**SMC**

## Operation Manual

| PRODUCT NAME |
| --- |

Ethernet MPC – Ethernet/IP$^{TM}$

| MODEL / Series / Product Number |
| --- |

MPC
Multi Position Cylinder
MPCXX-XXX-XXX-XX-DUT01607

# SMC Corporation

**SMC**

# 1. **Table of Contents**

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## 2. **Safety Instructions**

*These safety instructions are intended to prevent hazardous situations and/or equipment damage.*
*These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or*
*"Danger". They are all important notes for safety and must be followed in addition to International*
*standards (ISO/IEC), and other safety regulations.*
*ISO 4414: Pneumatic fluid power -- General rules relating to systems.*
*ISO 4413: Hydraulic fluid power -- General rules relating to systems.*
*IEC 60204-1: Safety of machinery -- Electrical equipment of machines. (Part 1: General requirements)*
*ISO 10218-1992: Manipulating industrial robots -- Safety.*
*Etc.*

| ⚠ **Caution** : | CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. |
| --- | --- |
| ⚠ **Warning**: | WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
| ⚠ **Danger** : | DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury. |

## ⚠ *Warning*

*1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.*
*Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.*

*2. Only personnel with appropriate training should operate machinery and equipment.*
*The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.*

*3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.*
*1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.*
*2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.*
*3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.*

*4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.*
*1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.*
*2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.*
*3. An application which could have negative effects on people, property, or animals requiring special safety analysis.*
*4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.*

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## ⚠ *Caution*

**The product is provided for use in manufacturing industries.**
*The product herein described is basically provided for peaceful use in manufacturing industries.*
*If considering using the product in other industries consult SMC beforehand and exchange specifications or a contract if necessary.*
*If anything is unclear, contact your nearest sales branch.*

## *Limited warranty and Disclaimer/Compliance Requirements*

*The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".*
*Read and accept them before using the product.*

### *Limited warranty and Disclaimer*

*1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.[\*1]*
*Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.*
*2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.*
*This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.*
*3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.*
*\*1) Vacuum pads are excluded from this 1 year warranty.*
*A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.*
*Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.*

### *Compliance Requirements*

*When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).*

## *Operator*

*♦This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.*
*♦Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the product.*

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■*Precautions*

<table>
<tr><td colspan="1">⚠ **Warning**</td></tr>
<tr><td>■*Do not disassemble, modify (including changing the printed circuit board) or repair.*<br>*An injury or failure can result.*</td></tr>
<tr><td>■**Do not operate the product outside of the specifications.**<br>**Do not use for flammable or harmful fluids.**<br>**Fire, malfunction, or damage to the product can result.**<br>**Verify the specifications before use.**</td></tr>
<tr><td>■*Do not operate in an atmosphere containing flammable or explosive gases.*<br>*Fire or an explosion can result.*<br>*This product is not designed to be explosion proof.*</td></tr>
<tr><td>■*If using the product in an interlocking circuit:*<br>•*Provide a double interlocking system, for example a mechanical system.*<br>•*Check the product regularly for proper operation.*<br>*Otherwise malfunction can result, causing an accident.*</td></tr>
<tr><td>■*The following instructions must be followed during maintenance:*<br>•*Turn off the power supply.*<br>•*Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.*<br>*Otherwise an injury can result.*</td></tr>
<tr><td colspan="1">⚠ *Caution*</td></tr>
<tr><td>■*After maintenance is complete, perform appropriate functional inspections.*<br>*Stop operation if the equipment does not function properly.*<br>*Safety cannot be assured in the case of unexpected malfunction.*</td></tr>
<tr><td>■*Provide grounding to assure the safety and noise resistance of the Serial System.*<br>*Individual grounding should be provided close to the product with a short cable.*</td></tr>
</table>

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■*NOTE*

○*Follow the instructions given below when designing, selecting and handling the product.*

•*The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.*

☐ **Product specifications**

• *When conformity to UL is necessary the SI unit must be used with a UL1310 Class2 power supply.*

•*The SI unit is a* ᶜ🅁ᵁₛ *approved product only if they have a* ᶜ🅁ᵁₛ *mark on the body.*

•*Use the specified voltage.*
*Otherwise failure or malfunction can result.*

•*Reserve a space for maintenance.*
*Allow sufficient space for maintenance when designing the system.*

•*Do not remove any nameplates or labels.*
*This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.*
*It may also result in non-conformity to safety standards.*

•*Product handling*

☐ **Installation**

•*Do not drop, hit or apply excessive shock to the Ethernet ITV system.*
*Otherwise damage to the product can result, causing malfunction.*

•*Tighten to the specified tightening torque.*
*If the tightening torque is exceeded the mounting screws may be broken.*
*IP65 protection cannot be guaranteed if the screws are not tightened to the specified torque.*

•*Never mount a product in a location that will be used as a foothold.*
*The product may be damaged if excessive force is applied by stepping or climbing onto it.*

☐ **Wiring**

•*Avoid repeatedly bending or stretching the cables, or placing heavy load on them.*
*Repetitive bending stress or tensile stress can cause breakage of the cable.*

•*Wire correctly.*
*Incorrect wiring can break the product.*

•*Do not perform wiring while the power is on.*
*Otherwise damage to the fieldbus system and/or I/O device can result, causing malfunction.*

•*Do not route wires and cables together with power or high voltage cables.*
*Otherwise the fieldbus system and/or I/O device can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.*
*Route the wires (piping) of the fieldbus system and/or I/O device separately from power or high voltage cables.*

•*Confirm proper insulation of wiring.*
*Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.*

•*Take appropriate measures against noise, such as using a noise filter, when the fieldbus system is incorporated into equipment.*
*Otherwise noise can cause malfunction.*

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## Environment

•Select the proper type of protection according to the operating environment.
IP65 protection is achieved when the following conditions are met.
(1) The units are connected properly with fieldbus cable with M12 connector and power cable with M12 connector.
(2) Suitable mounting of each unit (if using the optional manifold mount).
(3) All unused connectors are closed with a properly installed seal cap.
If using in an environment that is exposed to water splashes, please take measures such as using a cover.
•Do not use in a place where the product could be splashed by oil or chemicals.
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction etc.).
•Do not use the product in an environment where corrosive gases or fluids could be splashed.
Otherwise damage to the product and malfunction can result.
•Do not use in an area where surges are generated.
If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the fieldbus system, this may cause deterioration or breakage of the internal circuit of the fieldbus system. Avoid sources of surge generation and crossed lines.
•When a surge-generating load such as a relay or solenoid is driven directly, use a fieldbus system with a built-in surge absorbing element.
Direct drive of a load generating surge voltage can damage the fieldbus system.
•The product is **NOT** immune to lightning strikes. Take measures against lightning strikes in the system.
•Prevent foreign matter such as remnant of wires from entering the fieldbus system to avoid failure and malfunction.
•Mount the product in a place that is not exposed to vibration or impact.
Failure or malfunction can result.
•Do not expose the product to direct sunlight.
If using in a location directly exposed to sunlight, shade the product from the sunlight.  Failure or malfunction can result.
•Keep within the specified operating temperature range.
Malfunction can result.
•Do not operate close to a heat source, or in a location exposed to radiant heat.
Malfunction can result.

☐ **Adjustment and Operation**
•Perform settings suitable for the operating conditions.
Incorrect setting can cause operation failure.
•Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.
For the PLC protocol and programming refer to the relevant manufacturer's documentation.

☐ **Maintenance**
•Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
There is a risk of unexpected malfunction.
•Perform regular maintenance and inspections.
There is a risk of unexpected malfunction.
•After maintenance is complete, perform appropriate functional inspections.
Stop operation if the equipment does not function properly.
Otherwise safety is not assured due to an unexpected malfunction or incorrect operation.
•Do not use solvents such as benzene, thinner etc. to clean the unit.
They could damage the surface of the body and erase the markings on the body. Use a soft cloth to remove stains.  For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

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# 3. About this Manual

### 3.1. MPC

The MPC is SMC's low cost Ethernet positioning cylinder. The MPC series offers a cylinder, solenoid valve, linear positioner, and controller in one package.  With its integral position control, the MPC needs only power and Ethernet input signal. The target position is kept by opening and closing solenoid valves controlling pressure on the cylinder.  The MPC has an output signal to give position feedback to a customer's controller.  Standard ball bushings protect against side load.

### 3.2. Purpose

The purpose of this manual is to provide the user with necessary information to install, configure, and use the MPCXX-XXX-XXX-XX-DUT01607.  The MPC may be operated under the control of a network connected PLC.  This manual provides information for MPC setup and configuration, examples of the web interface, and a brief overview of the PLC.  This document is not an operator's manual for the Rockwell PLC or any other PLC.  Please see the PLC manufacturer's documentation for detailed instructions on the setup and use of your PLC.

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# 4. **Terminology**

| | Terms | Meaning |
|---|---|---|
| 100 | 100BASE-TX | Standard LAN transmission line with communication speed of 100 Mbps. |
| A | Auto negotiation | The function that automatically optimizes the common communication parameters such as speed, duplex mode, and flow control between Ethernet devices. |
| C | Counts | The MPC controls and reports position internally in **Counts**. The counts are used by hardware devices to control and measure the position regulated by the MPC. |
| | Current consumption | The current (power) necessary to operate each unit or device. |
| D | Downstream | Devices receiving power or communications signals which originate *from* or are *passed through* a given device are *downstream* of that device. |
| | DLR | An abbreviation for Device Level Ring: Performs a fast switching of the communication route when any problem occurs with the Ring network to maintain communication. |
| E | Enclosure (IPxy) | Abbreviation of International (Ingress) Protection. A standard related to protection from external objects (hands, steel balls, steel wire, dust, water, etc.) applied to the product. |
| F | Fieldbus | The protocol that uses digital communication to exchange signals between field equipment (instruments and actuators). |
| | Full duplex | Communication system that can send and receive data at the same time bi-directionally (similar to standard telephone). |
| H | Half duplex | Communication system that sends and receives data in one direction at a time (similar to two-way radio). |
| I | IP address | A 32 bit digit sequence which is assigned to identify devices which are connected to the network. This address must be unique for each device to ensure proper operation of the network. |
| M | MAC address | A unique number inherent to all devices which are connected to Ethernet. |
| | Ethernet/IP | By combining Ethernet, CANopen and hard real-time capabilities, Ethernet/IP integrates features and abilities from three different worlds. In contrast to a number of competing products, Ethernet/IP has remained extremely close to the Ethernet standard, retaining original Ethernet features and so reducing the cost of deployment in industrial environments. The protocol's second major advantage is the integration of CANopen technology, a robust and proven protocol widely used throughout the field of automation whose extensive standardization greatly simplifies network configuration. |
| P | PC | Personal Computer. |
| | PLC | Abbreviation for Programmable Logic Controller. A digital computer/controller used for automation of electromechanical processes. |
| R | Reboot | Unless otherwise noted, the term "reboot" in this document means that the MPC must be power cycled. |
| S | Setpoint | The specified position which the MPC has been directed to maintain. Setpoint may be specified via a setpoint sent from a PLC. **Setpoint** may refer to a human readable value – including measurement units – used to specify the position to be maintained by the MPC. **Physical setpoint** is a unit-less value **(physical counts)** used internally to control and monitors the MPC's physical position. Unless noted, setpoint refers to the human readable value including measurement units. Setpoint and position status values are sent between the MPC and a PLC in **counts** (physical setpoint). |
| | Serial Interface (SI) | A communication interface between two digital systems that transmits data as a series of voltage pulses down a wire. Each pulse represents a single bit of data. |
| | SI unit | Abbreviation for Serial Interface unit. A unit connected to a PLC to communicate input and output data. The MPC connection to another MPC or to a PLC or PC is a Serial Interface (SI). |
| T | Topology | Connection configuration of the network. |
| U | Upstream | A device which provides power or communications signals *to* a given device is *upstream* of that device. |

**Table 4-1 - Definitions and Terminology**

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# 5. **Product Summary**

The MPCXX-XXX-XXX-XX-DUT01607 (MPC) is a multi-position cylinder which is controlled by an Ethernet interface. MPCs move to a position value specified by the user. In the past, an electric actuator was the only option for applications demanding a multiple number of stroke positions. SMC's MPC series now provides an alternative and economical solution.

The Ethernet interface allows a user to configure, control, and monitor the MPC over a communication link using commands sent from a PLC or internal webserver. The user can change the position setpoint as required. The user can also monitor the operation of the MPC, verifying the actual position.

Offered as a pneumatic and lower cost alternative, the MPC (Multi Position Cylinder) uses an Ethernet input signal to automatically adjust the actuator stroke. Once the MPC reaches the desired position, it is pneumatically locked until the input signal is changed.

To accomplish this, the MPC utilizes an integrated cylinder, solenoid valve, linear sensor, and controller all in one unit. You need only to supply air, power, and the appropriate input signal. This easy adjustment makes the MPC perfect for on the fly changes to your process.

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# 6. How to Order

(Refer to product drawing for latest information)
Specify the part number for your MPC. The part number describes the MPC as follows:



| MPC## | - | ### | - | ### | - | ## | - | DUT01607 |

| BODY SIZE | STROKE | FIELD BUS | | PORT SIZE | | BUILD TYPE | |
|---|---|---|---|---|---|---|---|
| 25 | 50 | SPL | POWERLINK | N | 1/4" (STRAIGHT) | Nil | STANDARD |
| | 100 | SEN | Ethernet/IP™ | C* | 6mm(STRAIGHT) | 1 | CUSTOMER SPECIAL |
| 40 | 150* | | | | | | |
| | 200* | | | | | | |
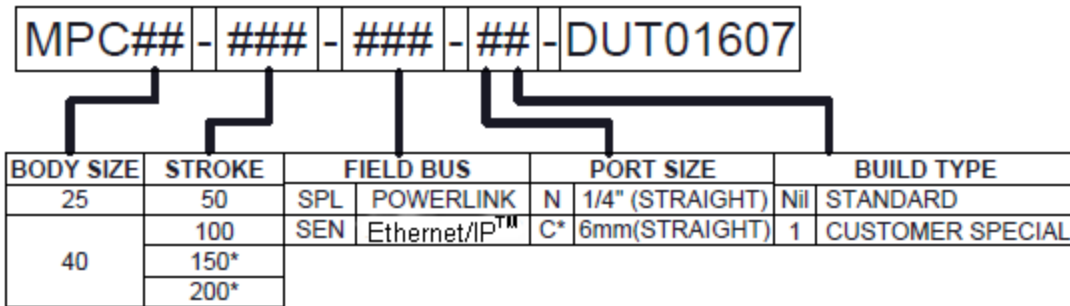
**Figure 6-1 – MPC Part Numbers**

## 6.1. Accessories

*Connector cables* (recommended – not included with MPC)

| MPC unit connection | Description | Compatible cable | | |
|---|---|---|---|---|
| | | Part number | Length | Specifications |
| **Fieldbus interface** | Cables | EX9-AC010EN-PSRJ | 1m | One end: molded M12 straight connector. Other end: RJ45 connector (Ethernet). |
| | | EX9-AC020EN-PSRJ | 2m | |
| | | EX9-AC030EN-PSRJ | 3m | |
| | | EX9-AC050EN-PSRJ | 5m | |
| | | EX9-AC100EN-PSRJ | 10m | |
| | | PCA-1446566 | 5m | One end: molded M12 right angle connector. Other end: flying leads. |
| | | EX9-AC005EN-M12M12 | 0.5m | Both ends: molded M12 straight connectors. |
| | | EX9-AC050EN-M12M12 | 5m | |
| | Field wire-able Connector | PCA-1446553 | -- | Connector: M12 straight plug connector. Use with PCA-1446566 to make a cable of desired length. |
| **Power supply** | Cables | EX500-AP010-SE | 1m | One end: molded M12 straight connector. Other end: flying leads. |
| | | EX500-AP050-S | 5m | |
| | | EX500-AP010-A | 1m | One end: molded M12 right angle connector. Other end: flying leads. |
| | | EX500-AP050-A | 5m | |
| | Cable with Speedcon connector | PCA-1401804 | 1.5m | One end: molded M12 straight connector. Other end: flying leads. |
| | | PCA-1401805 | 3m | |
| | | PCA-1401806 | 5m | |

**Table 6-2 - Recommended Cables**

*Note: More options are available. Contact SMC for information on these options.*

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## 6.2. **Seal cap**

Seal caps are used to protect the M12 size connector openings.  It is recommended that seal caps be used on all unused M12 connector openings.  Use of seal caps is required for all unused connections for IP65 rating.  (One Ethernet and one Power seal cap are attached to the MPC when shipped from factory as shown in figure 6-1.)
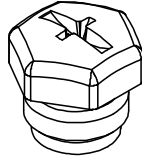
**Figure 6-3 – Seal Cap**

| Description | Part No. | Specification |
|---|---|---|
| **Seal cap** | EX9-AWTS | For M12 connector socket: 10pcs. |
| **Seal cap** | UIUSP-C08-DUQ00833 | For M12 Female Connector 1 pcs. |

**Table 6-4 - Seal Cap Part Numbers**

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# 7. **Summary of Product Elements**
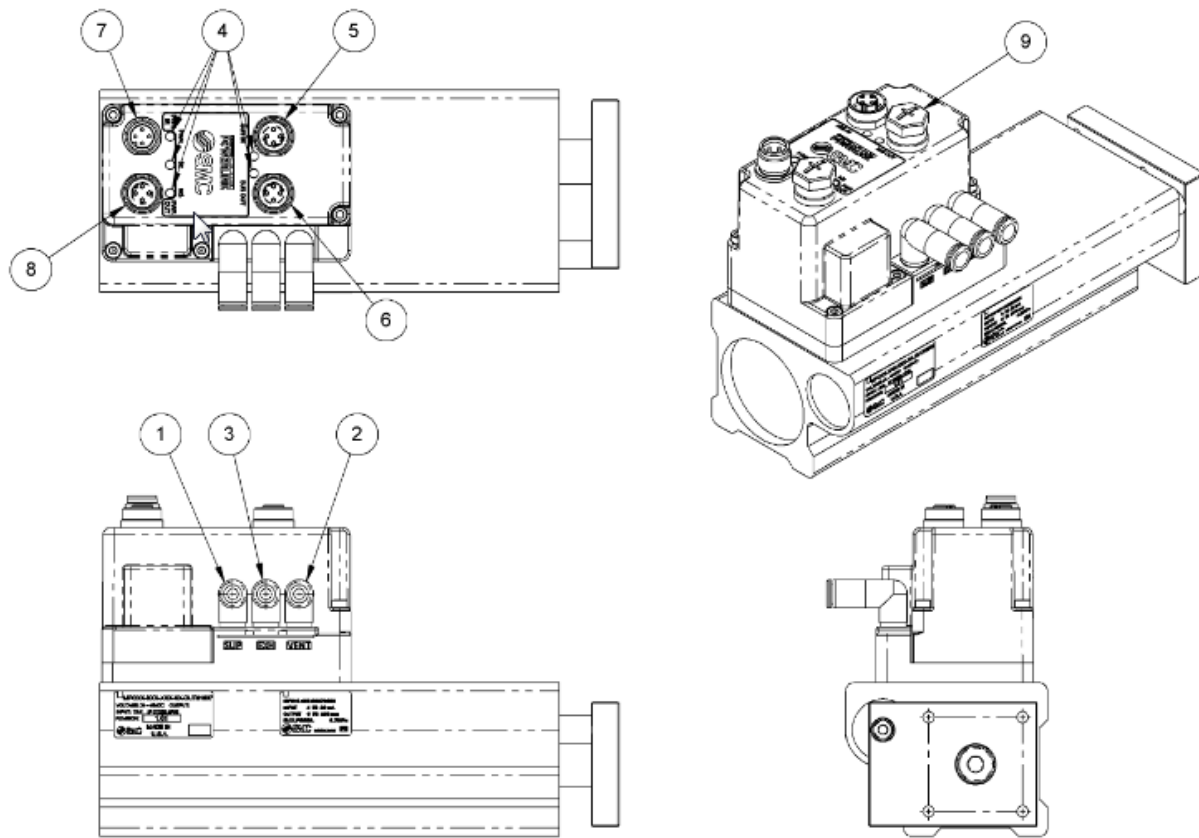


**Figure 7-1 - MPC Product Elements Drawing**

| | Element | Description |
|---|---|---|
| **1** | Air Supply | CDA supply for cylinder |
| **2** | Vent | Cover / Valve Vent |
| **3** | Exhaust | Cylinder Exhaust Port |
| **4** | LED Display | Status LEDs |
| **5** | Fieldbus interface connector (BUS IN) | Ethernet connection (Female M12, 4-pin socket, D-coded) |
| **6** | Fieldbus interface connector (BUS OUT) | Ethernet connection (Female M12, 4-pin socket, D-coded for daisy chain operation) |
| **7** | Power supply in | Cylinder operating voltage (Male M12 4-pin plug, A-coded connector) |
| **8** | Power supply out | Power Daisy chain (Female M12 4-pin socket, A-coded connector) |
| **9** | Seal Cap (Accessory) | 1pc. seal cap for unused fieldbus interface connector (BUS OUT); 1pc seal cap for unused power supply out connector |

**Table 7-2 – MPC Products Elements Table**

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# 8. Quick Start

## 8.1. Pneumatics
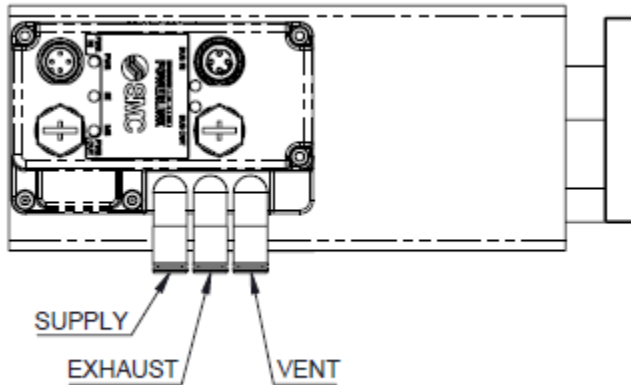


**Figure 8-1 – MPC Pneumatics Plumbing**

## 8.2. Supply Pressure

8.2.1.  CDA Supply Pressure is 0.1 to 0.7MPa.

| ⚠ *Caution* |
|---|
| ***DO NOT*** *enable air pressure until **ALL** pneumatic lines in the circuit have been properly connected and the connections have been verified to be correct.  Failure to follow this requirement can result in severe injury or equipment damage.* |
| *Be **SURE** you understand the location and function of the ports **BEFORE** connecting the MPC to an airline and an application device.  **VERIFY** that these lines are properly connected **BEFORE** enabling pneumatic pressure and **BEFORE** powering the MPC.* |

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## 8.3. Power
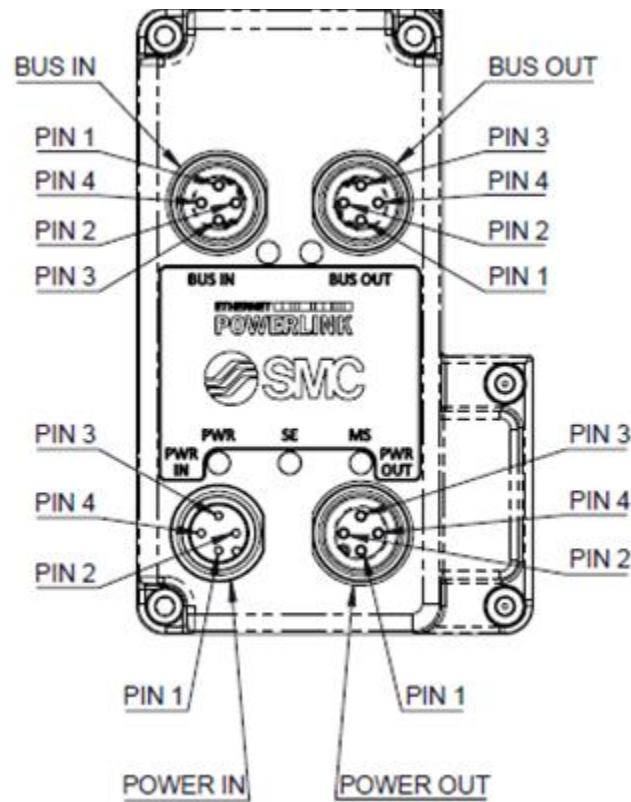


**Figure 8-2 – MPC Power Cable Pin Connections**

| POWER CONNECTORS | |
|---|---|
| PIN NO. | DESCRIPTION |
| 1 | + VDC |
| 2 | + VDC |
| 3 | - VDC |
| 4 | - VDC |

**Table 8-3 – MPC Power Pinout**

8.3.1.    Power in is 24 - 48 VDC +- 10% @ ~ 7Watts max

8.3.2.    For more about power refer to [Daisy Chaining Power](#)

## 8.4. Network Cable

8.4.1.    Network Bus In and Bus Out: M12 4-pin socket D-coded connectors
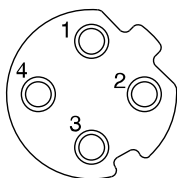


| No. | Designation | Description |
|---|---|---|
| 1 | TD+ | Transmit Data + |
| 2 | RD+ | Receive Data + |
| 3 | TD- | Transmit Data - |
| 4 | RD- | Receive Data - |

**Table 8-4 - MPC Ethernet Cable Pin Signals**

The Ethernet MPC Uses a standard M12 industrial Ethernet cable.  For cable selection see [Accessories](#).  You may use either port ("BUS IN" or "BUS OUT") for the Ethernet connection to the MPC.

## 8.5. **Ethernet/IP (From PLC Perspective)**

The EDS File can be downloaded from www.smcusa.com
Refer to Studio 5000 Setup for more details on PLC setup

| TYPE | Instance | Size | Description |
|---|---|---|---|
| **Output** | 100 | 1 INT or 2 SINT | Position set-point |
| **Input** | 150 | 2 INT or 4 SINT | 2 bytes measured position, 2 bytes diagnostics |

**Table 8-5 - IO Data Key**

8.5.1. **Output Position:** 12 bit value that is the position setpoint.
   - The 4 most significant bits should be 0.
8.5.2. **Input Position:** 12 bit value of the current position.
   - The 4 most significant bits are 0.
8.5.3. Input Diagnostics: 16 bit value (bits are numbered from the right)
   - Bit zero = power OK: 0= OK, 1 = Out of range

## 8.6. **IP Address**

The IP address is set to (192.168.1.20) at the factory. The IP address can be changed using the built in MPC web server. The webserver can be accessed by a PC connected to the network and set to the same subnet. DHCP/Bootp can be selected from the webserver if desired. Refer to Web pages for more details.

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# 9. MPC Default Parameters

The default values of configuration parameters are given below.  The user can change these parameters, if needed, as part of the MPC setup process.  Refer to Web pages for more details. Refer to Studio 5000 Setup for more details on PLC setup.

| Description | Value |
|---|---|
| IP Address | 192.168.1.20 |
| Subnet | 255.255.0.0 |
| Gateway | 0.0.0.0 |
| DNS Server | 0.0.0.0 |
| Hold on connection loss | Enabled |
| Hold till connection established | Enabled |
| Webpage Login ID | "user" |
| Webpage Login Password | "user" |

**Table 9-1 – Default Parameters**

# 10. Ethernet/IP Network Parameters

## 10.1. Network Specifications

10.1.1. Two M12 Ethernet Ports

10.1.2. Built in Ethernet switch

10.1.3. Minimum cycle time (RPI) 4ms

## 10.2. DLR (Device Level Ring)

10.2.1. Ethernet MPC is capable of being configured into a DLR network

## 10.3. Hold on Connection Loss

10.3.1. MPC will hold last position communicated by the PLC.  The Ethernet MPC will continue to maintain this position as long as power and air are still supplied.

## 10.4. Hold Till Connection

10.4.1. MPC will hold its last position until a connection to PLC is established.  The PLC should be ready to communicate the correct position upon connection to the Ethernet MPC.  The webserver or explicit messages can all be used to generate this initial connection.  This location is maintained by closed valves.  Some drifting of position could occur over time as air leaks from the cylinder.

## 10.5. Quick Connect

10.5.1. The Ethernet MPC has Quick Connect functionality.

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# 11.  Daisy Chaining Power and Ethernet

The daisy chaining feature is an *optional* way to power MPC units.  This eliminates the need to run a power cable to each MPC from the power supply directly or running a separate power trunk line.  Daisy chaining can eliminates the need for long power cables.

## 11.1.  Connecting MPCs for Daisy Chaining

The cable connections are critical for proper operation of daisy chaining.  The following is an example of proper cable connections.

When daisy chaining, the first MPC can supply power to the next 19 MPCs without the need for another power supply if using 48 volts.  This drops to **only 4** if using 24 volts.  The MPC has under voltage detection to let you know if you do not have enough voltage supplied to the MPC for proper operation.   The MPC does not limit the number of MPCs which can be connected to an Ethernet network.  The network size limits come from the PLC and how many devices it can talk to at one time.
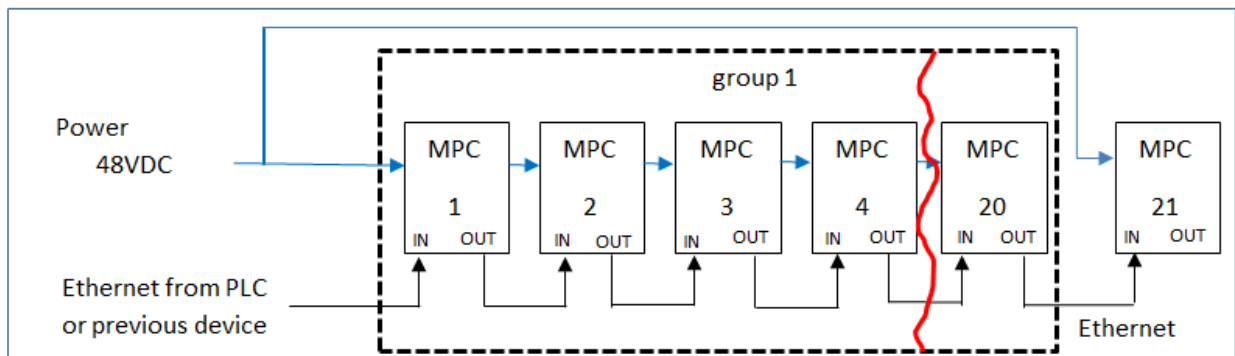


**Figure 11-1 - MPC Group Power Connections**

The diagram illustrates the Ethernet communication and power cable connections required to support 21 MPCs when daisy chaining is in use.  The MPCs in the dashed box form a single Power daisy chain group.  Note that power daisy chaining supports a ***maximum*** of 20 MPCs in one power group.  This does not mean that you cannot have more than 20 MPCs connected to a single supply.  More MPCs can be supported as long as the supply can source enough power to support multiple chains of MPCs.  Each MPC uses about 7 watts of power when moving.

*The following rules must be followed for proper operation*

11.1.1.  Good quality power and Ethernet cables must be used when daisy chaining

11.1.2.  No more than 4 amps per connector pair should be placed across MPC power In to Power Out.  This is a total of 8 amps if using both connector pairs as is suggested when using daisy chaining to reduce line and connector voltage loss.

# 12. **LED Indication**
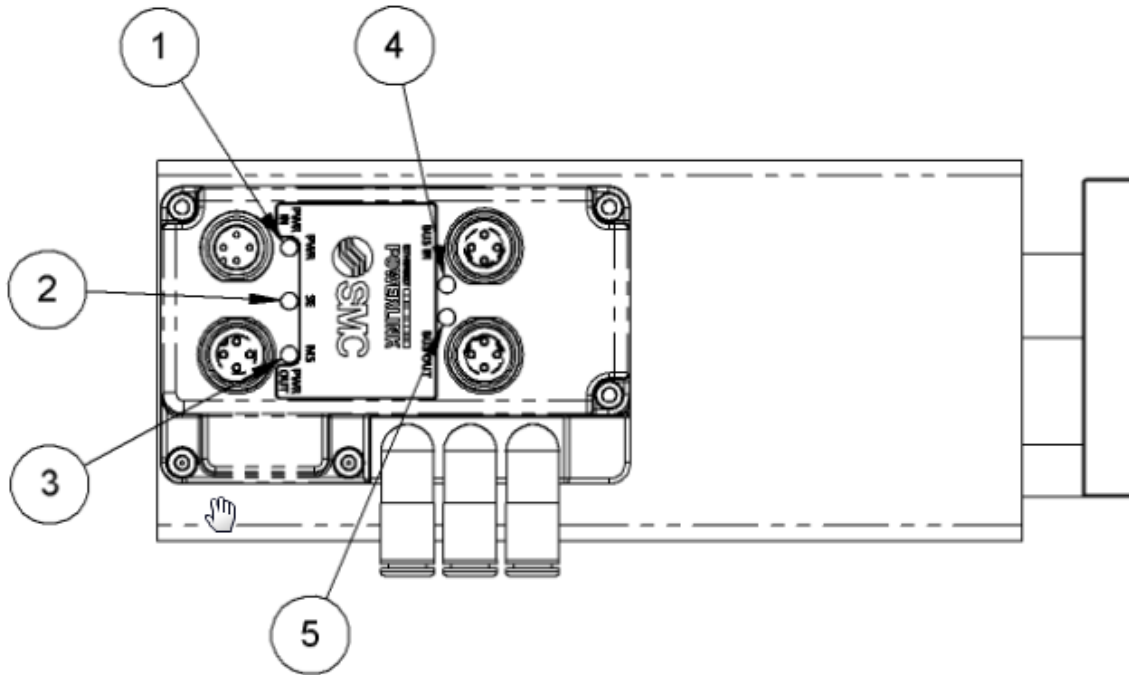


**Figure 12-1 MPC LED Locations**

| Balloon Number | Name | Description |
|---|---|---|
| 1 | PWR | Power OK indicator |
| 2 | NS | Network Status |
| 3 | MS | Module Status |
| 4 | Link/ACT | Bus In Ethernet Link and Activity Status |
| 5 | Link/ACT | Bus Out Ethernet Link and Activity Status |

**Table 12-2 MPC LED Indentifcation**

| LED | LED Status | | Description |
|---|---|---|---|
| PWR | | Green ON | Voltage for the MPC is supplied. |
| | | OFF | Voltage for the MPC is not supplied or is outside the tolerance range (24 VDC -10%) |
| NS | | OFF | The MPC operating voltage is not supplied or the MPC is in DHCP mode without a valid IP address. |
| | | Green ON | Communication established. |
| | | Green flashing | Idle link. |
| | | Red flashing | Communication time out. |
| | | Red ON | IP address duplicated. |
| MS | | OFF | The MPC operating voltage is not supplied. |
| | | Green ON | Operating normally – communication in progress. |
| | | Green flashing | Operating normally – idle link. |
| | | Red flashing | Recoverable error – Possible low voltage. |
| | | Red ON | Unrecoverable error. |

**Table 12-3 MPC LED Status Key**

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# 13. Studio 5000 Setup

## 13.1. EDS file – Rockwell Studio 5000

The EDS file can be downloaded from the www.smcusa.com website.  Install the EDS file by selecting Tools then EDS Hardware Installation Tool.
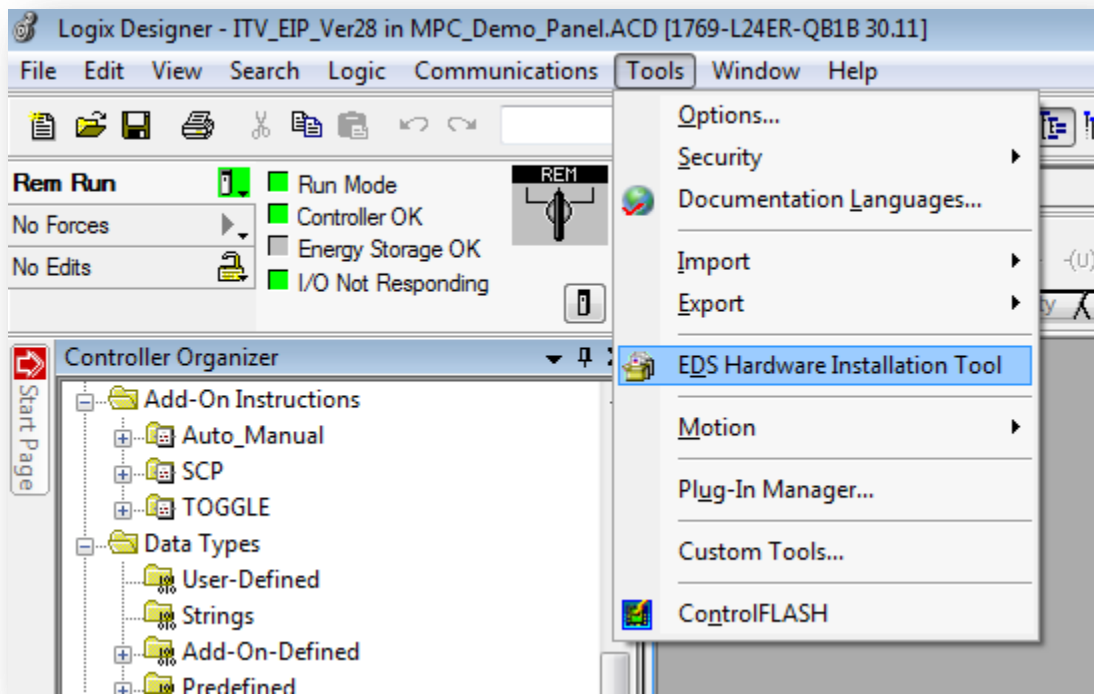


**Figure 13-1 EDS Tool**

Continue importing the EDS file by following the prompts then select the EDS file obtained from the www.smcusa.com website.

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## 13.2. Adding a device to Ethernet - Rockwell Studio 5000
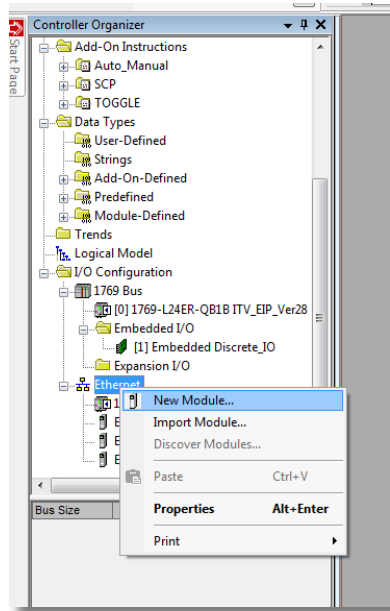
13.2.1. Add the Ethernet MPC by right clicking on Ethernet then clicking on New Module



**Figure 13-2 - New Module**

13.2.2. Select Module Type - Uncheck the Module Type Vendor Filters then scroll down to SMC Corporation vendor and check the box. Select MPC from the list of items then click on create. You can also use search to find the MPC.
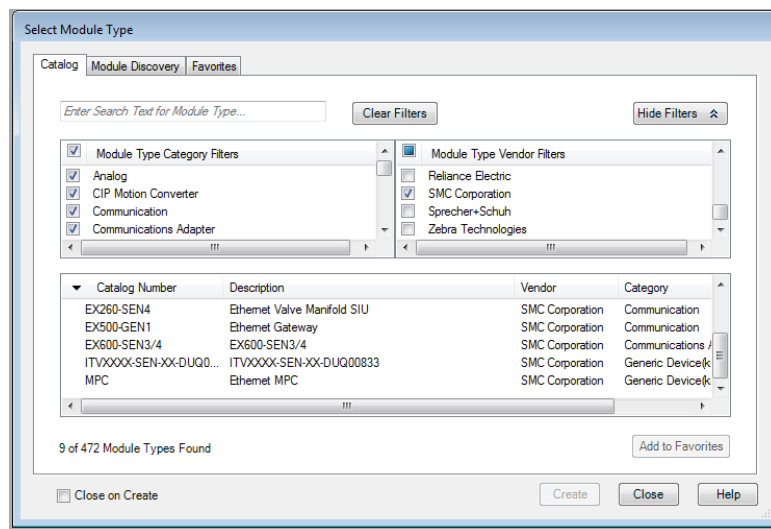


**Figure 13-3 – Module Select**

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13.2.3. New Module - Fill in the Name you want to give the MPC and the IP address. MPC will automatically be added to the name. Description is optional. Now select Change…
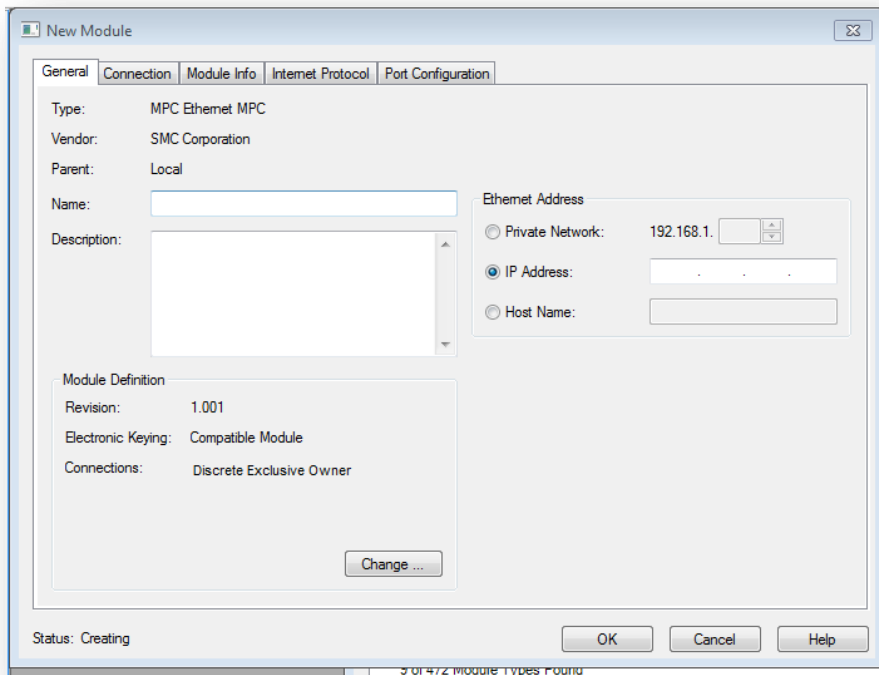


**Figure 13-4 – New ModuleSettings**

13.2.4. Module Definition - Click on SINT and then select INT. Switching to INT makes using the Ethernet MPC easier. Click on OK and then OK again
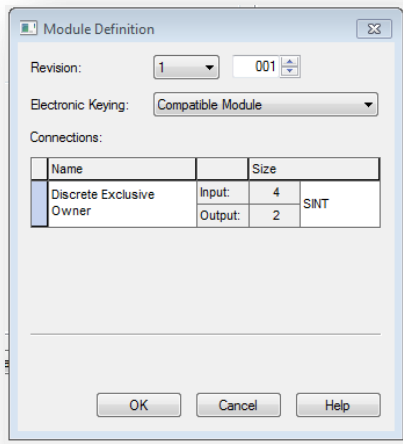


**Figure 13-5 – Module Connections**

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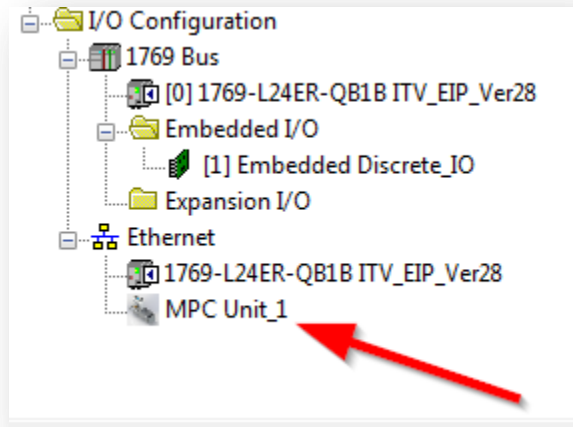### 13.2.5. Ethernet - You now have an Ethernet MPC added to your Ethernet network



**Figure 13-6 – PLC Ethernet**

### 13.2.6. MPC Tags will show up in the Controller Tags under the name you gave the MPC above



**Figure 13-7 – PLC Input and Output Data for the Ethernet MPC**

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# 14. Setpoint

Users specifying the **Setpoint** (position) using a PLC need to be aware that the PLC and Ethernet MPC use counts (see Terminology) to represent the position setpoint (from the PLC) and the current position value (from the MPC). These values are displayed as 16-bit hexadecimal quantities. (The 4 MSB should always be 0).

If the PLC allows a user to enter the position in units, for example, millimeters, it is the responsibility of the PLC program to convert the position in millimeters to the appropriate count value. It is also the responsibility of the PLC program to convert the position return value (current position) from counts to millimeters as needed for use on the PLC.

The following formula is used to calculate the position in counts given the position in a measurement unit and the scale factor: **Position Value = Counts/Scale Factor** or **Counts = Position Value * Scale Factor.**

If a value larger than 4095 (0X0FFF) is sent from the PLC to the MPC, the MPC will go to the **maximum supported** position (4095 counts).

| Position<br><br>Body Type | mm<br><br>Counts / mm | inches<br><br>Counts / inch | %fs<br><br>Counts / % |
|---|---|---|---|
| 50mm | 81.90 | 2080.26 | 40.95 |
| 100mm | 40.95 | 1040.13 | 40.95 |
| 150mm | 27.30 | 693.42 | 40.95 |
| 200mm | 20.48 | 520.07 | 40.95 |

**Table 14-1 - MPC Scale Factors**

## 14.1. Example: Convert the Position to Counts

Suppose you have specified a position of 50mm for a 100mm MPC. In order to convert that position to counts, use the formula above as follows: Find the scale factor corresponding to the MPC body type and the position measurement units in the table (above): In this case, the scale factor is **40.95**. As a result, **counts = 50 * 40.95 = 2047.5**. Since the pressure value in counts passed between the PLC and the MPC must be an integer, round to **2048 or 0x800**.

## 14.2. Example: Pseudo Code for 100mm MPC mm

```
// MPC slider and Feedback calculations
MPC_Setpoint = Slider_Setpoint * 40.95
Display_Feedback = MPC_Feedback / 40.95
```

## 14.3. Ladder Logic Example

PLC Example Code: This is a quick PLC code snippet showing how to scale the position to which you wish to move. The MUL instruction is used to convert from millimeters to counts. The tag Set_Position_mm is used hold the engineering unit you wish to move to. The 40.95 is the scale factor needed to convert from millimeters to counts that the 100 mm Ethernet MPC will understand. MPC_1:O.Data[0] is tag for the output to the Ethernet MPC. The scale factor just has to change if using a different stroke length MPC or if you prefer the imperial system to metric.
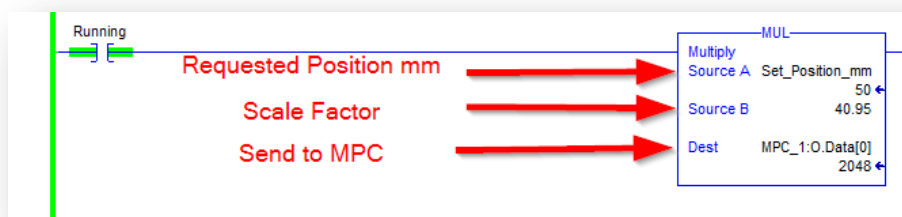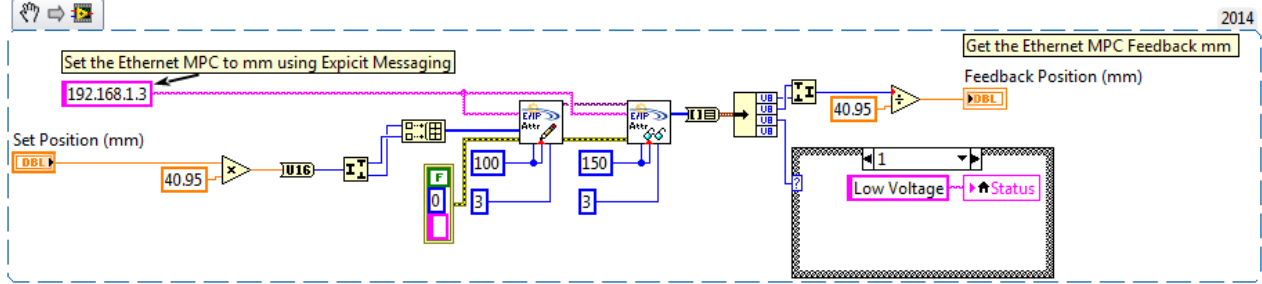


**Figure 14-2 – PLC Code snippet (converting from millimeters to counts)**

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### 14.4. **LabVIEW Example**

This is a LabVIEW png code snippet.  It can be saved then dragged and dropped into a LabVIEW block diagram.
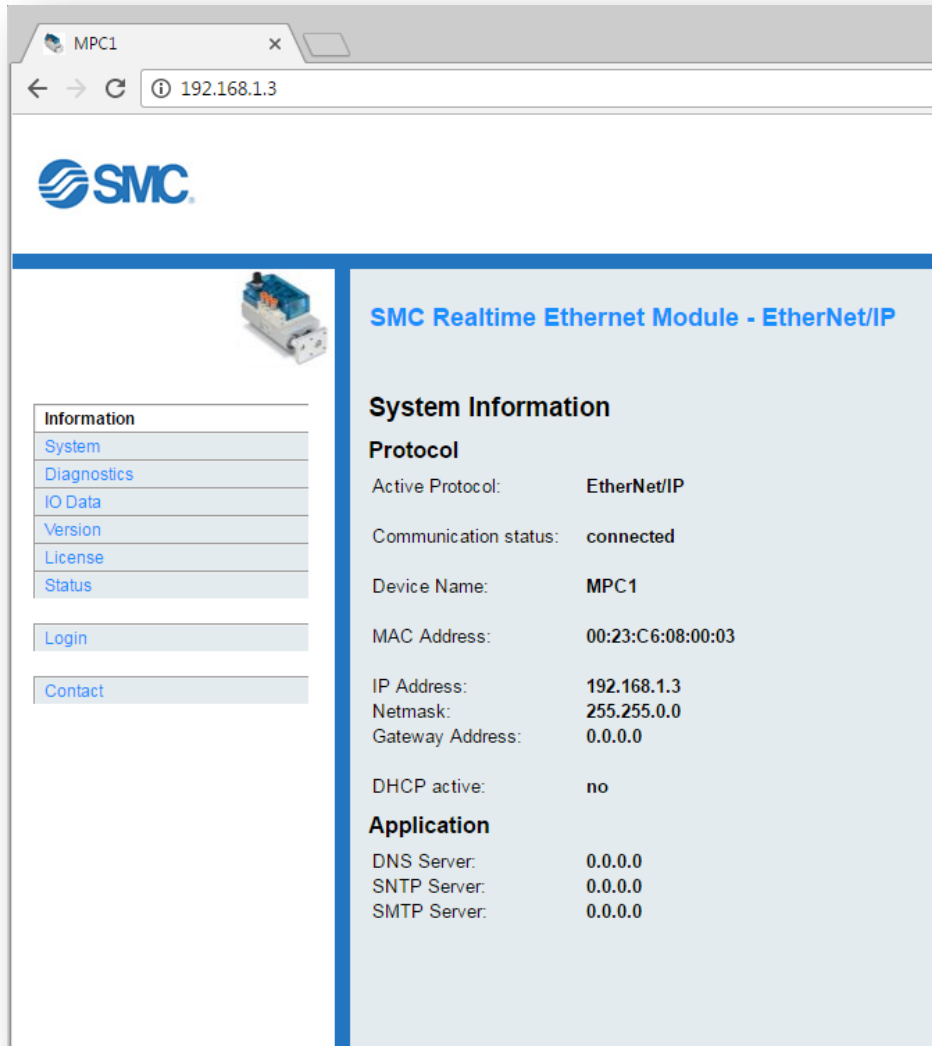
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# 15. Web Pages

Using a web browser (ex. Google Chrome, Fire Fox, Internet Explorer) on a PC, the user can view various Ethernet MPC settings.

## 15.1. System Page

Enter the IP address of the Ethernet MPC into your internet browser as shown below.
The "System Information" page will open.  PC must be on the same subnet!



**Figure 15-1 – System Page**

## 15.2. **Diagnostics Page**

Click "Diagnostics" to view the communication and connection status of the Ethernet MPC.
This page provides an overview of the current communication status of the Ethernet MPC and is
helpful in analyzing network and communication issues.



**Figure 15-2 – Network Diagnostics Page**

If you are experiencing communication problems, SMC support personnel may need information
from this page to help resolve the problems.

## 15.3. **IO Data Page**

Click "IO Data" to view the position setpoint sent to the Ethernet MPC and current Ethernet MPC position and status information sent from the Ethernet MPC to the PLC.



**Figure 15-3 – Network IO Data Page**
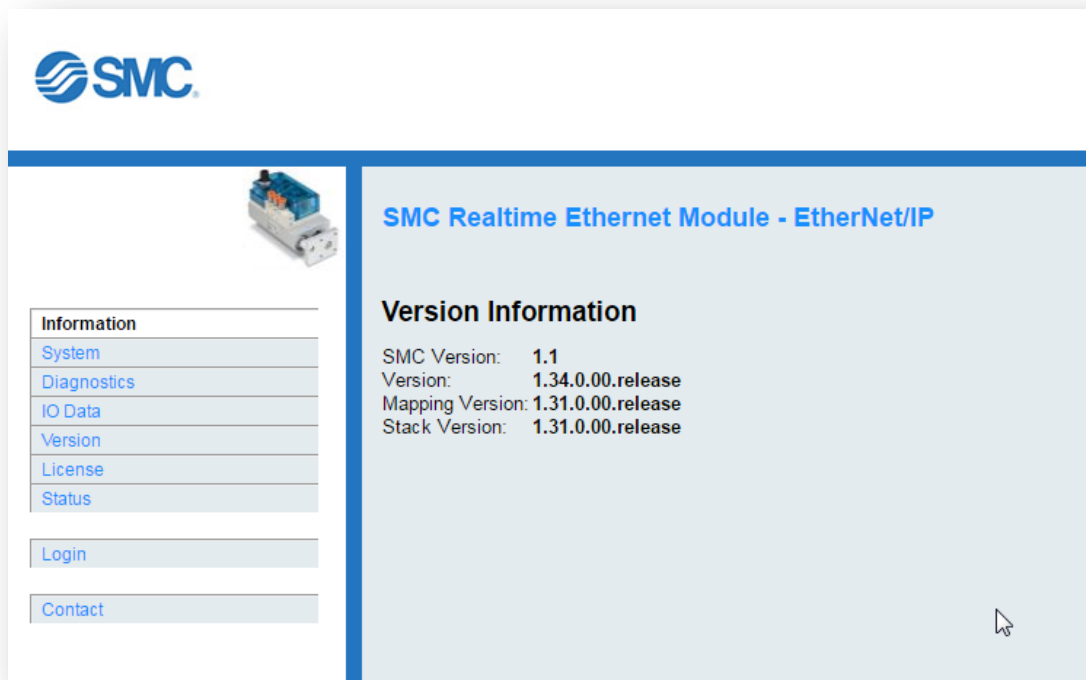
The Data Status column indicates if data has been communicated on the bus after power up. "Bad" indicates that data **has not** been written; "Good" indicates data **has** been written.

**Row 0** is the most recent setpoint sent to the MPC.

**Row 1** is the current MPC position value and status flags sent from the MPC.

## 15.4. **Version Page**

Click "Version" to see the versions of the firmware of the MPC.



**Figure 15-4 – Firmware Version Page**

## 15.5. **Ethernet MPC Status Page**

Click "Status" to see the current MPC Position and status of Ethernet MPC.

Note: The "MPC Status" page displays the current MPC position value based on the indicated position units. The page automatically translates count values into the current position displayed.



**Figure 15-5 - MPC Status Page**

Note: Fault indicators **MAY NOT** reflect the actual current state of the MPC. There is a potential delay between the occurrence of an event (alarm condition or status) and the screen refresh rate. Also, if for any reason communication between the MPC and the web browser is disrupted, the display will indicate the last state of the MPC **BEFORE** communication was lost. The LEDs on the top of the MPC **DO** reflect the current state of the MPC.

## 15.6. Login Page

Click "Login" and enter "user" as both the Username and the Password.
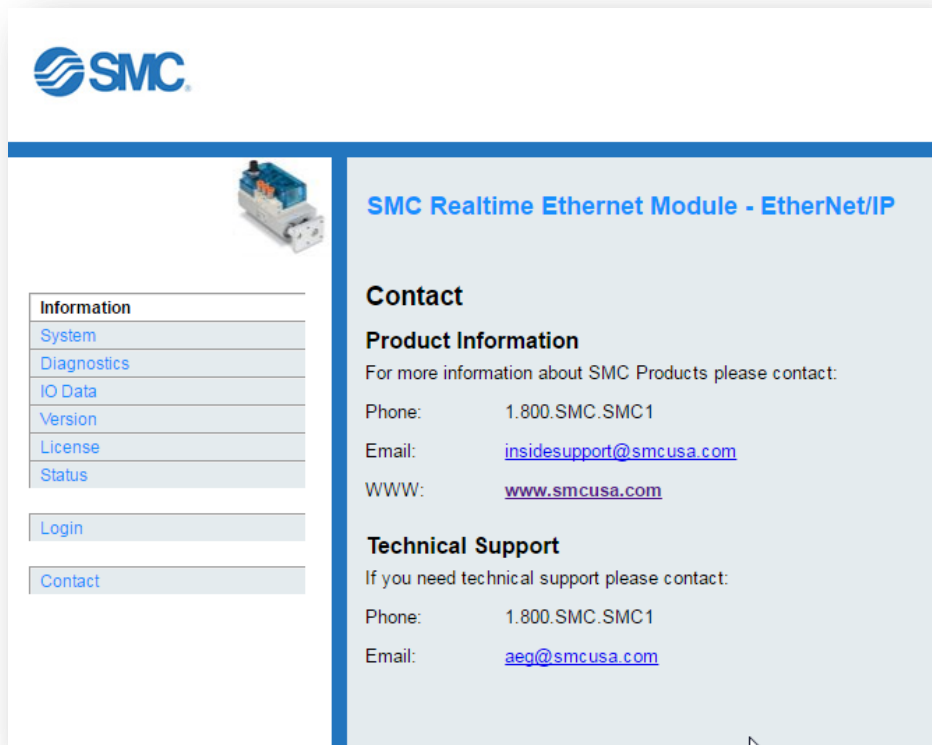


**Figure 15-6 – User Login Page**

Login with user privileges allows the user to Configure and control the MPC.
This is a successful User login. Note that the Configuration web pages are now accessible.



**Figure 15-7 – Successful user login screen**

### 15.7. **Contact Page**

Click "Contact" to find the telephone numbers and email addresses for SMC Product Sales and Technical Support.



**Figure 15-8 – Contact Page**

The "**Product Information**" contacts will connect you to the SMC sales team. Sales can help you order accessories for your Ethernet MPC and other SMC products to support your application. Sales can also help you obtain documentation for your Ethernet MPC.

The "**Technical Support**" contacts will connect you to the SMC technical support team. Tech support can help you resolve technical questions or problems with the operation and use of your Ethernet MPC. Tech support can also help you deal with questions related to the initial setup of your Ethernet MPC.

## 15.8. MPC Configuration Page

Below is a view of the "MPC Configuration" page. The top of the page ("MPC Status" frame) displays the current MPC position value and MPC status indicators. The bottom of the page ("MPC Position Override" frame) allows the user to override PLC control, change position, and change position units. Note: The page automatically translates count values into the position displayed.



**Figure 15-9 – Position Override Page**

The "MPC Position Override" frame has the following user selectable controls:

15.8.1. **Override PLC Control:** This is a checkbox. If the checkbox is OFF (unchecked), the MPC is controlled externally (typically from a PLC). When the MPC is externally controlled, the user cannot set the MPC position or change the position units from the web page. When the Override PLC Control checkbox is checked, press "Submit" or the keyboard Enter key for the change to take effect. Changing MPC control from the master to the web page (checking the Override PLC Control checkbox) gives the user control of the MPC from the webpage. There is no position change until the

user enters a position in the Set Position text box.  Changing MPC control from the web page to the master (clearing the Override PLC Control checkbox) gives the master device control of the MPC.  There may be an immediate position change to the position setpoint sent from the master device.  Note:  Be sure that MPC controlled equipment is in a SAFE STATE when you change Override PLC Control.  Note:  Override PLC Control will remain in the same state when you exit this page.  You must uncheck the PLC override and click submit to give control back to the PLC.

15.8.2. **Position Units:**  This is a set of radio buttons indicating the current position unit.  When Override PLC is set, the user can change the position unit.  When Position Units is changed, press "Submit" or the keyboard Enter key for the change to take effect.  The position value displayed in the "MPC Status" frame and in the "Set Position" box will change to match the new Position Unit selection.  No position change will occur.

15.8.3. **Set Position:**  This is a data entry box in the MPC "Position Override frame".  When Override PLC Control is set, the user can enter any legitimate setpoint value.  When the value of Set Position is changed, press "Submit" or the keyboard Enter key for the change to take effect.   If the setpoint value entered is legitimate, the MPC will move to this new position.  The position displayed in the "MPC Status" window will change to the new value.  If the value is out of range, the MPC position will not change.  The setpoint will change back to the previous value and the "Current Position" value will not change.  The title of "Set Position" will be displayed in RED, and the error message "Set Position Out of Range" will also be displayed in RED directly above the Submit button.   Note:  To change BOTH position units AND the setpoint value, position units MUST be changed first.

| ⚠ *Warning* |
|---|
| **BEFORE** *changing the position used by the MPC, verify that all equipment affected is in a **safe state**. Be **sure** that **ALL PERSONNEL** are clear of **ALL EQUIPMENT** that may be affected by the position change.  **Unexpected changes in equipment motion or behavior can result in injury or death.*** |
| *When Override PLC is enabled (checked), entering a valid value into the "Set Position" field and pressing "**Submit**" or the keyboard **Enter** key will cause the MPC to change position.  This will result in an **IMMEDIATE CHANGE** in position.  This change may cause an **immediate unexpected change in the behavior of equipment controlled by the MPC.  This change could cause injury or death.*** |
| *When Override PLC is changed to the disabled state (cleared), control will return to the master device.  The current position will change to the setpoint value sent by the master device.  This will result in an **IMMEDIATE CHANGE** in regulated position.  This change may cause an **immediate unexpected change in the behavior of equipment controlled by the MPC.  This change could cause injury or death.*** |
|  |

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### 15.9. Network Page

Click "Network" to view or change various network and operating parameters.



**Figure 15-10 Network Configuration**

The following sections describe the items that can be changed on the "Network Configuration" page. Multiple items can be changed at a time. When one or more items are modified, press "**Submit**" or the keyboard Enter key for the change to take effect.

Note for some changes to take effect, an Ethernet MPC power cycle is required. A power cycle will result in temporary loss of Ethernet MPC control. A power cycle will also result in temporary loss of communication to all downstream devices connected to the Ethernet MPC.

15.9.1. **Device Name** is optional. It may be left blank since it is not used by the Ethernet/IP™ protocol. When Device Name is changed, press "Submit" or the keyboard Enter key and then power cycle the Ethernet MPC to set the name.

15.9.2. **IP Address** is used to communicate with the Ethernet MPC. It MUST be unique on a network or subnet. Note: Use the SAME Subnet for ALL Ethernet MPCs for proper communication. If you change the IP address, it is STRONGLY RECOMMENDED that you record the new IP address before you press "Submit" or the keyboard Enter key. A new IP Address will take effect in the Ethernet MPC immediately when you

press "Submit" or the keyboard Enter key.  Control of the Ethernet MPC and communication between the Ethernet MPC and the PC (or master device) will be lost.  To reconnect the PC to the Ethernet MPC web page.  The Ethernet MPC IP address used in the master device (typically a PLC) must match the new Ethernet MPC IP address.

15.9.3. **Netmask** - The default value (255.255.0.0) is set to allow the MPC to monitor traffic in the 192.168.x.x range.  The netmask can be used to expand or reduce the network traffic that the MPC will monitor and or process.

15.9.4. **Gateway Server** - If the Ethernet MPC is not connected to a Gateway Server, the Gateway Server should be left as 0.0.0.0.  If another address is specified, the Ethernet MPC will attempt to use the indicated Gateway Server to manage network communication.

15.9.5. **DHCP** - Use of DHCP (Dynamic Host Configuration Protocol) is not necessary since the initial IP address is statically set by the factory.  The IP address can be changed to match the specific application network requirements.  When the Use DHCP checkbox is OFF (unchecked), the Ethernet MPC is NOT in DHCP mode.  The Ethernet MPC will have a static IP address.  When the Use DHCP checkbox is ON (checked), the Ethernet MPC is in DHCP mode.  The Ethernet MPC will not have an IP Address until a DHCP server sets the Ethernet MPC IP address.  An Ethernet MPC without an IP address cannot be communicated with or controlled by either the master or the Ethernet MPC webpage.  When the Use DHCP checkbox is changed, press "Submit" or the keyboard Enter key to set the DHCP state.  Note:  When checking the Use DHCP checkbox (turning DHCP on), the web page may no longer be connected to the Ethernet MPC.  Also, the Ethernet MPC may require a power cycle before the DHCP server will assign the Ethernet MPC an IP address.  Note: The DHCP checkbox setting is preserved across power cycles.  In DHCP mode (checkbox is checked), the Ethernet MPC IP address is NOT preserved across power cycles.

15.9.6. **DNS Server** - If the Ethernet MPC is not connected to a DNS (Domain Name System) Server, the DNS Server should be left as 0.0.0.0.  If another address is specified, the Ethernet MPC will attempt to use the indicated DNS Server to manage network communication.

15.9.7. **Hold on Connection Loss** - The "Enable Hold" checkbox is used to control Ethernet MPC behavior in the event Ethernet communication is lost.  If Ethernet communication is lost with "**Enable Hold**" **ON** (checked) and the Ethernet MPC is powered, the Ethernet MPC will continue to hold position. If Ethernet communication is lost with "**Enable Hold**" **OFF** (unchecked) and the Ethernet MPC is powered, the Ethernet MPC will move to 0.  If **power is lost**, the Ethernet MPC will hold position with closed valves.  To change the state of "**Hold on Connection Loss**", change the "**Enable Hold**" checkbox, press "**Submit**" or the keyboard **Enter** key and then power cycle the Ethernet MPC.
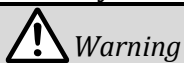
| ⚠ *Warning* |
| --- |
| *Several setting changes in this section require an Ethernet MPC power cycle.  Only power cycle an Ethernet MPC when all devices and equipment controlled by the Ethernet MPC and all devices receiving communication through the Ethernet MPC are in a verified safe state.  Verify* |

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*that all personnel are clear of all equipment which may be affected by power cycling an Ethernet MPC.*

*When an Ethernet MPC is power cycled, communication to and control of the Ethernet MPC is lost. When an Ethernet MPC is power cycled, communication to and control of **ALL** devices downstream of the Ethernet MPC is lost.*

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# 16. Explicit Messaging

The Ethernet MPC can be controlled using explicit messaging instead of implicit messaging as some PLCs do.  This option is useful if using LabVIEW or another programming language that may not have real time implicit libraries readily available.

| TYPE | Class | Instance | Attribute | Size | Description |
|---|---|---|---|---|---|
| **Output** | 100 | 100 | 3 | 1 INT | Position set-point |
| **Input** | 150 | 150 | 3 | 2 INT | 2 bytes measured position, 2 bytes diagnostics |
| | | | | | |

**Figure 16-1  Explicit Messaging**

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# 17. Installation and Handling

## 17.1. Air supply
Use clean air.
Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salts or corrosive gases, etc., as this may cause damage or malfunction.

Air quality
Take measures to ensure air quality, such as installing an aftercooler, air dryer or water separator. Compressed air containing large amounts of condensate may cause malfunction of pneumatic equipment.

Lubrication
Do not lubricate the cylinders.
Lubrication of this cylinder may cause malfunction. Lubrication other than as specified may cause operating failure.  If grease is required for maintenance, order using the part number: GR-H-010  （10g)

Do not wipe off the grease applied to the sliding part of the air cylinder.
If grease applied to the sliding part is forcibly removed, operation failure can result.
The sliding part may turn black if the cylinder is operated for a long distance. In such a case, wipe off the grease on the sliding part and apply fresh grease for a long time operation.  Use a cloth with water to remove the grease. Alcohol or special solvent may cause damage to the seals.

## 17.2. Operating environment
Do not use in an environment where corrosive gases, chemicals, or sea water are present.  These may cause failure or malfunction.

Do not use the product in an environment where the product may be splashed by oil or chemicals. If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction, or hardening of the lead wires).

## 17.3. Do not use the product in a food zone:
Do not use the product in; Food zone: An environment in which foods directly get into contact with the cylinder, and the food will be handled as a commodity.

## 17.4. OK to use the product in:
Splash zone: An environment in which foods can directly contact the cylinder, but the food that has contacted the cylinder will not be handled as a commodity.

## 17.5. Non-food zone - An environment in which foods do not contact the cylinder:
In locations where the cylinder is exposed to water, dust etc., there is a possibility that these contaminants can enter into the cylinder through the auxiliary ports. Connect tubing from the EXH port and VENT port, and extend the tubing to a location where there is no contaminants.

## 17.6. Do not use in an area where surges are generated:
If there are machines or equipment that generate large surges near the product (magnetic type lifter, high frequency inductive furnace, motor, etc.), this can result in deterioration and damage to internal components. Take protective measures to isolate the surge sources, and prevent the lines from coming into close contact.

Do not use a load which generates surge voltage.
When a surge-generating load such as a relay or solenoid is directly driven, use the product with a surge absorbing element built-in.

The product is not immune to lightning strikes. Take measures against lightning strikes in the system.  Failure or malfunction may result.

Do not use in an area where a magnetic field is generated.  Malfunction may result.

Do not let foreign matter, such as wire debris, get inside the product.  Failure or malfunction may result.

Do not use the product in an environment that is exposed to cyclic temperature patterns.  Heat cycles other than ordinary changes in temperature can adversely affect the internal components of the product.

Do not expose the product to direct sunlight.  If using in a location directly exposed to sunlight, protect the product from the sunlight. Failure or malfunction may result.

Keep within the specified operating temperature range.  The operating temperature range is 0 to 50oC.  Operation under low temperature may lead to damage or operation failure due to frozen moisture in the fluid or air. Protection against freezing is necessary.  Avoid abrupt temperature changes even within the specified temperature range.

Do not operate close to a heat source, or in a location exposed to radiant heat.

17.7.  **Installation**

Do not synchronize cylinders coupled to the same load.
As air is a compressible fluid, it is affected by fluctuations in the supply pressure, load, temperature and lubrication conditions, and deviation in the performance of individual cylinders, and the change of components over time. Therefore, it is possible to synchronize multiple cylinders for a short period of time, but the synchronization could fail due to changes in various conditions. When the synchronization fails, an excessive force will be applied to the piston rod, causing failure or malfunction. If the synchronized use is unavoidable, provide a guide with high rigidity and high precision to prevent failure of synchronization from the difference in force of the cylinders.

Do not place your hands or fingers in the clearance between the plate and the cylinder tube.
Injury may result if fingers are trapped between the plate and cylinder tube when the piston rod is retracted. Never place hands or fingers in this area. The cylinder is able to generate great force; it can lead to injury if hands or fingers are trapped.

Do not scratch or dent the sliding surfaces of the piston rod and the sensor rod.
Damage to the seals may lead to air leakage or operation failure.

Avoid applying rotating torque to the plate.  When tightening a screw into the thread on the plate, the piston rod should be fully retracted. Tighten it by giving consideration to preventing tightening torque from being applied to the sensor rod.

Do not operate the cylinder in an application in which the piston rod stops before the positioning stop. (e.g. Stoppage by clamping or external stopper)  This may lead to premature failure of the product.

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Plate load should be mounted so that the center of the gravity of the load will be on the piston rod shaft.  Failure or malfunction may result.
Do not touch the sensor rod.

Do not drop, hit or apply shock to the product.  Damage to the internal components may result, causing malfunction.

Do not pull the lead wire forcefully, or lift the product by the lead wire.  Hold the product body when handling to prevent damage, failure or malfunction.  The product will be damaged, leading to failure and malfunction.

Never mount a product in a location that will be used as a foothold.  The product may be damaged if excessive force is applied by stepping or climbing onto it.

Do not use this cylinder as a stopper.

Minimum adjusting stroke necessary for a positioning stop is 5mm.  Operate for 5mm or more before a positioning stop.

Ex: 1. To operate from the stop position 20mm to 22mm; 20mm $\rightarrow$ 15mm $\rightarrow$ 22mm
Ex: 2. To operate to the stop position of 3mm; 0mm $\rightarrow$ 8mm $\rightarrow$ 3mm

17.8. **Wiring (Including connecting/disconnecting of the connectors)**
Wire the cable to the connector of the body as shown below. Incorrect wiring can result in damage to the product.

Make sure the product is grounded to ensure noise tolerance.  Otherwise malfunction can result.

Do not pull hard on the lead wire.
Never lift the product equipped with tubing by holding the lead wires.  Damage to the connector, circuit board, cover or internal components may result, causing failure or malfunction.

Avoid repeatedly bending, stretching or applying a heavy object or force to the lead wire. Repetitive bending stress or tensile stress can cause the sheath of the wire to peel off, or break the wire. If the lead wire can move, fix it near the product.  The recommended bend radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the insulation material, whichever is larger.  Replace a damaged lead wire with a new one.

Wire correctly.  Incorrect wiring may cause malfunction or damage to the product.  Do not perform wiring while the power is on.  Damage to the internal components may result, causing malfunction.

Do not route wires and cables together with power or high voltage cables.  Route the wires of the product separately from power or high voltage cables to prevent noise and surge from entering the product.

Verify the insulation of wiring.
Poor insulation (interference with other circuits, poor insulation between terminals etc.) can apply excessive voltage or current to the product causing damage.

Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.  Do not use a cable longer than 100m.
Wire the DC (-) line as close as possible to the power supply.

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## 17.9. **Adjustment and Operation**

When the product is supplied with pressure for the first time or when the operating pressure is changed after the product is mounted to the application, operate the product for 1 or more reciprocating operations before starting the operation. Failure to follow this procedure may cause the product to malfunction.

There is a possibility of rod extrusion or overshooting when starting retraction depending on the operating conditions such as vertical operation, plate load or operating pressure. Assure proper operation before using the product.

Do not short circuit the load.
When the product load has a short circuit, over current may be generated, leading to damage of the product.

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## 18. **Washing**

When washing the product with steam, stay within the cylinder temperature range and wash quickly. If the sliding part is washed, the grease may be washed away, reducing the product life. Washing should be as infrequent as possible.

When washing the product using a brush, avoid applying excess force to the parts such as the lead wire and plastic cover, as these components are easily damaged.

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# 19. **Maintenance**

Do not disassemble or retrofit the product.  Failure or malfunction may result.

Perform periodical checks.
There is a risk of unexpected failure of components due to the malfunction of equipment and machinery.

Turn off the power supply, shut off the air supply, exhaust residual compressed air in the piping and verify the release of air before performing maintenance. There is a risk of unexpected operation.

Do not use solvents such as benzene, thinner etc. to clean the product.  This may damage the surface of the body and erase the markings on the body.  Use a soft cloth to remove stains.  For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

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## 20. Recovering the IP Address of SMC Ethernet MPC

The Ethernet MPC has a factory preconfigured static IP address of (192.168.1.20). Use this procedure when the current IP address of an Ethernet MPC is unknown. The IP address can be modified using the eight switches located under the cover of the Ethernet MPC. Power should be off to the unit or the power cable should be unplugged. In order to access the switches remove the 5 screws that hold the cover on using a 2.5mm Allen key. Carefully lift the cover off reveling the dip switches at one end of the circuit board stack.

The switches represent the lower octet of the IP address, the value of X in this example: 192.168.1.X. A switch is a binary 1 when it is pushed up toward the upper circuit board or a binary 0 when pushed down. The switch which corresponds to the most-significant-bit (MSB) of the lower octet is located on the right. The switches are read by the Ethernet MPC upon application of power. When power is applied, the state of the switches will then be used to determine the lower octet of the IP address.

*The switches come from the factory set to a collective decimal value of 255 (all switches pushed up). The IP address stored in flash (i.e. set from the webpage) is used when the switches are set to 255. When the switches are set to 0 (all switches pushed down) the factory defaults of the device are restored on power application.*

The user can then modify the IP address to the desired value via the webpage. REMINDER: to use the address set from the webpage the switches need to be returned to 255 or, if left at 0, the factory defaults will return on the next power cycle. A switch value different from 0 or 255 will cause the lower octet of the IP address to assume the corresponding value of the switches. Additional information related to network setup can be found in the sections Web Page Access and Network Page.
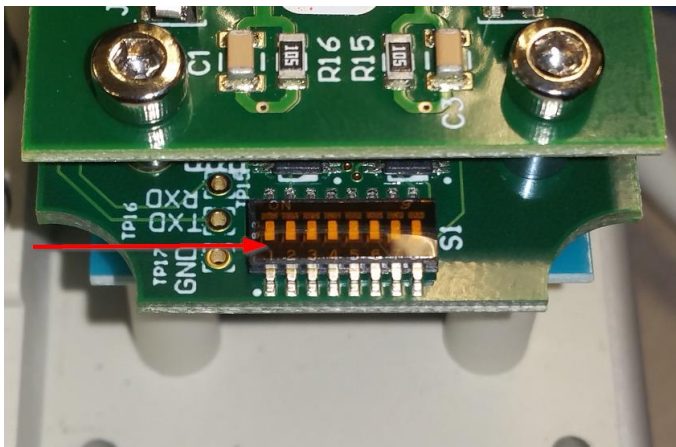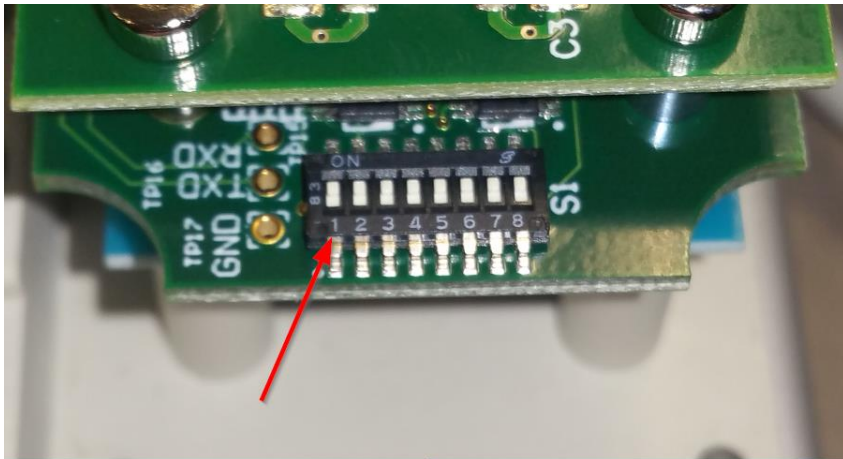


**Figure 18-1 SMD Cover**

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**Figure 18-2 Defualt Switch Position all up**

 SMC

| Revision History | | | |
|---|---|---|---|
| **Revision** | **Description** | **Date** | **Author(s)** |
| 1.0 | Initial release for Ethernet/IP MPC | 010/11/2016 | SMC US EPG |

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