
APPLICATION NOTE

Methods to Disable MMI Control of a Vehicle

Purpose

This document describes ways to release control of a vehicle for the purpose of allowing interaction between the vehicle and third party hardware.

Introduction

There are certain occasions where it is required that third party hardware interacts with or limits the motion of vehicle on a MagneMotion transport system. These include:

- Locating a vehicle to a high precision.
- Supporting the vehicle for a vertical or horizontal force.
- Mechanically gearing the vehicle to match third party hardware.
- Interfacing with a process station that locates the payload relative to itself.

During these processes, MagneMotion control of the vehicle's position should be released to allow movement without the control system attempting to correct. This will prevent the control system from attempting to hold the vehicle in the current position thus putting a force against the device constraining it, which can result in unpredictable motion or trigger the overheating protection on the motor.

There are two methods to disable control of a vehicle, both outlined in this document.

Control Off Position Tolerance

Control off position tolerance is a parameter that can be set in the node controller configuration file of MagneMover LITE systems. It specifies a distance from the current target (furthest position the vehicle has permission to reach) at which the system will stop attempting to control the vehicle. This can be set per path or per motor, but will apply to any vehicles stopping on that path or motor. Be sure to set the arrival tolerance (as described in the MagneMover LITE Configurator User's Manual, section 5) to be greater than or equal to the control off position tolerance, or the vehicle will stop driving before it arrives.

The control off position tolerance can be found in the advanced parameters section of the Motor Defaults page or a specific Motor's page in the MagneMover LITE Configurator. This section is normally hidden, but can be displayed by selecting **Show Advanced Parameters** from the **Options** menu.

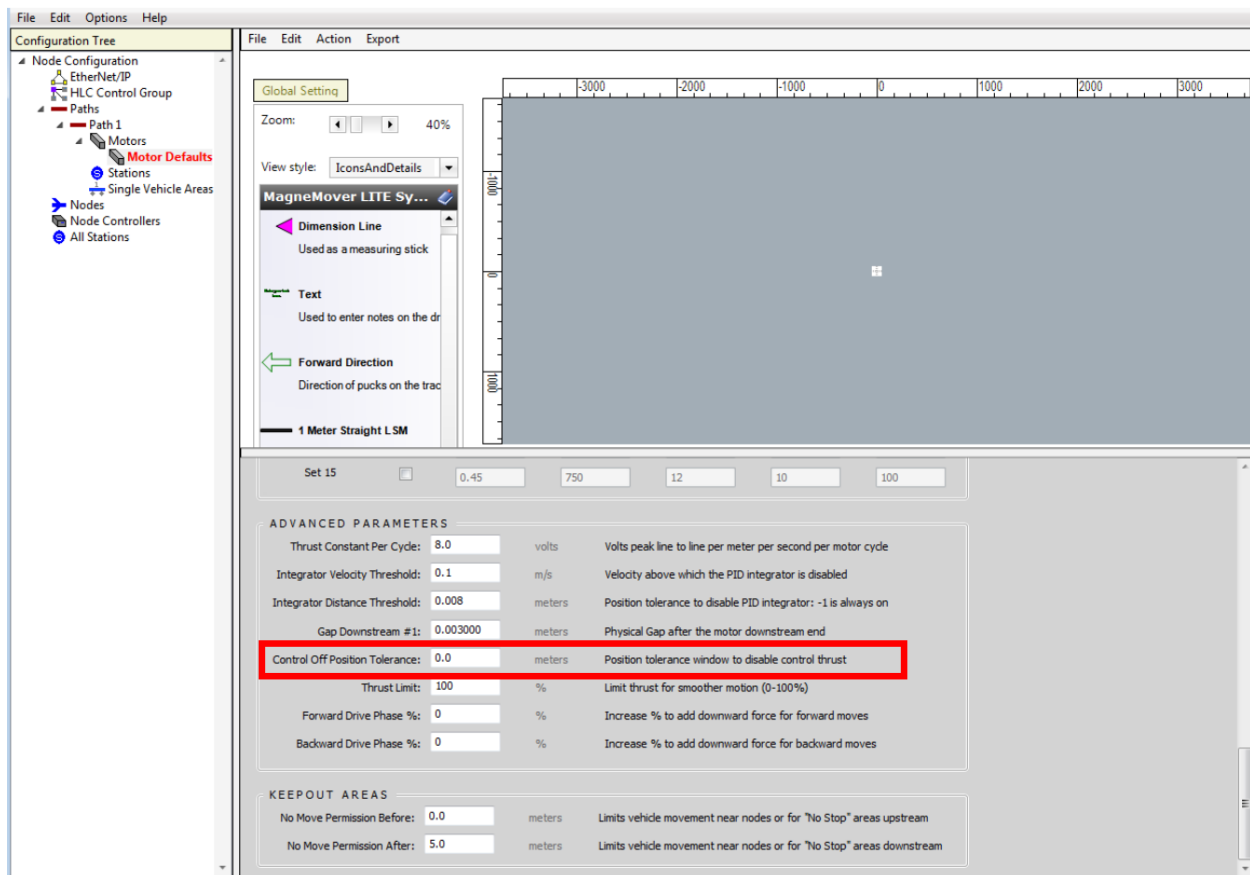


Figure 1: Location of the Control Off Position Tolerance Field in the Configuration Utility

This is most useful for stations where the vehicle is being located, pinned, or gripped at a single location. If the station location is set for the nominal position the vehicle will be located to by the process station and the control off position tolerance is set to the tolerance of the locating device, then MagneMotion control of the vehicle will be released when it is gripped by the third party hardware.

The process for using the control off position tolerance is as follows.

- 1) Order vehicle to a position
- 2) Wait for arrival
- 3) Grip vehicle and perform process
- 4) Release vehicle
- 5) Send vehicle order to next position

Once the vehicle receives a new order, it is given a new target and control will resume.

Another use for the control off position tolerance is to disable control of the vehicle while it is waiting in queue. Setting a small control off position tolerance (0.5mm for example) will cause

the vehicle to stop trying to drive exactly to position while it is waiting in queue, which will reduce power consumption and noise.

Disabling PID Control

One of up to 16 different sets of PID values can be selected when executing a move command. It is possible to use this functionality to disable the PID control loop as well. When a move command uses a PID control loop set in which all of the PID parameters are zero, the system will release control of the vehicle.

CONTROL LOOP PARAMETERS						
Parameter	PID Loop Set Enable	Vehicle Mass	Proportional Loop Gain (Kp)	Integral Loop Gain (Ki)	Velocity Loop Gain (Kd)	Feed Forward Scale (Kff)
Set 0 (Unloaded)	<input checked="" type="checkbox"/>	0.45	750	12	10	100
Set 1 (Loaded)	<input checked="" type="checkbox"/>	0.45	0	0	0	100
Set 2	<input type="checkbox"/>	0.45	750	12	10	100
Set 3	<input type="checkbox"/>	0.45	750	12	10	100
Set 4	<input type="checkbox"/>	0.45	750	12	10	100
Set 5	<input type="checkbox"/>	0.45	750	12	10	100
Set 6	<input type="checkbox"/>	0.45	750	12	10	100
Set 7	<input type="checkbox"/>	0.45	750	12	10	100
Set 8	<input type="checkbox"/>	0.45	750	12	10	100
Set 9	<input type="checkbox"/>	0.45	750	12	10	100
Set 10	<input type="checkbox"/>	0.45	750	12	10	100

Figure 2: PID Set 1 Configured to Release Control of the Vehicle

The motor will still track the position of the vehicle, but will not attempt to control it in any way. If the vehicle is ordered to a different location using the all zero PID parameter set, it will set that as its new destination but, because it is unable to drive, will report a jam.

The procedure to follow when using this method is as follows:

- 1) Order vehicle to destination position using a set of non-zero PID values.
- 2) Wait for vehicle to arrive.
- 3) Order vehicle to same destination using PID set with all parameters set to zero.
- 4) Vehicle should immediately report arrived.
- 5) Grip vehicle and perform process.
- 6) Release vehicle.
- 7) Order vehicle to next destination using a set of non-zero PID values.

Moving a Vehicle while PID Control is Disabled

If the vehicle will be moved to a different location than where PID control was disabled while not controlled by the MMI system, give the vehicle an order with the all zero PID coefficient set to the final destination before beginning movement. This will ensure the vehicle is tracked cleanly and recovers smoothly when normal control is reengaged at the final location.

TECHNICAL SUPPORT NOTICE

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Summary

Depending on the application and the task being performed, different methods may be applied. The system selected, type of station or process, vehicle density, throughput, and station locations will all factor in to this determination. In many cases, there will be multiple methods that can be used and which one is selected is at the discretion of the user.

For any questions related to the content of this document, please contact MagneMotion Customer Support.

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Email: customersupport@magnemotion.com

Related Documents:

990000436 - Host Controller TCP/IP Communication Protocol User's Manual

990000437 - Host Controller EtherNet/IP Communication Protocol User's Manual

990000628 - Mitsubishi PLC TCP/IP Library User's Manual

990000558 - MagneMover LITE Configurator User's Manual

990000559 - QuickStick Configurator User's Manual

More Information

MagneMotion Website: www.magnemotion.com

Questions & Comments: www.magnemotion.com/about-magnemotion/contact.cfm

Revision History

Rev.	Change Description
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A	Initial release
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