A Rockwell Automation Company

MagneMover LITE User Manual Addendum, Ethernet Motors

Document: 10003865989; MMI-UM030B-EN-P
Version: 02

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About This Addendum

This document is an addendum to the *MagneMover LITE User Manual* and describes the Ethernet motor. The Ethernet motors support communication between the motors and between the motors and node controllers using Ethernet instead of RS-422 for communication.

Purpose

This document explains how to install, operate, and maintain the MagneMover® LITE (MM LITE™) Ethernet motors in a transport system. Use this document in combination with the *MagneMover LITE User Manual* and other documentation that accompanies the transport system to design, install, configure, test, and operate a MagneMover LITE system. Instructor-led training classes that provide additional experience are available.

Audience

This document is intended for all users of MagneMover LITE transport systems and provides information on how to install, configure, and operate MM LITE transport systems using Ethernet connected motors.

Prerequisites

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

- Familiarity with general-purpose computers and with the Windows® operating system.
- Full documentation for the transport system is available.
- All personnel operating the transport system are properly trained.

Reference Documents

- 990000410, MagneMover LITE User Manual
- 10003890416, MML Ethernet Motor Configuration and Communication

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Introduction

Overview

This section provides an overview of the MagneMover LITE Ethernet motors. These motors use Ethernet instead of RS-422 for motor-to-motor and motor-to-node controller communications.

Ethernet Motor Overview

Ethernet Motor – The MagneMover LITE linear synchronous motor (LSM) with Ethernet communication connections. Ethernet communication replaces the original RS-422 communication providing higher data transfer rates and expanded options for wiring.

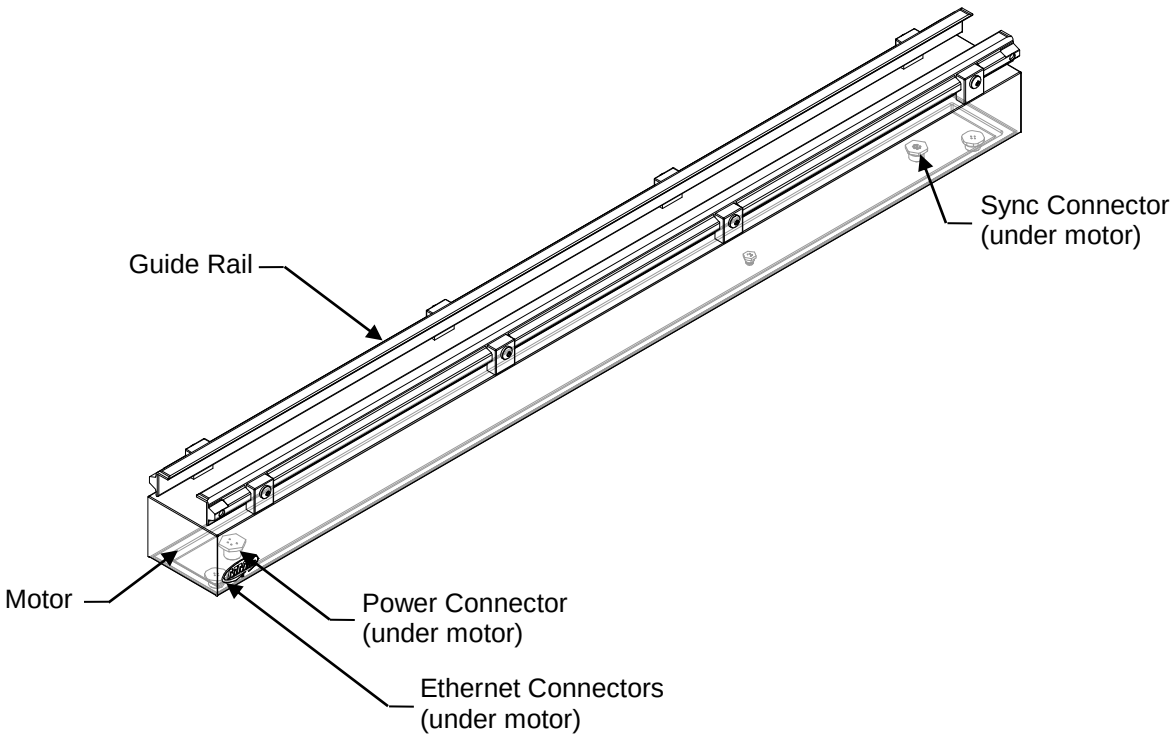

Figure 1: Detailed View of the 1000 mm Ethernet Motor

- **Motor** – The MagneMover LITE linear synchronous motor (LSM).
- **Guide Rail** – Integral rails maintain vehicles (pucks) in the proper relationship to the motors.
- **Ethernet Connections** – Provides connections for Ethernet communications.
- **Power Connection** – For connection of 36V DC to the motor.
- **Sync Connection** – Only provided on motors with the Sync option. For connecting the SYNC IT™ controller to the motor for direct control of vehicle motion.

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Safety

Overview

This section describes safety guidelines for the Ethernet motors and their use in a transport system. All personnel that are involved in the operation or maintenance of the MagneMover LITE components and system must be familiar with the safety precautions that are outlined in this section.

Regulatory Compliance

See the *MagneMover LITE User Manual* for all regulatory compliance information.

Safety Considerations

See the *MagneMover LITE User Manual* for all personnel and equipment safety information.

Symbol Identification

See the *MagneMover LITE User Manual* for all symbol identification and use information.

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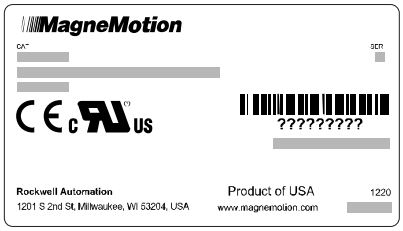
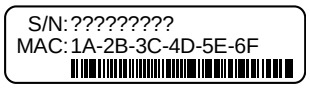
Label Identification and Location

Safety and identification labels are placed on those MagneMover LITE components that require them to provide hazard identification and information about the components at the point of use. This section describes each label, identifies its location, and for safety labels identifies the hazard and possible injuries.

Table 1: Labels Used on the 1000 mm Straight Motors

	Product Information Label Quantity: 1 Location: On the bottom of the motor
	MAC Address Label Quantity: 1 Location: On the bottom of the motor, extra copies supplied

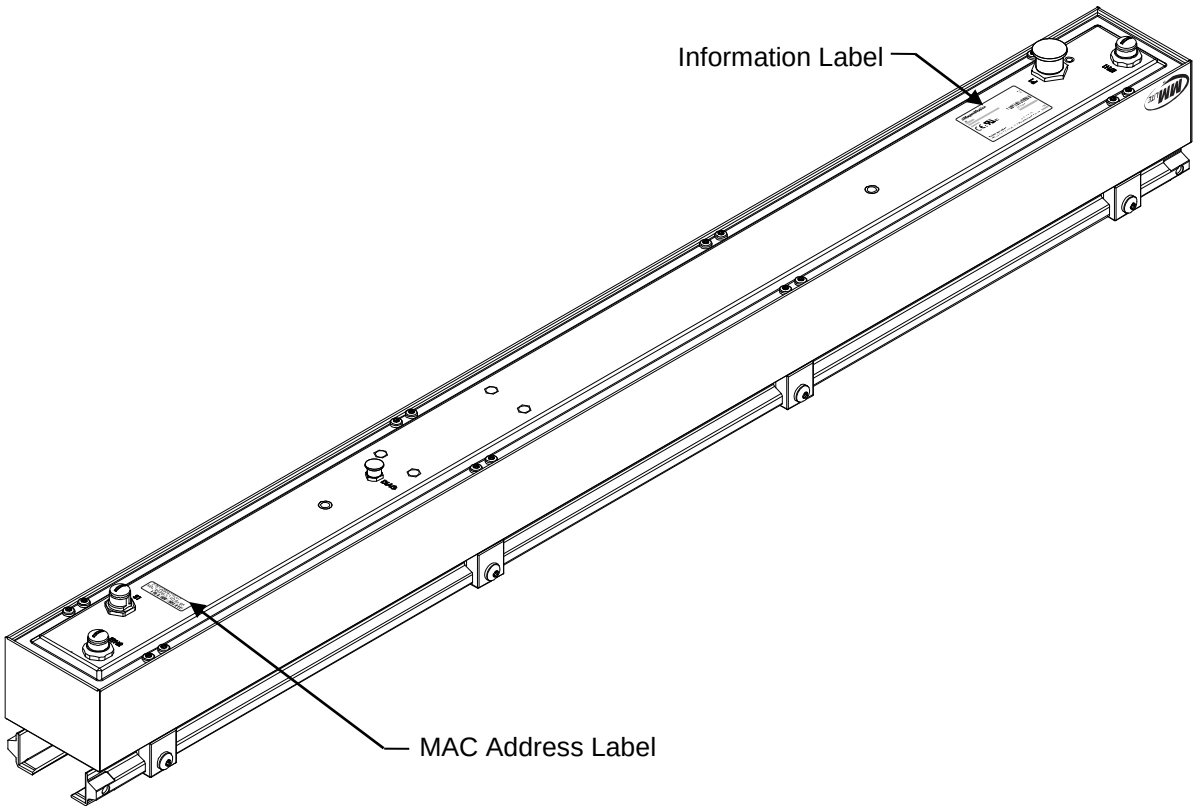


Figure 2: Locations of Labels on the 1000 mm Straight Motors

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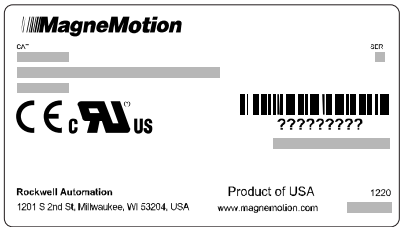
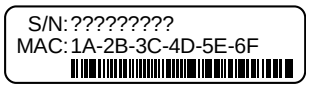
Table 2: Labels Used on the 250 mm Straight Motors

	Product Information Label Quantity: 1 Location: On the bottom of the motor
	MAC Address Label Quantity: 1 Location: On the bottom of the motor, extra copies supplied

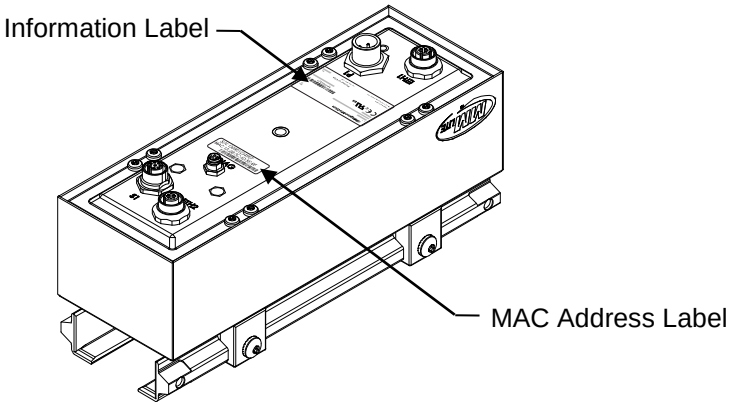


Figure 3: Locations of Labels on the 250 mm Straight Motors

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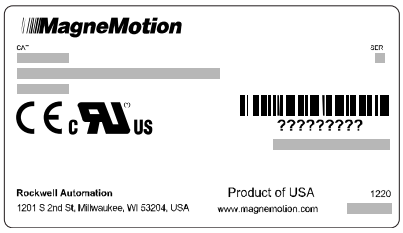
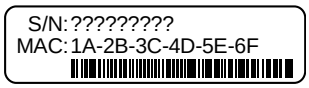
Table 3: Labels Used on the Curve Motors

	Product Information Label Quantity: 1 Location: On the bottom of the motor
	MAC Address Label Quantity: 1 Location: On the bottom of the motor, extra copies supplied

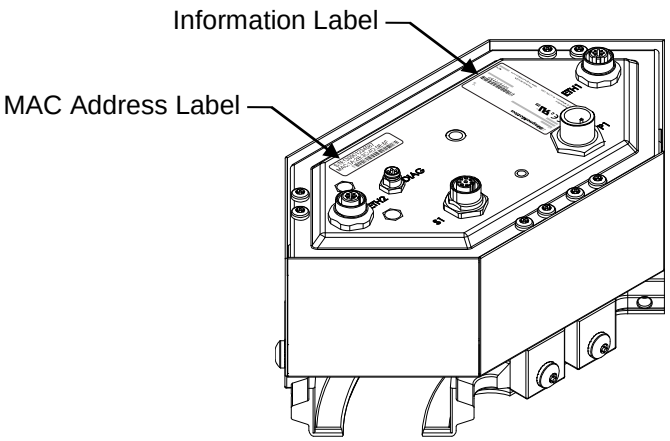


Figure 4: Locations of Labels on the Curve Motors

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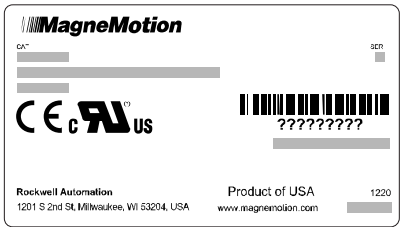
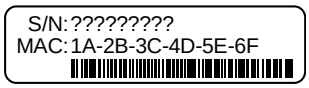
Table 4: Labels Used on the Switches

	Product Information Label Quantity: 1 Location: On the bottom of the motor
	MAC Address Label Quantity: 1 Location: On the bottom of the motor, extra copies supplied

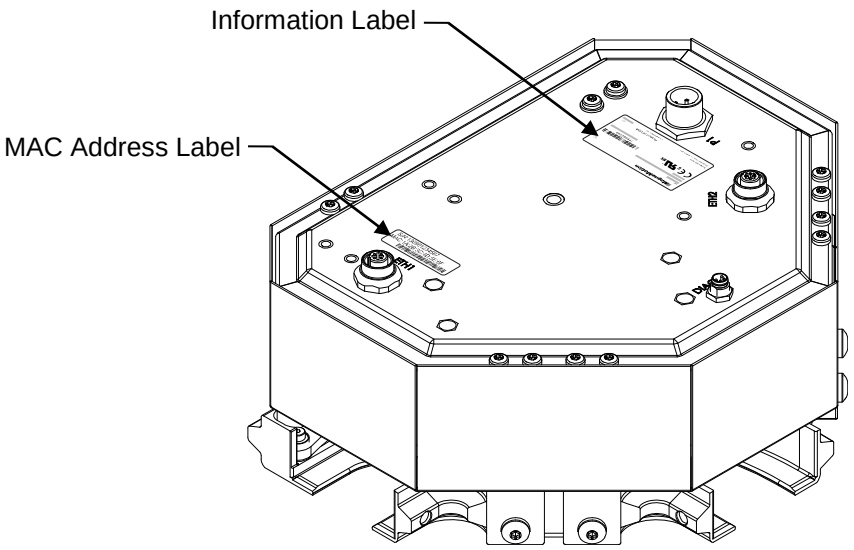


Figure 5: Locations of Labels on the Switches

Mechanical, Electrical, Magnetic Hazards

See the *MagneMover LITE User Manual* for detailed hazard and safety information.

⚠ CAUTION

Crush/Pinch Hazard

Moving mechanisms have no obstruction sensors.

Do not operate the MagneMover LITE components without barriers in place or personal injury could result in the squeezing or compression of fingers or other body parts between moving mechanisms.

⚠ CAUTION

Strong Magnets

To avoid severe injury, people with pacemakers and other medical electronic implants must stay away from the magnet array on the vehicles (pucks).

To avoid injury from strong magnetic attractive forces:

- Handle only one vehicle (puck) or magnet array at a time.
- Do not place any body parts, such as fingers, between a vehicle (puck) or magnet array and any ferrous material or another magnet array.
- Vehicles (pucks) or magnet arrays not being used must be secured individually in isolated packaging.

To avoid damage to watches, electronic instruments, and magnetic media (for example, cell phones, memory disks/chips, credit cards, and tapes) keep these items away from the magnet arrays.

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Recycling and Disposal Information

Information regarding disposal and recycling are provided in this section. The MagneMover LITE transport systems use the following items that require special handling for disposal or recycling. At the end of its life, this equipment must be collected separately from any unsorted municipal waste.

For China RoHS information, see https://literature.rockwellautomation.com/idc/groups/literature/documents/td/pec-td003_-en-e.pdf and reference Table B.

MagneMover LITE Transport System

No hazardous materials, other than the materials identified in this section, are used in the MagneMover LITE components.

Motors

The motors contain the following materials and must be disposed of by following all facility, local, and national procedures for the disposal of electronic equipment:

- Aluminum alloy with chromate over cadmium plating.
- Anodized Aluminum.
- Zinc-plated Low Carbon Steel Screws.
- Aluminum.
- Stainless Steel.
- Stainless Steel with Nickel plating,
- Circuit board with connectors and semiconductors.
- Synthetic rubber.
- Silicone sealant.
- Viton® (switch only).
- Igus® L280 (switch only).

Node Controllers

The node controllers contain the following materials and must be disposed of by following all facility, local, and national procedures for the disposal of electronic equipment:

- Anodized Aluminum.
- Circuit board with connectors and semiconductors.
- Zinc-plated Low Carbon Steel Screws.
- Lithium battery.

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Magnet Arrays

The magnet arrays (attached to the vehicles/pucks) as the motor secondary contain Neodymium Iron Boron (NdFeB) magnets. If these magnets are being removed or replaced, they must be handled in the following manner:

Follow all safety procedures for the handling of high strength magnets (see Magnetic Hazards in the *MagneMover LITE User Manual*).

Follow all facility, local, and national procedures for the disposal of hazardous materials. All strong permanent magnets must be demagnetized before disposal.

Packaging

The packaging for the MagneMover LITE motors and components contains the following materials. If the packaging is not being saved, it must be disposed of by following all facility, local, and national procedures for the disposal of packaging material:

- Cardboard.
- Polyethylene Foam.

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Design Guidelines

Overview

The primary benefit of using Ethernet communication with the motors is to provide higher data transfer rates. An additional benefit of using Ethernet is expanded options for wiring.

Ethernet Motors

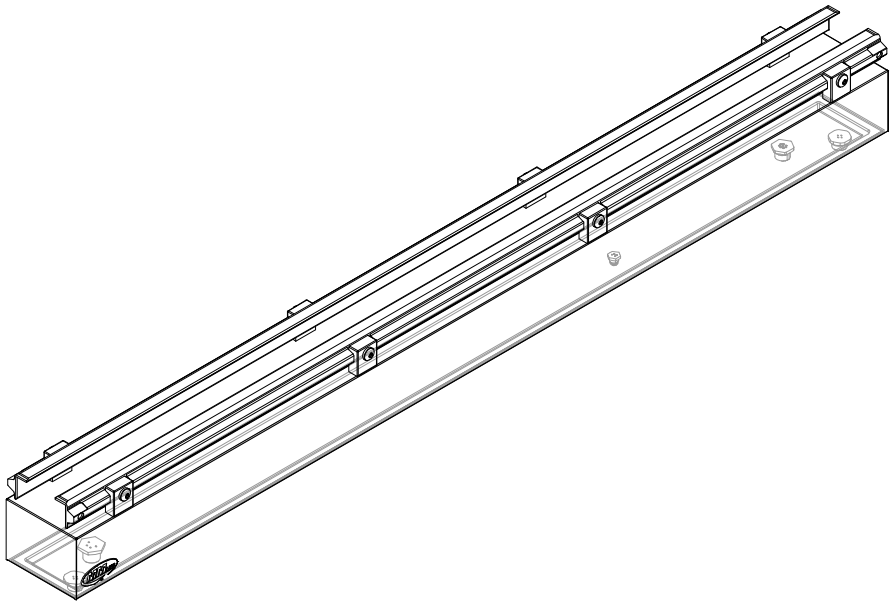

Figure 6: MM LITE Ethernet Motor

Benefits:

- Reduced number of node controllers.
- Increased limits on number of motors per path and/or vehicles per path.
- Foundation for enhanced condition monitoring and diagnostics.
- Ability to create additional paths without additional node controllers and cabling.

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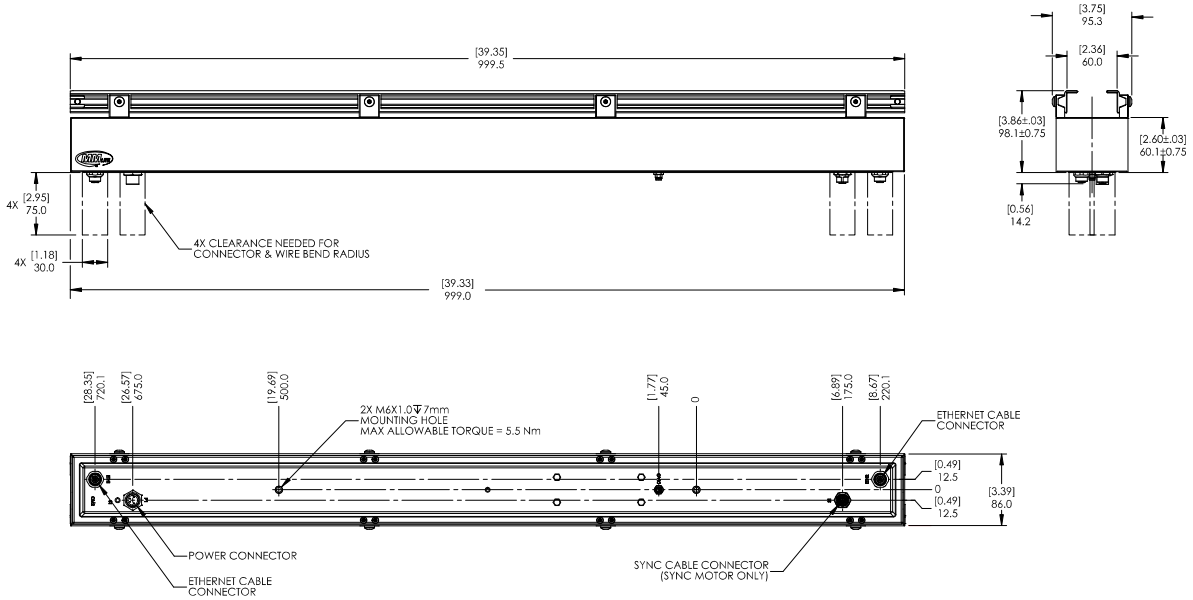
Specifications

Mechanical Specifications

1000 Millimeter Motor



Weight: 7.3 kg [16 lb]

All Dimensions in Millimeters [Inches]

Figure 7: 1000 mm MM LITE Ethernet Motor Mechanical Drawing

NOTE: Aluminum rails shown. Dimensions are the same for stainless steel rail and rail-less versions.

The Sync connection is only present if the Synchronization option is installed.

The exclusion zones that are shown are for the MM LITE Ethernet motor only. Additional exclusion zones may be required based on the use of the motor.

See the *MagneMover LITE User Manual* for the electrical specifications.

Exposed Materials

- 316/316L Stainless Steel.
- 304L Stainless Steel with Electroless Nickel plating (SS rails).
- A2, A4 Stainless Steel
- 6061-T6 Aluminum (Al rails).
- 6063-T5 Aluminum (Al rails).
- EPDM (synthetic rubber).
- Silicone.
- Dow Corning® Silicone 737 and 734.

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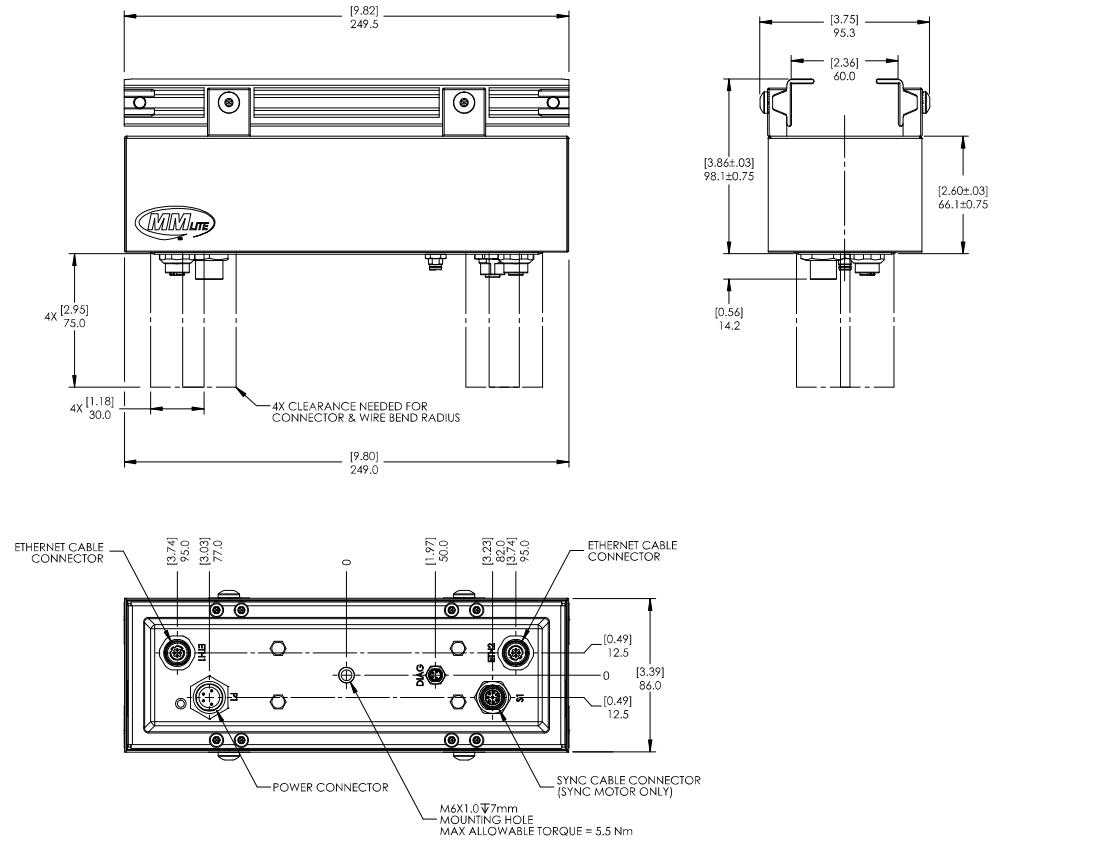
250 Millimeter Motor



Weight: 2.0 kg [4.4 lb] All Dimensions in Millimeters [Inches]

Figure 8: 250 mm MM LITE Ethernet Motor Mechanical Drawing

NOTE: Aluminum rails shown. Dimensions are the same for stainless steel rail and rail-less versions.

The Sync connection is only present if the Synchronization option is installed.

The exclusion zones that are shown are for the MM LITE Ethernet motor only. Additional exclusion zones may be required based on the use of the motor.

See the *MagneMover LITE User Manual* for the electrical specifications.

Exposed Materials

- 316/316L Stainless Steel.
- 304L Stainless Steel with Electroless Nickel plating (SS rails).
- A2, A4 Stainless Steel
- 6061-T6 Aluminum (Al rails).
- 6063-T5 Aluminum (Al rails).
- EPDM (synthetic rubber).
- Silicone.
- Dow Corning® Silicone 737 and 734.

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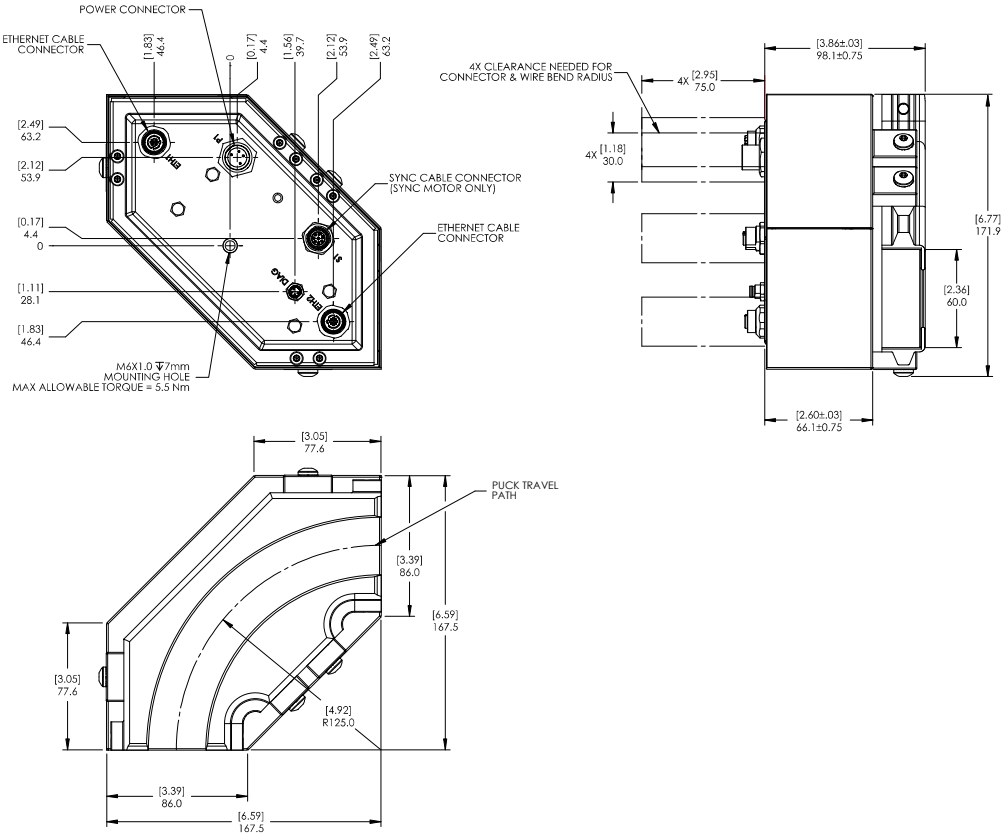
125 Millimeter R 90° Curve Motor



Weight: 1.8 kg [4 lb] All Dimensions in Millimeters [Inches]

Figure 9: 125 mm R 90° Curve MM LITE Ethernet Motor Mechanical Drawing

NOTE: Aluminum rails shown. Dimensions are the same for stainless steel rail and railless versions.

The Sync connection is only present if the Synchronization option is installed.

The exclusion zones that are shown are for the MM LITE Ethernet motor only. Additional exclusion zones may be required based on the use of the motor.

See the *MagneMover LITE User Manual* for the electrical specifications.

Exposed Materials

- 316/316L Stainless Steel.
- 303 Stainless Steel with Electroless Nickel plating (SS rails).
- A2, A4 Stainless Steel
- 6061-T6 Aluminum (Al rails).
- 6063-T5 Aluminum (Al rails).
- EPDM (synthetic rubber).
- Silicone.
- Dow Corning® Silicone 737 and 734.

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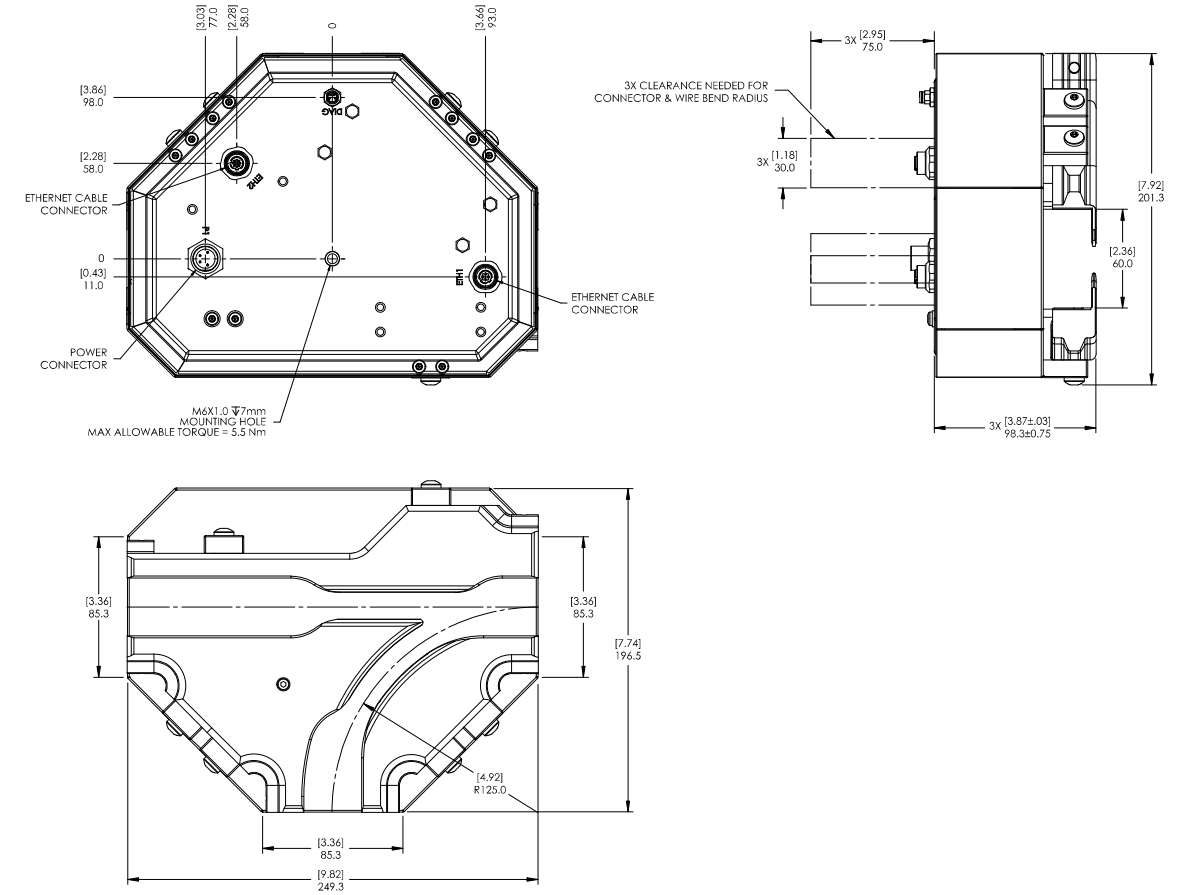
90° Left Switch



Weight: 4.2 kg [9.3 lb]

All Dimensions in Millimeters [Inches]

Figure 10: 90° MM LITE Ethernet Left Switch Mechanical Drawing

NOTE: Aluminum rails shown. Dimensions are the same for stainless steel rail version.

The exclusion zones that are shown are for the MM LITE Ethernet switch only. Additional exclusion zones may be required based on the use of the motor.

See the *MagneMover LITE User Manual* for the electrical specifications.

Exposed Materials

- 304L, 316/316L Stainless Steel.
- 303 Stainless Steel with Electroless Nickel plating (SS rails).
- A2, A4 Stainless Steel
- A1008 Commercial Steel, Type B
- 6061-T6 Aluminum (Al rails).
- 6063-T5 Aluminum (Al rails).
- EPDM (synthetic rubber).
- Silicone.
- Viton®.
- Igus® L280.
- Dow Corning® Silicone 737 and 734

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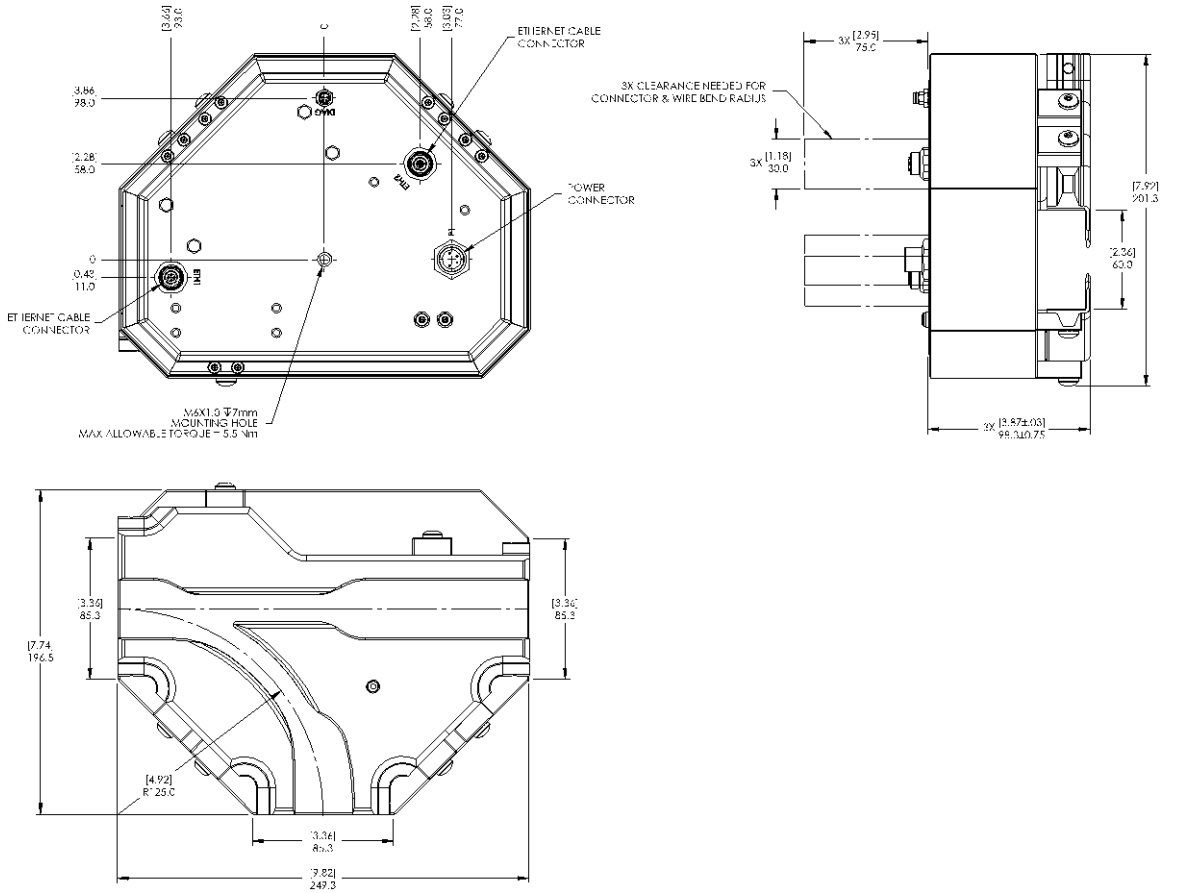
90° Right Switch



Weight: 4.2 kg [9.3 lb] All Dimensions in Millimeters [Inches]

Figure 11: 90° MM LITE Ethernet Right Switch Mechanical Drawing

- Aluminum rails shown. Dimensions are the same for the stainless steel rail version.
- The exclusion zones that are shown are for the MM LITE Ethernet switch only. Additional exclusion zones may be required based on the use of the switch.
- See the *MagneMover LITE User Manual* for the electrical specifications.

Exposed Materials

- 304L, 316/316L Stainless Steel.
- 303 Stainless Steel with Electroless Nickel plating (SS rails).
- A2, A4 Stainless Steel
- A1008 Commercial Steel, Type B
- 6061-T6 Aluminum (Al rails).
- 6063-T5 Aluminum (Al rails).
- EPDM (synthetic rubber).
- Silicone.
- Viton®.
- Igus® L280.
- Dow Corning® Silicone 737 and 734

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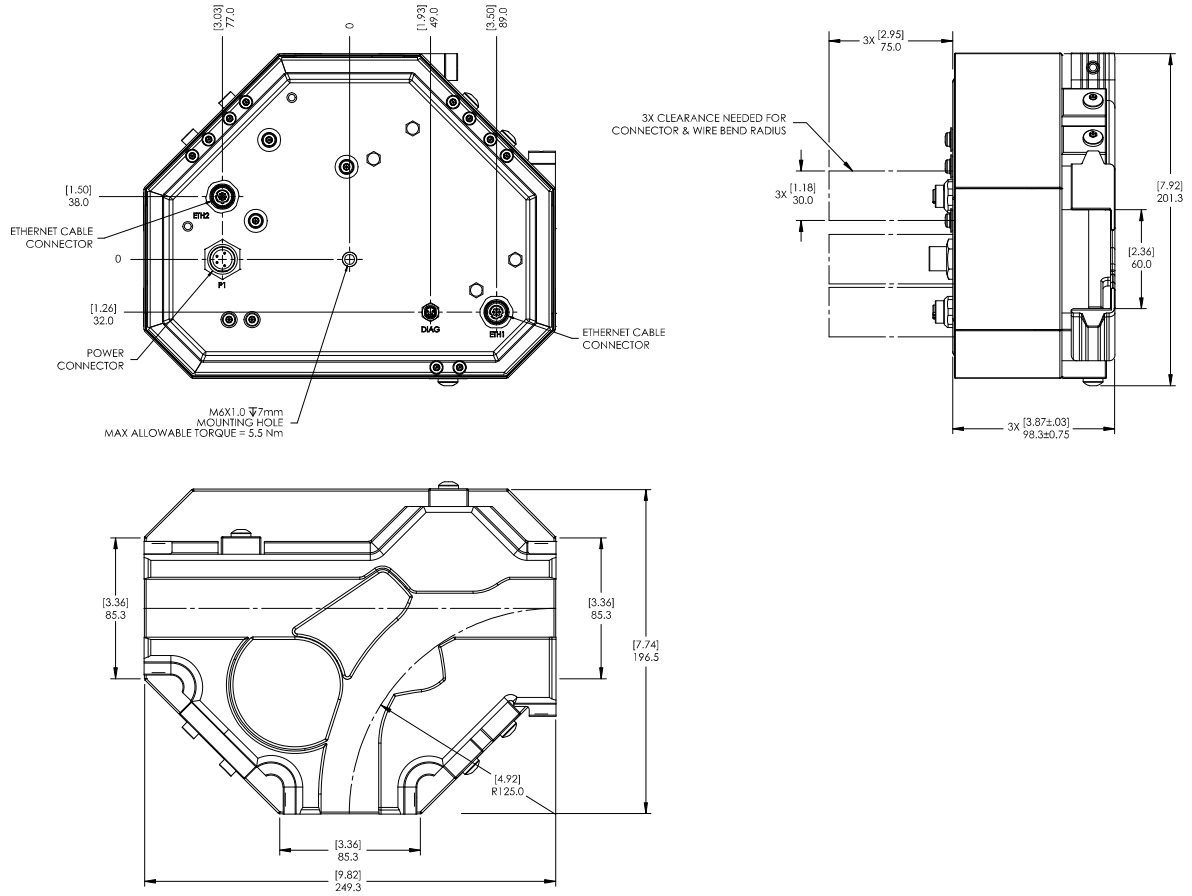
90° High Payload Left Switch



Weight: 4.3 kg [9.4 lb]

All Dimensions in Millimeters [Inches]

Figure 12: 90° MM LITE Ethernet High Payload Left Switch Mechanical Drawing

- Only available with aluminum rails as shown.
- The exclusion zones that are shown are for the MM LITE High Payload Ethernet switch only. Additional exclusion zones may be required based on the use of the switch.
- See the *MagneMover LITE User Manual* for the electrical specifications.

Exposed Materials

- 316/316L Stainless Steel.
- 303 Stainless Steel with Electroless Nickel plating (SS rails).
- A2, A4 Stainless Steel
- 6061-T6 Aluminum (Al rails).
- 6063-T5 Aluminum (Al rails).
- EPDM (synthetic rubber).
- White Vinyl Nitrile Rubber.
- Nitrile Rubber.
- VMQ silicone rubber.
- Silicone.
- Igus® L280.
- Tivar®.
- Dow Corning® Silicone 737 and 734.

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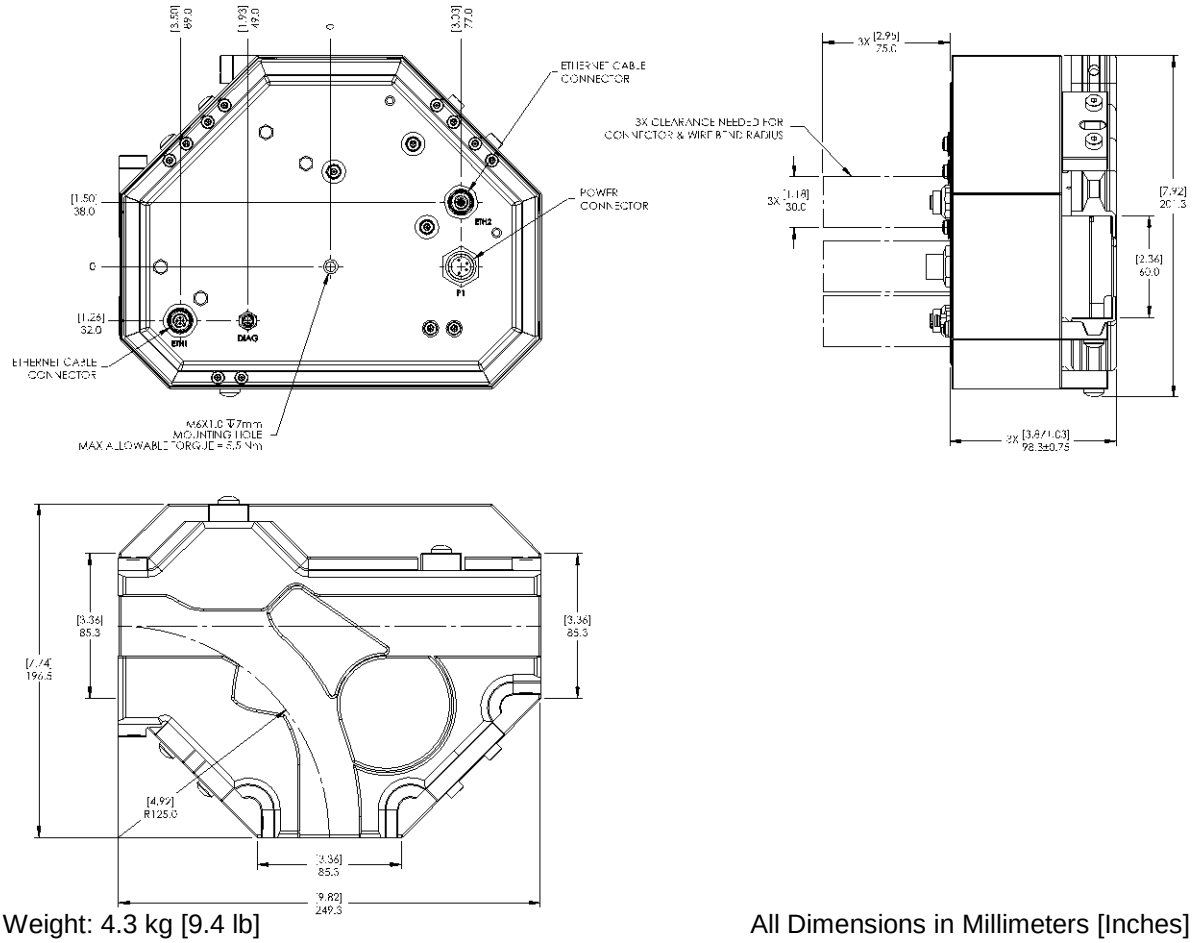
90° High Payload Right Switch



Weight: 4.3 kg [9.4 lb]

All Dimensions in Millimeters [Inches]

Figure 13: 90° MM LITE Ethernet High Payload Right Switch Mechanical Drawing

- Only available with aluminum rails as shown.
- The exclusion zones that are shown are for the MM LITE High Payload Ethernet switch only. Additional exclusion zones may be required based on the use of the switch.
- See the *MagneMover LITE User Manual* for the electrical specifications.

Exposed Materials

- 316/316L Stainless Steel.
- 303 Stainless Steel with Electroless Nickel plating (SS rails).
- A2, A4 Stainless Steel
- 6061-T6 Aluminum (Al rails).
- 6063-T5 Aluminum (Al rails).
- EPDM (synthetic rubber).
- White Vinyl Nitrile Rubber.
- Nitrile Rubber.
- VMQ silicone rubber.
- Silicone.
- Igus® L280.
- Tivar®.
- Dow Corning® Silicone 737 and 734.

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Electrical Specifications

The MagneMover LITE Ethernet motors are electrically the same as the standard MagneMover LITE motors. All electrical power information for the motors is provided in the *MagneMover LITE User Manual*.

Switches

The switches draw an additional 15 W of power per vehicle (puck) when the vehicle is moving at maximum acceleration or velocity (see the *MagneMover LITE User Manual*).

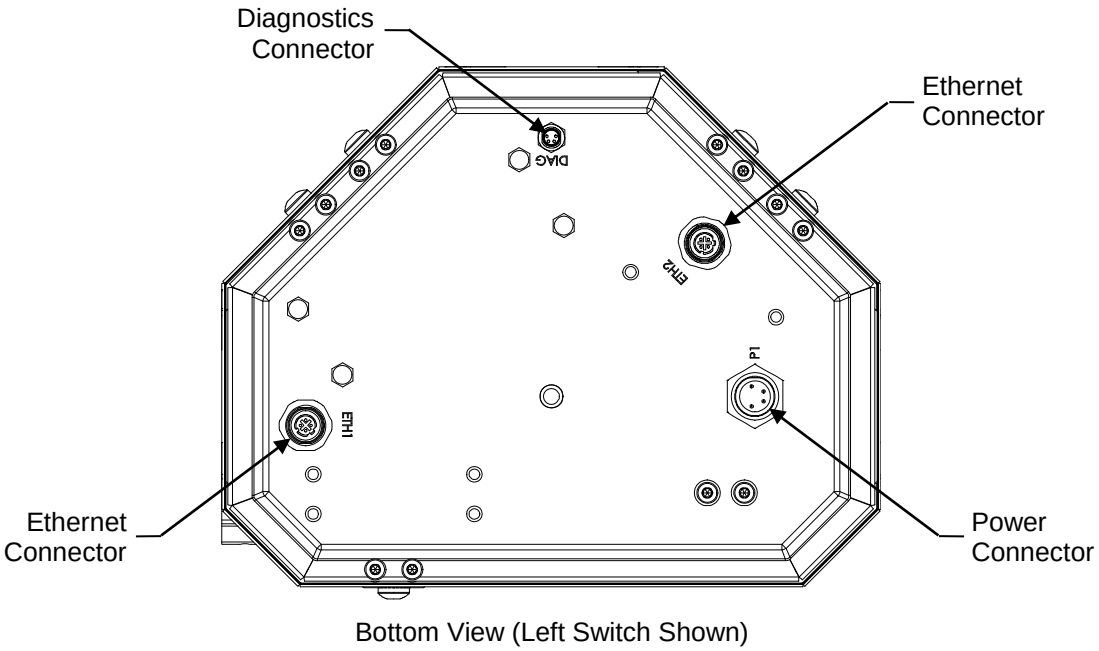

Figure 14: MM LITE Ethernet Switch Electrical Connections

The connector locations vary on the different versions of the switch. However, all connectors shown are on all switches.

Table 5: MML Ethernet Switch Electrical Connections

DIAG	Diagnostics – Factory Use Only	M8 Nano-Mizer, 4-Pin, Male
ETH1	Ethernet Communications (10/100/1000 BaseTx)	M12 Eurofast, FKFDD, Female
ETH2	Ethernet Communications (10/100/1000 BaseTx)	M12 Eurofast, FKFDD, Female
P1	Power 36V DC ±10% – 1.5 A typical, 5.0 A max.	Mini-Conn-X, 4-Pin, Male

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Straight and Curve Motors

The motors draw an additional 15 W of power per vehicle (puck) when the vehicle is moving at maximum acceleration or velocity (see the *MagneMover LITE User Manual*).

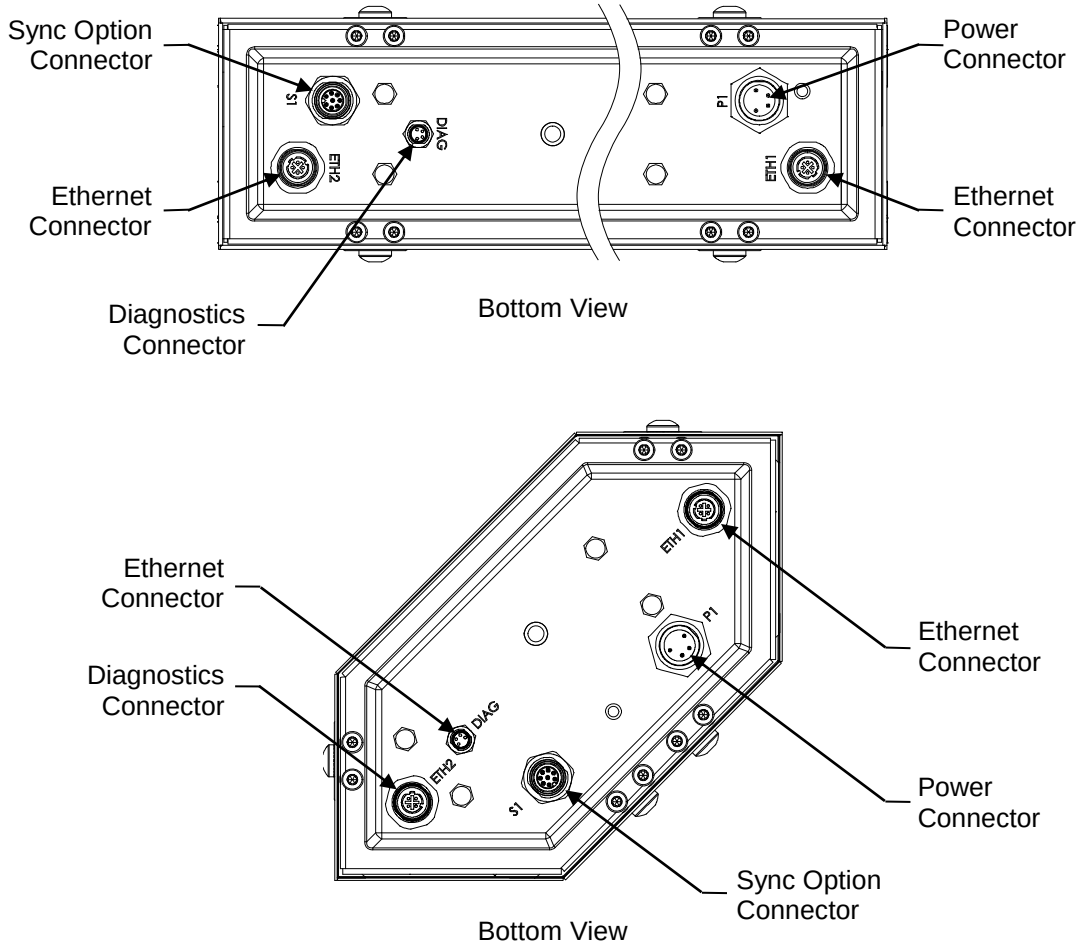

Figure 15: MM LITE Ethernet Motor Electrical Connections

Table 6: MML Ethernet Motor Electrical Connections

DIAG	Diagnostics – Factory Use Only	M8 Nano-Mizer, 4-Pin, Male
ETH1	Ethernet Communications (10/100/1000 BaseTx)	M12 Eurofast, FKFDD, Female
ETH2	Ethernet Communications (10/100/1000 BaseTx)	M12 Eurofast, FKFDD, Female
P1	Power 36V DC ±10% 1000 mm motor – 1.5 A typical, 5.0 A max. 250 mm motor – 0.4 A typical, 1.2 A max. Curve motor – 0.4 A typical, 1.2 A max.	Mini-Conn-X, 4-Pin, Male
S1*	External Synchronization	Micro-Mizer, 8-Pin, Male

* The Sync Option Connector is only present if the Synchronization option is installed.

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Environmental Requirements

Motors

Temperature:

Operating: 0 °C to 50 °C [32 °F to 122 °F]

Storage: -18 °C to 50 °C [0 °F to 122 °F]

Humidity:

0–85% Maximum (relative, noncondensing)

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Installation

Unpacking and Moving

The MagneMover LITE Ethernet motors arrive from the factory as a component ready for final installation. The information that is required to install these components is provided in the *MagneMover LITE User Manual*.

Installing Hardware

Each motor has a label that identifies its MAC address that is attached to the bottom of the motor.

Installing High Payload Switches

For basic installation instructions, refer to *Mounting Motors and Switches* in the *MagneMover LITE User Manual*.

When securing the motors to either end of the curve path in the switch, use an extended v-brace (200-2450-00) as shown in Figure 16. Use standard v-braces (200-2002-00) for all other rail connections.

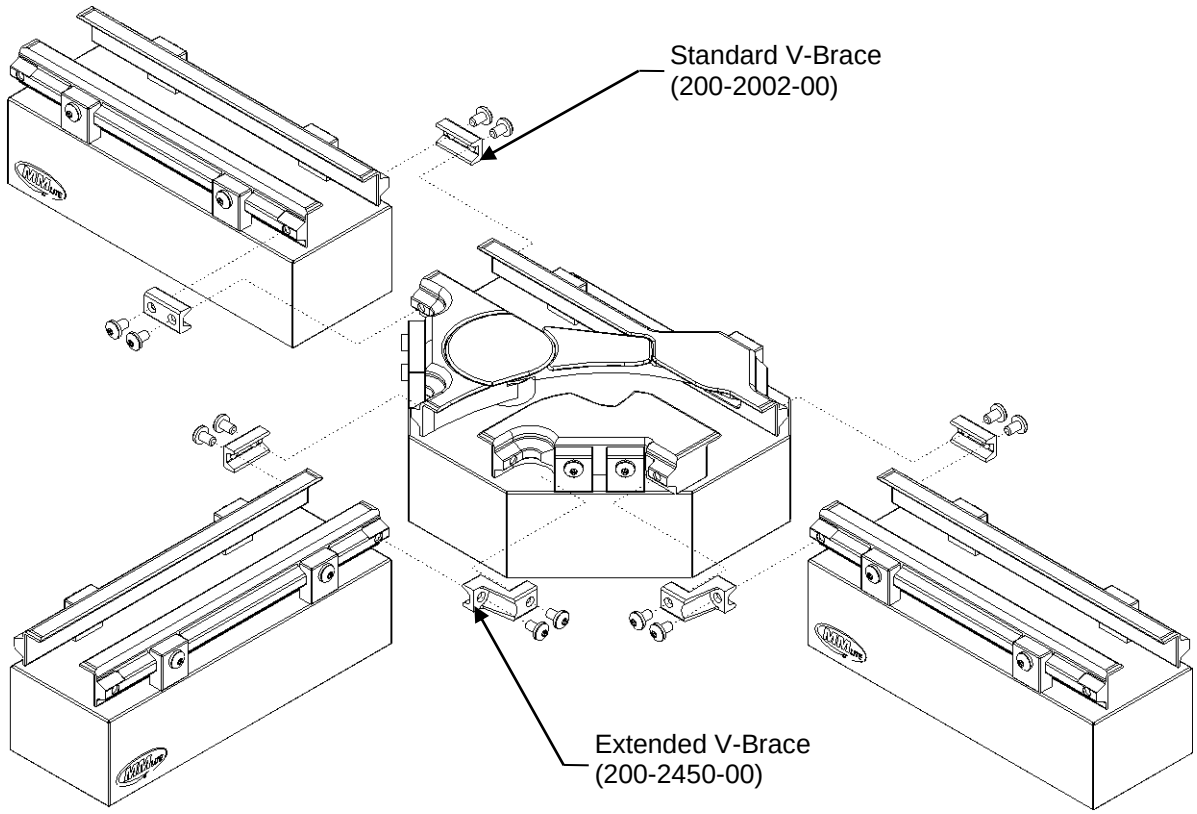

Figure 16: Install High Payload Switch

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Recommendations When Using the MML Ethernet Motors

- Recommended Ethernet addressing scheme (see Figure 17):

  Network.Path.Motor

  - Network addresses are used for network configuration
  - Path 0 addresses are used for subnet configuration:
    x.y.0.m – *m* = Node controllers/Network devices
  - Path *p* addresses are used for motors on that path:
    x.y.p.m – *p* = Path, *m* = Motor
- Switches are two logical track paths, only one IP address is assigned.
- Maximum number of motors per Ethernet chain = 50.
- Factory network design must minimize extra traffic on the physical network that the transport system is using.
  - Closed-loop Ethernet connections must be avoided (industry standard Ethernet practice) to help prevent network saturation.
  - Only pass transport system communication through the Ethernet chains in the transport system.
  - Large amounts of traffic can degrade the performance of the transport system.
- Standard IP UDP4 communication, low latency.
- 100BASE-TX Fast Ethernet (IEEE 802.3u) compliant.
- Minimum of CAT 5 cabling is required.
- Ethernet communication topology is independent of transport system configuration (Ethernet chaining does not have to follow the physical path layout).
- The use of Allen-Bradley® Stratix® Managed Ethernet switches is recommended to make sure of performance.
- Ethernet chains can consist of multiple paths (as defined in the layout drawing for the transport system).
- Chains do not need to start at the beginning of a path.
- If all motors in a path are not part of the same Ethernet chain, all chains the path is a member of must connect to the same network as the node controller.

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Connecting Motors and Electronics

The MagneMover LITE Ethernet motors can use different network style connection schemes depending on the application. When using Ethernet, all motors in a specific path must be connected to the same node controller (see Figure 17 through Figure 19). Additionally, multiple paths can be connected to the node controller using the same Ethernet chain.

Run power and communications cables in the cable chase under the motors to help protect them from damage and provide easy access for service.

NOTICE

Never connect or disconnect energized power lines to the MagneMover LITE transport system as damage to internal components can result.

NOTICE

The NC LITE only supports the custom MagneMotion Power over Ethernet (PoE). Never connect the NC LITE to a standard PoE network as damage to internal components can result.

The MM LITE motors and NC-12 node controller do not support Power over Ethernet (PoE). Never connect these components to a powered Ethernet network as damage to internal components can result.

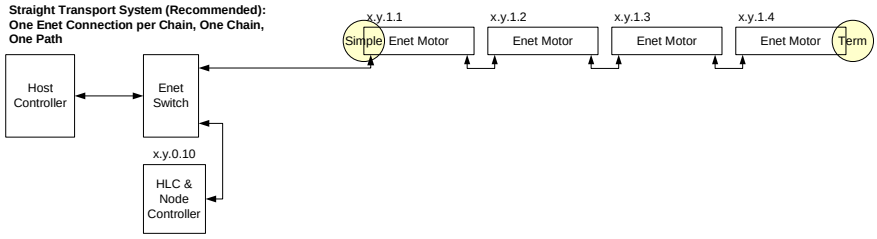

Figure 17: Simplified Representation of Ethernet Connections, One Straight Path

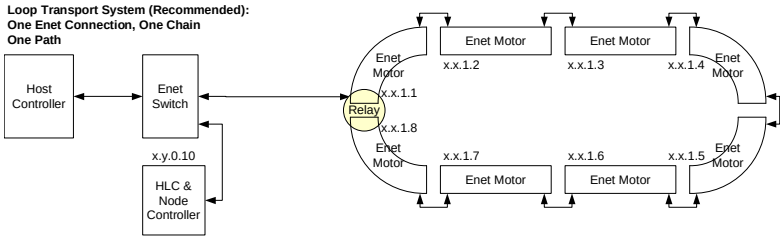

Figure 18: Simplified Representation of Ethernet Connections, One Loop Path

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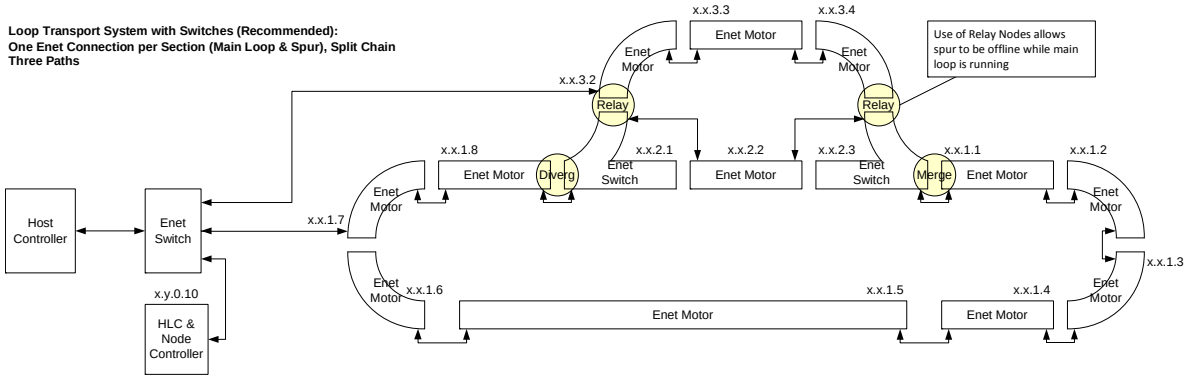

Figure 19: Simplified Representation of Ethernet Connections, Main Loop and Spur

Installing Ethernet Motor Communications Cables

See Figure 15 for the communication connection locations on the motors and switches. See Figure 17 through Figure 19 for simplified diagrams of the wiring.

1. Connect a CAT 5 network cable from a spare port on the Ethernet switch to the first motor in a chain and route the cable in the cable chase.
   - Record the node controller IP addresses from the transport system layout for entry into the Node Controller Configuration File.
   - Record the motor IP addresses from the transport system layout for entry into the MagneMotion Information and Configuration Service (MICS) file.
2. Connect a short CAT 5 network cable from the opposite end of the motor to the next motor in the chain.
3. Continue to connect the remaining motors in the chain with CAT 5 network cables.
4. Repeat Step 1 through Step3 for each chain in the MagneMover LITE transport system.
   - The motors at the ends of all paths that are connected in a node must be connected to the same node controller.
   - The motors at the end of a chain must not have their downstream Ethernet port connected.
5. Bundle and dress all cables (use nylon cable-ties) as required to achieve clean cable routing.
6. See Facilities Connections in the *MagneMover LITE User Manual* for external communications connections.

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Software

Create and upload the Node Controller Configuration File (see the *MagneMover LITE User Manual*). Creation of the Node Controller Configuration File is the same when using the Ethernet motors.

Create and upload the MICS file to define the Ethernet routes between the node controller and the motors (see 10003890416, *MML Ethernet Motor Configuration and Communication*).

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Maintenance

Repair

Table 7: Repair Procedures

Component	Maintenance Action	Page #
Motor	Replacing and Programming Motors	33

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Replacing and Programming Motors

The MagneMover LITE motors can be replaced easily depending upon the location and mounting method for the motor. See the *MagneMover LITE User Manual* for detailed motor replacement information.

Several steps must be taken after a new MagneMover LITE Ethernet motor is installed (see Installing Hardware on page 27) to make sure of proper operation. This motor installation can be either as a part of a new system installation or as a replacement for an existing motor

- Revise the MICS file
- Provision the motor on the network
- Program the motor

Required Tools and Equipment

- Computer with an Ethernet port and a web browser.
- Transport system MICS file.
- Motor ERF Image Files.

Procedure

1. Replace the motor. See the *MagneMover LITE User Manual*.
- Revise the entry in the MICS file for the new motor (see 10003890416, *MML Ethernet Motor Configuration and Communication*).

   Do not change the <IP_addr> or <Track_location> elements for the motor.

   1. Update the <Mac_addr> element with the MAC address for the new motor.
   2. Update the <Orientation> element with the orientation for the new motor.

2. Upload the MICS file to all node controllers.
3. Cycle logic power to the new motor to force the motor to request its network provisioning.
4. Using the node controller Web Interface, program the masters and slaves for the motor. See the *Node Controller Interface User Manual* for details.
5. Reset the Paths where the motors were programmed (use the host controller or the NCHost TCP Interface Utility, see the *NCHost TCP Interface Utility User Manual* for details).

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More Information

MagneMotion website: www.magnemotion.com

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

Revision History

Ver.	Change Description
00	Initial release
01	Added high payload switches
02	Added WEEE information and China RoHS data link. Corrected the Mechanical Specifications for the motors. Updated the Recommendations When Using the MML Ethernet Motors section.

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Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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