Introduction to Fieldbus Gateways

**Seamless communication between Ethernet and Fieldbus devices**

Fieldbus is an industrial network system used for real-time distributed control, and provides a way to connect devices in a manufacturing plant. Fieldbus works on a network structure that typically allows daisy-chain, star, ring, branch, and tree network topologies. In the past, computers were connected using RS-232 (serial connections), which only allows two devices to communicate with each other. This is equivalent to the currently used 4-20 mA communication scheme, which requires that each device has its own communication point at the controller level. Fieldbus, on the other hand, is equivalent to LAN-type connections, which require only one communication point at the controller level and allow multiple analog and digital points to be connected at the same time. The fact that Fieldbus works over a network is the main reason it is now widely used in industrial applications.

Moxa’s own line of Fieldbus gateways is the MGate series:
- MGate MB3000 Series: Modbus TCP to Modbus serial gateways
- MGate EIP3000 Series: EtherNet/IP to DF1 gateways

The MGate family uses several innovative design concepts and powerful options to make the gateways easy to use. In particular, ProCOM is a user-friendly tool that simplifies implementation.

### MGate™ MB3000 Series: Modbus TCP to Modbus Serial Gateways

Modbus is the standard protocol for communicating between a wide range of industrial devices, including PLCs, DCSs, HMIs, instruments, meters, motors, and drives. Moxa’s MGate™ MB3000 is specially designed to integrate Modbus TCP and Modbus RTU/ASCII networks. MGate™ MB3000 products support one or two Ethernet connections, and up to four serial ports.

### MGate™ EIP3000 Series: EtherNet/IP to DF1 Gateways

The EtherNet/IP and DF1 protocols are used by Rockwell and AB PLC, respectively, as their main communications protocols. A problem faced by many engineers is figuring out how to connect devices that use these two different protocols. One option is to buy an expensive, budget-busting PLC communications interface module. However, a much more cost-effective option is to use Moxa’s MGate™ line of products, which are specially designed to integrate EtherNet/IP and DF1 networks.

The MGate™ EIP3000 series of Modbus gateway products support some or all of these advanced features:
- Multiple masters
- Priority control
- Smart routing
- Serial redirector
- Powerful Windows Utility with multi-language support
- Built-in protocol analyzer
- ProCOM
- Built-in optical isolation for industrial device protection (isolation models only)
Features of the MGate™ MB3000 Series

Multiple Masters across Different Modbus Networks for Fully Compliant Operation

The MGate™ MB3000 supports 16 simultaneous TCP masters with up to 32 simultaneous requests per master. Serial masters are able to access up to 32 different IP addresses as TCP slaves. MGate™ MB3000 gateways have been designed so that even with multiple masters across different Modbus networks, communication remains compliant with each Modbus protocol.

Supports 16 TCP masters with up to 32 requests per master

![Diagram showing supported devices and network connections]

- Host Computers
- Modbus/TCP Master devices
- Ethernet
- PLC
- RS-232
- Flow meters, drives

Other Modbus gateways simply transfer all requests between Modbus networks on a FIFO (first in first out) basis, with no accommodation for urgent commands that require immediate attention. The advanced models of the MGate™ MB3000 (the MB3170 and MB3270) include a patent-pending priority control feature that allows urgent commands to be flagged for immediate response based on IP address, command type, or TCP port. The priority control feature allows the advanced models of the MB3000 series to get around the latency experienced by other Modbus gateways. With the priority control feature, the advanced MB3000 models are an ideal component of real-time control systems.

Patent Numbers: (US/TW)
US7,743,192 B2 / I332618
US7,725,635 B2 / I321007

Built-in Optical Isolation for Industrial Device Protection

The MGate™ MB3000 series includes two advanced models—the MB3170I and MB3270I—that offer built-in optical isolation for the serial signals as an option. Optical isolation helps prevent dangerous ground loops, spikes, and surges.

Priority Control for Critical Commands (Patented)

Flag urgent commands for immediate response

![Diagram showing priority control]

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The MGate™ MB3270, MB3280, and MB3480 include smart routing for enhanced compatibility with existing Modbus networks. Other Modbus gateways require a separate socket connection for each serial port, making them useless for TCP masters that can only open one connection. With smart routing on the MB3000 Modbus gateway, a TCP master can use just one socket connection to command serial slaves on every serial port.

The MGate™ MB3270 has a serial redirector function that allows additional options for Modbus network integration. The serial redirector function allows the commands of a serial master to be redirected to serial slaves on another port. In addition, a serial master can operate simultaneously with TCP masters or other serial masters, without altering the Modbus architecture or software. Using the serial redirector function, advanced MB3000 gateways can establish redundant backup control or Ethernet monitoring of Modbus networks that were originally designed for a single serial master.
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### Features of the MGate™ EIP3000 Series

#### Support for Multiple EtherNet/IP Connections

The MGate™ EIP3000 series products support up to 8 EtherNet/IP servers (incoming connections) and 8 EtherNet/IP clients (outgoing connections) simultaneously. Each connection can be set up for connected messaging (CM) or unconnected messaging (UCMM), and can send up to 16 requests at one time.

#### Easy-to-Use Routing Table

When using different serial port gateways, it is important to set up the “slave ID to serial port” mapping. Even when using a 1-port gateway, some legacy devices are only manufactured with one unique ID for all units. In this case, the ID must be translated before a message is sent to the same control network, and it helps the host computer to recognize all devices as individual units. The MGate™ EIP3000 is designed to meet all slave ID routing requirements. With MGate™ Manager, setting up a complete routing table is quick and easy with the graphical user interface that helps users design their “slave ID to serial port” mapping.

#### Use ProCOM to Implement Control via COM Port Mapping to Generate Four Additional Virtual Serial Channels

Most host software uses COM ports as a control interface. The MGate™ EIP3000 however, which is much more than just a device server, provides a COM mapping function and also retains DF1 connection capability. The MGate™ EIP3000 supports Windows 2000/XP/2003/Vista, and provides COM port mapping control of device servers and DF1 behavior compatibility of gateways. Each MGate™ EIP3000 gateway supports four virtual serial ports for remote control over an Ethernet connection.

#### Individual IP for Each Serial Port

For some SCADA software, such as RSLinx, the slave ID for an Ethernet connection is designed as a fixed number for every IP, which poses a problem when using multiple serial port gateways.

If a gateway provides only one IP on the Ethernet network, devices connected to other serial ports will never receive requests or commands from the SCADA software.

With the IP alias function, the MGate™ EIP3000 supports an individual IP for each serial port, allowing SCADA software to communicate through the gateway with DF1 devices on different serial ports at the same time.