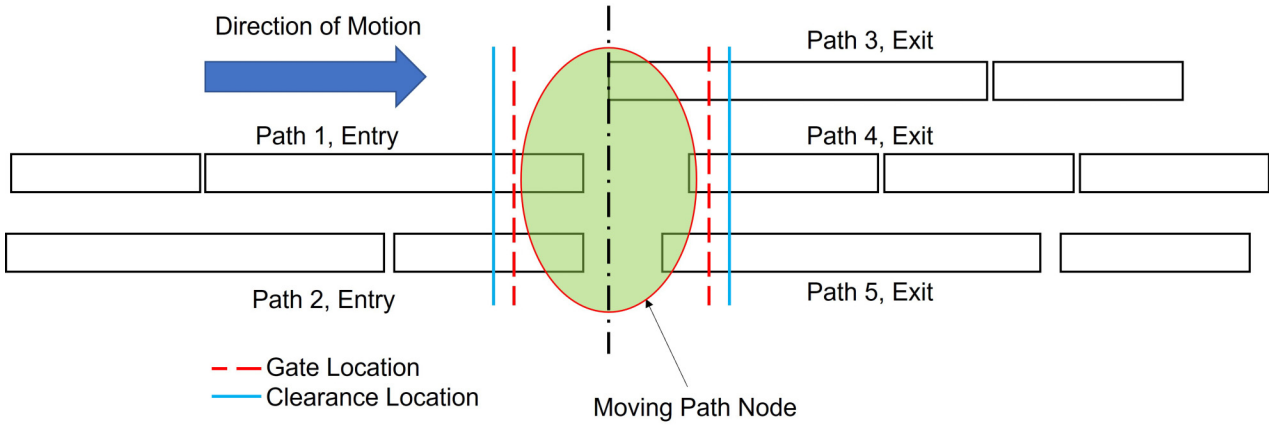


Figure 4-105: Moving Path Node

In the Moving Path node example shown in Figure 4-106, a Relay node has been added to the upstream end of Path 2 and the gate and clearance locations are much farther from the node. The gate and clearance locations may need to be farther from the node if the vehicle size is large or if there are any mechanisms that are related to the node that must be avoided.

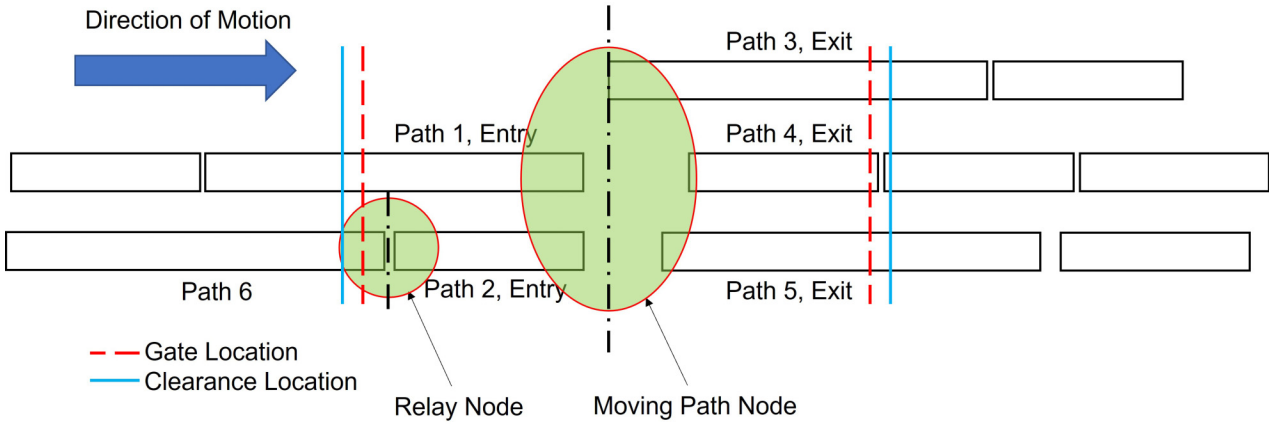


Figure 4-106: Moving Path Node - Unsynced Paths

For this example, the gate and clearance locations on the entry path are on a neighboring path, and the Sync Clearance and Gate Path ID with Entry/Exit Path ID option should be unchecked. The Gate Path ID and Clearance Path ID for Entry/Exit 2 onto Path ID 2 should be on Path 6, see Figure 4-107. The Gate Position and Clearance Position should be adjusted to reflect the correct positions at the downstream end of Path 6.

Moving Path Node Entry and Exit Parameters

Sync Gate & Clearance Path ID with Entry/Exit Path ID

Input Gap Delta Errors

	Entry/Exit	Path ID	Gate Path ID	Gate Position	Clearance Path ID	Clearance Position	Gap Delta
1:	Entry	1	1	6.1 m	1	6.05 m	0 m
2:	Entry	2	6	0.9 m	6	0.85 m	0 m
3:	Exit	3	3	0.21 m	3	0.27 m	0 m
4:	Exit	4	4	0.21 m	4	0.27 m	0 m
5:	Exit	5	5	0.21 m	5	0.27 m	0 m

Figure 4-107: Gate and Clearance Unsynced Path IDs

Gap Delta

The Gap Delta is used to correct for the difference in the motor downstream gaps between the exit Paths in Moving Path nodes. The last motor in each entry Path is configured with its Downstream Gap (from the motor's downstream end) set to a common reference.

Previous Gap Delta Guidance

In previous guidance, the common reference was typically the end of the motor extending farthest into the Node or the end of the entry Path guideway. The distance from that point to the upstream end of the motor on each exit Path is the Gap Delta and is entered into the Gap Delta field for that exit Path.

Figure 4-108 shows a Moving Path node, the measurements for each of the Entry Path motors, which are entered as the downstream gap in the motor configuration, and the measurements for each of the Exit Path motors. Note that the common point for all measurements is the end of the guideways where the moving motors are mounted.

The Gap Delta for each of the Exit Paths is shown in Figure 4-108. This value is then entered into the configuration for that Path in the node configuration. The Downstream Gaps for the Node would be configured, see Figure 4-109.

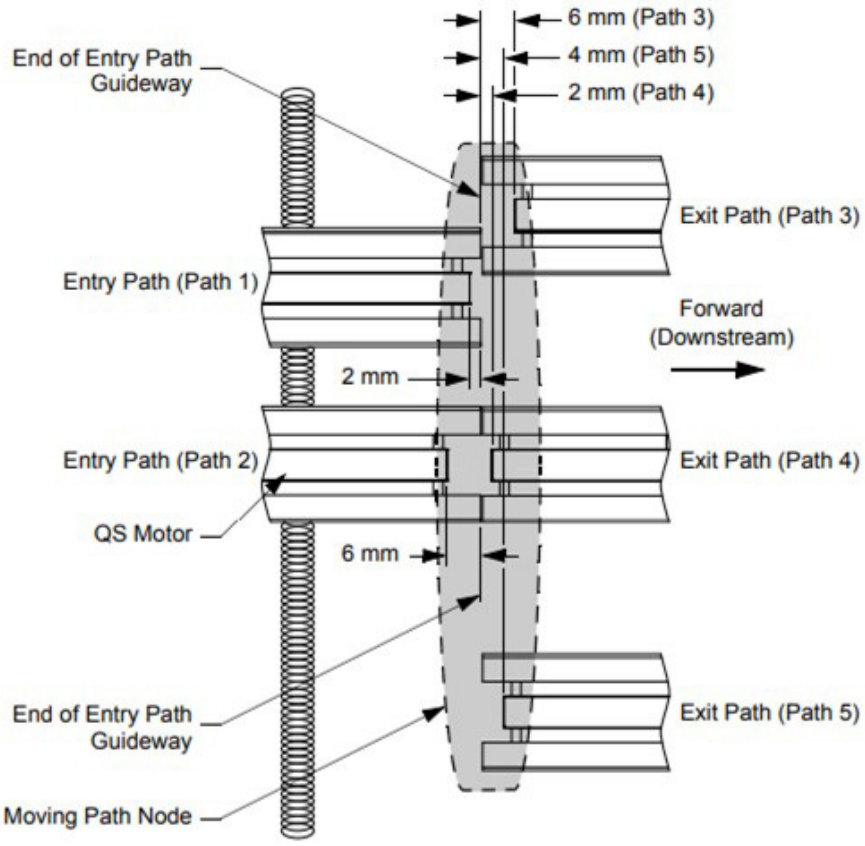


Figure 4-108: Moving Path Node Gap Delta - Previous Guidance

Moving Path Node Entry and Exit Parameters

Sync Clearance & Gate Path ID with Entry/Exit Path ID

Input Gap Delta Errors

	Entry/Exit	Path ID	Gate Position		Clearance Position		Gap Delta	
1:	Entry	1	6.1	m	6.05	m	0	m
2:	Entry	2	0.9	m	0.85	m	0	m
3:	Exit	3	0.21	m	0.27	m	0.006	m
4:	Exit	4	0.21	m	0.27	m	0.002	m
5:	Exit	5	0.21	m	0.27	m	0.004	m

Figure 4-109: Moving Path Node Gap Delta Example - Previous Guidance

Updated Gap Delta Guidance

The common reference for Downstream Gaps is the measured distance between the downstream end of the last motor on the entry path and the upstream end of the first motor on the closest exit path in the node. This is shown in the red dashed line in Figure 4-110, where Path 3 is the closest exit path to the node.

The Gap Delta for each Exit Path is then defined as the additional measured distance between the Downstream Gap and the upstream end of the first motor on the Exit Path. The Gap Delta for the closest path (Path 3 in Figure 4-110) should be equal to 0. All other gap deltas should be positive values.

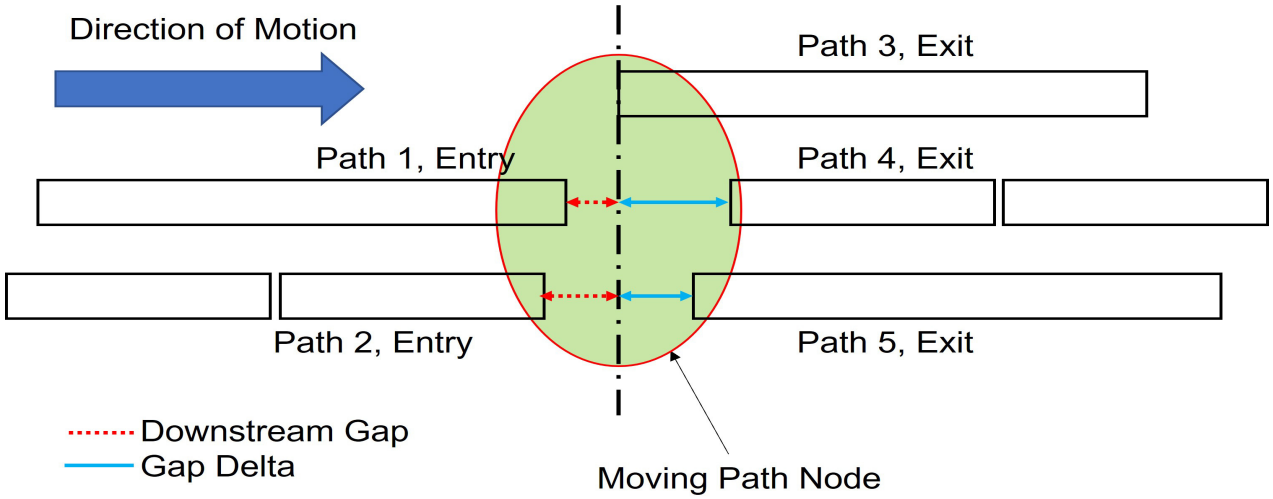


Figure 4-110: Moving Path Node Gap Delta

Input Gap Delta Errors

The Node Controller Web Interface can be used to detect precise motor gaps in a running QuickStick or QSHT system. It is advised to include the Gap Errors that are detected, as the level of precision that is provided by the Web Interface can improve vehicle motion across gaps. See the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001 for details on how to access the Motor Gap Information page.

To input the Gap Errors for a Moving Path node:

1. Create and upload the complete Node Configuration File for the system layout using the physical measured gaps for all **Downstream Gaps** and **Gap Deltas** in the system.

2. Command a vehicle to drive over all motor gaps in the system.

3. See **Motor Gap** Information in the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001 to obtain the detected **Gap Errors**. The **Motor Gap Information** page is shown in Figure 4-111.

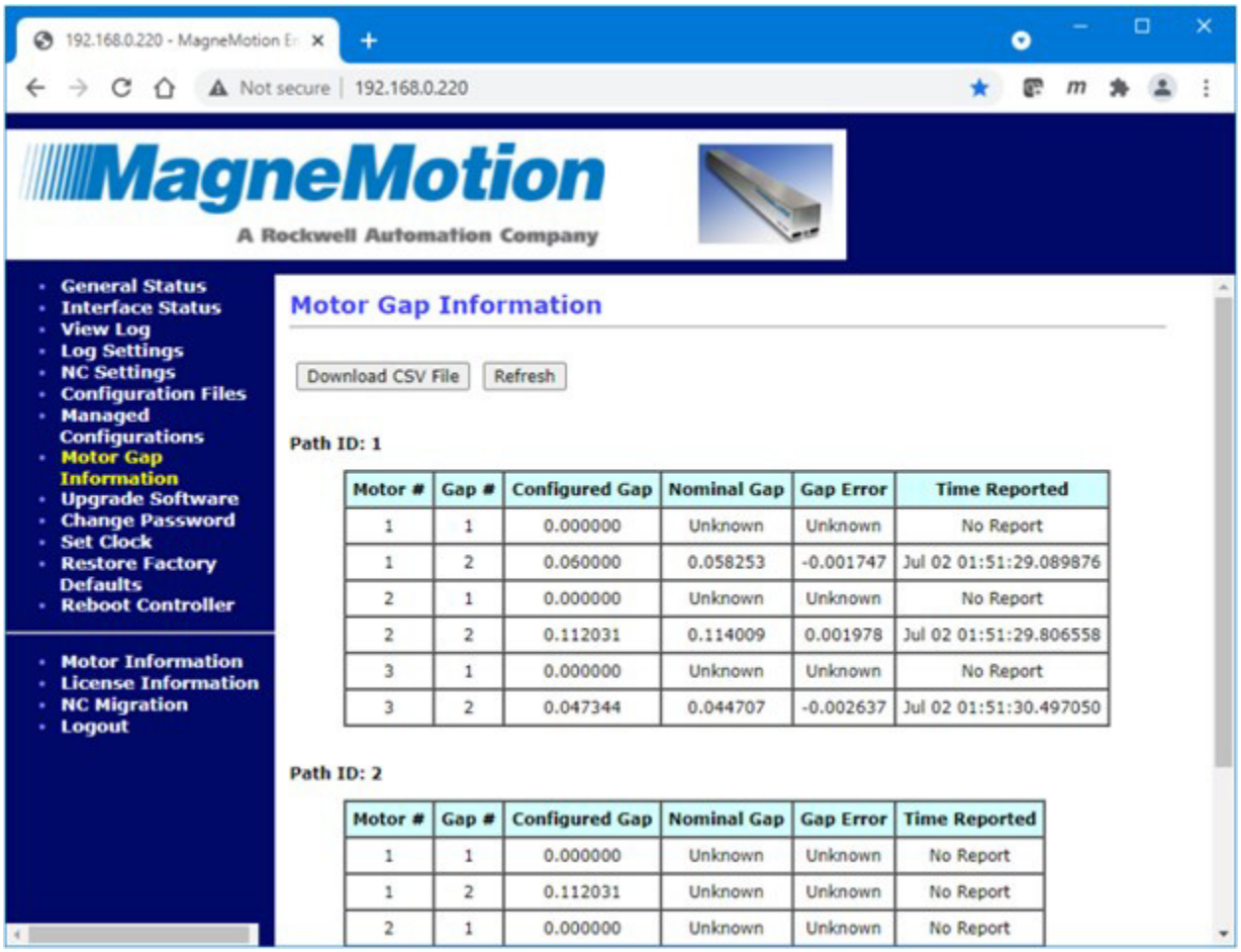


Figure 4-111: Node Controller Web Interface - Motor Gap Information Page

4. From the **Moving Path** node page, select **Input Gap Delta Errors**.

The Moving Path node Gap Error Adjustment window (see Figure 4-112) appears. The Downstream Gap of the last motor on all entry paths is displayed. The Gap Delta for each exit path is displayed.

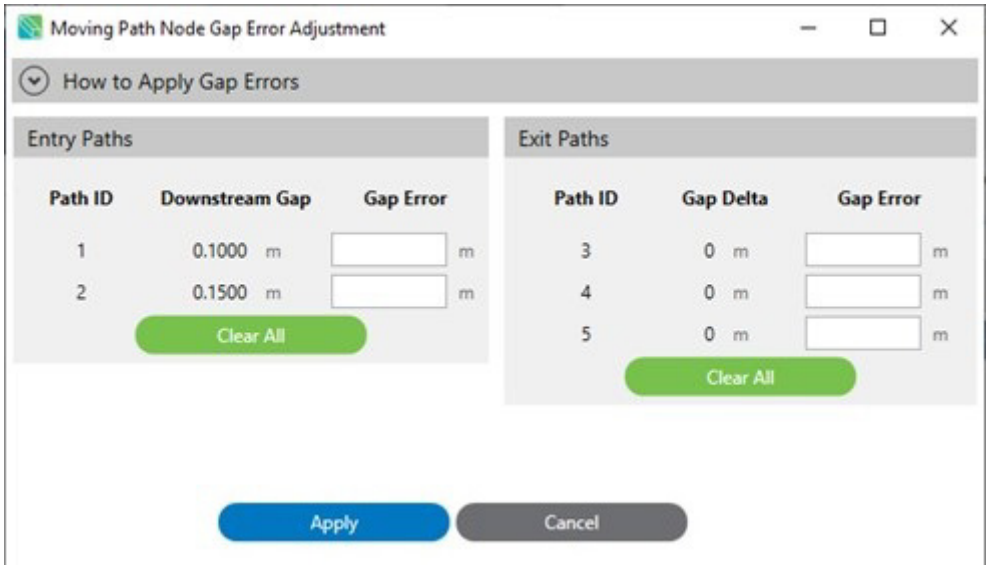


Figure 4-112: Moving Path Node Gap Error Adjustment Window

5. Input the **Gap Errors** from the **Motor Gap Information** page into the appropriate **Downstream Gap** and **Gap Delta** fields for each path in the node. Keep in mind the common reference point selected for the node.

6. Select **Apply** to apply all **Gap Errors**.

7. Repeat for each **Moving Path** node in the system.

8. Select **Save NDX Layout** on the **File** menu in the Configurator Menu Bar.

Internal Motor Gaps

QuickStick and QSHT motors contain an internal motor gap between the end of the internal stator and the outside of the motor housing. For motors along a path (not at a node), the internal gap for both ends of abutting motors is automatically added to the **Downstream Gap** of the previous motor. For internal gap details and information on **Downstream Gaps** see:

- *QuickStick 100 User Manual,* publication MMI-UM006
- *QuickStick 150 User Manual,* publication MMI-UM047
- *QuickStick HT User Manual,* publication MMI-UM007

Using the Updated Gap Delta Guidance, the Downstream Gap and the Gap Delta split the downstream gaps, see Figure 4-113.

For all entry paths, the Downstream Gap of the last motor on the path includes the internal gap of that motor and the physical measured gap to the node centerline.

For all exit paths, the Gap Delta includes the physical measured gap from the node centerline to the upstream end of the first motor on the path and the internal gap of the first motor on the path.

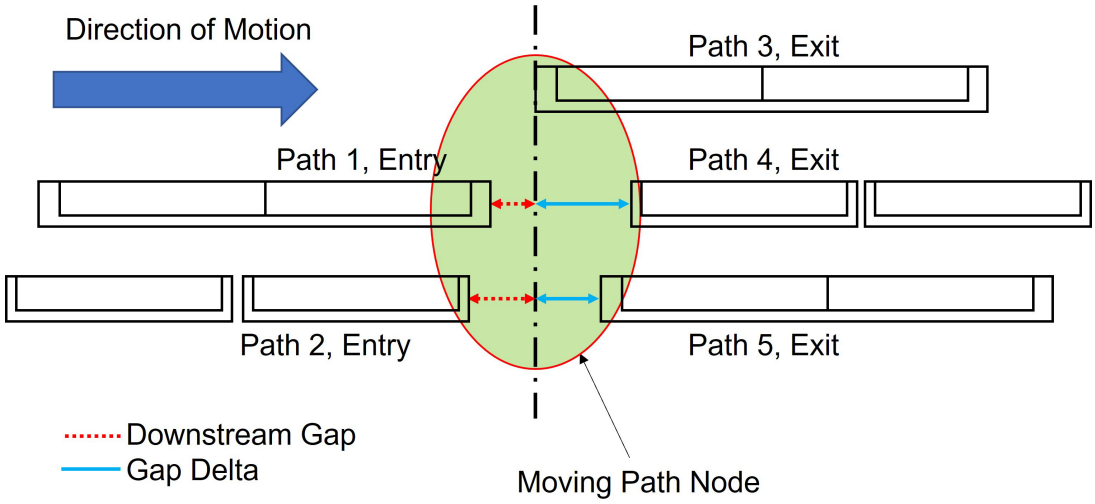


Figure 4-113: Gap Delta with Internal Gaps Shown

These internal gap values are all calculated automatically by the MagneMotion Configurator so that only physical measured gaps or detected gap errors need to be used as inputs.

Define and Edit Node Controllers

This section describes how to define and edit a node controller in the Node Controller Configuration File. Node controllers communicate vehicle information between motor controllers (internal to the MagneMover Lite and QuickStick motors, external to the QSHT motors) and the high-level controller. Each node controller in the transport system and the motors it is responsible for must be defined in the Node Controller Configuration File.

The node controller coordinates vehicle movements along the paths of motors, and is responsible for the motion for all motors on all paths that originate from nodes that the node controller owns.

The motor at the upstream end of each path, which is designated by a node, must communicate with a node controller. The motor at the downstream end of a path that connects to other paths through a node must also communicate with a node controller. The communication lines from all motors that are associated with a specific node must all connect to the same node controller.

There can be multiple node controllers in a transport system, each responsible for a subset of the nodes in the transport system. Any node controller in the transport system can also function as the HLC (see the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001).

NOTE: The maximum quantity of node controllers per transport system is system-dependent, see *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013.

Node Ownership

In transport systems, paths are defined as an uninterrupted string of motors placed end to end. Nodes are used to manage the interactions between paths. Each node has a set of connections from the motors at the path end(s) to a node controller. These connections may be physical for a serial based system or over a network for Ethernet based systems. The quantity of connections per node is equal to the quantity of paths involved in the node, and all connections from a node must go to the same node controller. Each path end must be associated with a communication port on the node controller.

- For serial motors (RS-422), a Comm Port number must be specified. The quantity of serial ports available on the node controller limits the quantity and type of nodes that can be owned.
- For Ethernet motors, use a Comm Port of Ethernet. See the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013 for limitations on the quantity of nodes per node controller on Ethernet systems.

When a node controller owns a node, it means all connections from that node are associated with the node controller. A singular node controller can own multiple nodes.

Use the Take Ownership and Remove Ownership buttons to associate nodes with node controllers on the system as desired.

Define a Node Controller

1. In the Configuration Tree, select **Node Controllers**, see Figure 4-114.

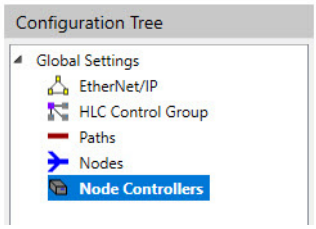


Figure 4-114: Configuration Tree with Node Controllers Selected

2. On the **Edit** menu in the Configurator Menu Bar, select **Add To End...** (or right-click on **Node Controllers** and select **Add To End...**).

   NOTE: Right-click on an existing node controller to open the **Edit** shortcut menu to insert a new node controller before or after the selected node controller.

   *The list of node controllers is expanded and displayed below **Node Controllers** in the Configuration Tree, see Figure 4-115 with the new node controller added to the list.*

The node controller is automatically numbered with the next available Node Controller ID.

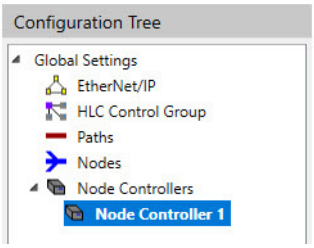


Figure 4-115: Configuration Tree Showing Node Controller Added

Edit a Node Controller

1. Expand the node controllers list in the Configuration Tree by selecting the symbol in front of **Node Controllers** or double-clicking **Node Controllers**.

   *The list of node controllers is expanded and displayed below **Node Controllers** in the Configuration Tree.*

2. Open the node controller to be edited by selecting the **Node Controller ID** for that node controller.

   *The **Node Controller Details** page for the selected node controller, see Figure 4-116, is displayed in the Configuration Settings Pane.*

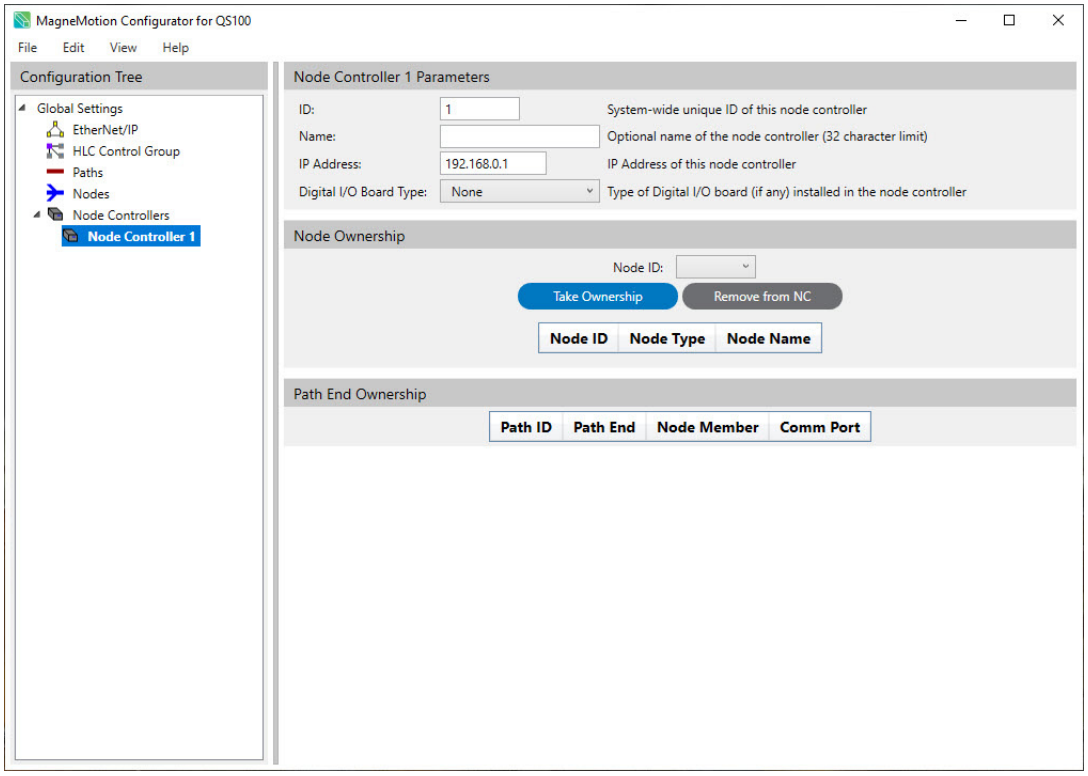


Figure 4-116: New (Undefined) Node Controller Page

3. Update the parameters for the node controller as required (see *Node Controllers on page 267* for detailed descriptions of all parameters).

4. From the **Node ID** drop-down list under **Node Ownership**, select a node for the node controller to monitor and control, then select **Take Ownership**.

   *The **Node Ownership List** is updated with the **Node ID**, **Node Type**, and the **Name**. The **Path End Ownership List** is updated with the IDs of all paths that are connected to the node, the end of the path (upstream or downstream) connected, and the node membership (enter or exit).*

5. From the **Comm Port** drop-down list, for the upstream or downstream end of each path that is listed, select the port that is used for the physical connection from the node controller to that end of the motor. For serial motors (RS-422), select the RS-422 port that is connected to the path. For Ethernet motors, select Ethernet.

   The communication ports that are selected here are displayed in the parameters for each path, see Create and Edit Path on page 87.

   NOTE: Make sure that all connections for a node use the same node controller.

6. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Examples

Figure 4-117 shows an NC-S node controller that is configured with one Merge-Diverge node that uses configured serial motors, see Figure 4-77. The node is not named and all four RS-422 communications lines that are associated with the Merge-Diverge node connect to this node controller. The NC-S does not have a Digital I/O board, so the type is set to ‘None’.

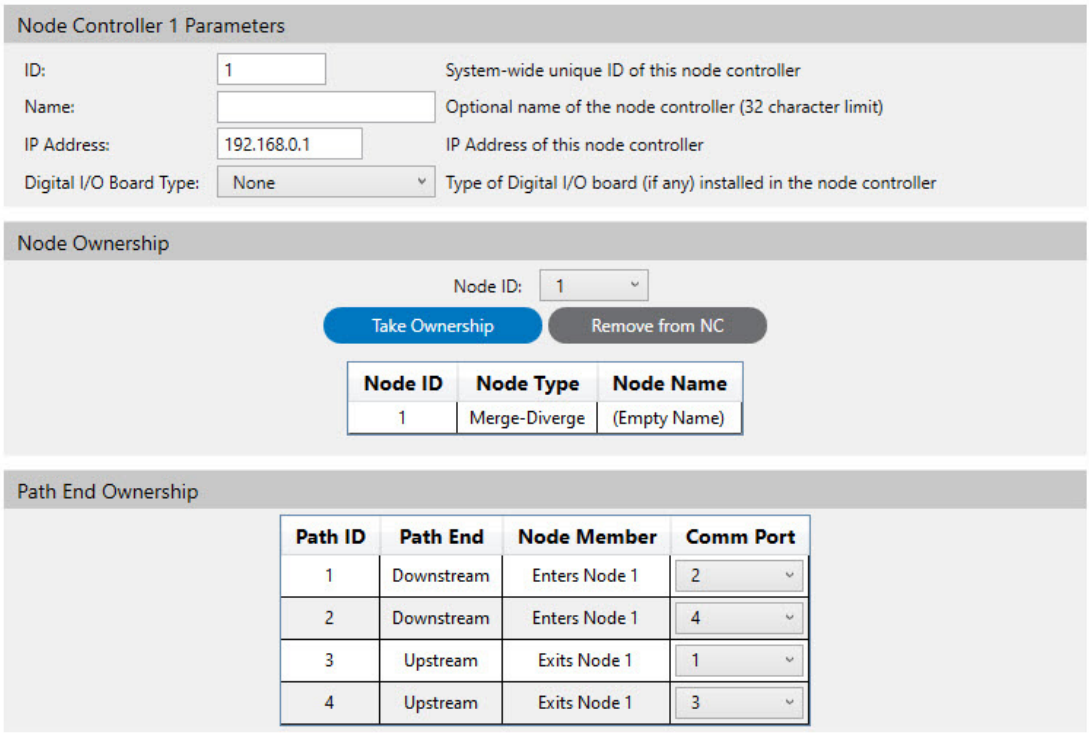


Figure 4-117: Node Controller (Defined) Example using Serial Communication

Figure 4-118 shows an NC-S node controller that is configured with one Merge-Diverge node that uses configured Ethernet motors, see Figure 4-77. The node is not named and all four Ethernet communications lines that are associated with the Merge-Diverge node connect to this node controller.

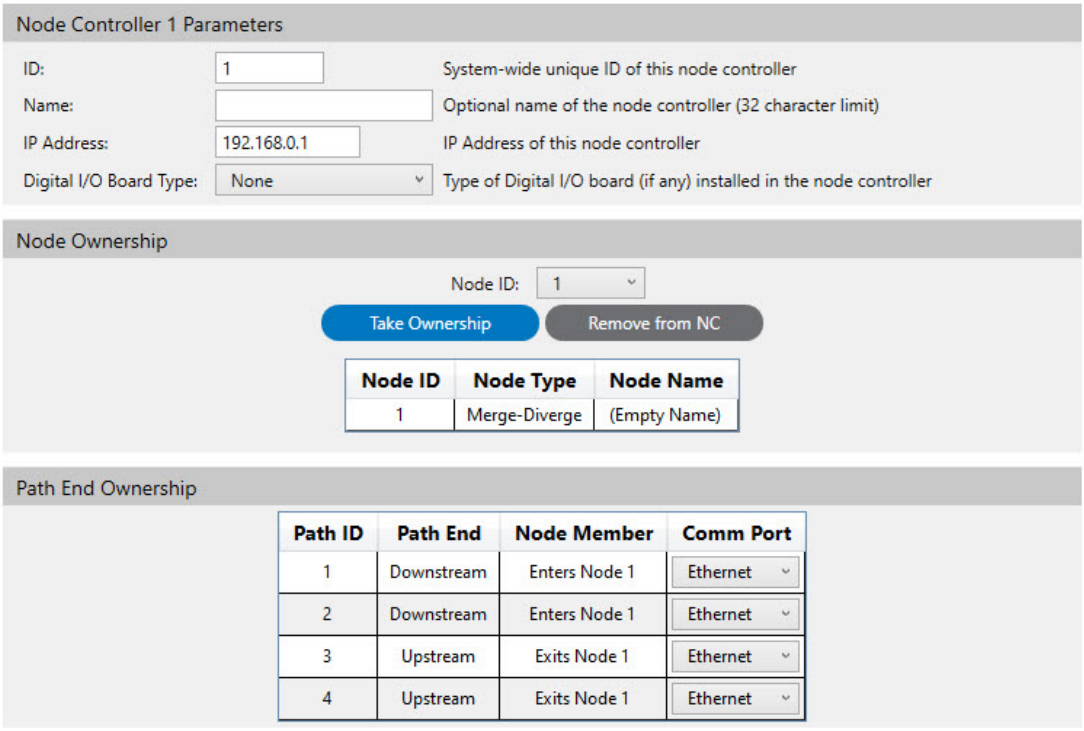


Figure 4-118: Node Controller Example using Ethernet Communication

Create and Edit Stations

This section describes how to create and edit stations in the Node Controller Configuration File. Stations are specific, designated positions on a Path, which is measured as the distance in meters from the start of the Path. Stations are used to command vehicles from the Host Controller to a predefined location, instead of having to provide the destination position for each vehicle command. Depending on the transport system, a station can be a more convenient reference point than a position, which is simply a physical position that is referenced from the beginning of a path.

Stations are one of two methods for identifying specific positions in the transport system. The other method is to provide the specific position on a path that is measured from the beginning of the path, such as 0.25 meters or 1.5 meters.

NOTE: The maximum quantity of stations per transport system is system-dependent, see *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013.

Do not position stations in the gap between motors.

NOTE: Configuration defined stations are for use only when host defined stations are not an option. It is highly advised that stations are assigned and managed in the host controller rather than defined here.

Show Stations

1. Enable the show stations option by selecting the **Show Stations** option in the **View** menu in the Configurator Menu Bar.

   *A check mark is displayed before the **Show Stations**, see Figure 4-119, to indicate it is selected. When a path is expanded, the **Show Stations** element is listed.*

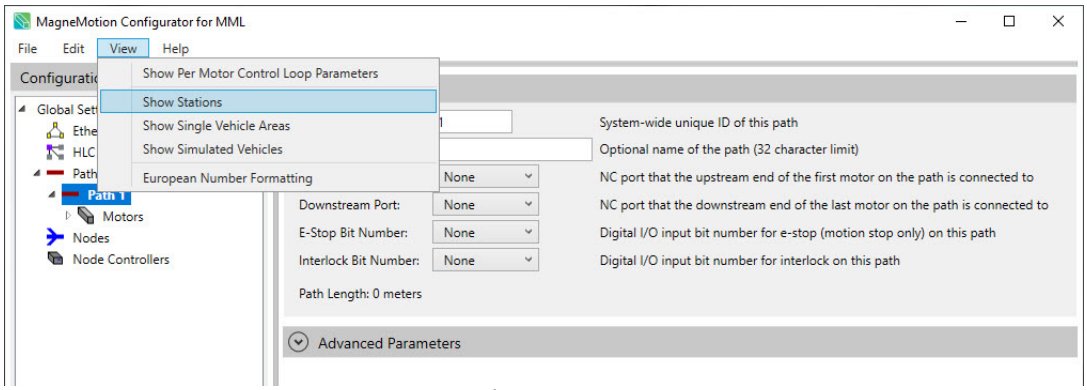


Figure 4-119: Show Stations Menu View Option

NOTE: The **Show Stations** selection is not saved in the Node Controller Configuration File and always defaults to cleared (unchecked) when the Configurator is started. However, if there are simulated vehicles in a Node Controller Configuration File it defaults to selected (checked) after the Configuration File is loaded.

Create a Station

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Expand the path where the station is going to be added by selecting the symbol in front of its **Station ID** or double-clicking the **Station ID**.

   *The path expands to show **Motors**, **Stations**, and other items related to the path.*

3. In the Configuration Tree, select **Stations**, see Figure 4-120.

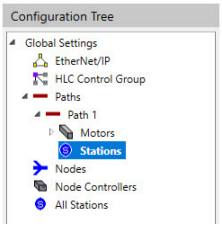


Figure 4-120: Configuration Tree with Stations Selected

4. On the **Edit** menu in the Configurator Menu Bar, select **Add To End...** (or right-click on **Stations** and select **Add To End...**).

   NOTE: Right-click on an existing station to open the **Edit** shortcut menu inserts a new station before or after the selected station.

   *The list of stations is expanded and displayed below **Stations** in the Configuration Tree, see Figure 4-121 with the new station added to the list. The station is automatically numbered with a **Station ID** based on the setting of the **Station Insert Mode** option.*

   NOTE: The **Station ID** is unique and can only be used once per configuration.

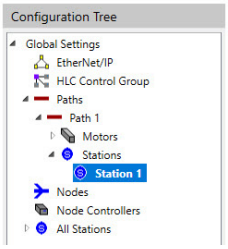


Figure 4-121: Configuration Tree Showing Station Added

Edit a Station

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Expand the path where the station to be edited is located by selecting the symbol in front of its **Station ID** or double-clicking the **Station ID**.

   *The path expands to show **Motors**, **Stations**, and other items related to the path.*

3. Expand the list of stations by selecting the symbol in front of **Stations** or double-clicking **Stations**.

   ***Stations** is highlighted and the list of **Stations** is expanded to show all stations on the path.*

4. Open the station to be edited (in this case **Station 1**) by selecting the **Station ID** for that station.

*The **Station Details** page for the selected station, see Figure 4-122, is displayed in the Configuration Settings Pane. This page identifies the path that the station is associated with at the top of the page.*

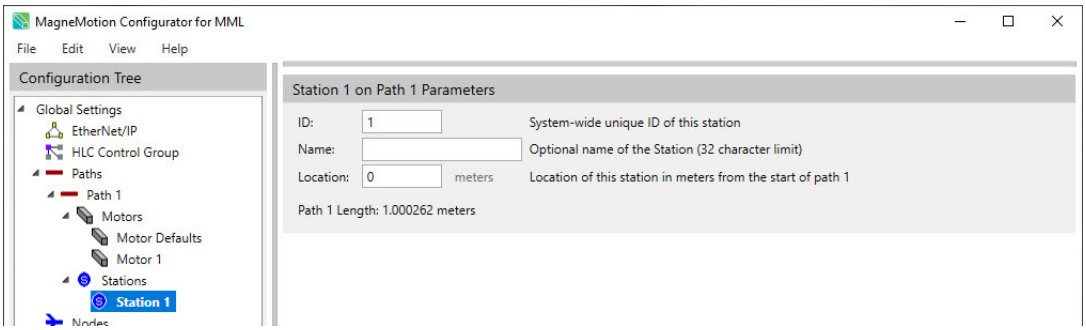


Figure 4-122: Station Page

5. Update the parameters for the station as required (see *Stations on page 270* for detailed descriptions of all parameters).

6. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Example

Figure 4-123 shows a typical station located 2.5 meters from the beginning of Path 1.

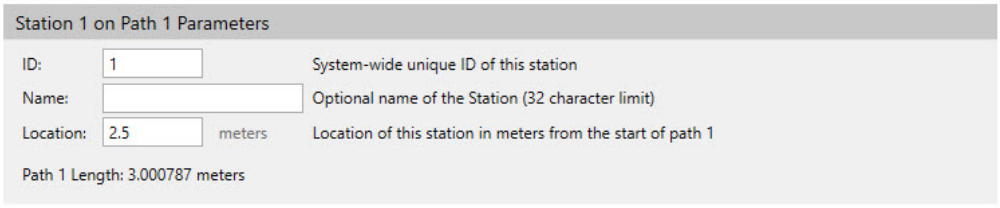


Figure 4-123: Station Example

View All Stations

After stations have been created, any station can be accessed for editing or viewing by Station ID instead of having to open each path to access the stations that are associated with that path.

NOTE: Accessing a station through the **All Stations** list provides the same functionality as accessing a station through the path that it is associated with.

1. Expand the list of all stations in the Configuration Tree by selecting the symbol in front of **All Stations** or double-clicking **All Stations**.

*The list of all stations is expanded and displayed below **All Stations** in the Configuration Tree, see Figure 4-124.*

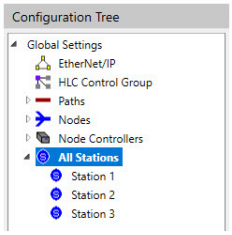


Figure 4-124: All Stations List

2. Open the station to be viewed or edited by selecting it.

   *The **Station Details** page for the selected station is displayed in the Configuration Settings Pane. The path that the station is associated with is displayed at the top of the page.*

3. Update the parameters for the station if necessary (see *Nodes on page 248* for detailed descriptions of all parameters).

4. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Create and Edit Single Vehicle Areas

This section describes how to define and edit Single Vehicle Areas (SVA) in the Node Controller Configuration File. In the transport system, this is a unidirectional area of a path where only one vehicle moving in the direction of the area is allowed to move at any time. Other vehicles on the path moving in the same direction as the initial vehicle in the SVA must wait before entering this area until the previous vehicle leaves the area. This queueing allows one vehicle to move backward and forward along a portion of a path without interfering with any other vehicles.

Single Vehicle Areas do not apply to vehicles moving in the opposite direction. That is, a downstream SVA only keeps vehicles moving downstream from entering it while a vehicle inside it entered when moving downstream. If a vehicle entered the SVA moving downstream, it does not keep vehicles moving upstream from entering it. If a vehicle entered the SVA moving upstream, it does not keep vehicles moving downstream from entering it.

NOTE: Single Vehicle Areas cannot overlap.

Single Vehicle Areas cannot be defined in switches.

Single Vehicle Areas cannot be defined for the full-length of the path.

Multiple Single Vehicle Areas cannot begin on the same motor.

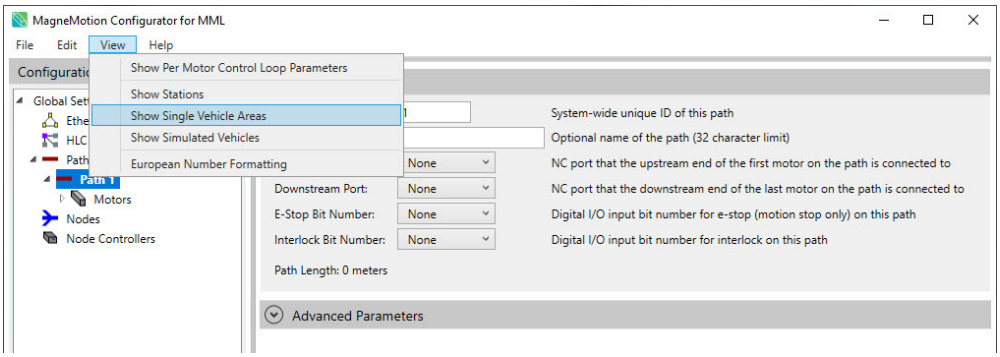


Figure 4-125: Show Single Vehicle Areas Menu View Option

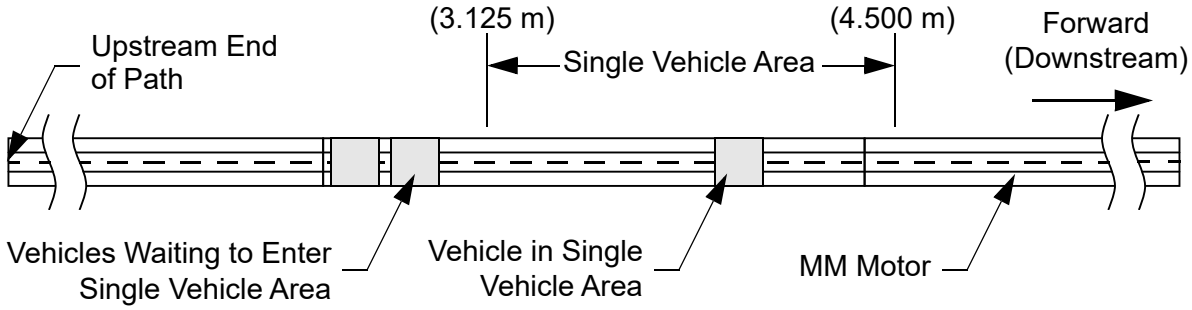


Figure 4-126: Single Vehicle Area

Show Single Vehicle Areas

1. Enable the stations option by selecting the **Show Single Vehicle Areas** option in the **View** menu in the Configurator Menu Bar.

   *A check mark is displayed before the **Show Single Vehicle Areas**, see Figure 4-127, to indicate it is selected. When a path is expanded, the **Single Vehicle Areas** element is listed.*

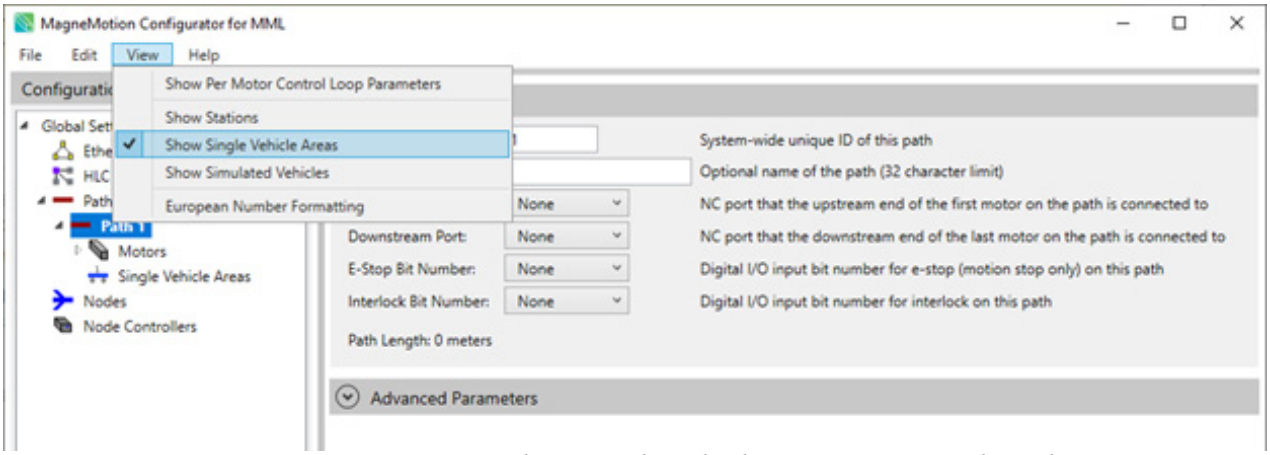


Figure 4-127: Show Single Vehicle Areas Option Selected

NOTE: The **Show Single Vehicle Areas** selection is not saved in the Node Controller Configuration File and always defaults to cleared (unchecked)

when the Configurator is started. However, if there are **Simulated Vehicles** in a Node Controller Configuration File it defaults to selected (checked) after the Configuration File is loaded.

NOTE: **Single Vehicle Areas** are hidden by default. Use the **View** menu in the Configuration Menu Bar, select **Show Single Vehicle Areas** to display them.

Create a Single Vehicle Area

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Expand the path where the **Single Vehicle Area** is going to be added by selecting the symbol in front of its **Single Vehicle Area ID**.

   *The path is highlighted and expands to show **Motors**, **Stations**, **Single Vehicle Areas**, and other items related to the path.*

3. In the Configuration Tree, select **Single Vehicle Areas**, see Figure 4-128.

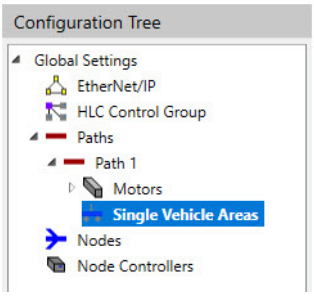


Figure 4-128: Configuration Tree with Single Vehicle Areas Selected

4. On the **Edit** menu in the Configurator Menu Bar, select **Add To End...** (or right-click on **Single Vehicle Areas** and select **Add To End...**).

   NOTE: Right-click on an existing **Single Vehicle Area** to open the **Edit** shortcut menu to insert a new SVA before or after the selected SVA.

   *The list of **Single Vehicle Areas** is expanded and displayed below **Single Vehicle Areas** in the Configuration Tree, see Figure 4-129 with the new SVA added to the list. The SVA is automatically numbered with the next **Single Vehicle Area ID**.*

NOTE: If a **Single Vehicle Area** is inserted into the existing list of SVA, all SVA following the new area are renumbered.

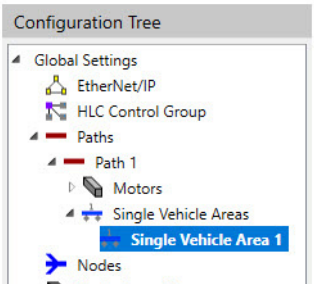


Figure 4-129: Configuration Tree Showing Single Vehicle Area Added

5. Save all changes to the **Single Vehicle Area** by selecting **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Edit a Single Vehicle Area

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Expand the path where the SVA is located by selecting the symbol in front of its **Single Vehicle Area ID**.

   *The path expands to show **Motors**, **Stations**, **Single Vehicle Area**s, and other items related to the path.*

3. Expand the SVA section by selecting the symbol in front of **Single Vehicle Areas**.

   ***Single Vehicle Areas** is highlighted and the list of Single Vehicle Areas is expanded to show all SVA on the path.*

4. Open the **Single Vehicle Area** to be edited by selecting it.

   *The **Single Vehicle Area Details** page for the selected SVA is displayed in the Configuration Settings Pane, see Figure 4-130. This page identifies the path that the SVA is associated with.*

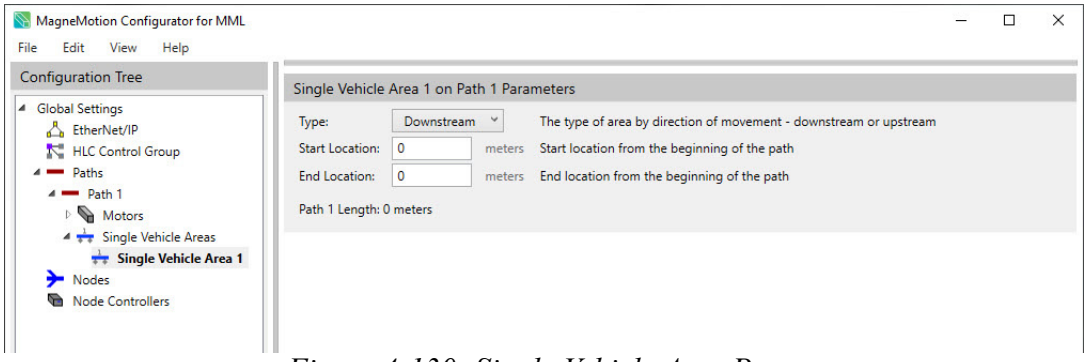


Figure 4-130: Single Vehicle Area Page

5. Update the parameters for the **Single Vehicle Area** as required (see *Single Vehicle Areas on page 271* for detailed descriptions of all parameters).

6. From the **Type** drop-down list, select the direction of movement on the path where the **Single Vehicle Area** is located. Enter the specific start and end positions as measured from the beginning of the path.

7. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Examples

If the configuration of the downstream **Single Vehicle Area** is the same as the configuration shown in Figure 4-126, configure the SVA, see Figure 4-131. These settings create a 1.375 m long **Single Vehicle Area** that starts 3.125 m from the beginning of the path.

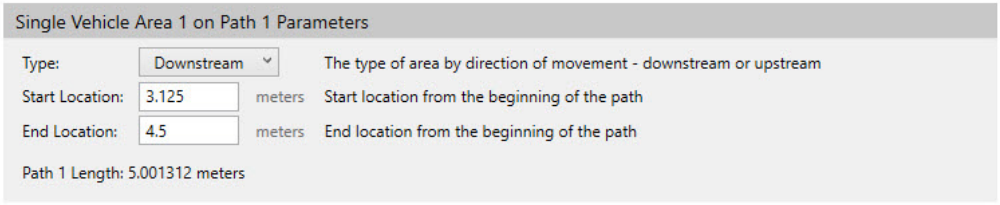


Figure 4-131: Single Vehicle Area Example – Downstream

If the configuration of the upstream **Single Vehicle Area** is the same as the configuration shown in Figure 4-126, configure the SVA, see Figure 4-132. These settings create a 1.375 m long **Single Vehicle Area** that starts 4.5 m from the beginning of the path.

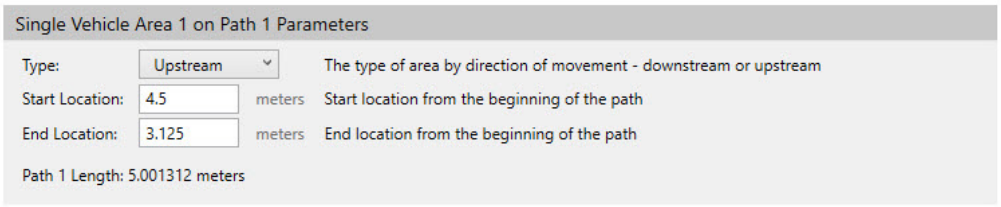


Figure 4-132: Single Vehicle Area Example – Upstream

Create and Edit Simulated Vehicles

This section describes how to show/hide simulated vehicles in the Configuration Tree and how to define and edit simulated vehicles in the Node Controller Configuration File. Simulated vehicles are required only when a node controller is being used as a high-level controller simulator for development (see the *MagneMotion Node Controller Interface User Manual,* publication MMI-UM001).

NOTE: Simulated Vehicles are hidden by default. Use the **View** menu in the Configuration Menu Bar, select **Show Single Vehicle Areas** to display them.

Show Simulated Vehicles

1. Enable the simulated vehicles option by selecting the **Show Simulated Vehicles** option in the **View** menu in the Configurator Menu Bar.

   *A check mark is displayed before the **Show Simulated Vehicles**, see Figure 4-133, to indicate it is selected. When a path is expanded, the **Simulated Vehicles** element is listed.*

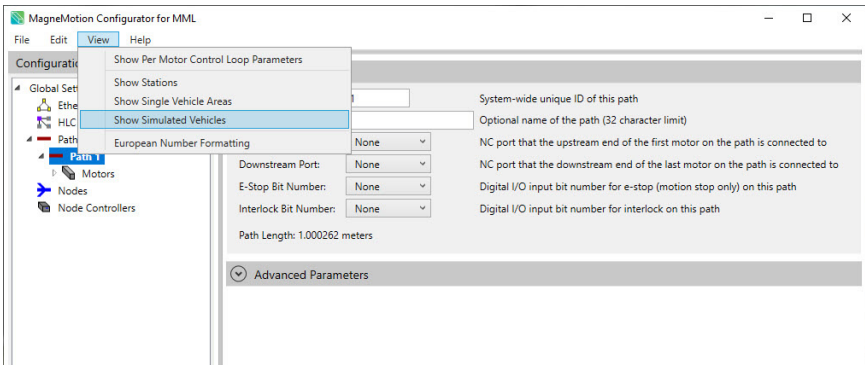


Figure 4-133: Show Simulated Vehicles Option Selected

NOTE: The **Show Simulated Vehicles** selection is not saved in the Node Controller Configuration File and always defaults to cleared (unchecked) when the Configurator is started. However, if there are simulated vehicles in a Node

Controller Configuration File it defaults to selected (checked) after the Configuration File is loaded.

Create a Simulated Vehicle

1. Enable the simulated vehicles option by selecting the **Show Simulated Vehicles** option in the **View** menu in the Configurator Menu Bar.

2. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

3. Expand the path where the simulated vehicle is going to be added by selecting the symbol in front of its **Simulated Vehicle ID** or double-clicking its name.

   *The path is highlighted and expands to show **Motors**, **Stations**, **Single Vehicle Areas**, and **Simulated Vehicles** related to the path.*

4. In the Configuration Tree, select **Simulated Vehicles**, see Figure 4-134.

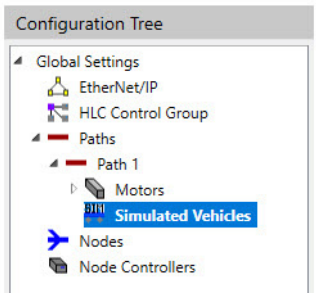


Figure 4-134: Configuration Tree with Simulated Vehicles Selected

5. On the **Edit** menu in the Configurator Menu Bar, select **Add To End...** (or right-click on **Simulated Vehicles** and select **Add To End...**).

   *The list of simulated vehicles is expanded and displayed below **Simulated Vehicles** in the Configuration Tree, see Figure 4-135 with the new simulated vehicle added to the list. The simulated vehicle is automatically numbered with the next **Simulated Vehicle ID**.*

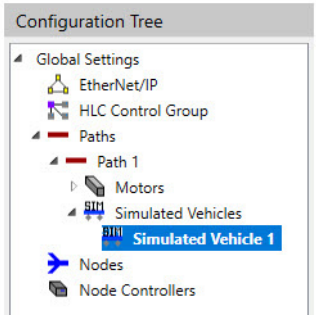


Figure 4-135: Configuration Tree Showing Simulated Vehicle Added

Edit a Simulated Vehicle

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Expand the path where the simulated vehicle to be edited is located by selecting the symbol in front of its **Simulated Vehicle ID** or double-clicking its name.

   *The path is highlighted and expands to show **Motors**, **Stations**, **Single Vehicle Areas**, and **Simulated Vehicles** related to the path.*

3. Expand the simulated vehicles section by selecting the symbol in front of **Simulated Vehicles** or double-clicking **Simulated Vehicles**.

   ***Simulated Vehicles** is highlighted and the list of simulated vehicles is expanded to show all simulated vehicles on the path.*

4. Open the **Simulated Vehicle** to be edited by selecting it.

   *The **Simulated Vehicle Details** page for the selected simulated vehicle is displayed in the Configuration Settings Pane, see Figure 4-136. This page identifies the path that the simulated vehicle is associated with.*

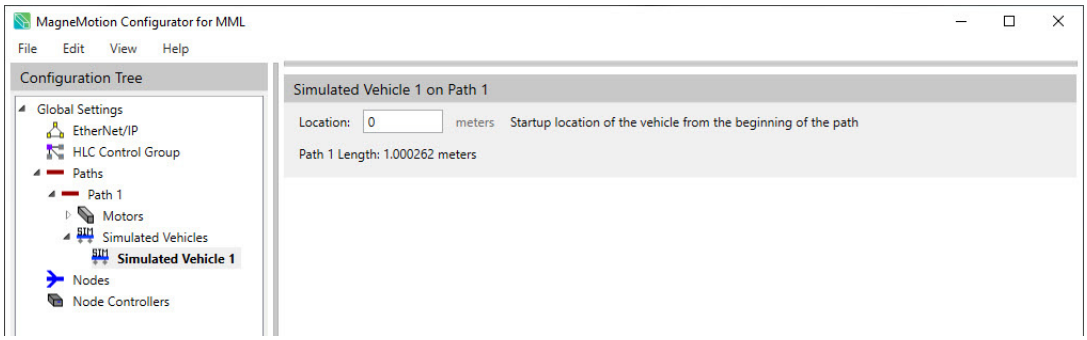


Figure 4-136: Simulated Vehicle Page

5. Update the parameters for the simulated vehicle as required (see *Simulated Vehicles on page 273* for detailed descriptions of all parameters).

6. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Example

Figure 4-137 shows a typical **Simulated Vehicle** located 1.5 meters from the beginning of Path 1.

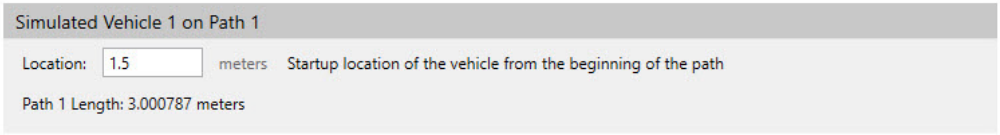


Figure 4-137: Simulated Vehicle Example

Define and Edit E-Stops

When using node controllers equipped with digital I/O ports, the I/O ports can be connected directly to an E-Stop circuit. An E-Stop is a user-supplied button (typically locking) that an operator can press if an emergency situation arises to halt all motion on any specified paths. When the node controller detects that the E-Stop button is activated, it commands all paths that are associated with that E-Stop to suspend vehicle movement. All motors on those paths suspend vehicle target requests and permission granting, and all vehicles come to a controlled stop and are held in position by the motors at their last granted position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command.

NOTICE	**The E-Stop is cleared by releasing the button that was pressed and issuing a Resume command.**

This section describes how to define and edit E-Stops (Emergency Stops) in the Node Controller Configuration File. See the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013, to wire the transport system to use an E-Stop.

Multiple E-Stop circuits can be connected to one node controller. Each path can then be configured to be associated with a specific E-Stop bit. Any or all paths can be associated with the same E-Stop bit. One E-Stop circuit can have multiple buttons that are wired together in series so that pressing any button initiates an E-Stop. The same E-Stop circuit can be used for multiple paths on different node controllers by wiring the E-Stop circuit to each node controller in series. It can be wired to a maximum of eight node controllers and reference the appropriate digital input bit on each path. See the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013, for more details.

SHOCK HAZARD: The E-Stop only executes the actions that are described, it is not the same as an EMO (Emergency Off) which removes all power to the transport system.

NOTE: This function is equivalent of sending a suspend command from the host.

Define an E-Stop

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Open the path where the E-Stop is going to be located by selecting the **Path ID**.

   *The **Path Details** page for the selected path, see Figure 4-138, is displayed in the Configuration Settings Pane.*

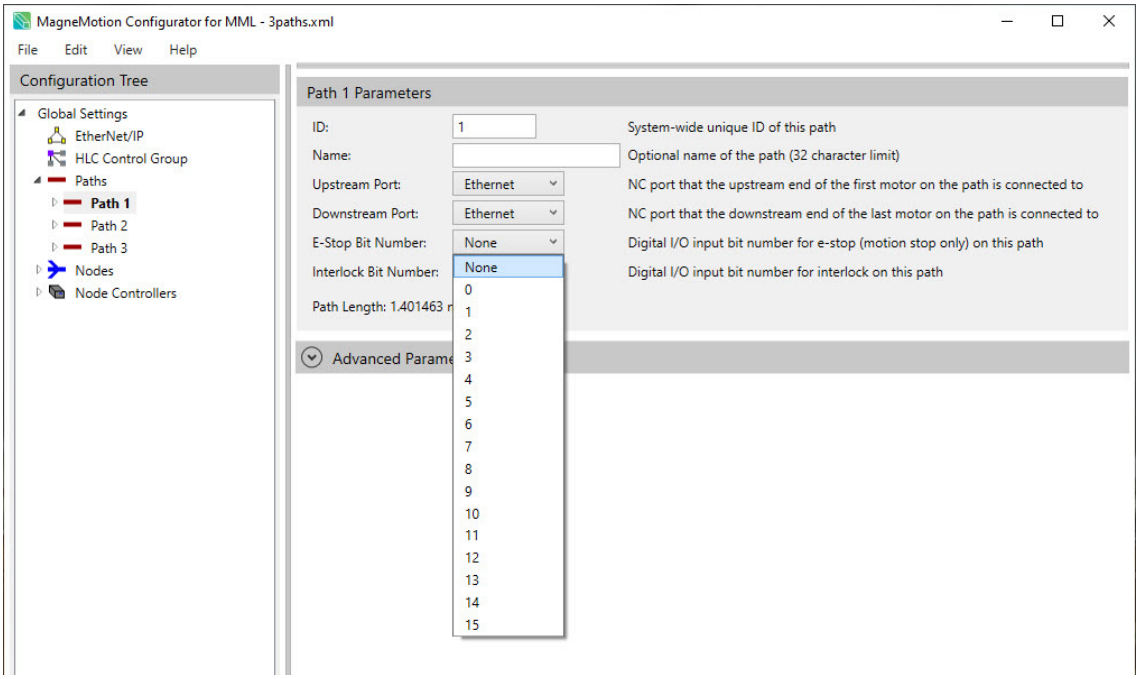


Figure 4-138: Adding an E-Stop to a Path

3. From the **E-Stop Bit Number** drop-down list, select the digital input bit to use for the E-Stop.

   NOTE: Maintain a log of digital I/O bits used on each node controller. Use the log to make sure that a bit is not configured for multiple uses and that all connections for a path use the same node controller.

4. Add the E-Stop to other paths that are connected to the node controller as required by setting the **E-Stop Bit Number** to the same input bit being used for the E-Stop.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Edit an E-Stop

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

*The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Open the path where the E-Stop to be edited is located by selecting the **Path ID**.

   *The **Path Details** page for the selected path, see Figure 4-139, is displayed in the Configuration Settings Pane.*

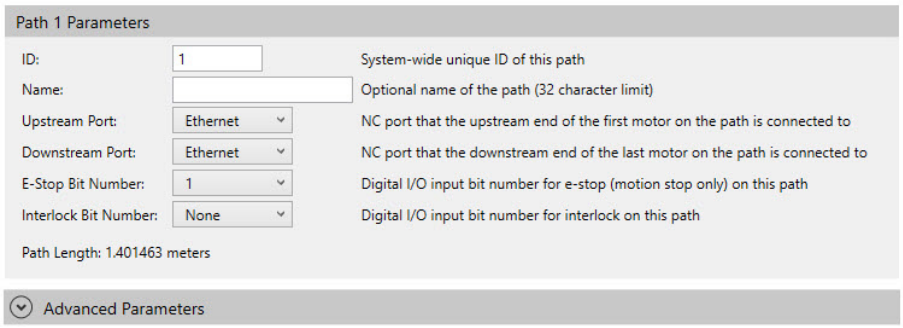


Figure 4-139: Editing an E-Stop on a Path

3. Change the E-Stop bit by selecting the new digital input bit to use for the E-Stop from the **E-Stop Bit Number** drop-down list.

   NOTE: Update the log of digital I/O bits used on each node controller. Verify that bits are not configured for multiple uses and that all connections for a path use the same node controller.

4. Update the E-Stop on other paths that are connected to the node controller as required by setting the **E-Stop Bit Number** to the same input bit being used for the E-Stop.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Define and Edit Interlocks

When using node controllers equipped with digital I/O ports, the I/O ports can be connected directly to an interlock circuit. An interlock is a user installed circuit that another piece of equipment in the facility can activate to halt all motion on any specified paths temporarily. When the node controller detects that the interlock circuit is activated, it commands all paths that are associated with that interlock to suspend vehicle movement. All motors on those paths suspend vehicle target requests and permission granting, and all vehicles come to a controlled stop and are held in position by the motors. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command. The interlock is cleared by deactivating the interlock circuit.

This section describes how to define and edit interlocks in the Node Controller Configuration File. See the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013, to wire the transport system to use an interlock.

Multiple interlock circuits can be connected to one node controller. Each path can then be configured to a specific interlock bit. Any or all paths can be associated with the same

interlock bit. The same interlock circuit can be used for multiple paths on different node controllers by wiring the interlock circuit to each node controller in series. A maximum of eight node controllers can be wired to reference the appropriate digital input bit on each path. See the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013, for more details.

SHOCK HAZARD: The Interlock only executes the actions that are described, it is not the same as an EMO (Emergency Off) which removes all power to the transport system.

AUTOMATIC MOTION HAZARD: Movement of the vehicles on the transport system is automatically resumed when the interlock is cleared, which could result in personal injury.

NOTE: This function is equivalent to sending a suspend command from the hos

Define an Interlock

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Open the path that is going to be interlocked by selecting the **Path ID**.

   *The **Path Details** page for the selected path, see Figure 4-140, is displayed in the Configuration Settings Pane.*

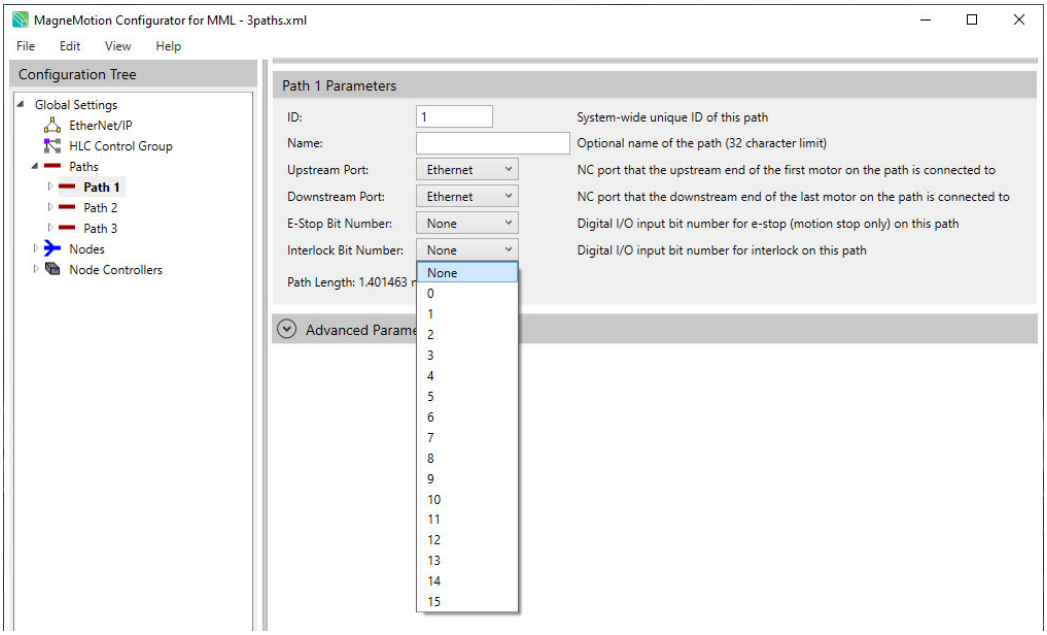


Figure 4-140: Adding an Interlock to a Path

3. From the **Interlock Bit Number** drop-down list, select the digital input bit to use for the interlock.

   NOTE: Maintain a log of digital I/O bits used on each node controller. Use the log to make sure that a bit is not configured for multiple uses and that all connections for a path use the same node controller.

4. Add the interlock to other paths that are connected to the node controller as required by setting the **Interlock Bit Number** to the same input bit being used for the interlock.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

Edit an Interlock

1. Expand the list of paths in the Configuration Tree by selecting the symbol in front of **Paths** or double-clicking **Paths**.

   *The list of paths is expanded and displayed below **Paths** in the Configuration Tree.*

2. Open the path where the interlock to be edited is located by selecting the **Path ID** for that path.

   *The **Path Details** page for the selected path, see Figure 4-141, is displayed in the Configuration Settings Pane.*

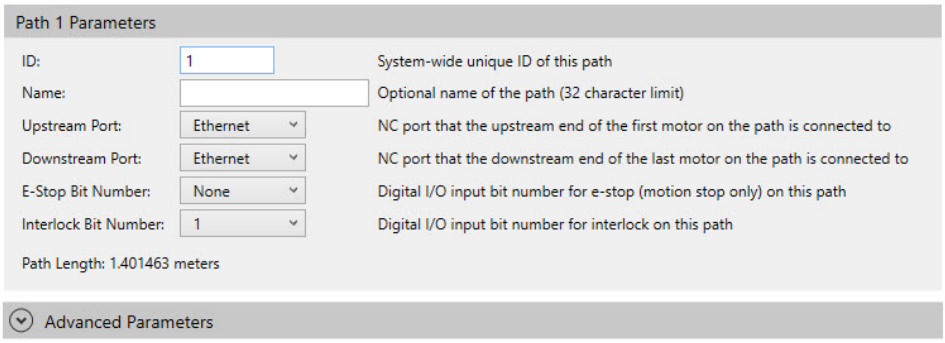


Figure 4-141: Editing an Interlock on a Path

3. Change the interlock bit by selecting the new digital input bit to use for the interlock from the **Interlock Bit Number** drop-down list.

   NOTE: Update a log of digital I/O bits used on each node controller. Verify that bits are not configured for multiple uses and that all connections for a path use the same node controller.

4. Update the interlock on other paths that are connected to the node controller as required by setting the **Interlock Bit Number** to the same input bit being used for the interlock.

5. Select **Save XML Config** on the **File** menu in the Configurator Menu Bar.

UI Reference 5

Overview

This chapter provides an overview of the User Interface (UI) for the MagneMotion® Configurator. Examples of each window, page, and dialog in the UI and descriptions of their features are included. The following parts of the User Interface are covered:

- User Interface Layout.
- User Interface Features.
- Dialog Box Reference.
- System Layout, including; the menu, layout options, and the track layout area.
- Configuration, including the menus and all configuration settings.

NOTE: Specific builds of the MagneMotion Configurator may not implement all the features that are described in this manual. See the Release Notes that are supplied with this application for more information.

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes at rok.auto/pcdc.

Interface Layout

All User Interface elements that are presented through the MagneMotion Configurator window follow the guidelines that are described in this chapter. The UI elements consist of three main areas that are always visible, see Figure 5-1. Additional windows that are opened through the UI can be positioned as desired.

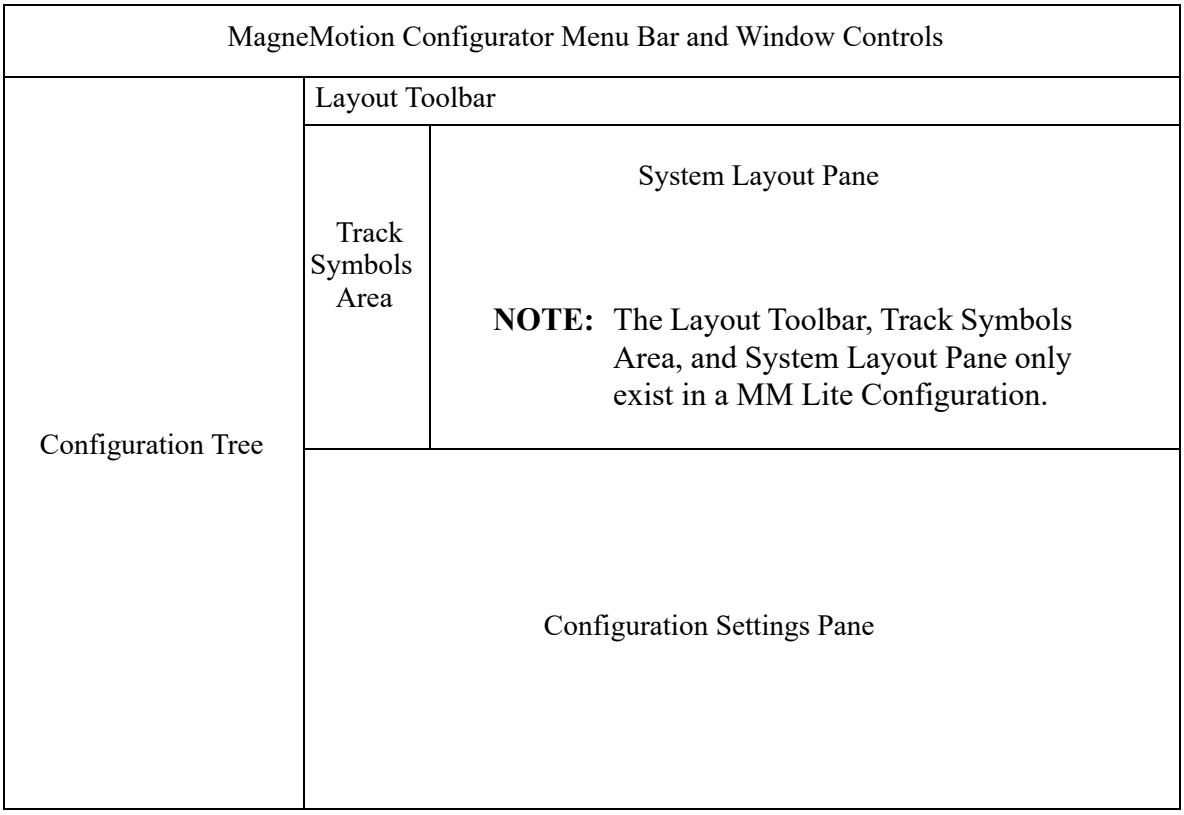


Figure 5-1: Window Layout

Window Behavior

- **Window Size** – The window can be sized as required, it opens at its default size and location each time the MagneMotion Configurator is started.
- **Pane Size** – The bar between the Configuration Tree and the System Layout Pane and Configuration Settings Panes can be moved horizontally as required. The bar returns to its default location each time the MagneMotion Configurator is started.

  The bar between the System Layout Pane and the Configuration Settings Pane can be moved vertically as required. The bar returns to its default location each time the MagneMotion Configurator is started.

User Interface Features

Dialog Boxes

A dialog box, see Figure 5-2, is used to select options, input information, and start operations. Dialog boxes are displayed when certain functions (for example, buttons that allow user input) are selected in the current window or dialog box. The dialog box that is displayed depends on the type of input that is required.

To close a dialog box and save the selection, select the button for that action (**Open**, **OK**, and so on). To close a dialog box without saving, select **Cancel**.

NOTE: When certain dialog boxes are open, no actions are permitted until the dialog box is closed.

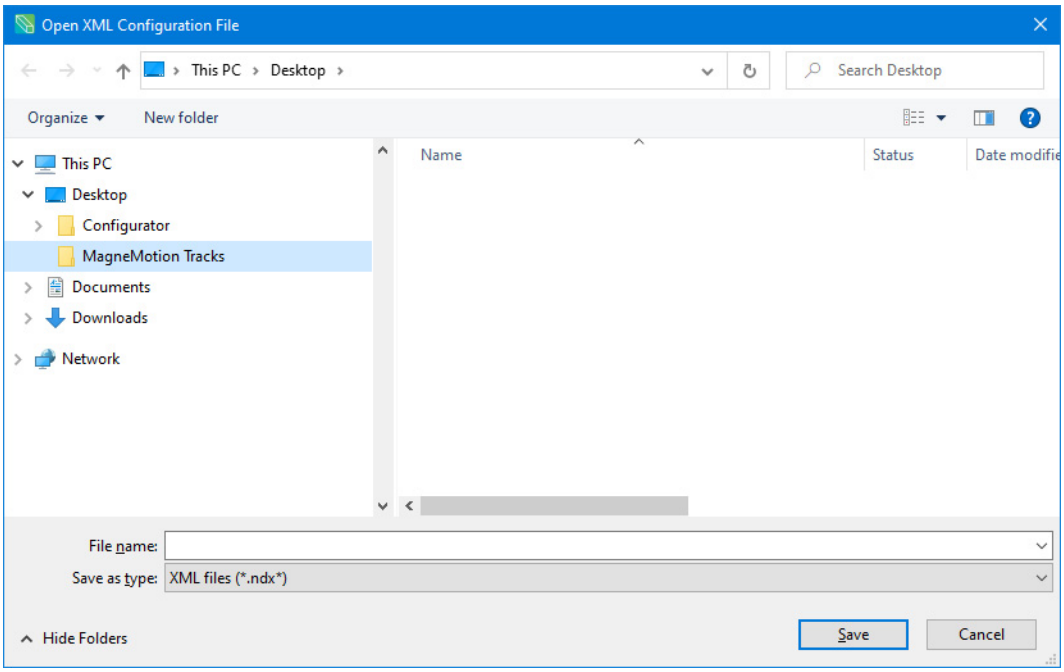


Figure 5-2: Dialog Box Example

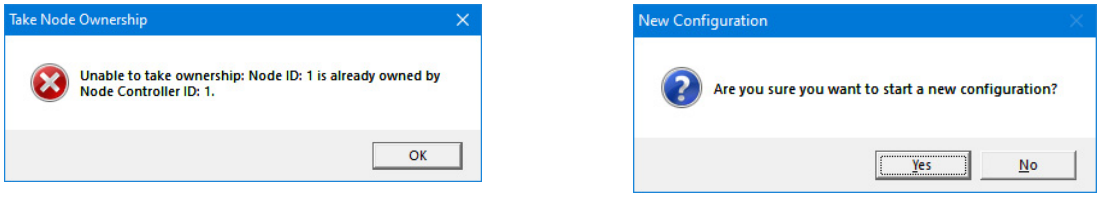
Messages

Messages, see Figure 5-3, are used to display information, to confirm user input, or to warn of user input is invalid. The Configurator automatically displays these messages when a restricted operation is attempted, or when some important operational information must be conveyed.

- Single-button messages provide a descriptive message that is related to the previously selected action. Select the **OK** to close the message after reading.

- Multi-button messages provide a descriptive message that is related to the previously selected action and options for response to the message. Select one of the options to close the message after reading.

NOTE: When certain messages are open, no actions are permitted until the message is closed.



Single Button Message Multi-Button Message

Figure 5-3: Message Examples

Dialog Box and Window Elements

Checkboxes, see Figure 5-4, are used to turn an option on or off by selecting (checking) or clearing (unchecking) the box. In those areas where multiple checkboxes are presented, multiple checkboxes can be selected.

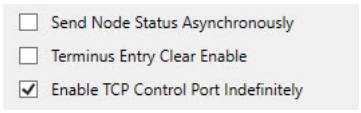
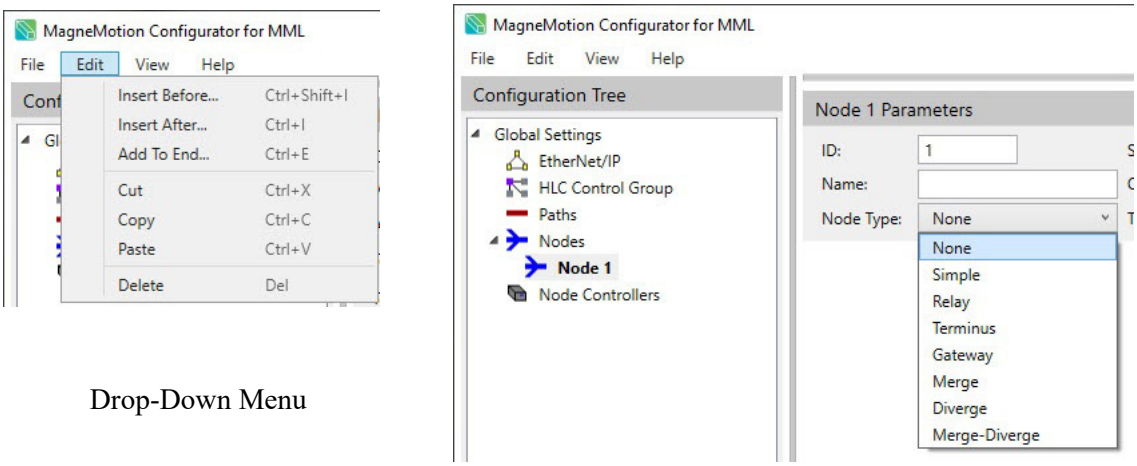


Figure 5-4: Checkbox Example

Drop-down menus or list, see Figure 5-5, are used to select one option from a list of available options. A drop-down menu or list is used when no confirmation of the selection is required; after an option is selected, it is immediately activated.



Drop-Down Menu Drop-Down List

Figure 5-5: Drop-down Menu Examples

Text fields, see Figure 5-6, are used to enter variable information, such as names, setpoints, and position values. Display fields, see Figure 5-6, are used to display fixed and variable information, such as property names and values returned from the controlled components.

NOTICE	**Fields containing invalid or improperly formatted values are outlined in red. If you hover over an invalid field, the error message appears.**

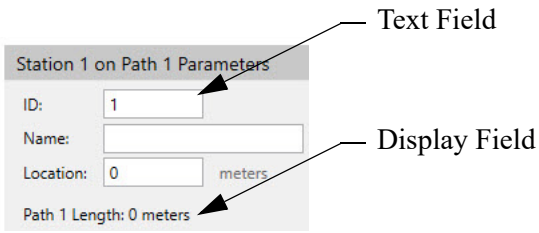


Figure 5-6: Text and Display Field Example

Each window, dialog box, and message contain graphical buttons (see Figure 5-7) that are used to perform various actions, including:

- Initiating an action.
- Changing the display.
- Opening dialog boxes, menus, or windows.

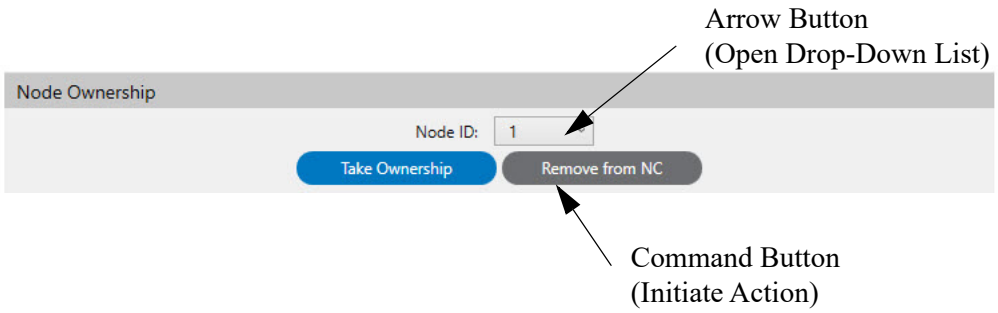


Figure 5-7: Button Example

Window and Dialog Box Reference

This reference provides a detailed description of each window, page, and dialog box displayed by the MagneMotion Configurator. All windows, menus, and dialog boxes in this reference are listed in functional order.

The MagneMotion Configurator is software that is used to create and edit the *node_configuration*.xml file, which is used to configure the transport system for operation.

Main Window

The Main Window for the MagneMotion Configurator, see Figure 5-8. This window provides access to all functions of the software. All window functions are described after the figure.

The Main Window provides access to the configuration menus in the Configurator Menu Bar at the top of the window, to the items in the Configuration Tree, and to the items displayed in the System Layout and Configuration Settings Panes. The function of each item in the Configuration Tree, the System Layout, and Configuration Settings Panes are described in this chapter along with all menu options and configuration settings.

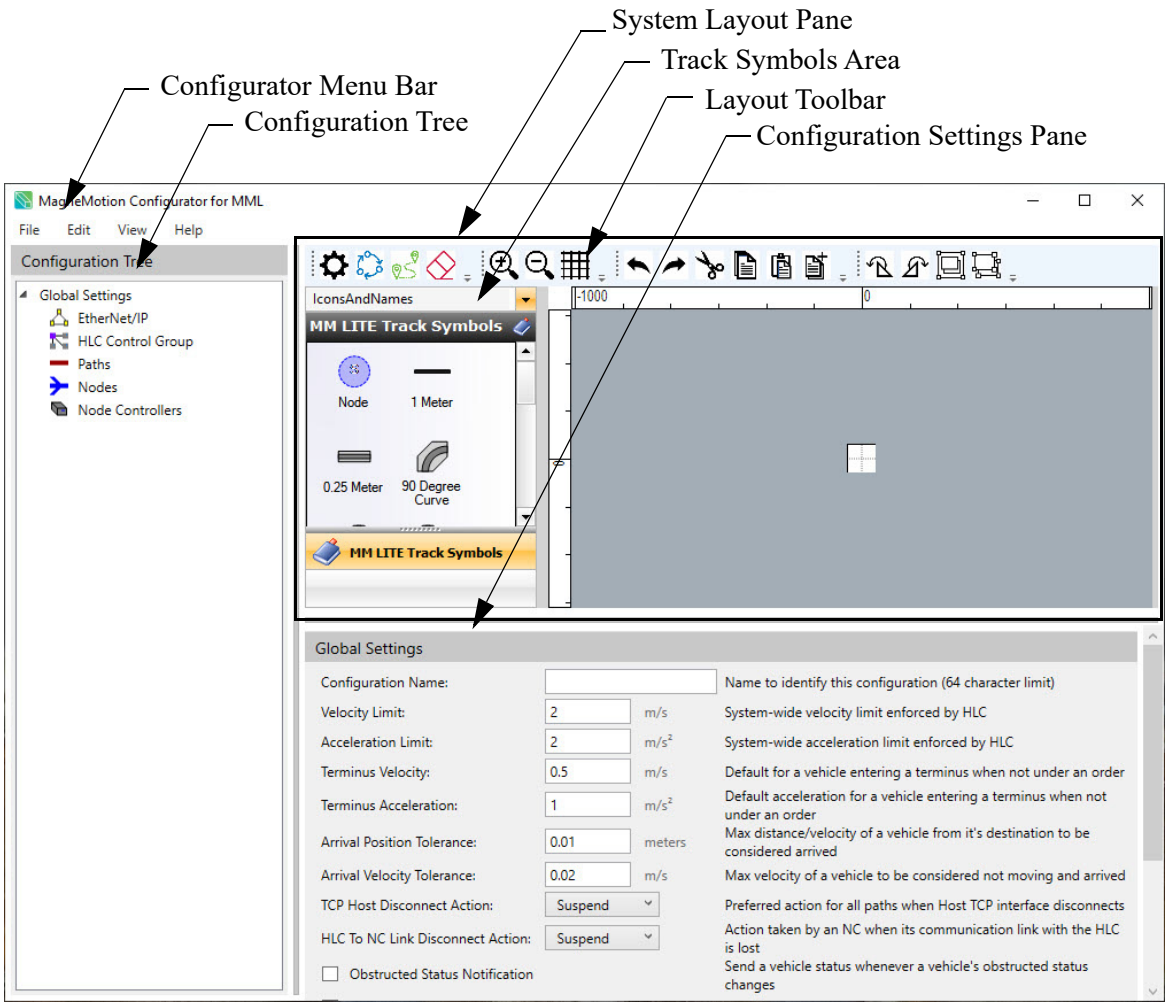


Figure 5-8: MagneMotion Configurator Main Window Overview

- **Configurator Menu Bar** – Provides access to configuration and common functions.
- **Configuration Tree** – Displays a list of the configuration categories and elements. A category or element with a hollow triangle symbol (▷) in front of it indicates that it can be expanded to show more related categories or specific elements (select the symbol or double-click the name). A category or element with a filled triangle symbol (◢) in front of it indicates that it can be collapsed to hide the related categories or elements (select the symbol or double-click the name).

- **System Layout Pane** – Displays a graphic configuration tool for creating a graphical representation of the transport system layout for MM Lite. The pane is divided into three sections; the Layout Toolbar, the Track Symbols Area, and the Layout Area.
- **Layout Toolbar** – Provides access to track layout functions.
- **Configuration Settings Pane** – Displays the page of settings that are associated with the category or element that is selected in the Configuration Tree.
- **Track Symbols Area –** The area of the System Layout Pane that is available for MM Lite to access the symbols that are used to create the track layout.

System Layout Pane for MM Lite

The System Layout Pane (see Figure 5-9), provides a configuration tool for creating a graphical representation of the transport system layout for MagneMover Lite. The pane is divided into three sections; the Layout Toolbar, the Track Symbols Area, and the Layout Area.

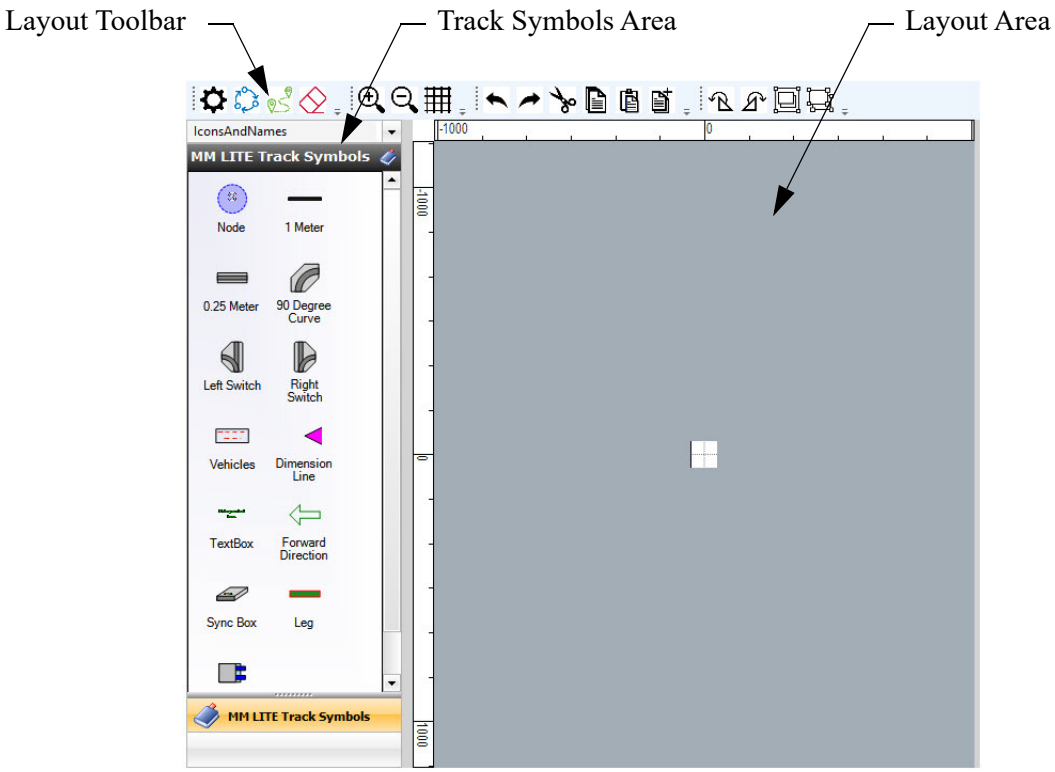


Figure 5-9: System Layout Pane

Layout Toolbar

The Layout Toolbar, see Figure 5-10, at the top of the System Layout Pane (see Figure 5-9) provides drop-down menus for access to the track layout functions, see Table 5-1.

Figure 5-10: Layout Toolbar

Table 5-1: Layout Toolbar Descriptions

Symbol	Name	Function
	Undo	Undo the last action.
	Redo	Redo the last action.
	Cut	Copy the selected symbol to the Windows® Clipboard and delete it from the track layout.
	Copy	Copy the selected symbol to the Windows Clipboard.
	Paste	Paste the most recent addition to the Windows Clipboard to the track layout.
	Duplicate	Create a copy of the selected symbol and paste it to the track layout.
	Zoom In	Enlarge the track layout centered around the center of the display.
	Zoom Out	Reduce the track layout centered around the center of the display.
	Toggle Grid Lines	Changes the visibility of the grid lines.
	Global Settings	Opens a dialog box for selection of system-wide configuration settings as described in *Global Settings on page 47*.

Table 5-1: Layout Toolbar Descriptions (Continued)

Symbol	Name	Function

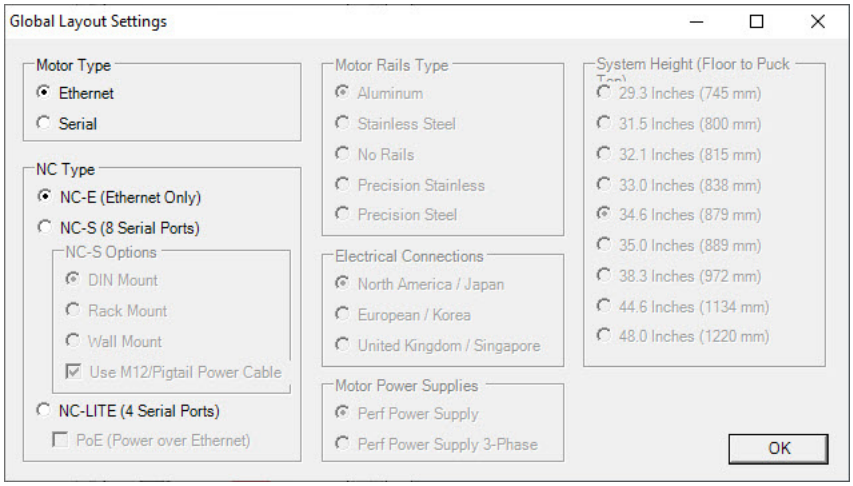



Figure 5-11: Global Layout Settings		
	Place The Nodes	Automatically places Merge, Diverge, Merge-Diverge, Simple, and Terminus nodes. Node placement is based on the manual placement of one Merge, Diverge, Simple, or Terminus node.
	Walk The Paths	Clears any existing configuration information then automatically places Merge, Diverge, Merge-Diverge, Simple, and Terminus nodes. Node placement is based on the manual placement of one Merge, Diverge, Simple, or Terminus node. Populates the Configuration Tree with a new Configuration that is based on the layout.
	Clear Path Indicators	Clears the path indicators added to the track layout after running Walk the Paths.
	Rotate Left	Rotates each selected symbol counter-clockwise 90°. When rotating multiple symbols, they are not rotated as a group, but instead each individual symbol is rotated around its own center. Symbols cannot be rotated if they are snapped to other symbols.
	Rotate Right	Rotates each selected symbol clockwise 90°. When rotating multiple symbols, they are not rotated as a group, but instead each individual symbol is rotated around its own center. Symbols cannot be rotated if they are snapped to other symbols.

Table 5-1: Layout Toolbar Descriptions (Continued)

Symbol	Name	Function
	Group	Combines the selected symbols into one object. Grouped symbols can be moved, rotated, or flipped as a group.
	Ungroup	Releases all symbols from the selected group.

Track Layout Options

The Track Symbols Area on the left of the System Layout Pane (see Figure 5-9) provides access to the symbols and tools that are used to create and control the track layout (see Figure 5-12). See *Track Layout on page 44* for usage.

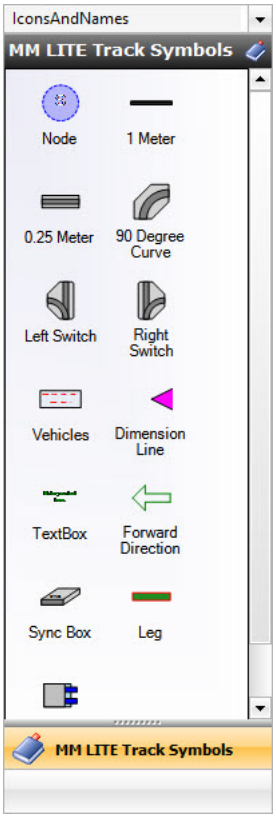


Figure 5-12: Track Symbols Area

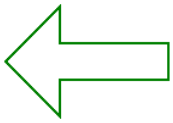
- **View Style** – Options are provided to control the display of the track layout symbols. The default is Icons and Details.
  - **Icons and Details** – Shows half-size icons, titles, and a description.
  - **Icons and Names** – Shows half-size icons and titles.
  - **Icons Only** – Shows only the symbol icons.
  - **List** – Shows small icons and titles.

- **Thumbnails** – Shows full-size icons and titles.

- **MM Lite Track Symbols**: The set of icons that are available for creating a transport system layout in the Layout Area.

Dimension Line: Provides a line where both ends can be positioned as required to measure the track layout.

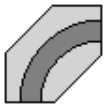
Text: Provides a box that can be positioned as required for text entry. After positioning the icon, double-click to edit the text and right-click to edit the text properties.



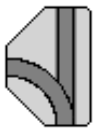
Forward Direction: Provides an arrow to show the direction forward motion of the vehicle.

1 Meter Straight LSM: Provides a 1 meter motor symbol that can be positioned as required in the track layout. Right-click on the symbol to identify the motor as a Sync or air-cooled version.

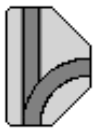
1/4 Meter Straight LSM: Provides a 1/4 meter motor symbol that can be positioned as required in the track layout. Right-click on the symbol to open a dialog box to identify the motor as a Sync or air-cooled version.



90° Curve LSM: Provides a 90° curve motor symbol that can be positioned as required in the track layout. Right-click on the symbol to open a dialog box to identify the motor as a Sync or air-cooled version.



Left Switch LSM: Provides a left switch symbol that can be positioned as required in the track layout. Not available when precision rails are selected. Right-click on the symbol to open a dialog box to select standard or high payload.



Right Switch LSM: Provides a right switch symbol that can be positioned as required in the track layout. Not available when precision rails are selected. Right-click on the symbol to open a dialog box to select standard or high payload.

Precision Rail Straight: Provides a straight precision rail symbol that can be positioned as required in the track layout. Only available when precision rails are selected

90° Rail Curve: Provides a 90° precision rail curve symbol that can be positioned as required in the track layout. Only available when precision rails are selected.

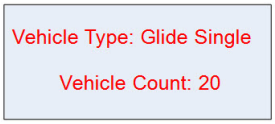
180° Rail Curve: Provides a 180° curve rail symbol that can be positioned as required in the track layout. Only available when precision rails are selected.

Leg: Provides a symbol that can be positioned as required in the track layout to indicate the position of legs. Right-click on the symbol to open a dialog box to specify the quantity of lanes being supported.

SYNC IT™ Controller: Provides a symbol that can be positioned as required in the track layout. Right-click on the symbol to open a dialog box to specify the quantity of Sync cables required (one per Sync motor).

Node: Provides a node identification symbol that can be positioned as required in the track layout.

Precision Locator: Provides a Precision Locators symbol that can be positioned as required in the track layout. Right-click on the symbol to open a dialog box to change the locator options.



Vehicles: Provides a box to show the number and type of vehicles being used in the track layout for individual material transport. Right-click on the symbol to open a dialog box to change the vehicle quantity and other options.

Layout Area

The Layout Area for the transport system layout (see Figure 5-13), on the right of the System Layout Pane, provides space for the creation of the transport system layout.

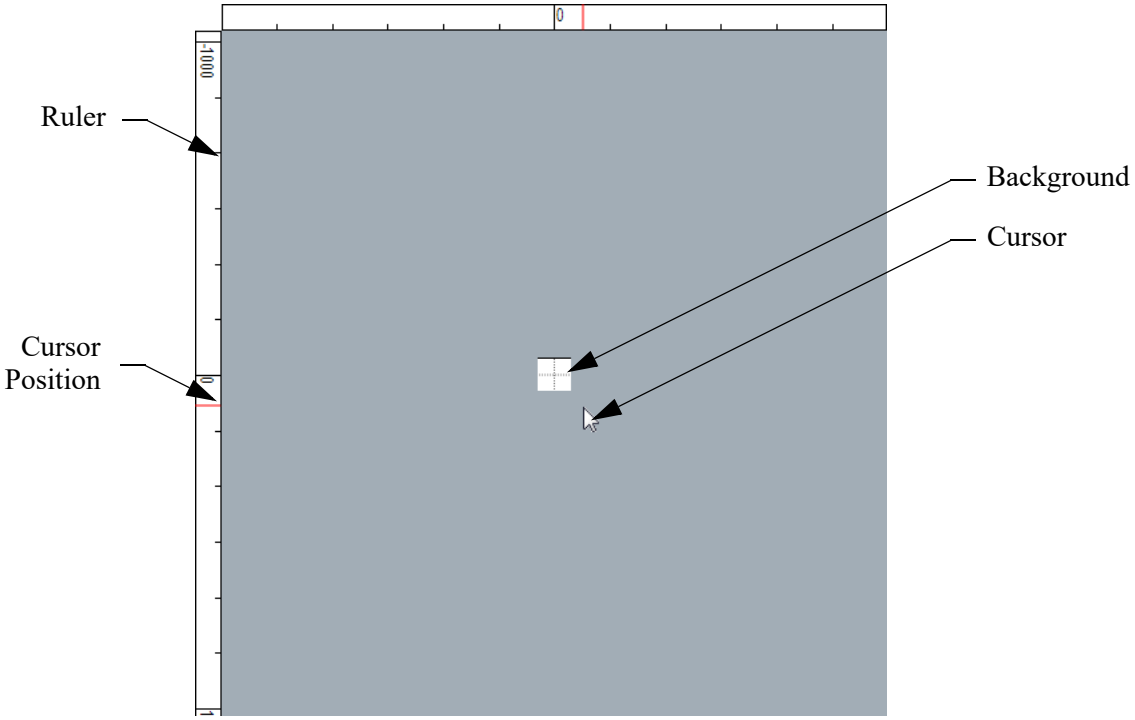


Figure 5-13: Layout Area

- **Ruler** – Provides measurements in millimeters.
- **Cursor Position** – Red line on each ruler that shows the current location of the cursor.
- **Background** – Gridded area for positioning of the symbols that are used to create the track layout. It automatically expands to include new symbols as required.

Configuration

The MagneMotion Configurator, see Figure 5-14, provides a configuration tool for creating the Node Controller Configuration File for the transport system. The window is divided into three sections; the Configurator Menu Bar, the Configuration Tree, and the Configuration Settings Pane. Selecting a configurable item in the Configuration Tree displays the settings that are associated with the item in the Configuration Settings Pane.

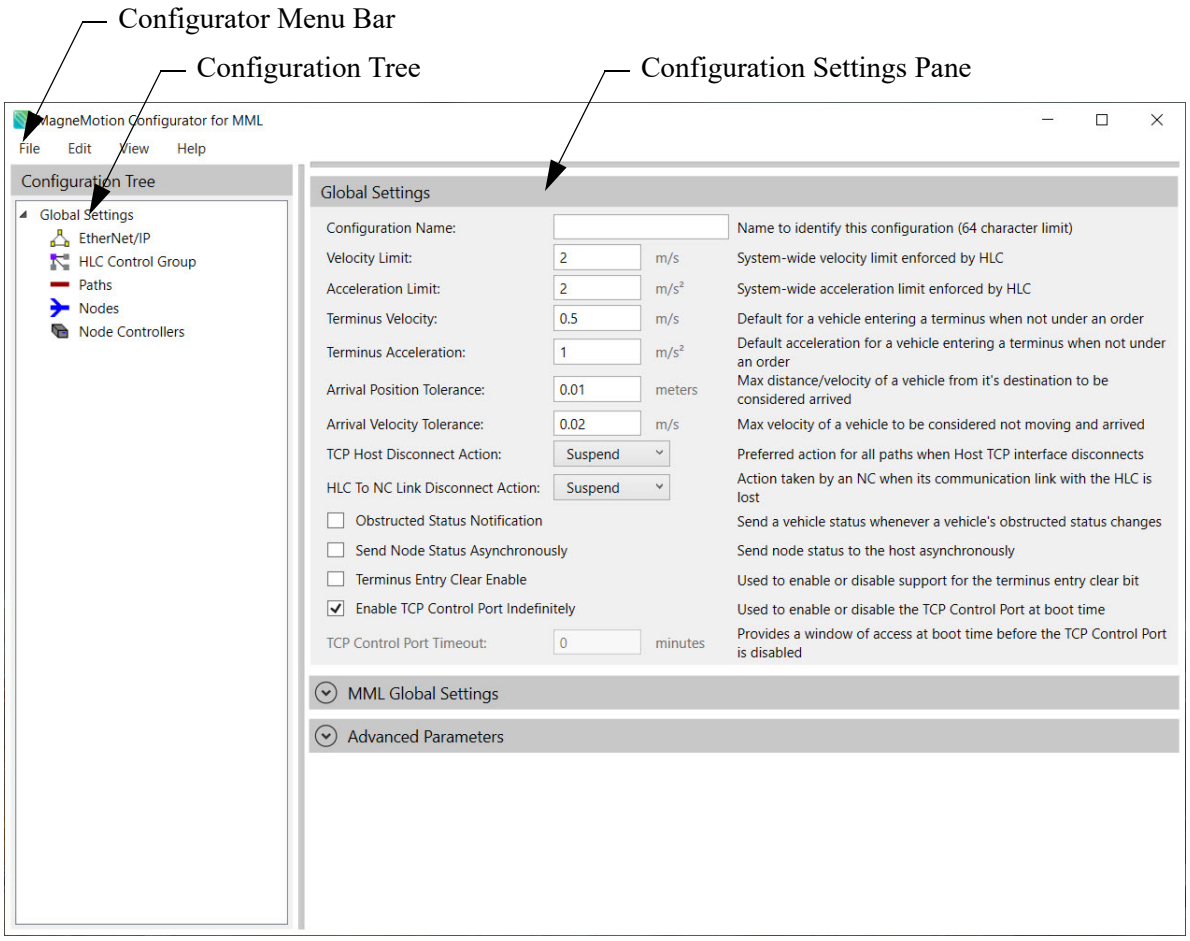


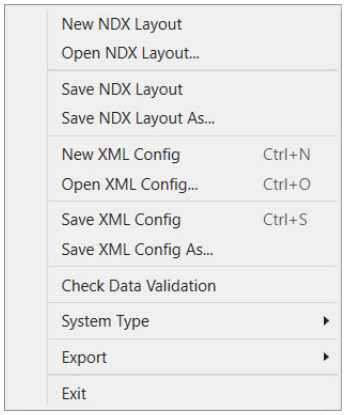
Figure 5-14: Configuration Tree and Configuration Pane

Configurator Menu Bar

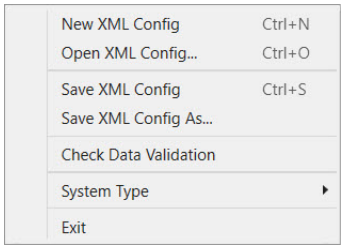
The Configurator Menu Bar, see Figure 5-15, at the top of the MagneMotion Configurator, provides drop-down menus for access to various configuration functions, see Figure 5-16. All Edit menu functions are also available on shortcut menus that are accessed by right-clicking on a Category or Element in the Configuration Tree.

Figure 5-15: Configurator Menu Bar

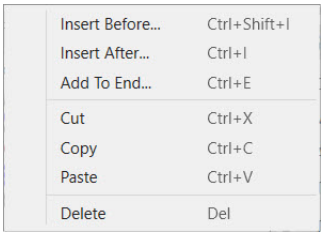
File Menu (MM Lite)



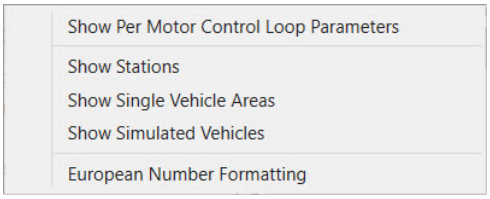
File Menu (QuickStick and QSHT)



Edit Menu



View Menu



Help Menu

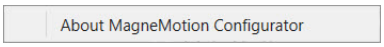


Figure 5-16: Configurator Menus

File

- **New NDX Layout** – creates a new track layout file for MM Lite in the System Layout Pane.
- **Open NDX Layout…–** opens an existing track layout file for MM Lite in the System Layout Pane.
- **Save NDX Layout** – Saves the existing track layout file.
- **Save NDX Layout As…** – Opens a dialog box to name and save a new track layout file.
- **New XML Config**– Creates a Node Controller Configuration File that contains only the default values for the Global Settings.
- **Open XML Config...** – Opens a dialog box to locate and open an existing Node Controller Configuration File.
- **Check Data Validation** – Checks that all parameter values are within the correct range. Generates a notification of all values correct, or a notification indicating which values are invalid/out of range.
- **System Type** – Expandable list to choose motor type (MagneMover® Lite™, QuickStick®, or QuickStick HT™)
- **Export** – Expandable list to choose export options

- **NDX Layout to PDF** – exports the track layout file that is used for MM Lite™ to PDF.
- **NDX Layout to BMP** – exports the track layout file that is used for MM Lite to BMP.
- **Create MMTRK file from Config** – Opens a dialog box for creation of a Track File that represents the current configuration for use with the NCHost TCP Interface Utility. Available for MM Lite only.

- **Exit** – Closes the MagneMotion Configurator. The Node Controller Configuration File is not saved and any changes that are made since the last save are discarded.

Edit

Table 5-1: Menu Definitions and Short-cut Keys

Menu	Action	Short-cut
File	New XML Config	Ctrl+N
	Open XML Config	Ctrl+O
	Save XML Config	Ctrl+S
Edit	Insert Before	Ctrl+Shift+I
	Insert After	Ctrl+I
	Add to End	Ctrl+E
	Cut	Ctrl+X
	Copy	Ctrl+C
	Paste	Ctrl+V
	Delete	Del (Delete)

- **Insert Before...** – Adds another element of the selected type before the selected element. Also available through a shortcut menu.
- **Insert After...** – Adds another element of the selected type after the selected element. Also available through a shortcut menu.
- **Add To End...** – Adds another element of the selected type to the end of the list of elements. Also available through a shortcut menu.
- **Cut** – Copies the current values of all settings from the selected element to an internal clipboard and deletes the element. Only available for elements that do not have sub-elements. Also available through a shortcut menu.
- **Copy** – Copies the current values of all settings from the selected element to an internal clipboard. Only available for elements that do not have sub-elements. Also available through a shortcut menu.

- **Paste** – Pastes the current values of all cut or copied settings on the internal clipboard to the selected element. The element being pasted to must be the same type as the element that was copied. Only available for elements that do not have sub-elements. Also available through a shortcut menu.
- **Delete** – Deletes the selected element from the Configuration Tree. Also available through a shortcut menu.

View

- **Show Per Motor Control Loop Parameters** – Displays the Control Loop Parameter sets for each motor on its Motor page when selected.
- **Show Stations** – The Stations option is displayed under Paths in the Configuration Tree when selected.
- **Show Single Vehicle Areas** – The Single Vehicle Areas option is displayed under Paths in the Configuration Tree when selected.
- **Show Simulated Vehicles** – The Simulated Vehicles option is displayed under Paths in the Configuration Tree when selected.
- **European Number Formatting** – Changes the formatting of all numbers that are displayed to European formatting (one thousand = 1.000,00) when selected.

Help

- **About MagneMotion Configurator** – Displays the MagneMotion Configurator version information.

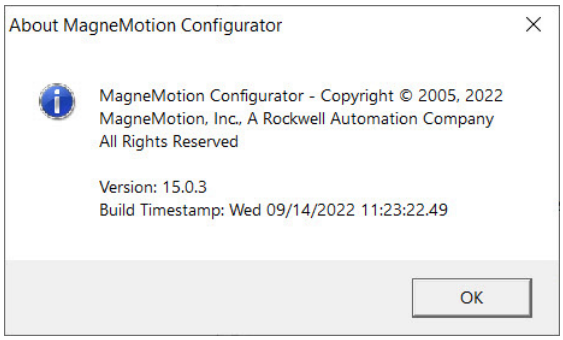


Figure 5-17: About MagneMotion Configurator Message

Shortcut Menus

The shortcut menus for the Configurator, which are accessed by right-clicking on a Category that has Elements or on an Element in the Configuration Tree, see Figure 5-18.

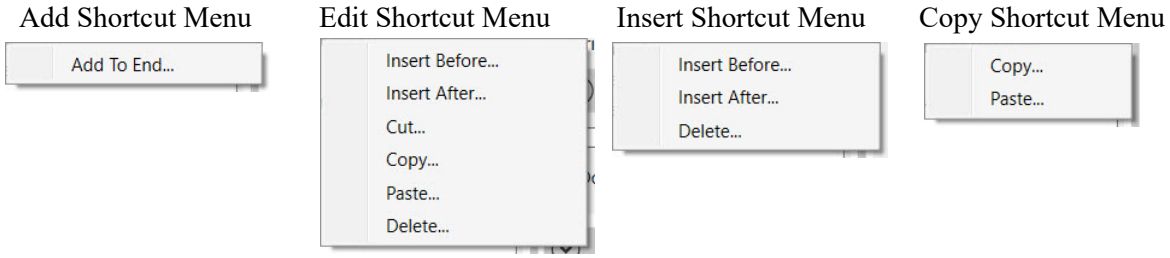


Figure 5-18: Configurator Shortcut Menus

Add Shortcut Menu

Available when right-clicking on paths, motors, stations, single vehicle areas, simulated vehicles, nodes, or node controllers in the Configuration Tree.

- **Add To End...** – Adds another element of the selected type to the end of the list of elements. Also available through a shortcut menu.

Edit Shortcut Menu

Available when right-clicking on a specific motor, station, single vehicle area, simulated vehicle, node, or node controller in the Configuration Tree.

- **Insert Before...** – Adds another element of the selected type before the selected element.
- **Insert After...** – Adds another element of the selected type after the selected element.
- **Cut...** – Copies the current values of all settings from the selected element to an internal clipboard and deletes the element.
- **Copy...** – Copies the current values of all settings from the selected element to an internal clipboard.
- **Paste...** – Pastes the current values of all cut or copied settings on the internal clipboard to the selected element. The element being pasted to must be the same type as the element that was copied.
- **Delete...** – Deletes the selected element from the Configuration Tree.

Insert Shortcut Menu

Available when right-clicking on a specific path in the Configuration Tree.

- **Insert Before...** – Adds another element of the selected type before the selected element.
- **Insert After...** – Adds another element of the selected type after the selected element.
- **Delete...** – Deletes the selected element from the Configuration Tree.

Copy Shortcut Menu

Available when right-clicking on the Motor Defaults for a path in the Configuration Tree.

- **Copy...** – Copies the current values of all settings from the selected element.
- **Paste...** – Pastes the current values of all cut or copied settings on the internal clipboard to the selected element. The element being pasted to must be the same type as the element that was copied.

Global Settings

Global Settings are settings that apply to all parts of the transport system (motors, nodes, vehicles, and so on). The Global Settings page with Advanced Parameters selected (see Figure 5-19), is accessed by selecting the Global Settings category at the top of the Configuration Tree. See *Configure Global Settings* *on page 75* for usage.

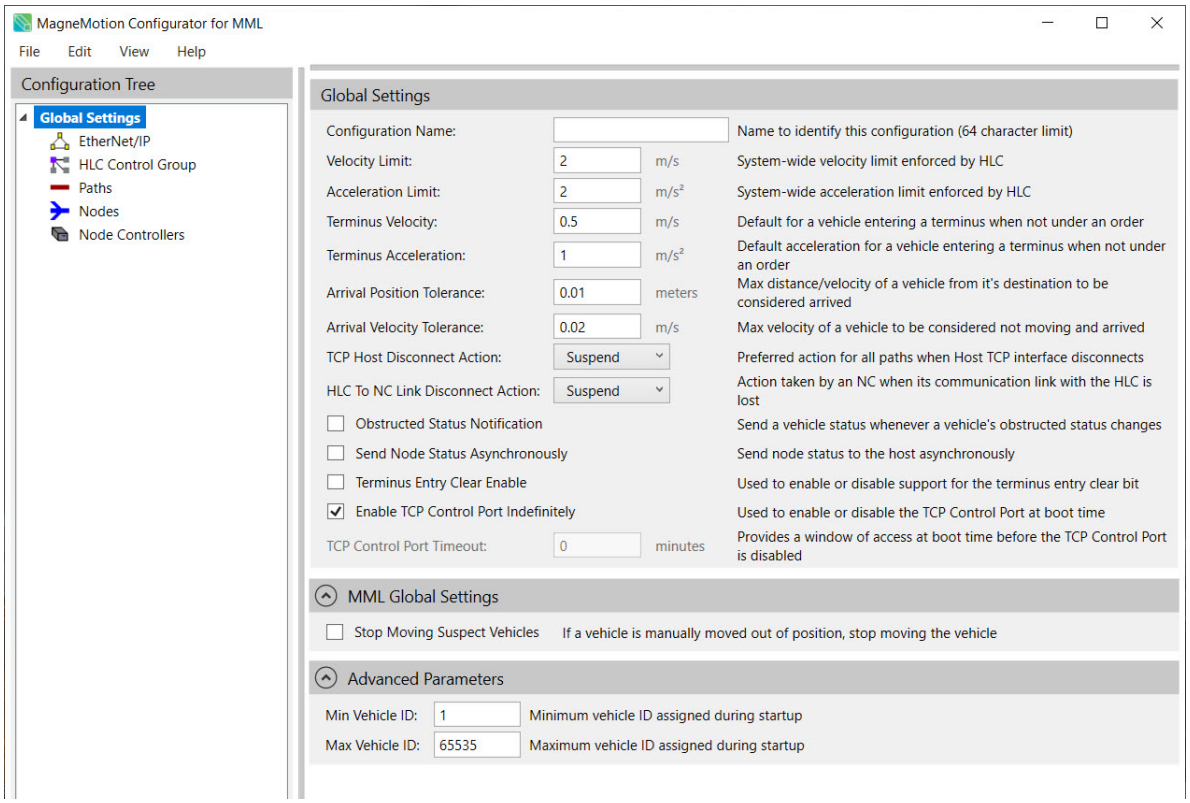


Figure 5-19: Global Settings Page with Advanced Parameters (MM Lite)

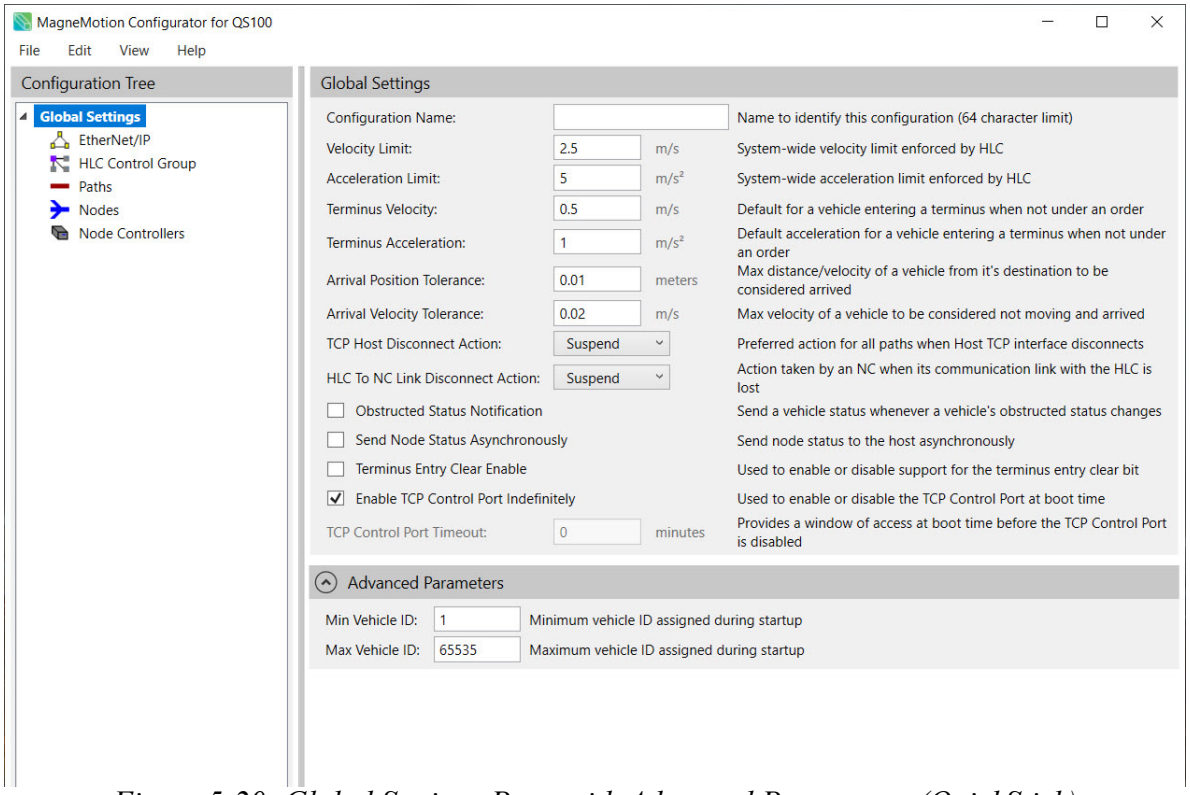


Figure 5-20: Global Settings Page with Advanced Parameters (QuickStick)

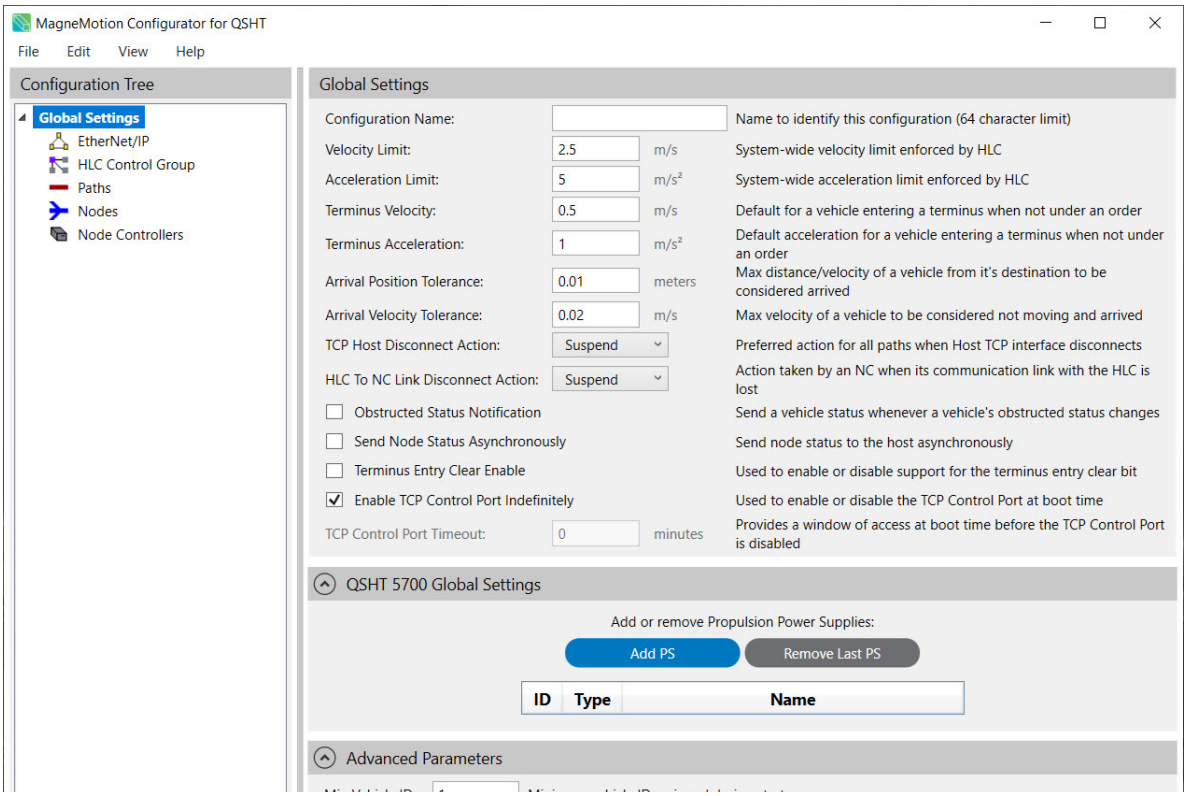


Figure 5-21: Global Settings Page with Advanced Parameters (QSHT)

Table 5-2: Global Setting Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Configuration Name	An optional name for the configuration for reference. If entered, this name is used to identify log files. Valid characters are: a…z, A…Z, 0…9, ~!@#$%^*()_ +`-={}|:"?[]\;',./ and space (64 characters maximum).	X	X	X
Acceleration Limit	Maximum acceleration/deceleration for all vehicles while they are on the transport system. The HLC rejects any vehicle motion commands that exceed this limit. The maximum acceleration can be set to any value within the limits of the transport system. The default is 2.0 m/s^2 (this value is system-dependent, see *Related Documentation* *on page 11* for the list of motor user manuals).	X	X	X
Velocity Limit	Maximum velocity for all vehicles while they are on the transport system. The HLC rejects any vehicle motion commands that exceed this limit. The maximum velocity can be set to any value within the limits of the transport system. The default is 2.0 m/s (this value is system-dependent, see (this value is system-dependent, see *Related Documentation* *on page 11* for the list of motor user manuals).	X	X	X
Terminus Acceleration	This setting applies only when there are Terminus nodes in the transport system and defines the acceleration/deceleration of the vehicle in the Terminus node as it enters and before it receives it's initial order. The maximum acceleration can be set to any value within the limits of the transport system. The default is 1.0 m/s^2.	X	X	X
Terminus Velocity	This setting applies only when there are Terminus nodes in the transport system and defines the velocity of the vehicle in the Terminus node as it enters and before it receives it's initial order. The maximum velocity can be set to any value within the limits of the transport system. The default is 0.5 m/s.	X	X	X

Table 5-2: Global Setting Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Arrival Position Tolerance	For all paths, the maximum distance that the vehicle can deviate from the actual destination for the HLC to consider the vehicle as arrived at its destination by monitoring motor status updates. If the tolerance is set too small, and the vehicle cannot stop within that tolerance, then the vehicle appears to have not arrived at its position and the transport system continues trying to move the vehicle to its destination. The default is 0.010 m.	X	X	X
NOTE: The Arrival Position Tolerance and Arrival Velocity Tolerance settings in the Global Settings are used to trigger an asynchronous vehicle status message to the host controller that provides the current position of the vehicle. A vehicle is not considered to have arrived at its destination by the HLC (even if the Arrival Position Tolerance is met) if the Arrival Velocity Tolerance is not met. When running Demo Scripts (see the *MagneMotion NCHost TCP Interface Utility User Manual,* publication MMI-UM010) setting the Arrival Position Tolerance to a large value (for example, 1.0 m) and setting the Arrival Velocity Tolerance to the system Velocity Limit supersedes the motor settings and allows uninterrupted motion as the system considers the vehicle to have arrived when it nears its target position, which allows the start of the next vehicle command for the vehicle without having the vehicle slow or stop.			
Arrival Velocity Tolerance	For all paths, the maximum velocity of a vehicle for the HLC to consider the vehicle as not moving by monitoring motor status updates. If the tolerance is set too small, and the velocity of the vehicle is not within the tolerance, the vehicle appears to have not arrived at its destination and the transport system continues trying to move the vehicle to its destination. The default is 0.020 m/s. If a Reset command is sent to the node controller via the host controller interface, vehicles are commanded to stop and are not considered stopped until within this tolerance. If on a Reset command, all vehicles do not come to a stop within 5 seconds the node controller resets the motors, which means they stop applying stopping force to the vehicles.	X	X	X
NOTE: The Arrival Velocity Tolerance and the Arrival Position Tolerance are used together to make sure that the vehicle has arrived. A vehicle is not be considered to have arrived at its destination by the HLC (even if the Arrival Velocity Tolerance is met) if the Arrival Position Tolerance is not met. When running Demo Scripts (see the *MagneMotion NCHost TCP Interface Utility User Manual,* publication MMI-UM010) setting the Arrival Velocity Tolerance to the system Velocity Limit and setting the Arrival Position Tolerance to a large value (for example, 1.0 m) supersedes the motor settings and allows uninterrupted motion as the system considers the vehicle to have arrived when it nears its target position, which allows the start of the next vehicle command for the vehicle without having the vehicle slow or stop.			

Table 5-2: Global Setting Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
TCP Host Disconnect Action	Identifies the action to be taken on all paths, in the event the TCP/IP interface to the host controller disconnects. The default is Suspend. **None:** No action is performed when a disconnect occurs. **Suspend:** Directs all motors on the specified paths to suspend vehicle target requests and permissions and causes all vehicles to come to a controlled stop. After the vehicle is stopped, the motors hold the vehicles in position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command. **FastStop*:** Directs all motors on the specified paths to apply maximum thrust, opposite to the current direction of motion for the vehicles on those paths.	X	X	X
Obstructed Status Notification	Select to have the HLC automatically send Vehicle Status (0xD5) messages that indicate a vehicle is obstructed sent asynchronously using the TCP/IP communications protocol whenever a vehicle becomes obstructed. Vehicles are obstructed when they are unable to acquire permission to move further because of a vehicle in the way, a hardware fault, or movement is suspended. The default is cleared (off).	X	X	X
NOTE: If enabled, this option can result in many Obstructed Vehicle Status messages being sent when vehicles are in a queue. If not enabled, the host controller must poll the HLC for vehicle status information. This setting does not apply to the EtherNet/IP™ communications protocol.				
Send Node Status Asynchronously	Select to have Node Status (0xD3) messages that indicate a change in a node sent asynchronously using the TCP/IP communications protocol whenever a node changes state. Nodes are considered to change state whenever a vehicle enters/exits the node, a switch changes position, and so on. The default is cleared (off).	X	X	X
NOTE: If enabled, this option can result in many node status messages being sent whenever any node changes state. If not enabled, the host controller must poll the HLC for node status information. This setting does not apply to the EtherNet/IP communications protocol.				

Table 5-2: Global Setting Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Terminus Entry Clear Enable	Select to enable support for the Terminus ENTRY_ CLEAR bit in the Node Status response from the HLC for handshaking Terminus nodes. If not selected, Terminus node operation remains unchanged with this bit masked to be always Off. The default is cleared (off).	X	X	X
Enable TCP Control Port Indefinitely	Select to enable the TCP/IP control port. The default is selected (on). **TCP Control Port Enable:** Must be selected for the TCP/IP control port to remain active indefinitely. **TCP Control Port Timeout:** Used when the TCP/IP control port enable is off. Provides a window of access at boot time before the TCP/IP control port is disabled. The maximum timeout is 60 minutes. The default is 0 min (no timeout).	X	X	X
HLC To NC Link Disconnect Action	Identifies the action to be taken on all paths, in the event the high level controller cannot communicate with a node controller. The default is Suspend. **Suspend:** Directs all motors on the specified paths to suspend vehicle target requests and permissions and causes all vehicles to come to a controlled stop. After the motor is stopped, the motors hold the vehicles in position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command. **FastStop*:** Causes all motors on the specified paths to apply maximum thrust, opposite to the current direction of motion for the vehicles on those paths.	X	X	X

Table 5-2: Global Setting Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Propulsion Power Supplies	The propulsion power supply parameters in the Global Settings identify all Kinetix® 2198-Pxxx DC-bus power supplies being used with QSHT 5700 Inverters. Only available for QSHT 5700 systems. **Add PS:** Adds a row to the power supply list. **Remove Last PS:** Removes the last row from the power supply list. **ID:** A Configurator specified unique ID number for each power supply. **Type:** Power supply type. Currently only DC-bus power supply is supported. **Name:** An optional name for the power supply for reference.	—	—	X
NOTE: Once all Propulsion Power Supplies have been created, each QSHT 5700 motor must be associated with a power supply. To configure, set the Propulsion Power Supply ID field in the Motor Defaults or Motor #n in Path n pages under QSHT 5700 Motor Parameters. See Propulsion Power Supply ID in Table 5-6 on page 227 for more information.				
Stop Moving Suspect Vehicles	Select to have the system stop moving vehicles that have been manually moved out of position. The default is cleared (off).	X	—	—

* This option is not available for MagneMover Lite.

EtherNet/IP Settings

- EtherNet/IP is used to communicate with an Allen-Bradley® ControlLogix® controller that is being used as a host controller (see the *MagneMotion Host Controller TCP/IP Communication Protocol User Manual,* publication MMI-UM003 and *MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual,* publication MMI-UM004). The EtherNet/IP Settings page (see Figure 5-22), is accessed by selecting the EtherNet/IP category from the Configuration Tree. See *Set EtherNet/IP Settings* *on page 78* for usage.

NOTE: If the host controller is using TCP/IP communications, do not enable this option or change the EtherNet/IP settings.

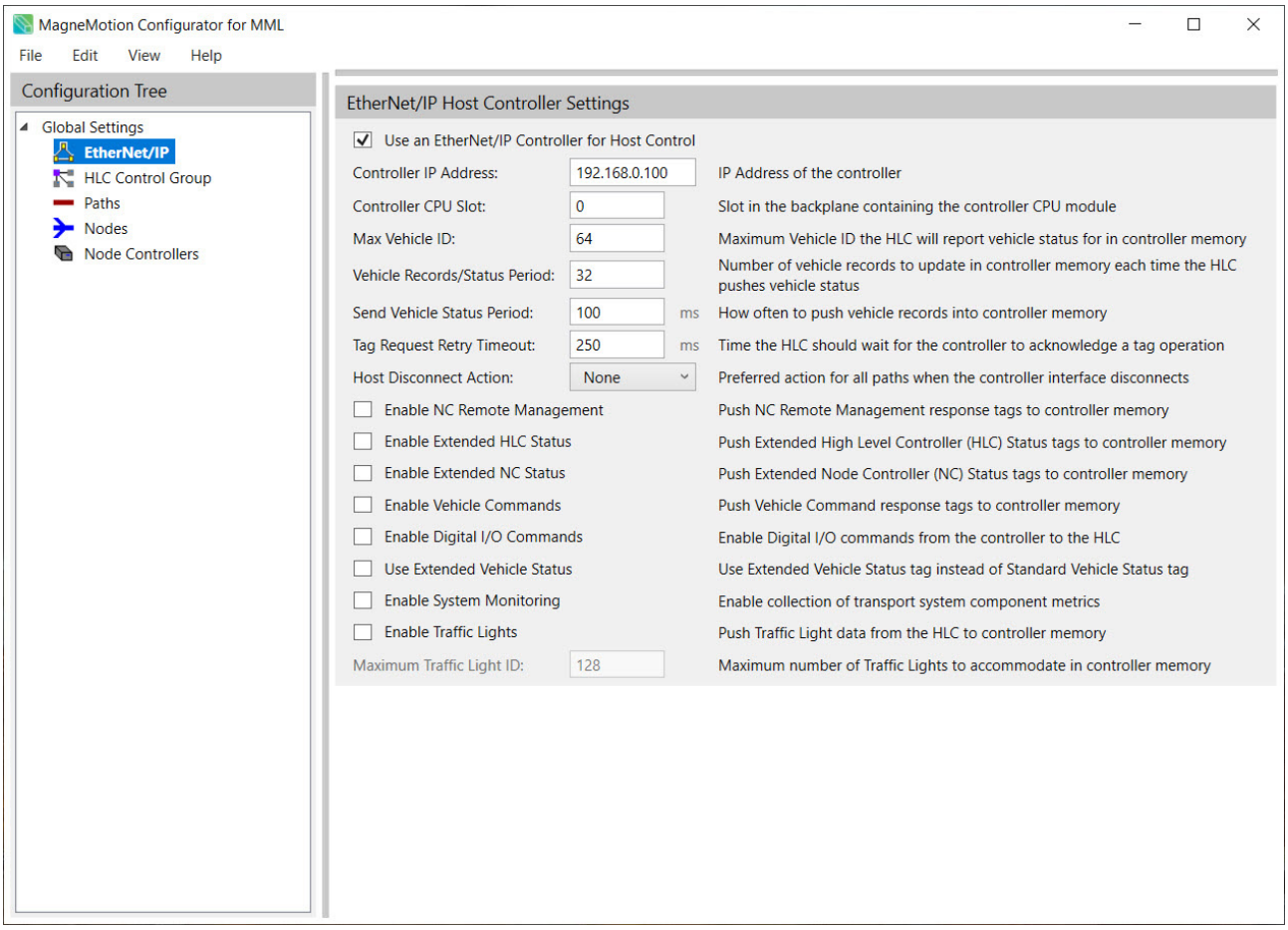


Figure 5-22: EtherNet/IP Settings Page (MM Lite)

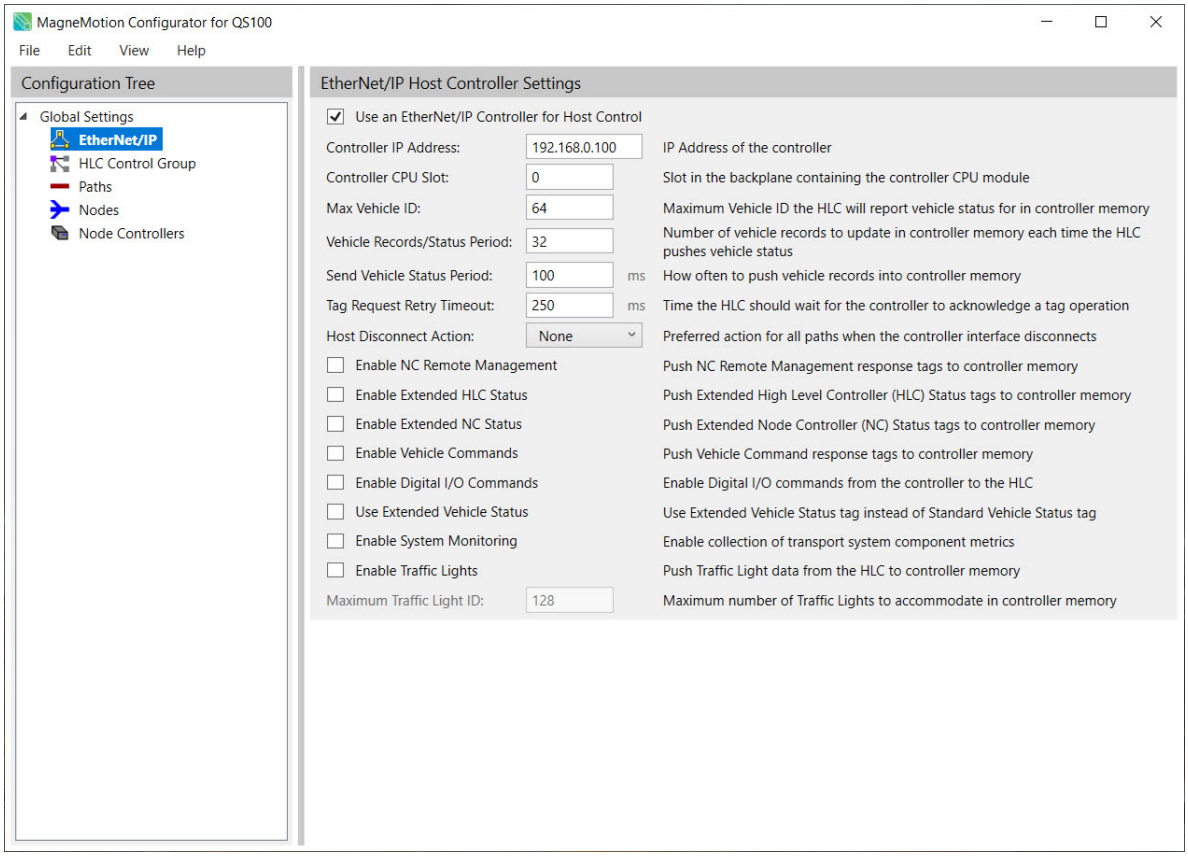


Figure 5-23: EtherNet/IP Settings Page (QucikStick)

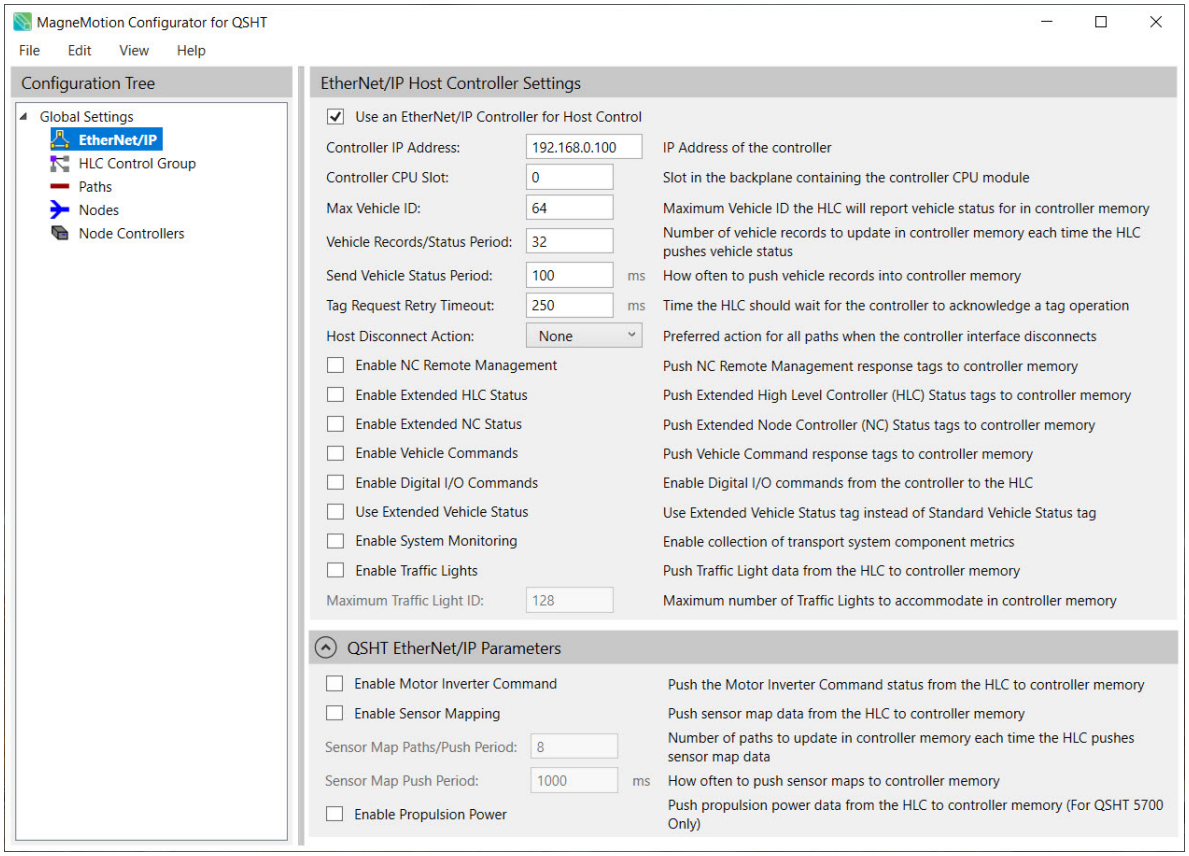


Figure 5-24: EtherNet/IP Settings Page (QSHT)

Table 5-3: EtherNet/IP Settings Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Use an EtherNet/IP Controller for Host Control	Select to enable control of the transport system via the EtherNet/IP protocol. The default is cleared (off).	X	X	X
Controller IP Address	The IP address of the EtherNet/IP interface in the host controller that the HLC (high-level controller) uses for communication.	X	X	X
Controller CPU Slot	The slot in the host controller that contains the CPU module that the HLC communicates with. This slot can be any slot and is typically a value from 0 to 13. The default is Slot 0.	X	X	X

Table 5-3: EtherNet/IP Settings Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Max Vehicle ID	Maximum quantity of vehicle IDs that the HLC reports vehicle status to the tag memory in the host controller. Used to limit the size of the MMI_ vehicle_status array. The default is 64 (the maximum is system-dependent, see *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013).	X	X	X
NOTE: Vehicle IDs greater than the Max Vehicle ID value are not reported. The Max Vehicle ID value that is specified in the Global Settings page must be equal to or smaller than the Max Vehicle ID value to make sure that status is reported for all possible vehicle IDs.				
Vehicle Records / Status Period	The quantity of vehicle records to update in the host controller memory each time the HLC pushes vehicle status to the host controller memory. When using standard Vehicle Status, the maximum is 224 and must be less than or equal to PLC Max Vehicle ID. The default is 32. When using Extended Vehicle Status, the maximum is 144 and must be less than or equal to PLC Max Vehicle ID. The default is 32.	X	X	X
Send Vehicle Status Period	How often to send vehicle status records (defined in Vehicle Records per Status Period) to the host controller memory in milliseconds. The maximum is 5000 ms (5 seconds). The default is 100 ms. When using a host controller with a slower CPU, this value can be increased. Do not set this setting too low when using a larger Vehicle Records per Status Period as the EtherNet/IP link could be saturated with traffic. If the setting for Vehicle Records per Status Period is a low number (for example, 16 or less), decrease this parameter to get vehicle status updates that are at least as current as the data in HLC memory.	X	X	X

Table 5-3: EtherNet/IP Settings Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Tag Request Retry Timeout	Time the HLC must wait for the host controller to acknowledge a tag operation in milliseconds. The minimum is 50 ms. Increase this value for a high latency network. The default is 250 ms. After three timeouts and retries of a tag request, the communications link is restarted. For fast low latency networks, this value can be lowered. For slow high latency networks, or when using a host controller with a slower CPU, this value can be increased to help prevent premature cycling of the link. The MMI_heartbeat tag is written at an interval three times (3x) this parameter (default every 750 ms).	X	X	X
Host Disconnect Action	Identifies the action to be taken on all paths in the event the EtherNet/IP interface to the host controller disconnects. The default is None. **None:** No action is performed when disconnect occurs. **Suspend:** Directs all motors on the specified paths to suspend vehicle target requests and permissions and causes all vehicles to come to a controlled stop. After the motor is stopped, the motors hold the vehicles in position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command. **FastStop*:** Causes the motor software to apply maximum thrust, opposite to that of each vehicle's current direction, halting each vehicle abruptly, and holding each vehicle at its halted position.	X	X	X
Enable NC Remote Management	Select to push node controller remote management response tags to the host controller memory. This selection allows up to 20 Managed Node Controller Configuration Files to be uploaded for a system. A managed Node Controller Configuration File can be activated on the HLC, and distributed to all node controllers system wide. The default is cleared (off).	X	X	X
Enable Extended HLC Status	Select to push extended HLC status tags to the host controller memory. The extended HLC status tag includes the software version, configuration ID, and configuration status of the HLC. The default is cleared (off).	X	X	X

Table 5-3: EtherNet/IP Settings Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Enable Extended NC Status	Select to push extended node controller status tags to the host controller memory. The extended node controller status tag includes the software version, configuration ID, and configuration status of the node controllers. The default is cleared (off).	X	X	X
Enable Vehicle Commands	Select to push vehicle command and response memory tags to the host controller memory. The vehicle subcommands supported include; Clear Suspect Bit, Delete Vehicle, and so on. The default is cleared (off).	X	X	X
Enable Digital I/O Commands	Select to enable the send and receive for Digital I/O Commands between the host controller and the HLC. The default is cleared (off).	X	X	X
Use Extended Vehicle Status	Select to use the MMI_extended_vehicle_status tag (see the *MagneMotion Host Controller TCP/IP Communication Protocol User Manual,* publication MMI-UM003 and *MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual,* publication MMI-UM004). Clear to use the MMI_vehicle_status tag. The default is cleared (off).	X	X	X
Enable System Monitoring	Select to enable the use of the system monitoring UDTs. The default is cleared (off).	X	X	X
Enable Traffic Lights	Select to push and read traffic light command and response memory tags to the host controller memory. The default is cleared (off). Max Traffic Light ID: Only enabled when Enable Traffic Lights is selected. Defines the maximum quantity of traffic lights to accommodate in the host controller memory. The default is 128.	X	X	X
Enable Motor Inverter Command †	Select to enable the use of the motor inverter control UDTs. Only available for QSHT 5700 systems. The default is cleared (off).	—	—	X
NOTE: This feature is only active on certain custom configurations.				

Table 5-3: EtherNet/IP Settings Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Enable Sensor Mapping †	Select to enable the use of the sensor-mapping UDTs. Only available for QSHT systems. The default is cleared (off). **Sensor Maps Paths / Push Period:** Only enabled when Enable Sensor Mapping is selected. Specifies the quantity of paths to update in the host controller memory each time the HLC pushes QuickStick HT motor sensor map data to the host controller memory. The default is 8. **Sensor Map Push Period:** Only enabled when Enable Sensor Mapping is selected. Specifies the period (in milliseconds) to send the next batch of QuickStick HT motor sensor map data to the host controller memory. The default is 1000 ms.	—	—	X
Enable Propulsion Power†	Select to push propulsion power supply status tags to the host controller memory. Only available for QSHT 5700 systems. The default is cleared (off).	—	—	X

* This option is not available for MagneMover Lite.

† This parameter is only for the QSHT 5700.

See the *MagneMotion Host Controller TCP/IP Communication Protocol User Manual,* publication MMI-UM003 and *MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual,* publication MMI-UM004 for additional information on using TCP/IP or EtherNet/IP communication protocols.

HLC Control Group Settings

The HLC Control Group is used only when the transport system has been subdivided into smaller transport systems where each subsystem has its own high-level controller (HLC) and you desire to have Vehicle ID management across the transport system. The HLC Control Group Settings page is used to identify the HLC of one of these subsystems as the Vehicle ID Server HLC. The Vehicle ID Server HLC provides Vehicle ID management across the HLC Control Group when Gateway nodes are used to transfer vehicles from one subsystem to another (see *Gateway Node* *on page 252*).

The HLC Control Group Settings page (see Figure 5-25), is accessed by selecting the HLC Control Group category from the Configuration Tree. See *Defining HLC Control Groups* *on page 80* for usage.

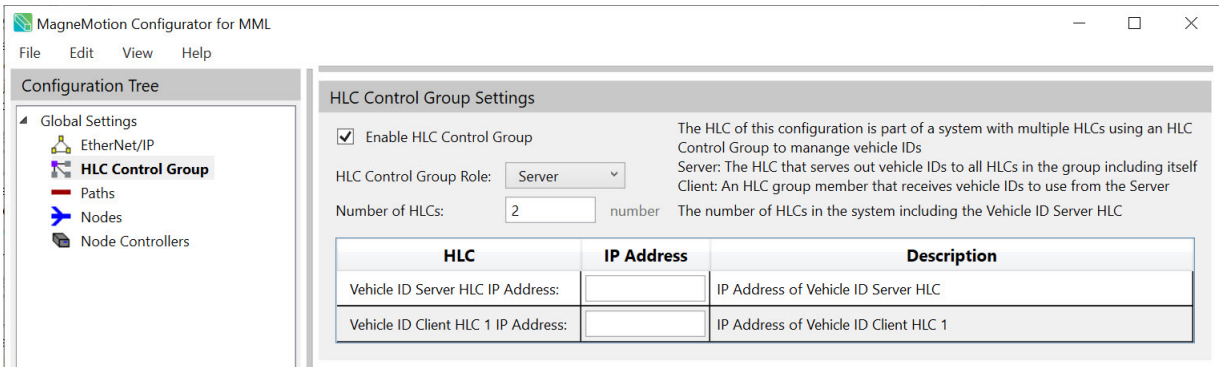


Figure 5-25: HLC Control Group Settings Page

Table 5-4: HLC Control Group Settings Parameters

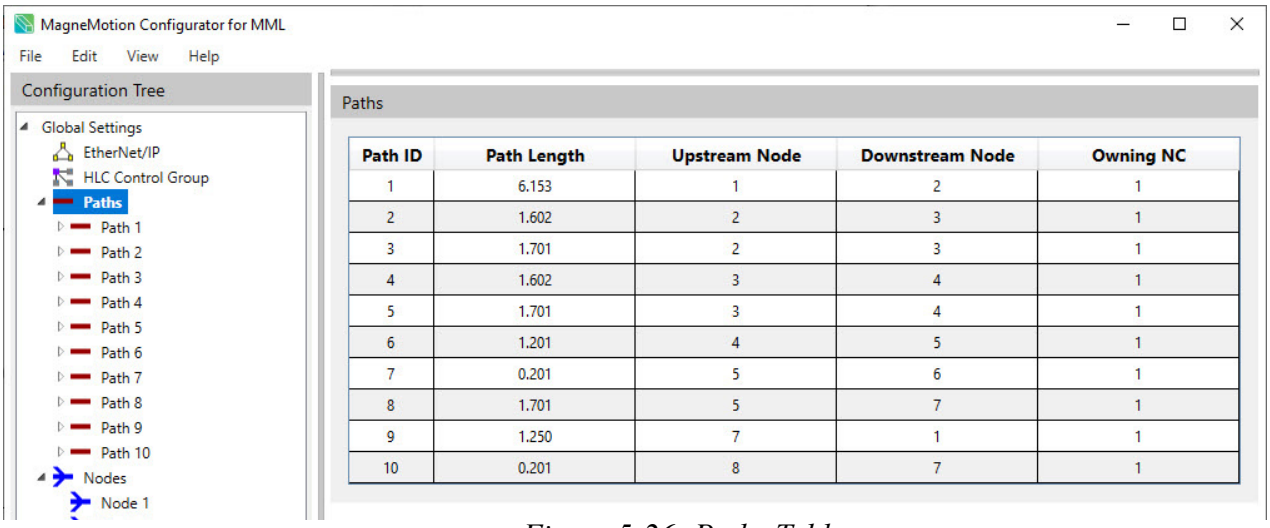
Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Enable HLC Control Group	Select if the HLC of this configuration is part of a transport system with multiple HLCs using an HLC Control Group for Vehicle ID management.	X	X	X
HLC Control Group Role	Identifies the role of this configuration's HLC within the HLC Control Group. **Server**: The HLC that manages all the Vehicle ID numbers within the HLC Control Group. **Client**: An HLC Control Group manager that receives the Vehicle ID numbers from the Server.	X	X	X
NOTE: When using an HLC Control Group, only one subsystem can be defined as the Vehicle ID Server. The HLCs for all other subsystems must be defined as Vehicle ID Clients.				

Table 5-4: HLC Control Group Settings Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Number of HLCs	The quantity of subsystems within the HLC Control Group. The HLC that is acting as the Vehicle ID Server is included in this count (that is, a HLC Control Group with one server and one client has two HLCs). Only available vehicle the HLC Control Group Role is defined as Server. The default is 2.	X	X	X
HLC Master IP Address	The IP address of the Vehicle ID Server HLC within the HLC Control Group. Only available vehicle the HLC Control Group Role is defined as Server.	X	X	X
HLC Slave *n* IP Address	The IP address of each Vehicle ID Client HLC within the HLC Control Group. Only available vehicle the HLC Control Group Role is defined as Server.	X	X	X

Paths

The *View Paths Table on page 86* provides a view only overview for the defined paths. There are links to the associated components for an alternate navigation through the file. Selecting Paths from the Configuration Tree displays a table of information about all paths that are defined in the configuration, see Figure 5-26.



Path ID	Path Length	Upstream Node	Downstream Node	Owning NC
1	6.153	1	2	1
2	1.602	2	3	1
3	1.701	2	3	1
4	1.602	3	4	1
5	1.701	3	4	1
6	1.201	4	5	1
7	0.201	5	6	1
8	1.701	5	7	1
9	1.250	7	1	1
10	0.201	8	7	1

Figure 5-26: Paths Table

Paths are used to define the route that a vehicle travels. The Path Details page for Path 1, see Figure 5-27. Select any path from the Paths list in the Configuration Tree to access the details page for that path. See *Create and Edit Path on page 89* for usage.

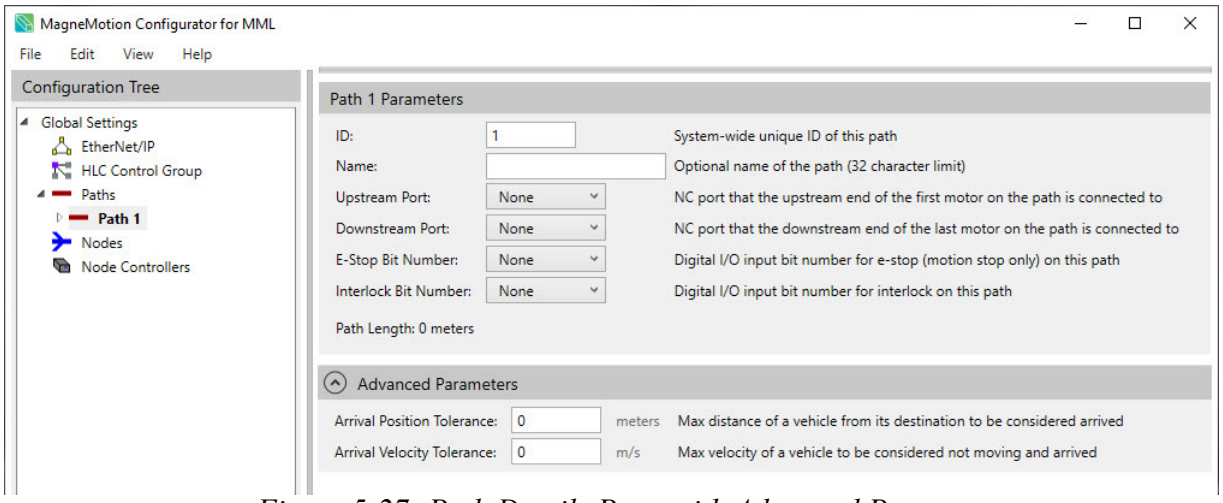


Figure 5-27: Path Details Page with Advanced Parameters

Table 5-5: Paths Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
ID	A unique numerical identifier for the path (must be a positive integer).	X	X	X
Name	An optional name for the path for reference. This name is not used, or displayed, by the transport system. Valid characters are: a…z, A…Z, 0…9,~!@#$%^*()_+`-={}|:"?[]\;',./ and space (32 characters maximum).	X	X	X
Upstream Port	Identifies the port where the upstream end of the path is connected. The upstream ends of all paths must connect to a node controller. The default is None. **Serial Motors (RS-422):** Select the port that is connected to the path via an RS-422 communication cable. **Ethernet Motors:** Select Ethernet.	X	X	X
Downstream Port	Identifies the port where the downstream end of the path is connected. The downstream ends of paths only connect to node controllers if vehicles will move past the path end onto another path. The default is None. **Serial Motors (RS-422):** Select the port that is connected to the path via an RS-422 communication cable. **Ethernet Motors:** Select Ethernet.	X	X	X
E-Stop Bit Number	Provides a menu that lists all the digital input bits in the node controller. This bit is used to monitor an optional E-Stop button for this path. The default is None. See the *MagneMotion Node Controller Hardware User Manual*, publication MMI-UM013to determine the Digital I/O options for the node controller.	X	X	X
Interlock Bit Number	Provides a menu that lists all the digital input bits in the node controller. This bit is used to monitor an optional interlock for this path. The default is None. See the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013 to determine the Digital I/O options for the node controller.	X	X	X
Length	The total length of the path as calculated from the motor sections included in the path. If the number or type of motors, or the spacing between motors is changed, this value can change.	X	X	X

Table 5-5: Paths Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Startup Style *	Identifies the method to use during startup when there is a vehicle on the path. **Standard:** Used for vehicles that are shorter than the length of the path. During startup the motors are commanded to move the vehicle to an empty motor block so the sensors in the motor can detect the front edge of the magnet array. **Edge Reveal:** Used for vehicles that are longer than the length of the path. During startup the motors are commanded to move the vehicle in the specified direction until the edge of the array at the end of the magnet array at the opposite end of the array can be detected by the sensors in the motor. The default is Upstream. • **Upstream:** Vehicles are moved upstream to detect the downstream edge of the magnet array while locating the vehicle. To allow the magnet array to move beyond the upstream end of the path, an Overtravel node must be placed at the upstream end of the path. • **Downstream:** Vehicles are moved downstream to detect the upstream edge of the magnet array while locating the vehicle. To allow the magnet array to move beyond the downstream end of the path, either an Overtravel node must be placed at the downstream end of the path or a large downstream gap must be defined for the last motor on the path.	—	—	X
Arrival Position Tolerance	Used when the tolerance for this path must differ from the global setting (see *Global Setting Parameters on page 203* for the Arrival Position Tolerance parameter description). The default is 0.0 m (use the Global Settings value).			
Arrival Velocity Tolerance	Used when the tolerance for this path must differ from the global setting (see *Global Setting Parameters on page 203* for the Arrival Position Tolerance parameter description). The default is 0.0 m/s (use the Global Settings value).			

* This parameter is only for the QSHT 5700.

Motors

Motors are used to move the vehicles on the track. To simplify configuration, Motor Defaults are used to predefine the motor settings on a path before they are added. After motors have been added to a path, changes to specific motor parameters, such as motor type, can be made. The individual motor pages provide a subset of the parameters on the Motor Defaults page. See *Define and Edit Motors and Vehicle Parameters* *on page 91* for usage.

Motor Defaults

The Motor Defaults page (see Figure 5-28), is accessed by selecting Motor Defaults under a path in the Configuration Tree. See *View or Edit Motor Defaults and Parameters* *on page 91* for usage. This page provides the default settings for all motors added to the path where it is located.

NOTE: Changes made to the parameters in the Motor Defaults page are propagated to all motors that have already been added to a path. Any parameter that has been changed for a specific motor is not affected if changes are made on the Motor Defaults page.

After a motor has been added to a path, changes to parameters specific to the individual motor are made using the motor-specific configuration pages. To display the configuration page for a motor, select the Motor ID assigned to that motor in the Configuration Tree. Motor-specific pages contain a subset of the parameters that are displayed on the Motor Defaults page.

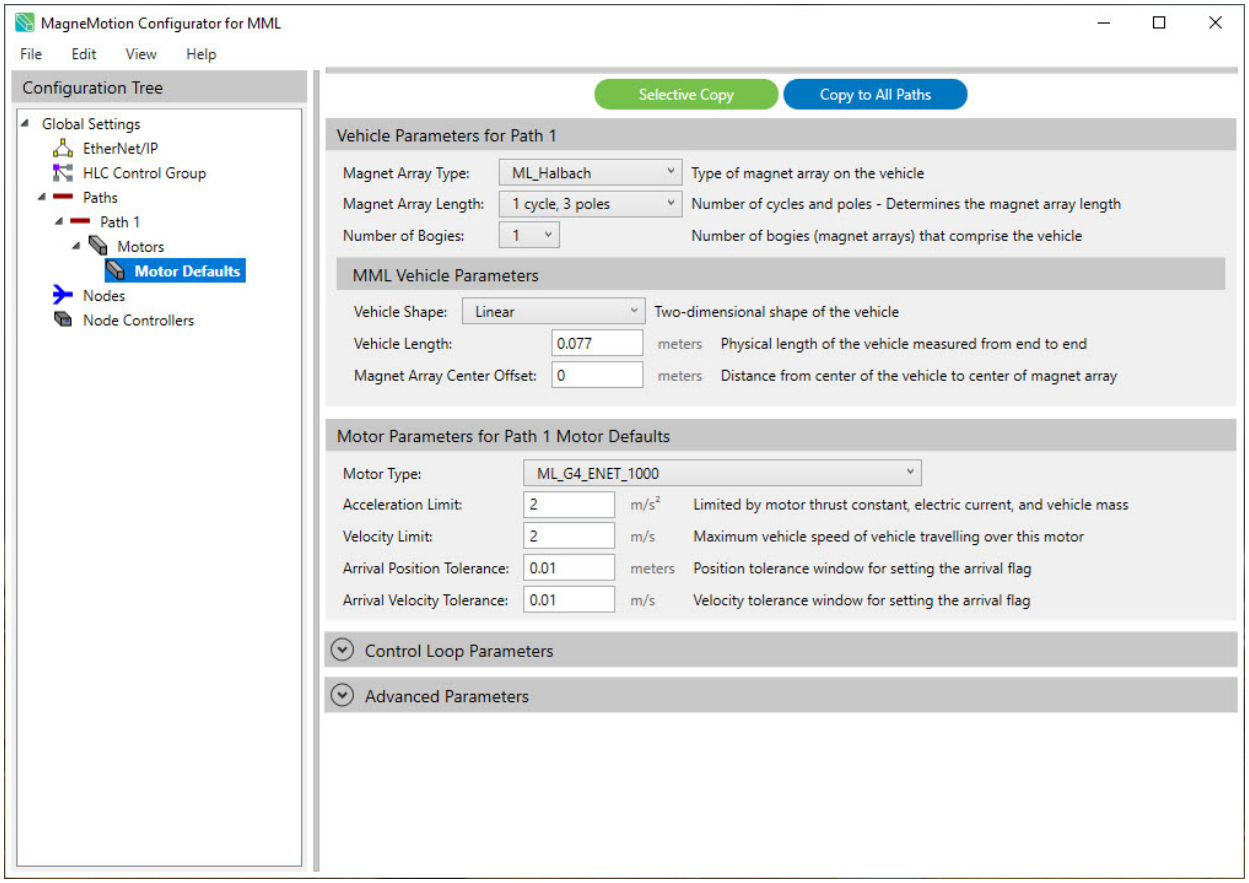


Figure 5-28: Motor Defaults Page (MM Lite)

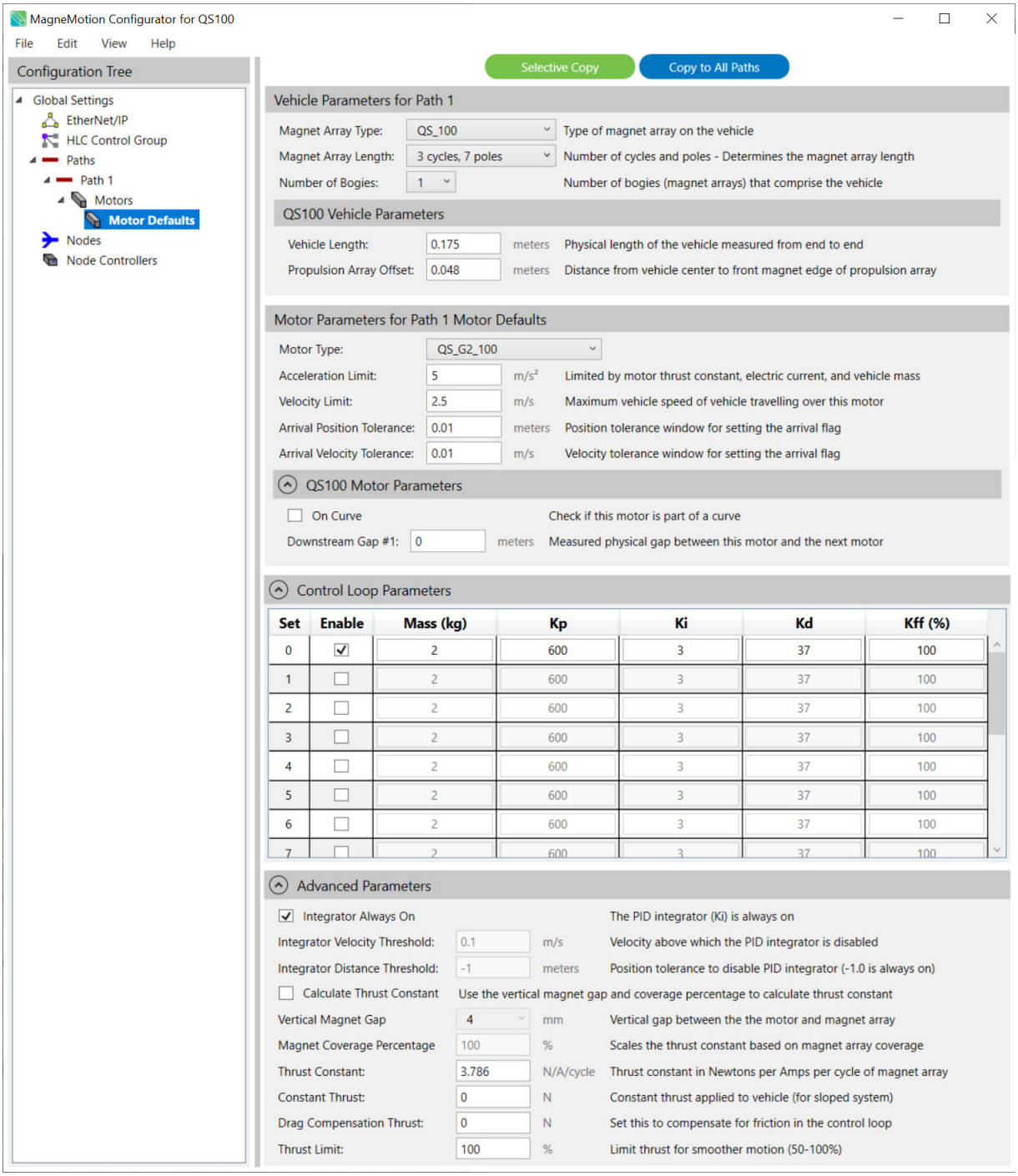


Figure 5-29: Motor Defaults Page (QucikStick)

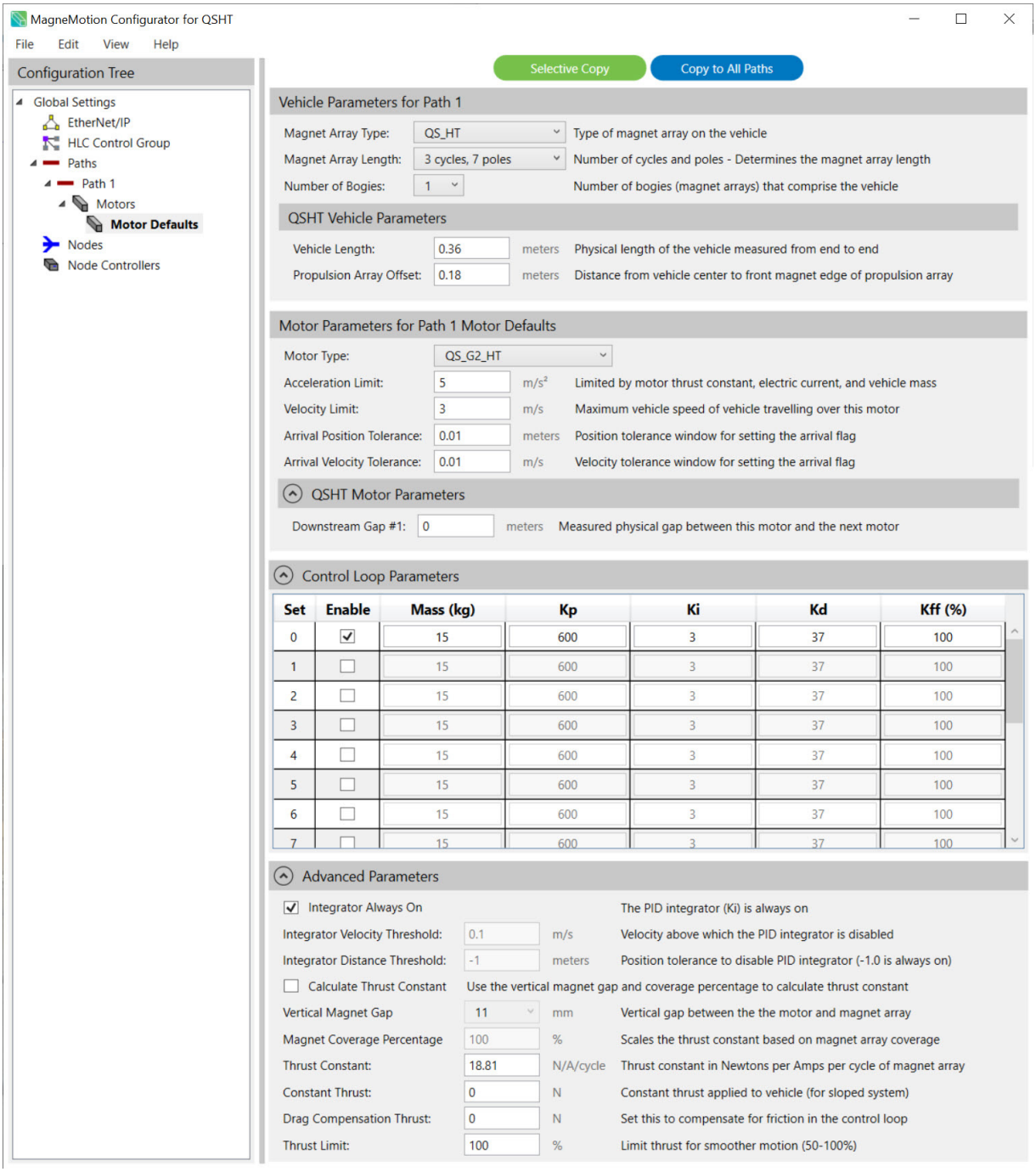


Figure 5-30: Motor Defaults Page (QSHT)

Motor #*n* in Path *n*

The Motor page (see Figure 5-31), is accessed by selecting a specific motor under a Path in the Configuration Tree. This page provides the settings for each individual motor on the path where it is listed. See *Define and Edit Motors and Vehicle Parameters on page 91* for usage. The parameters that are presented are described in Table 5-6 on page 227.

NOTE: The Control Loop Parameters section is only displayed when the Show Per Motor Control Loop Parameters option is selected in the View menu in the Configurator Menu Bar.

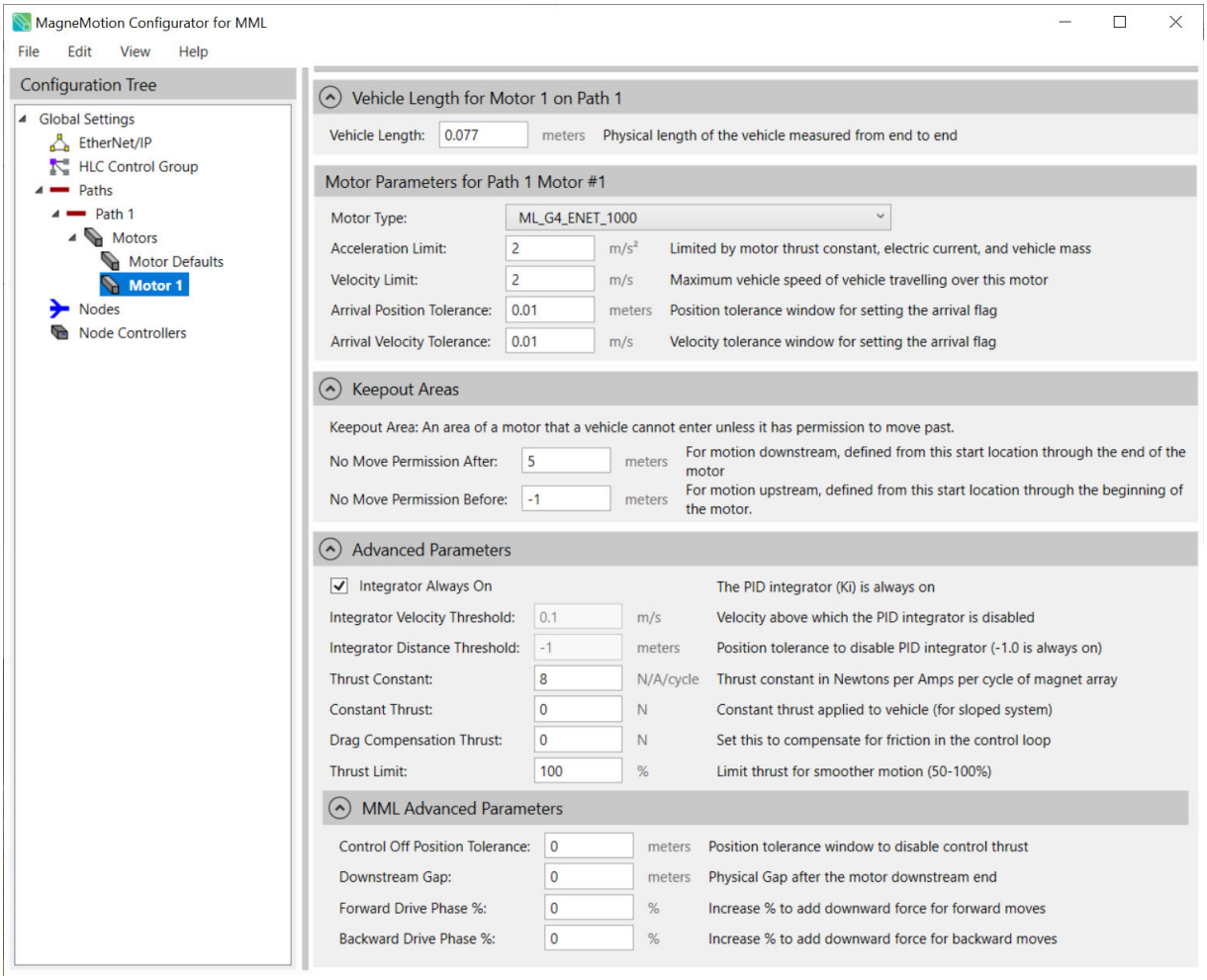


Figure 5-31: Motor Page - MagneMover Lite

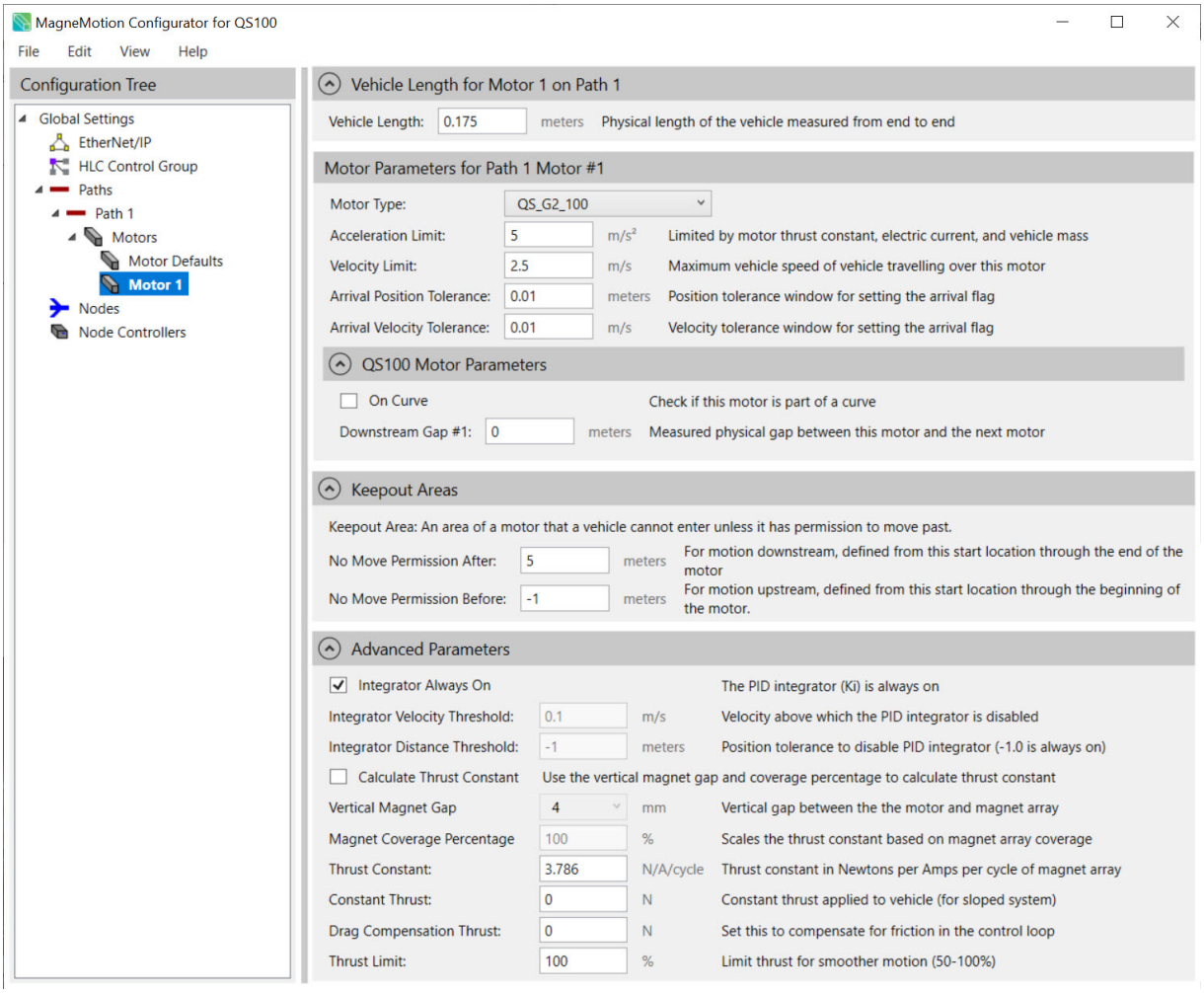


Figure 5-32: Motors Page - QuickStick 100

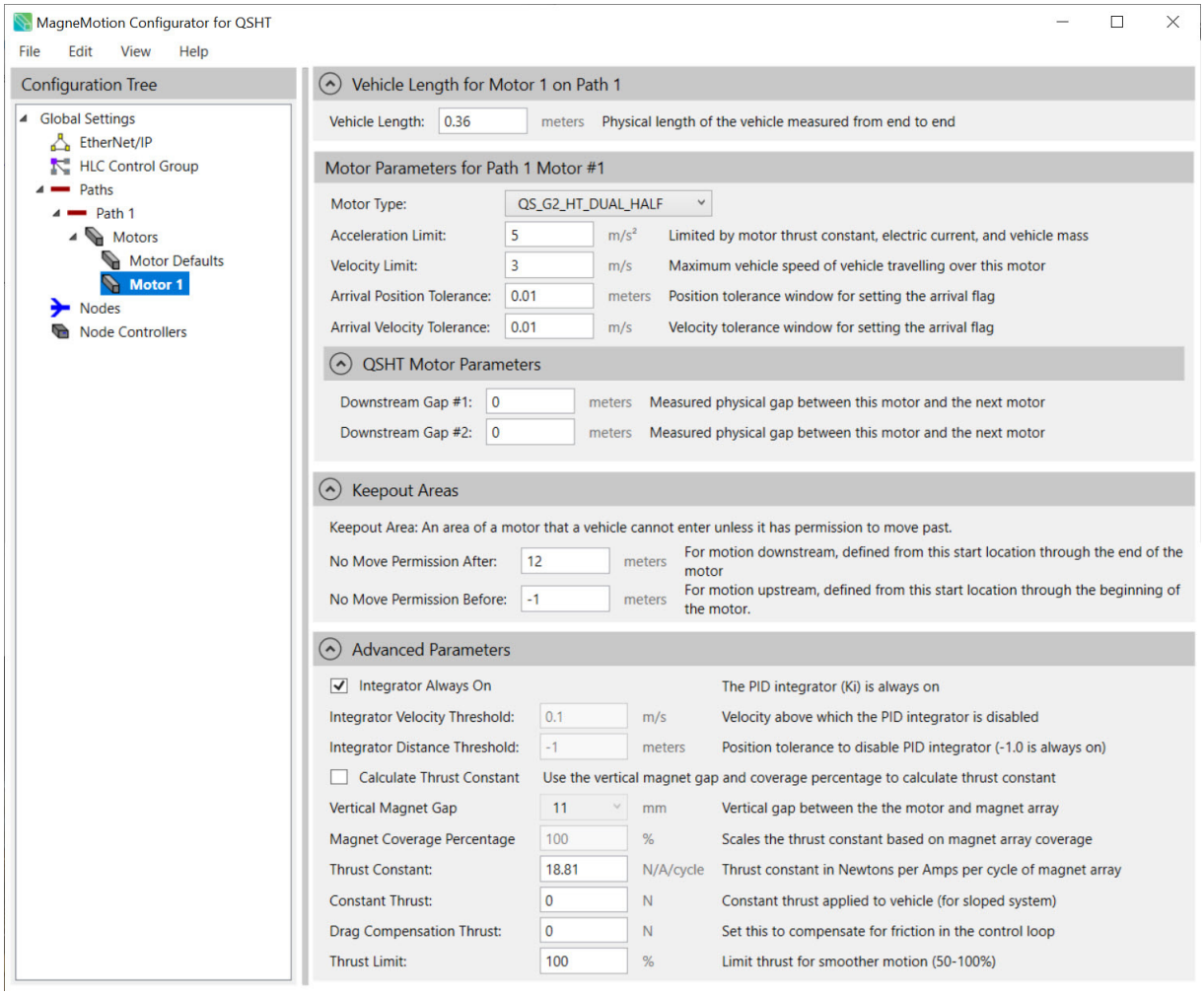


Figure 5-33: Motor Page - QuickStick HT

Table 5-6: Vehicle and Motor Parameters

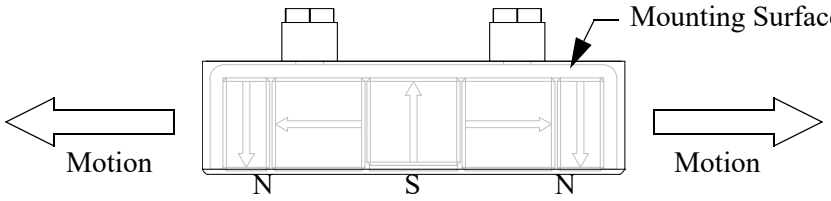
Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Vehicle	Any **Vehicle** parameters are only available through **Motor Defaults.**				
	Magnet array type	The magnet array type options are populated based on the System Type. To change system types, select File > System Type. **MagneMover Lite:** Select if the transport system is using MM Lite motors. The default MM Lite motor is ML_ Halbach. ML_Halbach is a special arrangement of permanent magnets (see Figure 5-34), placed perpendicular to the direction of motion that augments the magnetic field on the side of the array that faces the motor while canceling the field to near zero on the other side. **QuickStick**: Select if the transport system is using QuickStick motors. The default for QuickStick is QS_100. **QuickStick HT:** Select if the transport system is using QSHT motors. The default for QSHT is QS_HT.	X	X	X
					

Figure 5-34: Side View of Halbach Array, 1 Cycle, 3 Poles

Table 5-6: Vehicle and Motor Parameters (Continued)

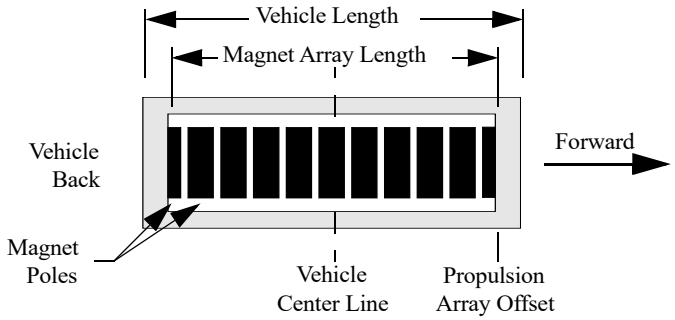
Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Magnet array length	Provides a menu listing the available lengths of the magnet array type that is selected for movement and position sensing. The magnet array length is determined by the total quantity of cycles and poles in the magnet array (Figure 5-34 shows a MM Lite 1 cycle, 3 pole Halbach magnet array). **Cycles:** The quantity of North-South-North pole groups. **Poles**: The quantity of poles in the array (two cycles share one North pole).	X	X	X
	Vehicle Length QuickStick	Physical length of the vehicle measured from end to end (see Figure 5-35). The length is typically defined as longer than the actual vehicle length to account for the vehicle's corners in curves (based on the actual vehicle geometry and curve radius). The Vehicle Length should include any overhang from the payload the vehicle is transporting, see *Define Vehicle Defaults for QuickStick and QSHT* *on page 101*. Also available for individual motors when Advanced Parameters is selected. The default is 0.175 m.	—	X	X
					

Figure 5-35: Vehicle and Magnet Array Length

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Vehicle Length MM Lite	When the Vehicle Shape is set to Linear, this is the physical length of the vehicle in meters (0.062 m to 1.50 m) as measured from end-to-end. If the track has curves or switches in it, the Vehicle Length must be configured to account for the corners of the vehicle in curves (based on the vehicle geometry and curve radius, see Figure 5-36) to help keep vehicles from colliding with each other when moving through curves. See Figure 4-25, *Vehicle Length in Curves, on page 96*. The Vehicle Length must include any overhang from the payload the vehicle is transporting, see *Define Vehicle Defaults for MM Lite™ on page 97*. Available through Motor Defaults, or for individual motors when the Advanced Parameters option is selected. When using a standard 62 mm x 62 mm vehicle, the vehicle length must be configured as 77 mm, which adds 15 mm to the standard vehicle length to account for the corners of the vehicle when moving through curves. When using a standard 62 mm x 150 mm double-bogie tandem vehicle, the Vehicle Length must be configured as 165 mm to account for the corners when moving through curves.	X	—	—

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Magnet Array Center Offset	When the Vehicle Shape is set to Linear, this is the distance from the physical center of the vehicle to the physical center of the propulsion array in meters (+/- 500 mm). A positive value specifies the magnet array is downstream from the center of the vehicle (that is, at the vehicle front). A negative value specifies the magnet array is upstream from the center of the vehicle. See Figure 4-26, Figure 4-27, and Figure 4-28 on page 99. When a tandem vehicle is being used, this is the distance from the center of the vehicle to the mid-point between the two magnet arrays. When the Vehicle Shape is set to Rectangular, this is disabled and displays the last value entered. The default is 0.0 m. The Magnet Array Center Offset and the Vehicle Length are used to define the location of the front and rear edges of the vehicle when using linear dimensions for collision avoidance purposes.	X	—	—
	Vehicle Shape	Identifies the type of vehicle in use. The default is Linear.	X	—	—
		Linear: Only the length of the vehicle is used for collision avoidance. On curved paths, a longer length must be specified, see Figure 5-36 to account for the effects of the width of the vehicle, which causes extra space between vehicles on a straight path.	X	—	—

Table 5-6: Vehicle and Motor Parameters (Continued)

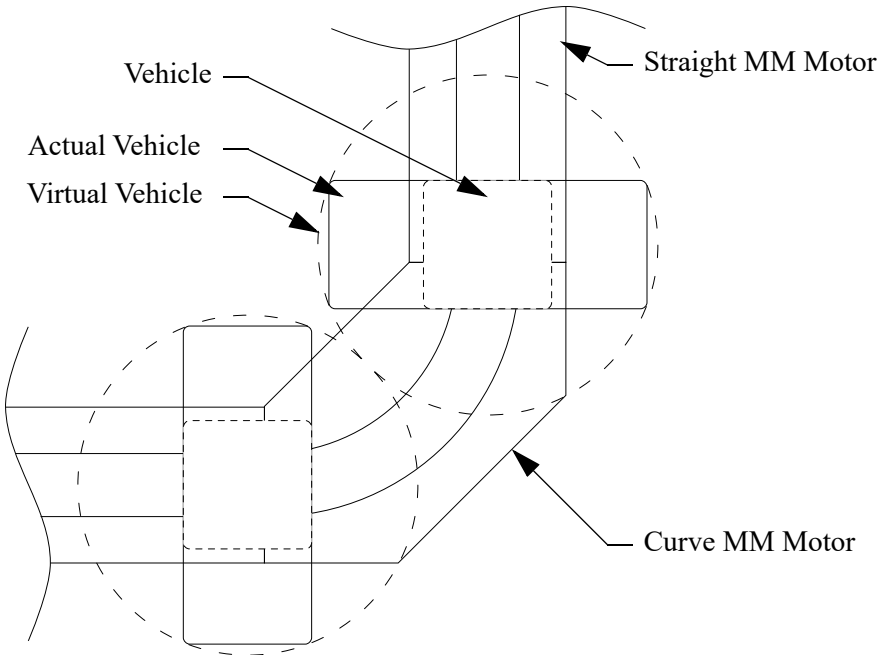
Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
		 *Figure 5-36: Linear Vehicle*			
		Rectangular: The length, width, and position of the magnet array are used for collision avoidance, see Figure 5-37. The system performs all necessary calculations to provide proper spacing of vehicles without collision in both curves and straight sections of a path.	X	—	—

Table 5-6: Vehicle and Motor Parameters (Continued)

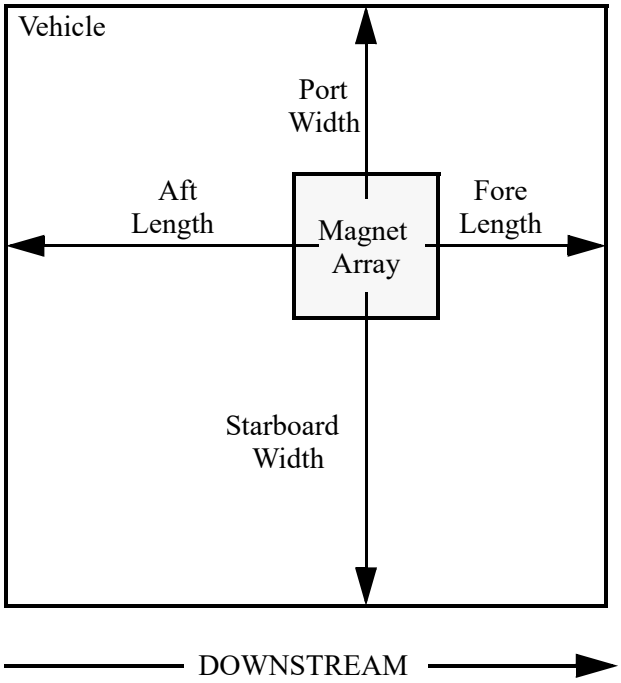
Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
		 *Figure 5-37: Rectangular Vehicle*			
	Fore Length	The physical distance from the center of the magnet array to the front of the vehicle in meters (0.031…0.2125 m). Only available when a vehicle shape of Rectangular is selected. See Figure 5-37, *Rectangular Vehicle, on page 232*.	X	—	—
	Aft Length	The physical distance from the center of the magnet array to the back of the vehicle in meters (0.031…0.2125 m). Only available when a vehicle shape of Rectangular is selected.	X	—	—

Table 5-6: Vehicle and Motor Parameters (Continued)

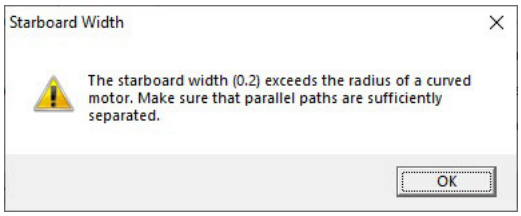
Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Starboard Width	The physical distance from the center of the magnet array to the starboard (right) side of the vehicle in meters (0.031…0.2125 m). Only available when a vehicle shape of Rectangular is selected. If the value entered is larger than the radius of a curve motor, the Configurator displays a warning, see Figure 5-38. This notice is displayed as a reminder to verify the spacing of parallel paths to make sure that vehicles do not collide.	X	—	—
	 *Figure 5-38: Vehicle Width Warning Alert*				
	Port Width	The physical distance from the center of the magnet array to the port (left) side of the vehicle in meters (0.031…0.2125 m). Only available when a vehicle shape of Rectangular is selected. If the value entered is larger than the radius of a curve motor, the Configurator displays a warning, see Figure 5-38.	X	—	—

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Number of Bogies	The quantity of sections on the bottom of a vehicle that contain magnet arrays. Single bogie vehicles contain one fixed magnet array. Double bogie vehicles (tandem vehicles) contain two magnet arrays, typically each magnet array is fixed to a pivoting vehicle section with a linkage that connects those vehicles to each other. Double bogies are used to provide additional thrust or movement of larger loads. Available through Motor Defaults only. The default is 1.	X	X	X
	NOTE: All vehicles in the transport system must use the same quantity of bogies.				
	Gap Between Bogies	The space between the inner edges of the magnet arrays on each of the vehicles. Only applies when there are double bogies on the vehicles. Units are in cycles (1 cycle = 48 mm for QuickStick and 120 mm for QSHT). The number entered must be an integer. For example, if the magnet arrays are QS_100 and are separated by 200 mm, enter ‘4’ (200/48 ~ 4). Only available through Motor Defaults. The default is 0 cycles.	—	X	X
	Interbogie Position Correction	Corrects the skewing of independent magnet arrays when the vehicle travels on curves in the transport system. It only applies when there are double bogies on the vehicles. It is the Edge-to-edge distance between the magnet arrays when on a curve. Contact Rockwell Automation® TechConnect for additional information on setting this parameter. Only available through Motor Defaults. The default is 0 m.	—	X	X

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Propulsion Array Offset	Distance from the physical center of the vehicle to the forward edge of the propulsion array (see Figure 5-35 on page 228). Only available through Motor Defaults. The default is 0.048 m. The Propulsion Array Offset and the Vehicle Length are used to define the location of the front and rear edges of the vehicle for collision avoidance purposes.	—	X	X
Motor					
	Motor Type	Provides a menu that lists the available motor types for selection of the type of motor being used according to the transport system layout. See Table 4-2 on page 104 for motor types and descriptions based on system type. The motor type options are populated based on the System Type. To change system types, select File > System Type.	X	X	X
	Acceleration Limit	Upper acceleration/deceleration limit to set for the motor. Make sure that the limit set is within the specification of the motor family, otherwise overshooting and collisions are possible. If the value is less than the system limit, vehicle motion that exceeds the value that is specified is limited to the specified value. The default is 2.0 m/s^2 (this value is system-dependent, see the system maximums that are shown in (this value is system-dependent, see *Related Documentation on page 11* for the list of motor user manuals).	X	X	X

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Velocity Limit	Upper velocity limit to set for the motor. Make sure that the limit set is within the specification of the motor family. In some instances, this limit can be lower than the velocity maximum specified for the path where the motor is located. For example, if a section of the path requires the motors enforce a lower velocity (to slow down for a curve for instance), those motors near the curve can have a lower velocity limit. If the value is less than the system limit, vehicle motion that exceeds the value that is specified is limited to the specified value. The default is 2.0 m/s (this value is system-dependent, see the system maximums that are shown (this value is system-dependent, see *Related Documentation* *on page 11* for the list of motor user manuals).	X	X	X
	Arrival Position Tolerance	The maximum distance that a vehicle can deviate from its actual destination for the motor to consider the vehicle as having arrived at its destination. If the tolerance is set too small, and the vehicle cannot stop within that tolerance, then the vehicle appears to have not arrived at its commanded position and the motor continues trying to move the vehicle to its destination. The default is 0.010 m.	X	X	X
	NOTE: The Arrival Position Tolerance and the Arrival Velocity Tolerance are used together to make sure that the vehicle has arrived. A vehicle is not considered to have arrived at its destination by the motor (even if the Arrival Position Tolerance is met) if the Arrival Velocity Tolerance is not met. When a vehicle arrives within the Arrival Position and Velocity Tolerances, the motor notifies the HLC by asynchronously sending a move command complete message. This does not trigger an asynchronous message from the HLC to the Host controller. The Host controller is updated about the arrival based on the Global Settings or Path Settings only.				

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Arrival Velocity Tolerance	The maximum velocity of a vehicle for the motor to consider the vehicle as not moving and having arrived at it's destination. If the tolerance is set too small, and the vehicle cannot reach a velocity within the tolerance, then the vehicle appears to have not arrived at its commanded position and the motor will continue trying to move the vehicle to its destination The default is 0.010 m/s.	X	X	X
	NOTE: The Arrival Velocity Tolerance and the Arrival Position Tolerance are used together to make sure that the vehicle has arrived. A vehicle is not considered to have arrived at its destination by the motor (even if the Arrival Velocity Tolerance is met) if the Arrival Position Tolerance is not met. When a vehicle arrives within the Arrival Velocity Tolerance and the Arrival Position Tolerance, the motor notifies the HLC by asynchronously sending a move command complete message that provides the current position of the vehicle. This does not trigger an asynchronous message from the HLC to the Host controller. The Host controller is updated about the arrival based on the Global or Path settings only.				
	On Curve	Select if the QuickStick motor is located on a curve on the transport system layout. The default is cleared (off). See *QuickStick 100 User Manual*, publication MMI-UM006 or the *QuickStick 150 User Manual*, publication MMI-UM047 for additional information. **Curve Correction Slot ID:** Enabled if On Curve is selected. Indicate the slot ID of the curve correction table in the Web Interface to be used for this motor. Default is 1.	—	X	—

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Downstream Gap #1	The physical space between the rear end of one motor and the front end of the next abutting motor (also referred to as the Motor Gap). When using QSHT Dual Half motors, the Downstream Gap #1 is used for the gap between the two motors. The default is 0.0 m. The minimum space is 2.0 mm. See Figure 4-36 on page 108.	—	X	X
	Downstream Gap #2 *	The physical space between the rear end of one motor and the front end of the next abutting motor (also referred to as the Motor Gap). The Gap Downstream #2 parameter only applies when using 1 m QSHT and QSHT Dual Half motors. The default is 0.0 m. The minimum space is 2.0 mm. See Figure 4-36 on page 108.	—	—	X
	NOTE: The additional distance, inside the motor, from the end of the stator to the end of the motor housing, for both ends of abutting motors is automatically added to this distance and is specific to the motor type and size. For detailed information about calculating the motor gap based on the motor type, see either the *QuickStick 100 User Manual*, publication MMI-UM006, the *QuickStick 150 User Manual,* publication MMI-UM047*, or the QuickStick HT User Manual*, publication MMI-UM007.				

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	NC Disconnect Action *	Provides a menu listing the action to be taken by the motor, in the event the NC communication link disconnects. The default is None. **None:** No action is performed when a disconnect occurs. **Suspend:** Directs the motor to suspend vehicle target requests and permissions and causes all vehicles on the motor to come to a controlled stop. After the motor is stopped, the motor holds the vehicles in position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command. **FastStop:** Directs the motor to apply maximum thrust, opposite to the current direction of motion for all vehicles on the motor. After the motor is stopped, the motor holds the vehicles in position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command.	—	X †	X †

Table 5-6: Vehicle and Motor Parameters (Continued)

Parameter Group	Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
	Digital Input #*n* *	Provides a menu listing the actions available for the motor to take when the selected QSHT 5700 Inverter digital input is low. Only available for QSHT 5700 systems. The default is None. **None:** No action is performed. **Suspend:** Directs the motor to suspend vehicle target requests and permissions and causes all vehicles on the motor to come to a controlled stop. After the motor is stopped, the motor holds the vehicles in position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command. **FastStop:** Directs the motor to apply maximum thrust, opposite to the current direction of motion for all vehicles on the motor. After the motor is stopped, the motor holds the vehicles in position. Stopping time for each vehicle is dependent on the mass of the vehicle, the payload, and the acceleration setting of its current movement command.	—	—	X
	Propulsion Power Supply ID *	The ID of the propulsion power supply for this QSHT 5700 motor, which is identified on the Global Settings page. Only available for QSHT 5700 systems. The default is 1.	—	—	X

* This option is not available for MagneMover Lite.

† This option is for QuickStick 150 and QSHT 5700 only, it is not for QuickStick 100 or QSHT.

Control Loop Parameters

16 sets of Control Loop Parameters are available for configuration and use for PID loop control. Specific sets of parameters can be specified through either the Host Controller TCP/IP Communication Protocol or the Host Controller EtherNet/IP Communication Protocol. Available through Motor Defaults, or for individual motors when Show Per Motor Control Loop Parameters is selected.

- **Set 0 (Unloaded)** – Always enabled. Predefined as the set to be used for unloaded vehicles when Set 1 is also enabled.
- **Set 1 (Loaded)** – If enabled, predefined as the set to be used for loaded vehicles.
- **Sets 2…14** – Available for defining various payload and velocity requirements.
- **Set 15** – Predefined as the startup PID values. This PID set is automatically used during startup. If it is not enabled (unchecked), PID Set 0 is scaled by 25% and used for startup.

Different PID sets can be defined to account for such things as incremental changes in payload and to meet desired vehicle acceleration and velocity during operation. After the PID is defined in the Configurator, and saved in the Node Controller Configuration file, a PID set becomes available for use in vehicle move commands. Vehicle move commands are executed through either the Host Controller TCP/IP Communication Protocol, the Host Controller EtherNet/IP Communication Protocol, or the NCHost TCP Interface Utility. When a move command is issued, the sending application references a specific PID Set by its index number, as defined in the Configuration file.

The checkbox must be selected (checked) in order for the parameters for a specific PID Set to be saved and available to the host application(s) from the Configuration File when the specified control loop parameter set is specified in a command:

Table 5-7: Control Loop Parameters

Parameter Name *	Parameter Description	MM Lite	Quick Stick	QSHT
Set	PID set index used by the Host Controller to identify which control loop values to use for a motion command.	X	X	X
Enable	Select to enable the use of the specific **Set**. The default is cleared (unchecked) for all sets except Set 0. Only sets that are enabled can be specified in motion commands.	X	X	X
Mass (kg)	The mass of the vehicle (vehicle + magnet_array + payload). The default value varies by system type and quantity of bogies.	X	X	X
Kp	Kp is the control loop proportional gain, it controls the amount of force applied proportional to the position error.	X	X	X
Ki	Ki is the control loop integral gain, it controls the amount of force applied proportional to the integral loop gain error, correcting errors in position over time.	X	X	X

Table 5-7: Control Loop Parameters (Continued)

Parameter Name *	Parameter Description	MM Lite	Quick Stick	QSHT
Kd	Kd is the control loop derivative gain, it controls the amount of force applied proportional to the velocity error, providing damping in the control loop.	X	X	X
Kff	Kff is the control loop feed forward scale, it increases or decreases the feedforward force without affecting other control loop gains. The feedforward force normally applies the correct amount of force to achieve the desired acceleration based on the specified mass.	X	X	X

* For each PID Set, the all parameters apply.

Advanced Parameters

Table 5-8: Advanced Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Drag Compensation Thrust	Used to compensate for friction. This force is applied in the direction that a vehicle moves to arrive at the destination and ramps down to zero when near the destination. The default is 0.0 N.	X	X	X
Constant Thrust	Defines the constant thrust that is applied to vehicles for sloped transport systems. The default is 0.0 N.	X	X	X
Thrust Limit	Limits the maximum thrust that is applied to a vehicle to a percentage of available motor thrust. Lowering the thrust limit achieves smoother motion. The default is 100%.	X	X	X
Integrator Always On	The Integrator Velocity Threshold and Integrator Distance Threshold options are ignored when selected. This setting must be cleared if vehicles on the motor are held at a specific position by an external mechanism to help prevent PID Loop windup. The default is selected (on). **Integrator Velocity Threshold:** The velocity below which the PID Control Loop Integrator is enabled. The default is 0.1 m/s. **Integrator Distance Threshold:** The distance to the destination below which the PID Control Loop Integrator is enabled. If set to -1.0 m, the integrator is always on unless disabled due to another setting. The default is -1.0 m.	X	X	X

Table 5-8: Advanced Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Thrust Constant *	Select Calculate Thrust Constant to enable the use of the Vertical Magnet Gap and Magnet Coverage Percentage to calculate the Thrust Constant. Vertical Magnet Gap and Magnet Coverage Percentage is enabled, and Thrust Constant is disabled. When off, Vertical Magnet Gap and Magnet Coverage Percentage is disabled, and Thrust Constant is enabled to allow manual entry of the desired value. The default is unselected (off). **Vertical Magnet Gap**: The measured vertical gap between the top of the motor and the bottom of the magnet array in mm. QuickStick default is: 4 mm QSHT default is: 11 mm **Magnet Coverage Percentage**: Scales the thrust constant based on the magnet array coverage percentage for stations on this motor. Use 100% coverage if the magnet array is shorter than the motor when the vehicle is at it's destination. The default is 100%. **Thrust Constant**: Thrust constant of the motor per cycle of the engaged magnet array. One cycle for a standard MM Lite magnet array is 54.5 mm long and consists of one full-size magnet array and two half-size magnets in a Halbach array. When the magnet array consists of multiple cycles (like one QuickStick and QSHT system), the half-size magnets from adjacent cycles are combined into one full-size magnet. The thrust constant varies with the vertical gap between the magnet and the motor and the magnet coverage percentage. MM Lite default is: 8.0 N/A/cycle QuickStick default is: 3.786 N/A/cycle QSHT default is: 18.81 N/A/cycle	X	X	X
Downstream Gap MM Lite	The physical space between motors. Do not change this setting for a standard MM Lite installation. The default is 0.003 m.	X	—	—
Control Off Position Tolerance	The distance to the destination below which the PID Control Loop is disabled (no thrust is applied due to the control loop). Thrust is not enabled until the distance from the destination is twice this value. The default is 0.0 m.	X	—	—

Table 5-8: Advanced Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Forward Drive Phase %	Controls the amount of downward force that is applied to the vehicle during forward (downstream) moves as a percentage of the thrust force. Increasing the percentage increases the downward force. The default is 0%.	X	—	—
Backward Drive Phase %	Controls the amount of downward force that is applied to the vehicle during backward (upstream) moves as a percentage of the thrust force. Increasing the percentage increases the downward force. The default is 0%.	X	—	—
Use Smart Integrator	When checked, enables the use of the smart integrator feature. Smart integrator controls the integral term of the PID Control Loop to apply a consistent force when the vehicle is at standstill, allowing better compensation for cogging. **Smart Integrator On Distance:** Enable the smart integrator when the distance to the target falls below this value. Default is 0 m. **Smart Integrator Off Distance:** Disable the smart integrator when the distance to the target becomes larger than this value. Default is 0 m. **Smart Integrator Delay:** Time the vehicle must be within the Smart Integrator On Distance before the smart integrator enables. Default is 0 ms.	—	X	—

Table 5-8: Advanced Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Use Hold Down Current †	When checked, enables the use of the hold down feature. Hold down force applies a vertical force to the magnet array, increasing the attractive force to the track. This increases friction and decreases the effect of disturbances on the vehicle while at rest. **Hold Down On Distance:** Enable hold down when the distance to the target falls below this value. Default is 0 m. **Hold Down Off Distance:** Disable hold down when the distance to the target becomes larger than this value. Default is 0 m. **Hold Down Magnitude:** Current (in Amps) to apply to holding down a vehicle. Default is 0 A.	—	X	—
Use EMP	When checked, enables the use of the Electro-Magnetic Pinning (EMP) feature. EMP applies a lateral force to the vehicle that increases as the vehicle is moved away from its target independent of the control loop. this reduces motion while in station and compensates for disturbances. **EMP On Distance:** Enable EMP when the distance to the target falls below this value. Default is 0 m. **EMP Off Distance:** Disable EMP when the distance to the target becomes larger than this value. Default is 0 m. **EMP Magnitude:** Current (in Amps) to apply to pinning a vehicle. Default is 0 A.	—	X	—

* The Thrust Constant parameter is available for all system types. The Calculate Thrust Constant, Vertical Magnet Gap, and Magnet Coverage Percentage are only for QuickStick and QSHT.

† The magnitude of the hold down current and EMP combined must be less than the continuous current limit of the motor to prevent overheating

Keepout Areas

Keepout Areas are sections of a path where the motors do not allow a vehicle to enter unless it has permission (from the motors) to move fully past the area. It is typically used near merge points to keep two vehicles from merging onto one path simultaneously or in areas where some other action needs to occur that requires the area to be clear (such as closing a fire door). If vehicle movement is suspended (E-Stop, Interlock, or a Suspend command is issued), any vehicle in the Keepout Area moves beyond the Keepout Area and then decelerates to a stop. See *Create and Edit Nodes on page 119* for usage.

A vehicle that enters a Keepout Area in the direction of the Keepout Area takes ownership of all motor blocks within the Keepout Area. A Keepout Area in one direction does not affect the motion of vehicles moving in the other direction unless there is a vehicle within the Keepout Area moving in the direction of the Keepout Area. If vehicle movement is suspended (E-Stop, Interlock, or a Suspend command is issued), any vehicle in the Keepout Area moving in the direction of the Keepout Area moves beyond the Keepout Area and then decelerates to a stop.

NOTE: Keepout Areas can start anywhere on a motor but must always end at the end of a motor.

Table 5-9: Keepout Area Parameters

Parameter Name *	Parameter Description	MM Lite	Quick Stick	QSHT
No Move Permission Before	For vehicles moving upstream, the position relative to the start of the motor where the Keepout Area begins. All motors in the desired area must have this value set correctly for proper operation. Maximum is 6.0 m. The default is 0.0 m (not in a Keepout Area).	X	X	X
No Move Permission After	For vehicles moving downstream, the position relative to the start of the motor where the Keepout Area begins. All motors in the desired area must have this value set correctly for proper operation. The default is 5.0 m (not in a Keepout Area).	X	X	X

* These parameters do not exist on the Motor Default page, only on the individual motor pages.

Nodes

Nodes are used to define the connections between paths. The Node page (see Figure 5-39), is accessed by expanding the Nodes list in the Configuration Tree and selecting the appropriate node. See *Create and Edit Nodes on page 117* for usage. The parameters pages for the different node types are provided after the description of the basic nodes page. Only the additional parameters for each node type are described.

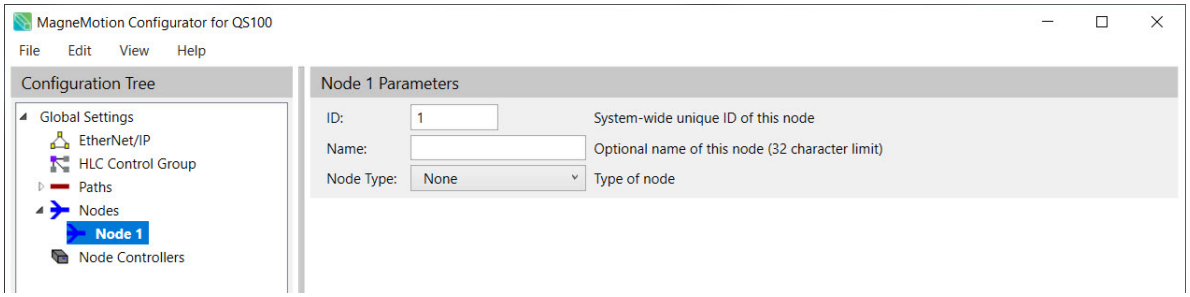


Figure 5-39: Node Page

Table 5-10: Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
ID	A unique numerical identifier for the node, it must be a positive integer.	X	X	X
Name	An optional name for the node for reference. If used, the name is displayed on the node controller parameters page.	X	X	X
Node Type	Provides a menu that lists all available node types. The default is None. The node types vary based on system type. **None:** The node type has not been specified. **Simple:** Begins a path. **Relay:** Connects the end of a path and the beginning of a path. **Terminus:** Connects a path on the transport system to an external system to allow vehicles to move to or from the transport system. **Gateway:** Connects two independent paths, with each path managed by separate HLC Control Groups. Separate HLCs must be configured to manage each independent control group. **Merge:** Connects two paths to a third path. **Diverge:** Connects one path to two additional paths. **Merge-Diverge:** Connects two paths to two additional paths. **Overtravel –** Permits a vehicle to move past the end of the motor at the beginning or end of a path**.** **Moving Path –** Connects Paths, mounted on a Host-controlled mechanism that moves those Paths to other Paths at multiple locations.	X	X	X

Simple Node

A Simple node is used to begin a path that is not connected to anything else at the upstream end. See *Simple Node* *on page 121* for configuration. The additional parameters for the Simple node are described after Figure 5-40.

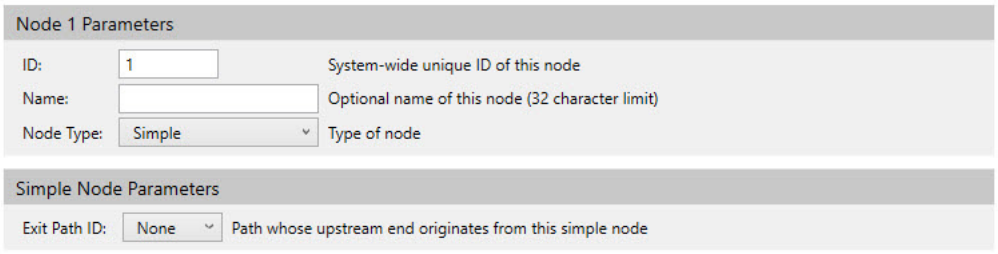


Figure 5-40: Simple Node Parameters

Table 5-11: Simple Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Exit Path ID	Provides a menu that lists all paths in the transport system for selection of the path that exits the node. The default is None.	X	X	X

Relay Node

A Relay node is used to connect the downstream end of a path and the upstream end of a path. See *Relay Node on page 123* for configuration. The additional parameters for the Relay node are described after Figure 5-41.

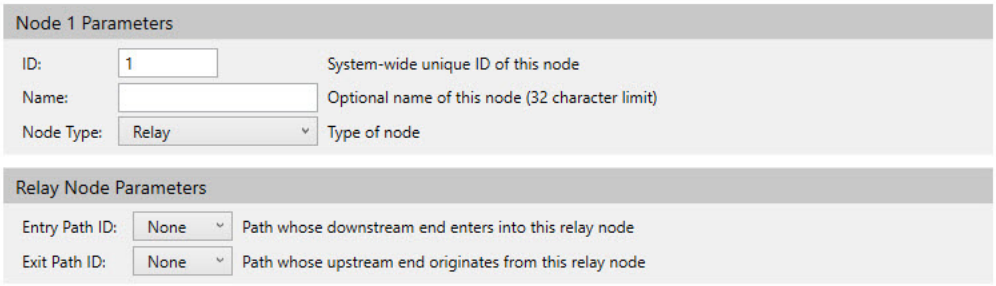


Figure 5-41: Relay Node Parameters

Table 5-12: Relay Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Entry Path ID	Provides a menu that lists all paths in the transport system for selection of the path that enters the node. The default is None.	X	X	X
Exit Path ID	Provides a menu that lists all paths in the transport system for selection of the path that exits the node. The default is None.	X	X	X

Terminus Node

A Terminus node is used to move vehicles to or from another system. See *Terminus Node on page 124* for configuration. It may be located at either the upstream or downstream end of a path. The additional parameters for the Terminus node are described after Figure 5-42.

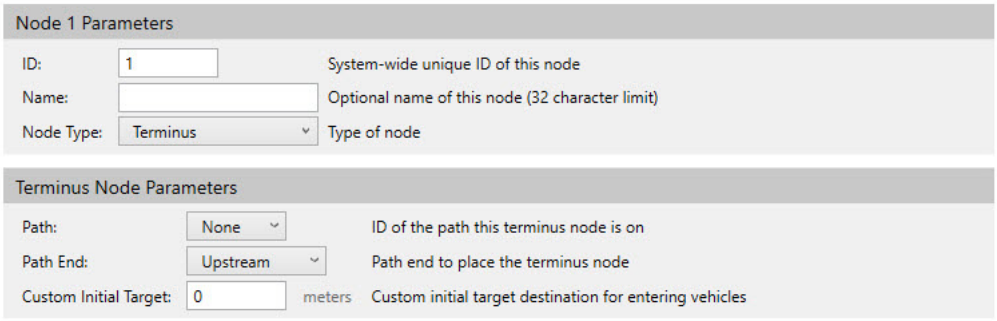


Figure 5-42: Terminus Node Parameters

Table 5-13: Terminus Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Path	Provides a menu that lists all paths in the transport system for selection of the path where the node is located. The default is None.	X	X	X
Path End	Provides a menu for selection of the path end where the node is located. The default is Upstream. **Downstream:** The node is located at the downstream end of the path (end of the path). **Upstream:** The node is located at the upstream end of the path (beginning of the path).	X	X	X
NOTE: Typically the upstream end is used to bring vehicles into the transport system and the downstream end is used to remove vehicles from the transport system. However, vehicle motion can be bidirectional, which allows movement in either direction at either end of the path.				
Custom Initial Target	Initial target destination on the specified Path for vehicles entering the transport system through this node.	X	X	X

Gateway Node

A Gateway node is used for connecting paths between independent transport systems. These independent transport systems may or may not be linked using an HLC Control Group. After the Gateway node is configured, vehicles are able to pass freely between transport system subsystems (each managed by its own HLC). If the subsystems are linked using an HLC Control Group, vehicles passing between subsystems will keep their assigned Vehicle ID.

NOTE: There is a maximum of two Gateway nodes per node controller, one upstream and one downstream. The Gateway nodes do not need to be on the same path.

- - The upstream Gateway node in a gateway pair has a corresponding downstream node on another node controller belonging to another subsystem of the transport system.
- - The downstream Gateway node in a gateway pair has a corresponding upstream node on another node controller belonging to another subsystem of the transport system.

The additional parameters for the Gateway node are described after Figure 5-43. See *Gateway Node* *on page 138* for configuration.

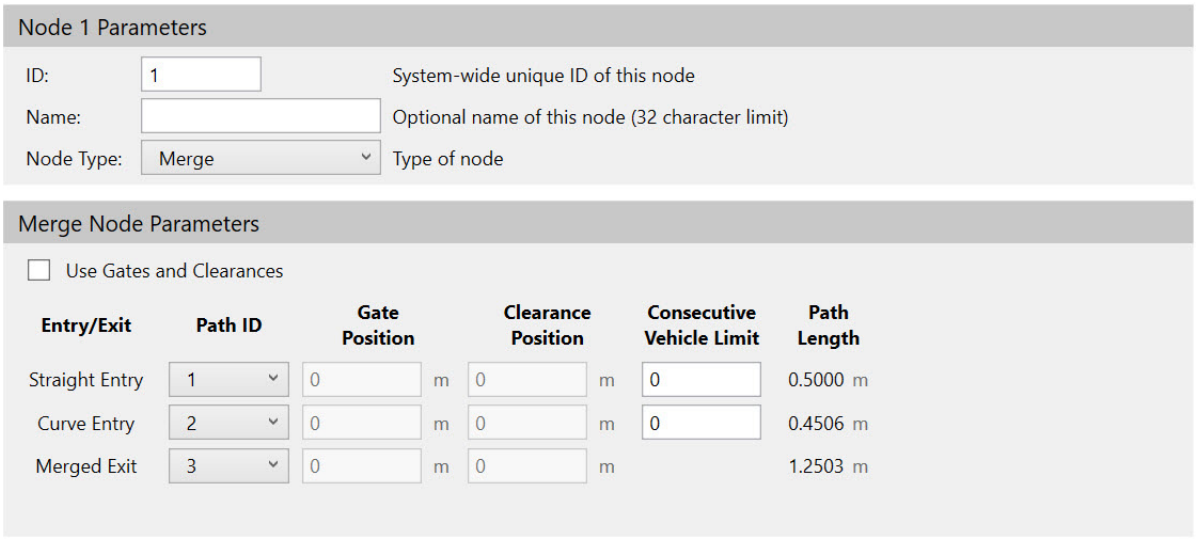


Figure 5-43: Gateway Node Parameters

Table 5-14: Gateway Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Path	Provides a menu that lists all paths in the transport system to select the path where the node is located. The default is None.	X	X	X
Path End	Provides a menu for selection of the path end where the node is located. The default is Upstream. **Downstream:** The node is used at the downstream end of the path. **Upstream:** The node is used at the upstream end of the path.	X	X	X
Peer IP Address	The IP address of the node controller responsible for the Gateway node in the other subsystem. Both node controllers must be on the same local subnet.	X	X	X
Peer Node ID	The Node ID of the Gateway node in the other subsystems. The default is None.	X	X	X

Merge Node

A Merge node is used to connect the downstream ends of two paths to the upstream end of a third path. See *Merge Node on page 126* for configuration. The additional parameters for the Merge node are described after Figure 5-46.

NOTE: Merge nodes are only available for MagneMover Lite.

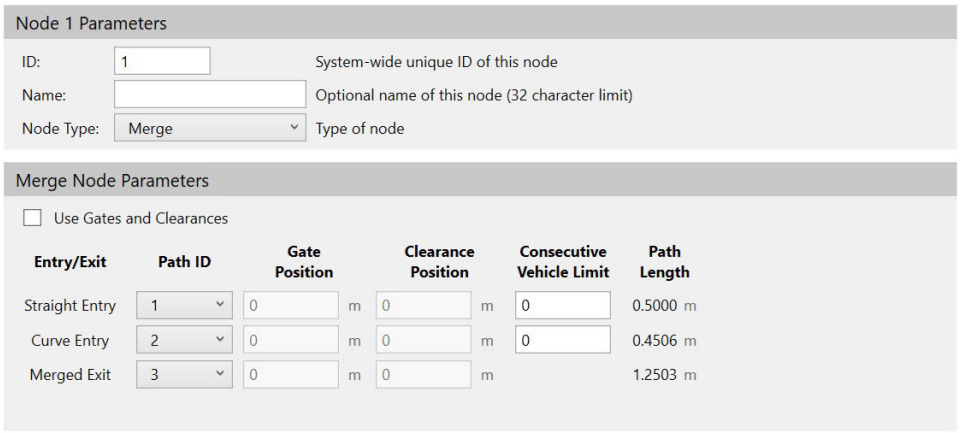


Figure 5-44: Merge Node Parameters - Linear Vehicle Shape on Paths

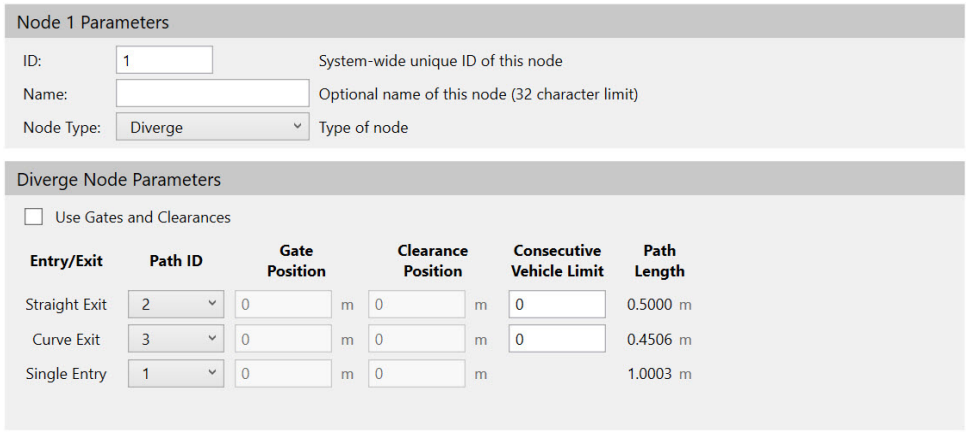


Figure 5-45: Merge Node Parameters - Rectangular Vehicle Shape on Paths

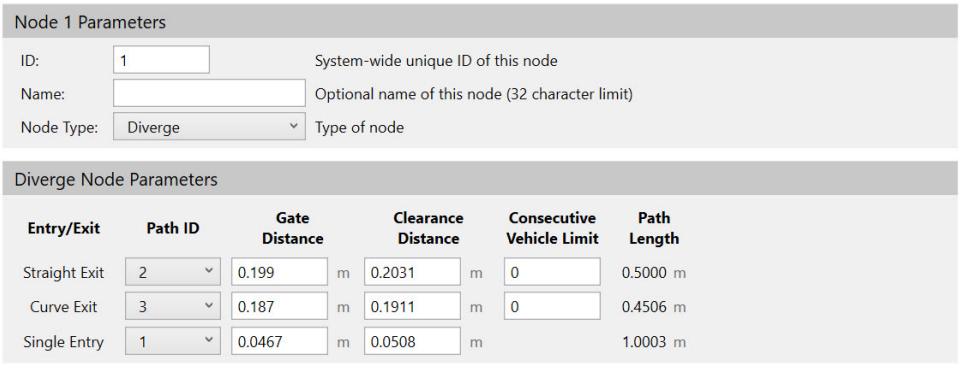


Figure 5-46: Merge Node Parameters - Vehicle Shape Mismatch

Table 5-15: Merge Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Entry/Exits	Lists the entry and exit paths for the node.	X	—	—
Path ID	Provides menus that list all paths in the transport system for selection of the two entry paths and the two exit paths where the node is located. The default is None.	X	—	—
Gate Position	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. The gate location is defined as the position of the center of the vehicle (in meters) from the start of the entry or exit path. See *MM Lite Linear Gates and Clearances* *on page 152* for more information.	X	—	—
Clearance Position	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. The clearance location is defined as the position of the center of the vehicle (in meters) from the start of the Entry/Exits path. See *MM Lite Linear Gates and Clearances* *on page 152* for more information.	X	—	—
Use Gates and Clearances	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. Enables/disables the use of the Gate Position and Clearance Position parameters. See *MM Lite Linear Gates and Clearances* *on page 154* for more information.	X	—	—
Gate Distance	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Rectangular vehicle shape. The gate location is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle. See *MM Lite Rectangular Gates and Clearances* *on page 153* for more information.	X	—	—
Clearance Distance	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Rectangular vehicle shape. The clearance location is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle. See *MM Lite Rectangular Gates and Clearances* *on page 153* for more information.	X	—	—

Table 5-15: Merge Node Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Consecutive Vehicle Limit	This limit applies to downstream motion through the switch. For each entry path, this limit defines the quantity of vehicles that are allowed to traverse the path downstream when there is a vehicle in cue for switch access in the downstream direction on the other entry path. After the specified quantity of vehicles has traversed the switch or there are no more vehicles cued, additional vehicles on that entry path are stopped and control of the switch is transferred to the other entry path. Any vehicles in cue on that other entry path can then enter the switch (up the maximum that is specified for that path if vehicles are now cued on the other path). The default is 0 (no limit).	X	—	—
Path Length	The total length of the selected Path ID as calculated from the motor sections included in the path. If the number, type of motors, or the spacing between motors is changed, this value can change.	X	—	—
Vehicle Shape	The vehicle shape defined in the Motor Defaults of the selected Path ID. Only displayed when there is a mismatch of vehicle shapes that are involved in a node, which is accompanied by a Vehicle Shape Mismatch Error (Figure 4-67 on page 128).	X	—	—

Diverge Node

A Diverge node is used to connect the downstream end of one path to the upstream ends of two paths. See *Diverge Node on page 128* for configuration. The additional parameters for the Diverge node are described after Figure 5-49.

NOTE: Diverge nodes are only available for MagneMover Lite.

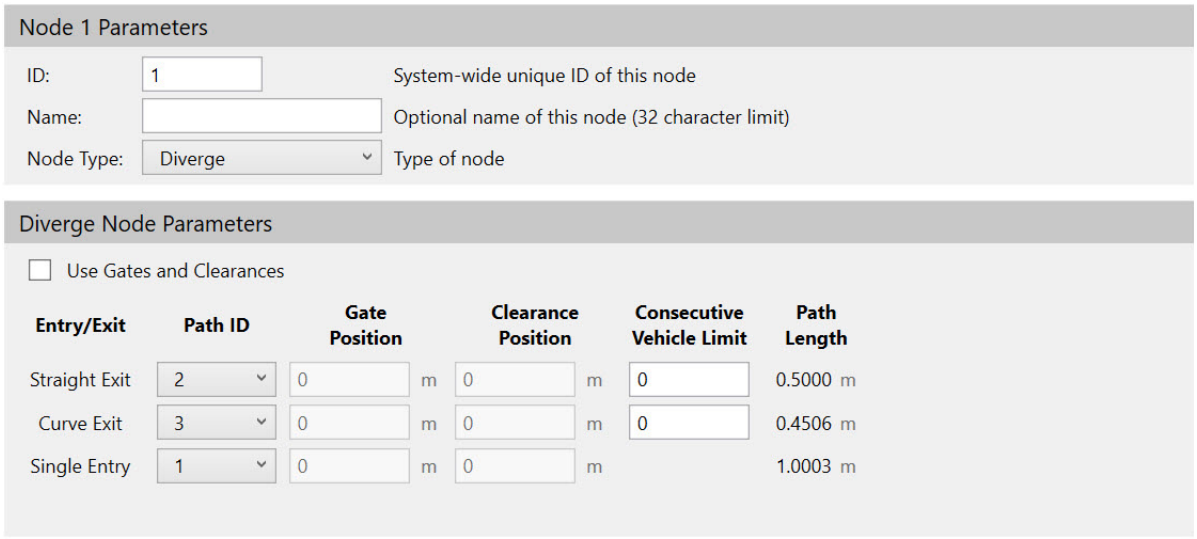


Figure 5-47: Diverge Node Parameters - Linear Vehicle Shape

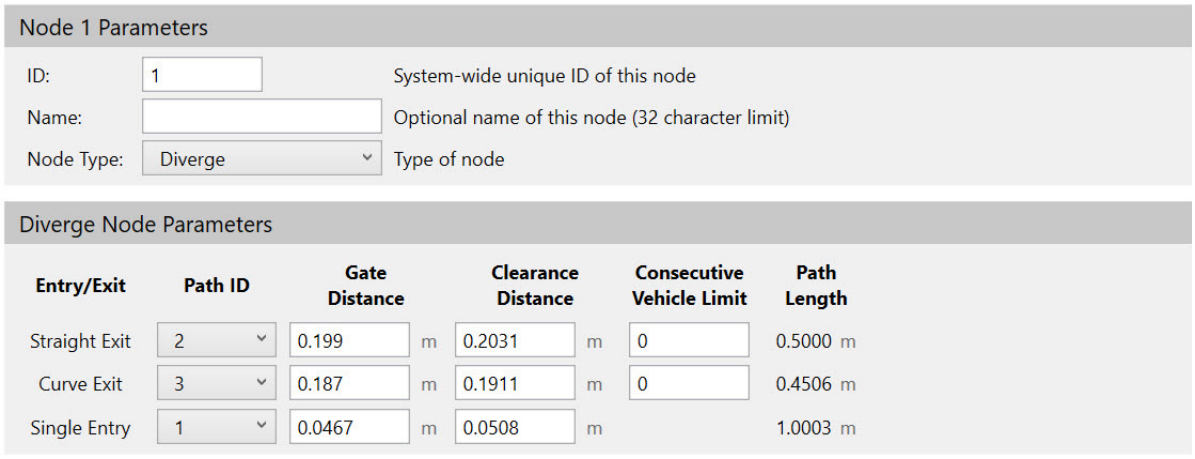


Figure 5-48: Diverge Node Parameters - Rectangular Vehicle Shape

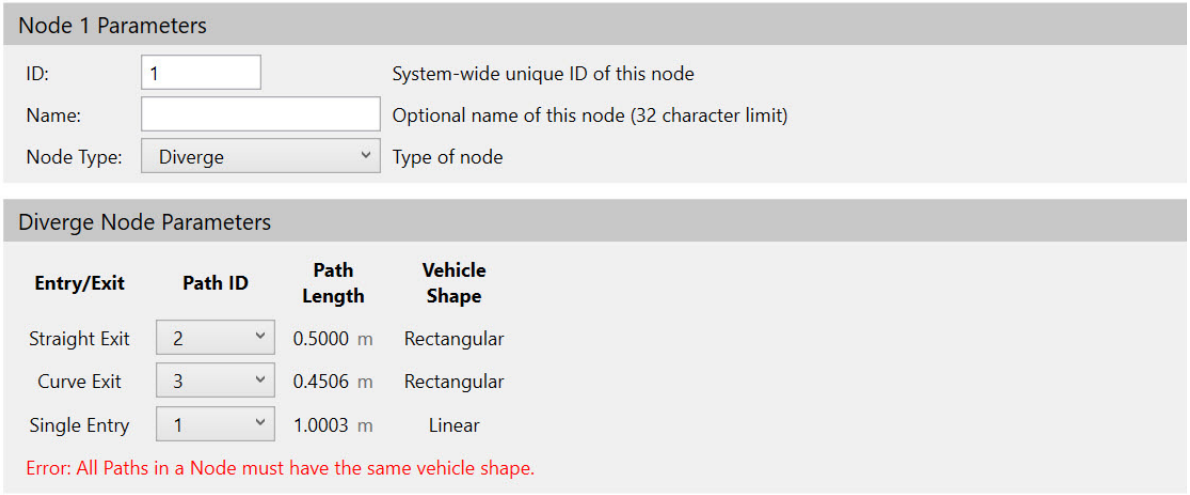


Figure 5-49: Diverge Node Parameters - Vehicle Shape Mismatch

Table 5-16: Diverge Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Entry/Exits	Lists the entry and exit paths for the node.	X	—	—
Path ID	Provides menus that list all paths in the transport system for selection of the two entry paths and the two exit paths where the node is located. The default is None.	X	—	—
Gate Position	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. The gate location is defined as the position of the center of the vehicle (in meters) from the start of the entry or exit path. See *MM Lite Linear Gates and Clearances* *on page 154* for more information.	X	—	—
Clearance Position	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. The clearance location is defined as the position of the center of the vehicle (in meters) from the start of the entry or exit path. See *MM Lite Linear Gates and Clearances* *on page 154* for more information.	X	—	—
Use Gates and Clearances	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. Enables/disables the use of the Gate Position and Clearance Position parameters. See *MM Lite Linear Gates and Clearances* *on page 154* for more information.	X	—	—
Gate Distance	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Rectangular vehicle shape. The gate location is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle. See *MM Lite Rectangular Gates and Clearances* *on page 153* for more information.	X	—	—
Clearance Distance	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Rectangular vehicle shape. The clearance location is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle. See *MM Lite Rectangular Gates and Clearances* *on page 153* for more information.	X	—	—

Table 5-16: Diverge Node Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Consecutive Vehicle Limit	This limit applies to downstream motion through the switch. For each entry path, this limit defines the quantity of vehicles that are allowed to traverse the path downstream when there is a vehicle in cue for switch access in the downstream direction on the other entry path. After the specified quantity of vehicles has traversed the switch or there are no more vehicles cued, additional vehicles on that entry path are stopped and control of the switch is transferred to the other entry path. Any vehicles in cue on that other entry path can then enter the switch (up the maximum that is specified for that path if vehicles are now cued on the other path). The default is 0 (no limit).	X	—	—
Path Length	The total length of the selected Path ID as calculated from the motor sections included in the path. If the number, type of motors, or the spacing between motors is changed, this value can change.	X	—	—
Vehicle Shape	The vehicle shape defined in the Motor Defaults of the selected Path ID. Only displayed when there is a mismatch of vehicle shapes that are involved in a node, which is accompanied by a Vehicle Shape Mismatch Error (Figure 4-67 on page 128).	X	—	—

Merge-Diverge Node

A Merge-Diverge node is used to connect the downstream ends of two paths to the upstream ends of two paths. See *Merge-Diverge Node on page 132* for configuration. The additional parameters for the Merge-Diverge node are described after Figure 5-52.

NOTE: Diverge nodes are only available for MagneMover Lite.

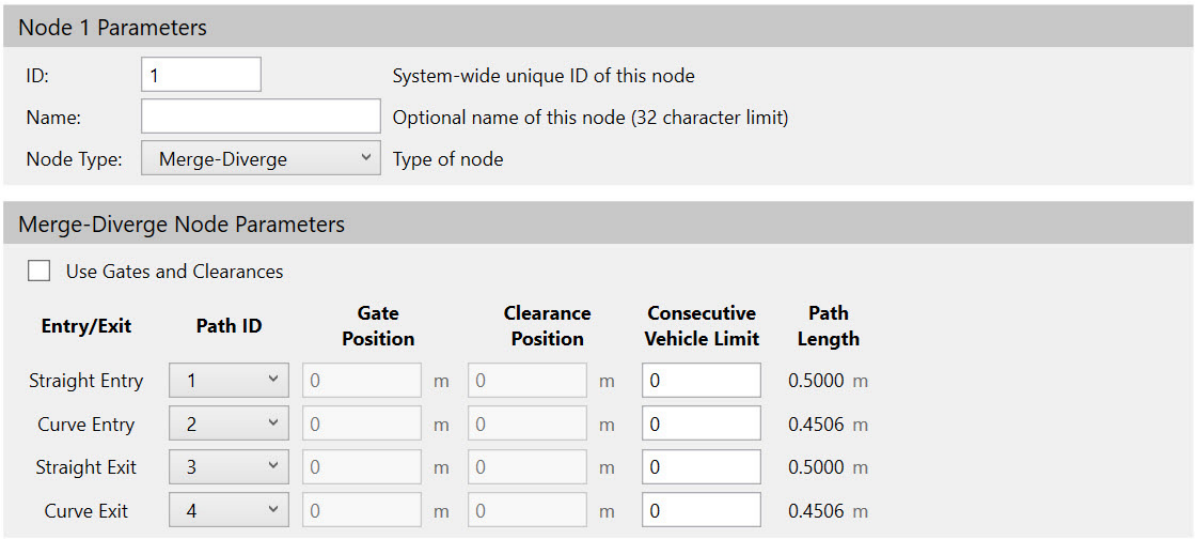


Figure 5-50: Merge-Diverge Node Parameters - Linear Vehicle Shape

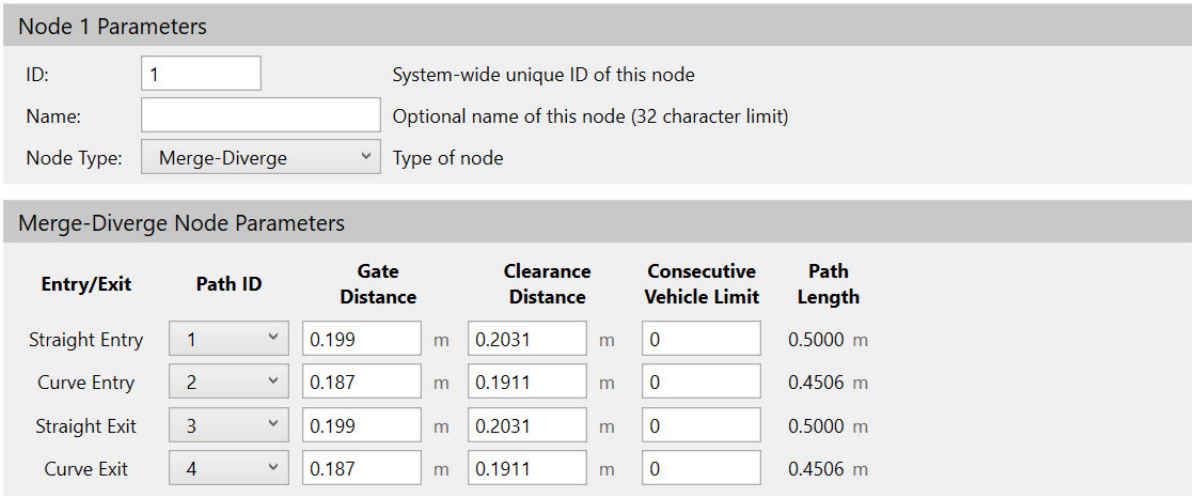


Figure 5-51: Merge-Diverge Node Parameters - Rectangular Vehicle Shape

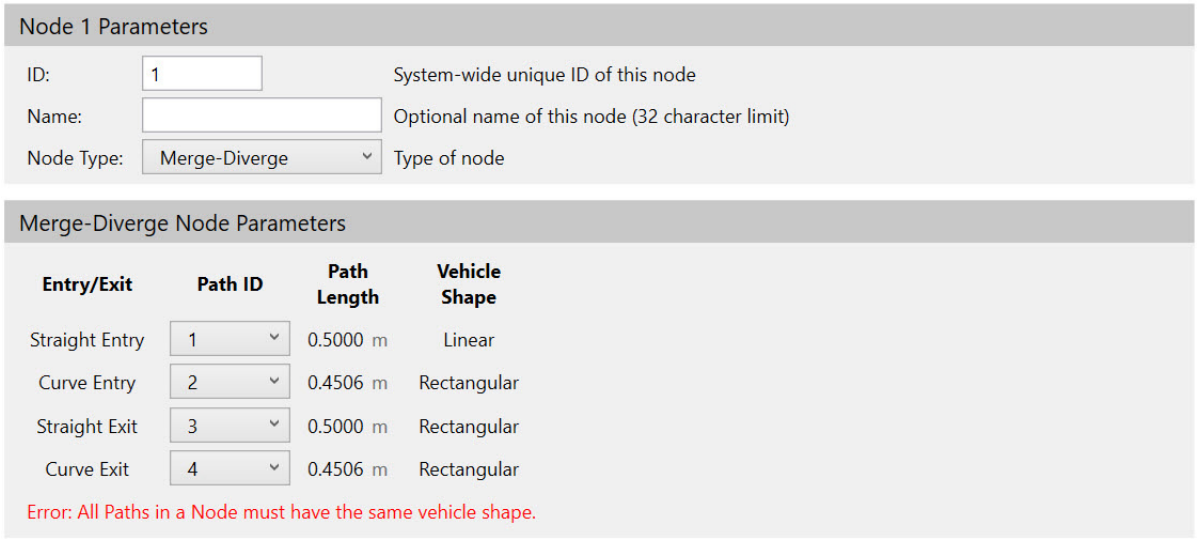


Figure 5-52: Merge-Diverge Node Parameters - Vehicle Shape Mismatch

Table 5-17: Merge-Diverge Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Entry/Exits	Lists the entry and exit paths for the node.	X	—	—
Path ID	Provides menus that list all paths in the transport system for selection of the two entry paths and the two exit paths where the node is located. The default is None.	X	—	—
Gate Position	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. The gate location is defined as the position of the center of the vehicle (in meters) from the start of the entry or exit path. See *MM Lite Linear Gates and Clearances* *on page 154* for more information.	X	—	—
Clearance Position	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. The clearance location is defined as the position of the center of the vehicle (in meters) from the start of the entry or exit path. See *MM Lite Linear Gates and Clearances* *on page 154* for more information.	X	—	—
Use Gates and Clearances	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Linear vehicle shape. Enables/disables the use of the Gate Position and Clearance Position parameters. See *MM Lite Linear Gates and Clearances* *on page 154* for more information.	X	—	—
Gate Distance	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Rectangular vehicle shape. The gate location is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle. See *MM Lite Rectangular Gates and Clearances* *on page 153* for more information.	X	—	—
Clearance Distance	Used for Merge, Diverge, and Merge-Diverge nodes where all Paths in the node have a Rectangular vehicle shape. The clearance location is defined as the distance in meters from the end of the motor closest to the node to the center of the vehicle. See *MM Lite Rectangular Gates and Clearances* *on page 153* for more information.	X	—	—

Table 5-17: Merge-Diverge Node Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Consecutive Vehicle Limit	This limit applies to downstream motion through the switch. For each entry path, this limit defines the quantity of vehicles that are allowed to traverse the path downstream when there is a vehicle in cue for switch access in the downstream direction on the other entry path. After the specified quantity of vehicles has traversed the switch or there are no more vehicles cued, additional vehicles on that entry path are stopped and control of the switch is transferred to the other entry path. Any vehicles in cue on that other entry path can then enter the switch (up the maximum that is specified for that path if vehicles are now cued on the other path). The default is 0 (no limit).	X	—	—
Path Length	The total length of the selected Path ID as calculated from the motor sections included in the path. If the number, type of motors, or the spacing between motors is changed, this value can change.	X	—	—
Vehicle Shape	The vehicle shape defined in the Motor Defaults of the selected Path ID. Only displayed when there is a mismatch of vehicle shapes that are involved in a node, which is accompanied by a Vehicle Shape Mismatch Error (Figure 4-67 on page 128).	X	—	—

Overtravel Node Parameters

An Overtravel node is used to permit part of a vehicle to move past the end of the motor at the beginning or the end of a path (see *Overtravel Node on page 140* for usage). Additional support structure (guideway) for the vehicle must be provided, or the vehicle's supports (wheels) must not be allowed to move past the end of the guideway. If appropriate cautions are not taken for the vehicle, it could fall off of the guideway or get caught on the end of the guideway preventing further movement. The additional properties for the Overtravel node are described after Figure 5-53.

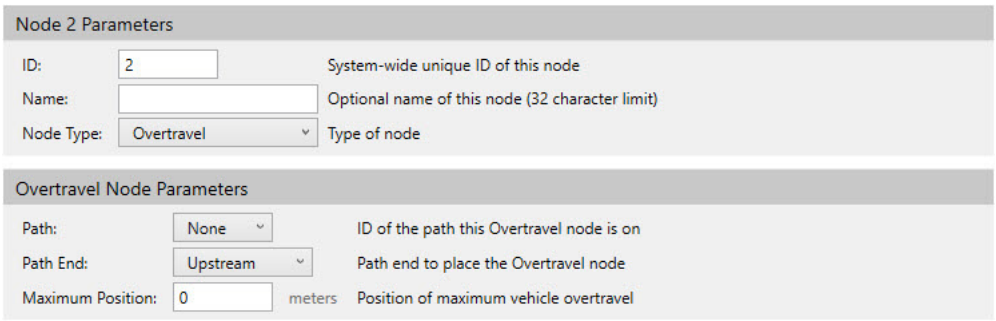


Figure 5-53: Overtravel Node Parameters

Table 5-18: Overtravel Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Path	Provides a menu listing all paths in the transport system for selection of the path where the node is located. The default is None.	—	X	X
Path End	Provides a menu for selection of the path end where the node is located. The default is Upstream. **Downstream:** The node is located at the downstream end of the path (end of the path). **Upstream:** The node is located at the upstream end of the path (beginning of the path).	—	X	X
Maximum Position	The maximum vehicle overtravel (a negative number indicates travel before an upstream node and a positive number indicates travel after a downstream node). The default is 0.0 (no overtravel).	—	X	X

Moving Path Node Parameters

A Moving Path node is used to connect the ends of fixed paths to the ends of paths being moved by a Host-controlled mechanism (see *Moving Path Node* *on page 143* for usage). The mechanism providing the movement may be any user-supplied mechanism including QuickStick motors. The additional properties for the Moving Path node are described after Figure 5-54.

Use of the Moving Path node requires the host controller to command the drive mechanism to position an entry path so that it aligns with an exit path. The host controller must then issue a Link command (see the *MagneMotion Host Controller TCP/IP Communication Protocol User Manual,* publication MMI-UM003 and *MagneMotion Host Controller EtherNet/IP Communication Protocol User Manual,* publication MMI-UM004) to connect the two paths to allow vehicle movement. After the vehicle has moved beyond the node, the paths must be unlinked before moving the moving path to a new position.

NOTE: Moving Path nodes are only available for QuickStick and QuickStick HT systems.

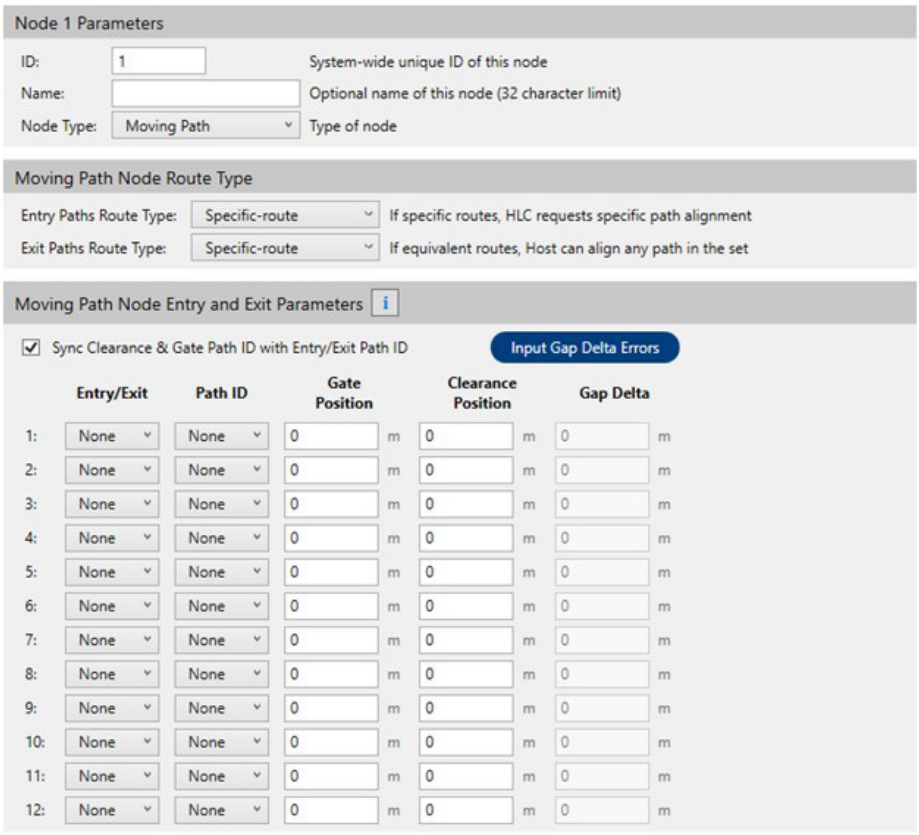


Figure 5-54: Moving Path Node Properties

Table 5-19: Moving Path Node Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Entry Paths Route Type	Provides a menu for selection of the type of routing that is used when the path is an entry path. An entry path is a path whose downstream end is a member of the Moving Path node. A vehicle moving downstream enters the node on an entry path. The default is Specific-route. **Specific-route:** Used if the entry path is fixed and only a specific moving path in the node can satisfy the route. The HLC requests alignment of specific paths. **Equivalent-route:** Used if the entry path is a moving path and any moving path in the node can satisfy the route. The host controller identifies and aligns equivalent paths.	—	X	X
Exit Paths Route Type	Provides a menu for selection of the type of routing that is used when the path is an exit path. An exit path is a path whose upstream end is a member of the Moving Path node. A vehicle moving downstream exits the node on an exit path. The default is Specific-route. **Specific-route:** Used if the exit path is fixed and only a specific moving path in the node can satisfy the route. The HLC requests alignment of specific paths. **Equivalent-route:** Used if the exit path is a moving path and any moving path in the node can satisfy the route. The host controller identifies and aligns equivalent paths.	—	X	X
Entries and Exits	Provides a menu for selection of the path's relationship to the node. The default is None. **Entry:** The path at this position is an entry to the Moving Path node. **Exit:** The path at this position is an exit from the Moving Path node. **None:** The entry is not used.	—	X	X
Path	Provides menus listing all paths in the transport system for selection of the entry paths and exit paths where the node is located. The default is None.	—	X	X

Table 5-19: Moving Path Node Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Clearance	**Path ID:** (if different from the Entry/Exit Path ID) where the Clearance Position is located. **Position:** The location, in meters, to the center of the vehicle where the vehicle's trailing edge is considered cleared from the node. Applies to the trailing edge for all vehicles exiting the node, regardless of vehicle direction. The default is 0.0 m (see *Node Gates and Clearances* *on page 147*).	—	X	X
Entry Gate	**Path ID:** (if different from the Entry/Exit Path ID) where the Clearance Position is located. **Position:** The location, in meters, to the center of the vehicle where the leading edge of the vehicle is considered clear of the node and/or vehicles and their payloads on adjoining paths. Applies to the leading edge for all vehicles entering the switch, regardless of vehicle direction. The default is 0.0 m (see *Node Gates and Clearances* *on page 147*).	—	X	X
Gap Delta	Used on exit paths to correct for the difference in the distance between the downstream gap of the last motor on the entry path and the front end of the first motor on each exit path. The default is 0.0 m (see *Gap Delta* *on page 157*).	—	X	X

Node Controllers

Node controllers are used to provide monitoring and control of the nodes, paths, and motors in the transport system. The Node Controller page (see Figure 5-55), is accessed by expanding the Node Controllers list in the Configuration Tree and selecting the appropriate node controller. See *Define and Edit Node Controllers* *on page 160* for usage.

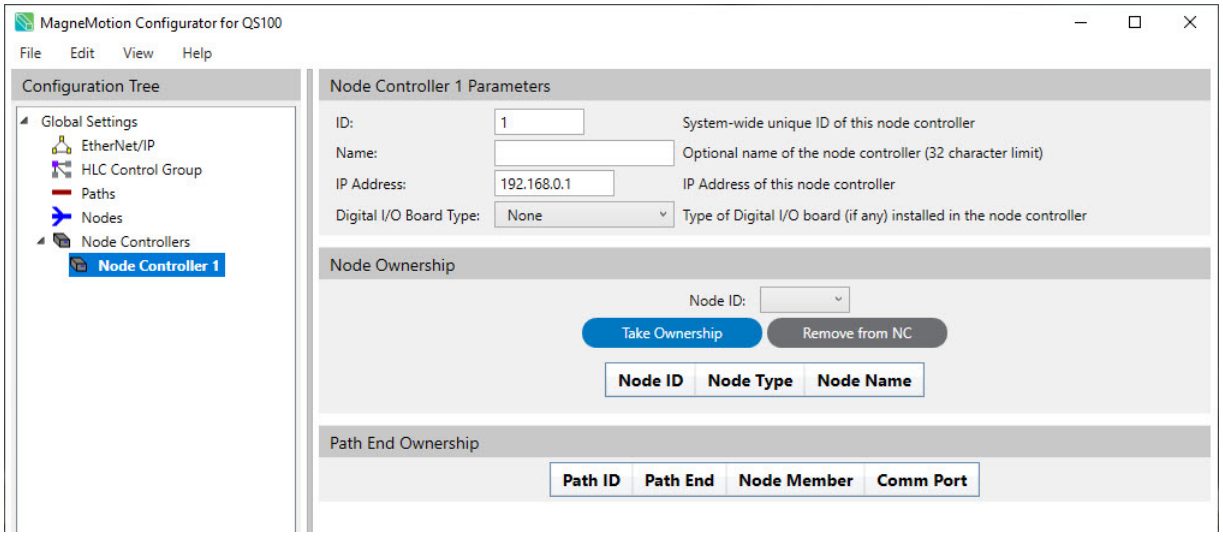


Figure 5-55: Node Controllers Page

Table 5-20: Node Controller Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
ID	A unique numerical identifier for the node controller (must be a positive integer).	X	X	X
Name	An optional name for the node controller for reference. This name is not used, or displayed, by the transport system.	X	X	X
IP Address	IP address of the node controller.	X	X	X

Table 5-20: Node Controller Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Digital I/O Board Type	Provides a menu of the types of digital I/O boards that may be installed in the node controller. The default is None. The options vary based on system type. **None:** No digital I/O board installed. **NC-12 Solid State 16 Bit:** Provides 16 optically isolated solid-state digital inputs and 16 optically isolated solid-state digital outputs. **NC-E Series A Solid State 4 Bit:** Provides 4 optically isolated solid-state digital inputs and 4 optically isolated solid-state digital outputs. **NC-E Series B Solid State 8 Bit:** Provides 8 optically isolated solid-state digital inputs and 8 optically isolated solid-state digital outputs.	X	X	X
NOTE: I/O board selection does not apply to node controllers that do not provide digital I/O.				
Node Ownership Control	This section provides the tools to select the nodes that this node controller is responsible for. **Node ID:** Provides a menu that lists all nodes in the transport system for selection of a node to be controlled, or released, by the node controller. The default is 1. **Take Ownership:** Causes the node controller to take ownership of the selected node. The node is listed in the Node Ownership and all paths that are associated with the node are listed in the Path End Ownership. **Remove Ownership:** Causes the node controller to release ownership of the selected node. The node is removed from the Node Ownership and all paths that are associated with the node are removed from the Path End Ownership.	X	X	X
Node Ownership	Lists the nodes, their type, and their optional name that this node controller is responsible for.	X	X	X
Path End Ownership List	Lists all path ends involved in the node(s) that are owned by this node controller.	X	X	X

Path End Ownership List

Table 5-21: Path End Ownership List Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Path ID	Shows the ID of the paths that are connected to the node.	X	X	X
Path End	Identifies the end of the paths connecting to the node (upstream or downstream).	X	X	X
Node Member	Identifies the node and the way the path connects to the node (Enters or Exits).	X	X	X
Comm Port	Provides a menu that lists all communication ports that could be available on the node controller. The selected port is used for communication with the motor at the Path End that is connected to the node. The menu lists the maximum quantity of ports that could be available, make sure the port selected is the port connected to the motor. • For all node controller types that support RS-422, when using RS-422 communication, select the port being used. • For all node controllers types, when using Ethernet communication, select Ethernet.	X	X	X

All Stations

The All Stations category in the Configuration Tree provides an easy method to view all configured stations regardless of the path that they are on. There are no parameters that are associated with this category. However, selecting any of the stations in the All Stations list displays its property page for review or editing, see Figure 5-56.

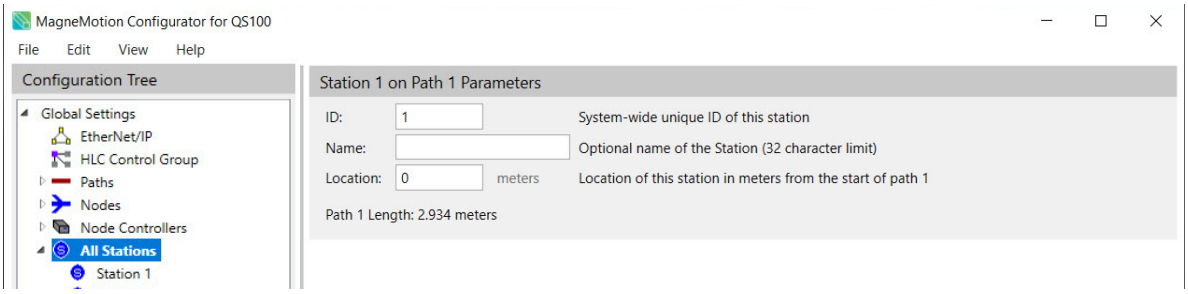


Figure 5-56: All Stations Configuration Tree Category

Stations

Stations are used to define a specific position on a path to send a vehicle. The Station page (see Figure 5-57), is accessed either by expanding the Stations list under a path in the Configuration Tree or by expanding the All Stations list and selecting the appropriate station. See *Create and Edit Stations on page 165* for usage.

NOTE: Stations are hidden by default. Use the View menu in the Configuration Menu Bar, select Show Stations to display them. Before adding new stations to a path with existing stations, make sure that they are set appropriately.

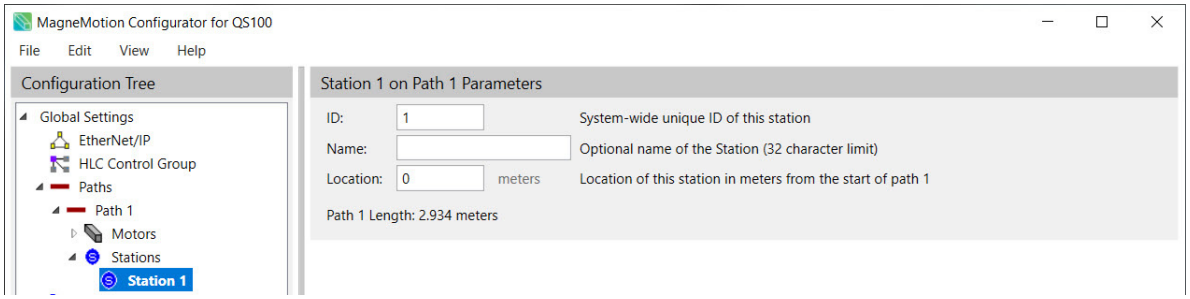


Figure 5-57: Stations Page

Table 5-22: Station Page Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
ID	A unique numerical identifier for the station (1…2048).	X	X	X

Table 5-22: Station Page Parameters (Continued)

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Name	An optional name for the station for reference. This name is not used, or displayed, by the transport system. Valid characters are: a…z, A…Z, 0…9,~!@#$%^*()_+`-={}|:"?[]\;',./ and space (32 characters maximum).	X	X	X
Location	Position on the path where the station is located, measured from the beginning of the path. The default is 0.0 m.	X	X	X
Path *n* Length	The total length of the path as calculated from the motor sections included in the path where the station is located. If the number, type of motors, or the spacing between motors is changed, this value can change.	X	X	X

Single Vehicle Areas

Single Vehicle Areas (SVA) define an area on a path where only one vehicle at a time can enter and move. The Single Vehicle Area page (see Figure 5-58), is accessed by expanding the Single Vehicle Areas list under a path in the Configuration Tree and selecting the appropriate SVA. See *Create and Edit Single Vehicle Areas* *on page 169* for usage.

NOTE: Single Vehicle Areas are hidden by default. Use the View menu in the Configuration Menu Bar, select Show Single Vehicle Areas to display them.

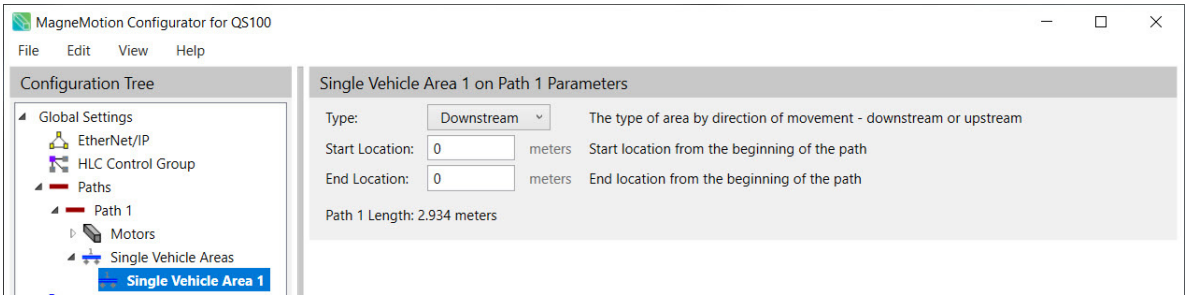


Figure 5-58: Single Vehicle Area Page

NOTE: Two or more Single Vehicle Areas that are defined in the same direction cannot overlap. Single Vehicle Areas that are defined in opposite directions can overlap; that is, an SVA for downstream motion can cover some or all of an SVA for upstream motion.

Table 5-23: Single Vehicle Area Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Type	Provides a menu that lists the area types by direction of movement on the path. The default is Downstream. **Downstream:** The normal commanded motion on the path where the Single Vehicle Area is located is downstream (forwards). **Upstream:** The normal commanded motion on the path where the Single Vehicle Area is located is upstream (backwards).	X	X	X
Start Location	Position for the start of the Single Vehicle Area, which is measured from the beginning of the path where the area is located. The default is 0.0 m.	X	X	X
End Location	Position for the end of the Single Vehicle Area, which is measured from the beginning of the path where the area is located. The default is 0.0 m.	X	X	X
NOTE: For a downstream Single Vehicle Area, the end location on the path is further downstream (larger number than the Start Location). For an upstream Single Vehicle Area, the end location on the path is further upstream (smaller number than the Start Location).				
Path *n* Length	The total length of the path as calculated from the motor sections included in the path where the SVA is located. If the number, type of motors, or the spacing between motors is changed, this value can change.	X	X	X

Simulated Vehicles

Simulated vehicles are used to create simulated vehicles for transport system testing. The Simulated Vehicle page (see Figure 5-59), is accessed by expanding the Simulated Vehicles list under a path in the Configuration Tree and selecting the appropriate simulated vehicle. See *Create and Edit Simulated Vehicles on page 174* for usage. The simulated vehicle is a simulated version of the vehicle that is defined on the *Motor Defaults* page.

NOTE: To access the Simulated Vehicle page (see Figure 5-59), make sure the Show Simulated Vehicles option in the View menu in the Configurator is selected.

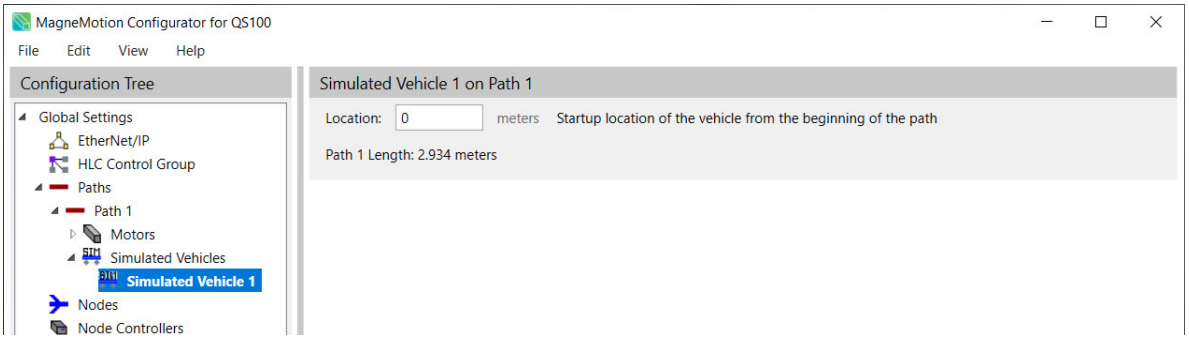


Figure 5-59: Simulated Vehicles Page

Table 5-24: Simulated Vehicle Parameters

Parameter Name	Parameter Description	MM Lite	Quick Stick	QSHT
Location	The starting position for the Simulated Vehicle measured from the beginning of the path. The default is 0.0 m.	X	X	X
Path *n* Length	The total length of the path as calculated from the motor sections included in the path where the Simulated Vehicle is located. If the number, type of motors, or the spacing between motors is changed, this value can change.	X	X	X

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Troubleshooting 6

Overview

This chapter describes the common difficulties that may be encountered when using the MagneMotion® Configurator. Included in this chapter are:

- Initial Troubleshooting.

MagneMotion Configurator Troubleshooting

Table 6-1 briefly identifies common MagneMotion Configurator faults, and general solutions.

Table 6-1: Initial MagneMotion Configurator Troubleshooting

Symptom	Problem	Solution
Transport system components, such as paths, are not displayed in the Configuration Tree or not displayed correctly.	No Node Controller Configuration File loaded.	Open the Node Controller Configuration File in the Configurator. See *Run the MagneMotion Configurator* *on page 26*.
	Incorrect Node Controller Configuration File loaded.	Make sure that the correct Node Controller Configuration File is open. See *Run the MagneMotion Configurator* *on page 26*.
The MagneMotion Configurator does not run.	Microsoft® .NET is not installed or is missing components.	Download and install the Microsoft .NET Framework 4 (Standalone Installer). (http://www.microsoft.com/en-us/download/details.aspx?id=17718)
The Track Layout File does not contain the saved layout.		
The MagneMotion Configurator crashes when running the Walk the Paths command.		
Red outline displayed next to text entry field.	Invalid or improperly formatted value was entered.	Reenter the value and make sure that it is valid and correctly formatted. See *Dialog Box and Window Elements* *on page 186*.

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Appendix

Additional Documentation

Release Notes

The release notes that are supplied with MagneMotion software include special instructions, identification of software versions, identification of new features and enhancements, and a list of known issues. Reading this file is recommended before using the software.

Upgrade Procedure

The upgrade procedures that are supplied with MagneMotion software provide instructions for upgrading from one version of MagneMotion software to another. They also include the procedures for file and driver upgrades that are associated with the software.

Transport System Limits

For information on transport system limits, see the *MagneMotion Node Controller Hardware User Manual,* publication MMI-UM013.

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Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

Documentation Feedback

Your comments help us serve your documentation needs better. If you have any suggestions on how to improve our content, complete the form at rok.auto/docfeedback.

Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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