

MOX Gateway Field Controller

User Guide

0809-602-2303



Preface

Scope of the User Guide

This MOX Gateway Controller User Guide contains information for MOX Gateway controllers with the following part numbers:

Part Number	Description
MX602-3212-01	PROFIBUS DP Master
MX602-30-05-08-00	PROFIBUS DP Master
MX602-30-05-08-02	PROFIBUS DP Master (GSM/GPRS)
MX602-30-05-10-00	ControlNET
MX602-30-05-15-00	Serial
MX602-3212-07	EtherNet/IP Slave

This guide has been organized for the operator, and it is expected that the user is an engineer, technician, electrician or similar with an understanding of the operating and programming requirements of related MOX products.

Related Documents

Typical application of the gateway module contains a collection of MOX equipment and several software packages. For this reason, a number of related documents should be read in conjunction with this user guide.

The related documents are noted below:

- MOX Unity Field Controller User Guide
- MOXIDE User Guide
- MOXGRAF User Guide
- MOXCON User Guide

Conventions Used



When you see the “exclamation mark” icon in the left-hand margin, the text to its immediate right will be a special note. Please ensure that you read this information to increase your understanding of the systems operation.



When you see the “stop sign” icon in the left-hand margin, the text to its immediate right will be a warning. This information could prevent injury loss of property or even death (in extreme cases). It is very important that you stop and read this information and ensure that you have complete understanding before continuing with the procedures.

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1 Overview

The MOX Gateway is a leading edge industrial controller designed to interface with field devices and control equipment via many of the advanced communication methods available. The final solution is Enterprise ready allowing data from your remote sites to seamlessly flow into your integrated SCADA system. The MOX Gateway utilizes open communications options to allow quick integration into your existing system.

The MOX Gateway affords the protocol conversion between industry standards such as MODBUS TCP/IP and PROFIBUS DP, etc. The modular fieldbus additions are high performance options meeting the highest industry demands.

The application capability of the MOX Gateway extends way beyond the traditional boundaries. The MOX Gateway is suitable for a wide variety of applications across a varied range of industries with recognition for outstanding versatility, cost effectiveness, performance and a scalable architecture. Having protocol conversions built in and integrated within the field controller provides a highly flexible and quickly realisable solution.

Comprehensive functions are available for start-up and ongoing diagnostics and certain device conditions and transmission errors may be displayed on the front panel LEDs. Further diagnostic functions, especially for testing the fieldbus communications may also be carried out directly from the configuration software.

2 Specifications

2.1 Key Features

- Modular Construction
- Open Systems Interconnection
- Enterprise Ready Solution
- Integrated and Transportable IEC61131 Control Software
- Standard Serial and Ethernet Communications
- Functions in Standalone or Integrated Configurations
- Numerous onboard Communications Options

2.2 PROFIBUS DP (MX602-3212-01)

The MOX Gateway PROFIBUS DP (MX602-3212-01) is designed to provide protocol conversion between PROFIBUS DP and MODBUS TCP/IP, DNP, IEC, etc. It acts as a master on a PROFIBUS DP network and communicates with PROFIBUS DP slaves.

MOX configuration software, "MOXIDE" enables you to easily configure the MOX Gateway controllers with their Ethernet and serial ports. And "MOXCON" can be used to configure the controller so that it can drive and access data from the connected PROFIBUS DP slaves. With the entire configuration done, "MOXGRAF" could be adopted to build a program to implement automatic monitor and control.

2.2.1 Familiarization

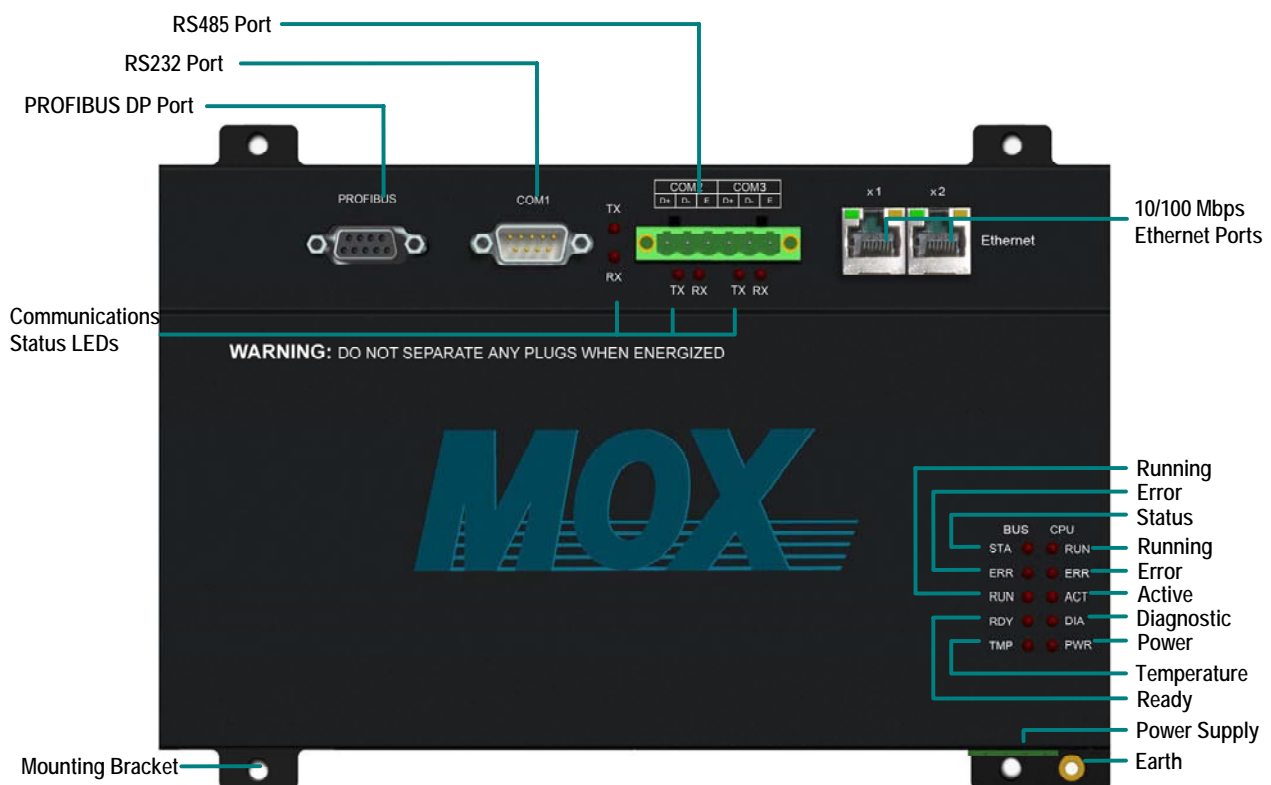


Figure 1 MX602-3212-01 MOX Gateway PROFIBUS DP Familiarization

2.2.2 Key Features

- PROFIBUS DP Master
- Two isolated RS485 ports, one RS232 port
- Two 10/100Mbps Ethernet ports

- Support multiple communication protocols: DNP, Modbus, etc.
- CPU operating temperature measurement
- Non-volatile state data storage

2.2.3 Datasheet

Power Requirements	
Power Input Range	+24VDC (9~30VDC)
Power Dissipation	<5W
Onboard Fuse	Yes
Fuse Type	51NM-0080H
Fuse Value	0.8A/250V
CPU Specifications	
Clock Speed	400MHz
DDR RAM	128MBytes
Flash Memory	256MBytes
Communication Specifications	
PROFIBUS DP	1 × PROFIBUS DP port
Ethernet	2 × 10/100Mbps Ethernet ports
	Auto negotiation
	Auto-crossover detection
RS485	2 × Isolated RS485 ports
	Baud Rate: 1200bps ~ 115200bps
	Isolated Voltage: 2500Vrms
RS232	1 × RS232 port
	Baud Rate: 1200bps ~ 115200bps
Temperature Characteristic	
Temperature Monitor	Yes
Temperature Alarm	Yes
Environmental Conditions	
Operating Temperature	-20~70°C
Storage Temperature	-40~85°C
Relative Humidity	5~95%, non-condensing

Table 1 MX602-3212-01 MOX Gateway PROFIBUS DP Datasheet

2.2.4 LED Indication

LED	State	Description
RUN	ON	CPU is running normally.
	OFF	System does not start.
	Flashing in 0.5Hz	No MOXGRAF code (control code).
ERR	ON	Communication error.
	OFF	Communication OK.
ACT	OFF	Reserved.
DIA	Flashing in 0.5Hz	System is running.
	OFF	System not started.
PWR	ON	Module is powered on.
	OFF	Module is powered off.

Table 2 PROFIBUS DP Gateway LED of the CPU Column

LED	State	Description
RUN ERR	ON OFF	CPU is running normally.
RUN ERR	Flashing in 0.5Hz OFF	There is no MOXGRAF code present.
RUN ERR	ON ON	CPU is running normally, but with I/O communication error.

Table 3 PROFIBUS DP Gateway CPU State Trouble Shooting

LED	State	Description
STA	ON	Device is holding the PROFIBUS Token and is able to transmit Telegrams.
	Flashing irregular	Device is sharing the PROFIBUS Token with other Master devices in the PROFIBUS network.
ERR	ON	Device has found a communication problem to at least one PROFIBUS-DP Slave or has detected a short circuit.
	OFF	Communication OK.
RUN	ON	Communication is running. The device has established at least one configured fieldbus connection.
	Flashing in 5Hz	No error in the configuration found, communication is stopped or ready for communication but no connection to any slave.
	Flashing irregular	Power Up: Configuration missing or faulty, device needs commissioning. Runtime: Host Watchdog timeout
RDY	OFF	No heavy runtime error
	Flashing irregular	Hardware or heavy runtime error detected
TMP	ON	CPU working temperature is beyond the alarm limit.
	OFF	CPU working temperature is within the alarm limit.

Table 4 PROFIBUS DP Gateway LED of the DP Column

LED	State	Description
STA	OFF	Device is not configured or has not received the Token permission on the PROFIBUS network.
ERR	OFF	
RUN	OFF	Device has no power supply or hardware defect
RDY	OFF	

Table 5 PROFIBUS DP Gateway State Trouble Shooting

LED	State	Description
TX	OFF	No communication
	Flash	There is attempted outgoing communication
RX	OFF	No communication
	Flash	There is attempted incoming communication

Table 6 RS232/RS485 Serial Port LEDs

LED	State	Description
LINK (Green)	ON	Connection is linked
	OFF	No connection is linked
ACT (Yellow)	Flashing	Transmitting or receiving data
	OFF	No data transmitted or received

Table 7 Ethernet Port LEDs

2.2.5 Communication Ports

2.2.5.1. PROFIBUS DP Port

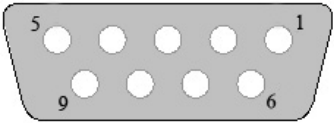
	Pin No.	Symbol	Description
	3	Data+	Non invert receiver input and non invert driver output of Data
	8	Data-	Invert receiver input and invert driver output of Data
	5	GND	Ground
	6	VCC	Power supply (Positive)

Table 8 Signal Description of PROFIBUS DP

2.2.5.2. RS232 Port

A RS232 communication port marked as COM1 is supplied. It is a male D type connector. The asynchronous rate of this serial port is programmable up to 115,200bps.

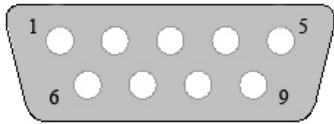
	Pin No.	Signal	Description
	1	DCD	Carrier Detector
	2	RXD	Receive Data
	3	TXD	Transmit Data
	4	DTR	Data Terminal Ready
	5	GND	Signal Ground
	6	DSR	Data Set Ready
	7	RTS	Request to Send
	8	CTS	Clear to Send
	9	RING	Ring Indicator

Table 9 Signal Description of RS232

2.2.5.3. RS485 Port

The module has two RS485 communication ports identified as COM2 and COM3. The asynchronous rates of the RS485 ports are programmable respectively up to 115,200bps. Both of the RS485 ports are 2500Vrms isolated to the system.

Symbol	Description
D+	Non invert receiver input and non invert driver output of Data
D-	Invert receiver input and invert driver output of Data
E	Shield

Table 10 Signal Description of RS485

2.2.5.4. Ethernet Port

The module provides two 10/100M Ethernet ports marked as Eth1 and Eth2. Both ports support auto-negotiation function which can automatically configure the Ethernets to take the maximum advantage of their abilities. All the Ethernets have HP Auto-MDIX function to implement auto crossover detection function.

The two Ethernet ports are 1000Vrms isolated to the system.

2.2.6 Configuration


Before starting to configure the controller, make sure that the controller is correctly connected to the computer as well as to the slaves.

- Use "IPConfig" within "MOXIDE" to set the IP address of the controller so that it can communicate with the computer.
- Use "MOXCON" to configure the controller so that it can drive and access data from the connected PROFIBUS DP slaves.

By using "MOXIDE", more configurations can be implemented. Configuration for the Ethernet and serial ports will be taken as an example to introduce in this chapter.

2.2.6.1. Ethernet Port Configuration

The two 10/100Mbps Ethernet ports are marked as Eth1 and Eth2. Communications are accessible through the onboard RJ45 connector ports.

	<i>The factory default IP address of the Eth1 is 192.168.1.32</i>
	<i>The factory default IP address of the Eth2 is 192.168.0.32</i>

Programming the MOX Gateway with MOXGRAF may be conducted via either of the two ports.

SCADA/HMI interfaces that support the MODBUS TCP/IP protocol and DNP3.0 can communicate with the MOX Gateway.

To alter the IP address of the controller, “IP Config” can help to implement the operation easily. Within “MOXIDE”, select **Tools | IPConfig** to open the IP configuration application.

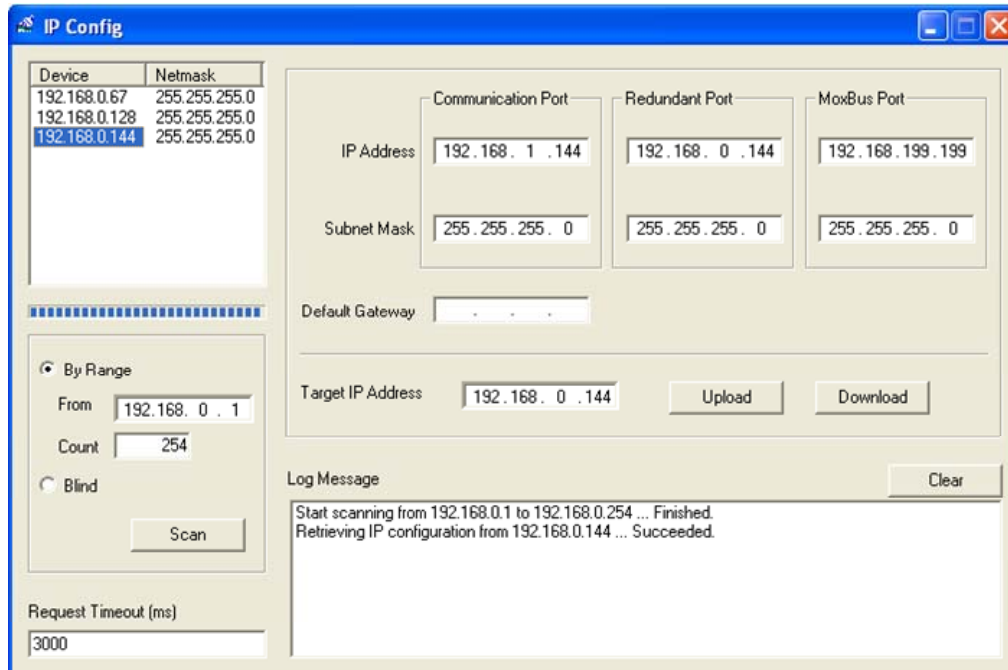
If you are unsure of what the current IP address of the Gateway is, you are able to scan all connected MOX Gateways using this tool. “IP Config” application provides two scanning methods, “**By Range**” and “**Blind**”.

“**By Range**” method takes two parameters. “**From**” indicates starting address and “**Count**” indicates the scanning range. For instance: Set “**From**” with 192.168.1.1 and “**Count**” with 254 then select the “**Scan**” button. This example will scan all the physical connected controllers with the IP address range from 192.168.1.1 to 192.168.1.254.

The “**Blind**” method takes no parameters. Simply select the “**Blind**” option and click on the “**Scan**” button to scan all the controllers in the same network.

If the Gateway’s IP is found, it will be displayed in the **Target List** window. Double click on the displayed IP and select the “**Upload**” button to display all IP information of that Gateway.

If you know the IP address, simply type it into the **Target IP Address** prompt and select “**Upload**”.



The IP Config window displays a table of devices and their netmasks. The third device, 192.168.0.144, is selected. The window also shows configuration for three ports: Communication Port, Redundant Port, and MoxBus Port. The Communication Port is set to 192.168.1.144, the Redundant Port to 192.168.0.144, and the MoxBus Port to 192.168.199.199. All ports have a subnet mask of 255.255.255.0. The Default Gateway is set to The Target IP Address is 192.168.0.144. The window includes buttons for Upload and Download. The Log Message section shows the following messages: "Start scanning from 192.168.0.1 to 192.168.0.254 ... Finished." and "Retrieving IP configuration from 192.168.0.144 ... Succeeded." The Request Timeout (ms) is set to 3000.

Device	Netmask
192.168.0.67	255.255.255.0
192.168.0.128	255.255.255.0
192.168.0.144	255.255.255.0

Communication Port: IP Address: 192.168.1.144, Subnet Mask: 255.255.255.0

Redundant Port: IP Address: 192.168.0.144, Subnet Mask: 255.255.255.0

MoxBus Port: IP Address: 192.168.199.199, Subnet Mask: 255.255.255.0

Default Gateway:

Target IP Address: 192.168.0.144

Log Message: Start scanning from 192.168.0.1 to 192.168.0.254 ... Finished.
Retrieving IP configuration from 192.168.0.144 ... Succeeded.

Request Timeout (ms): 3000

Figure 2 IP Configuration

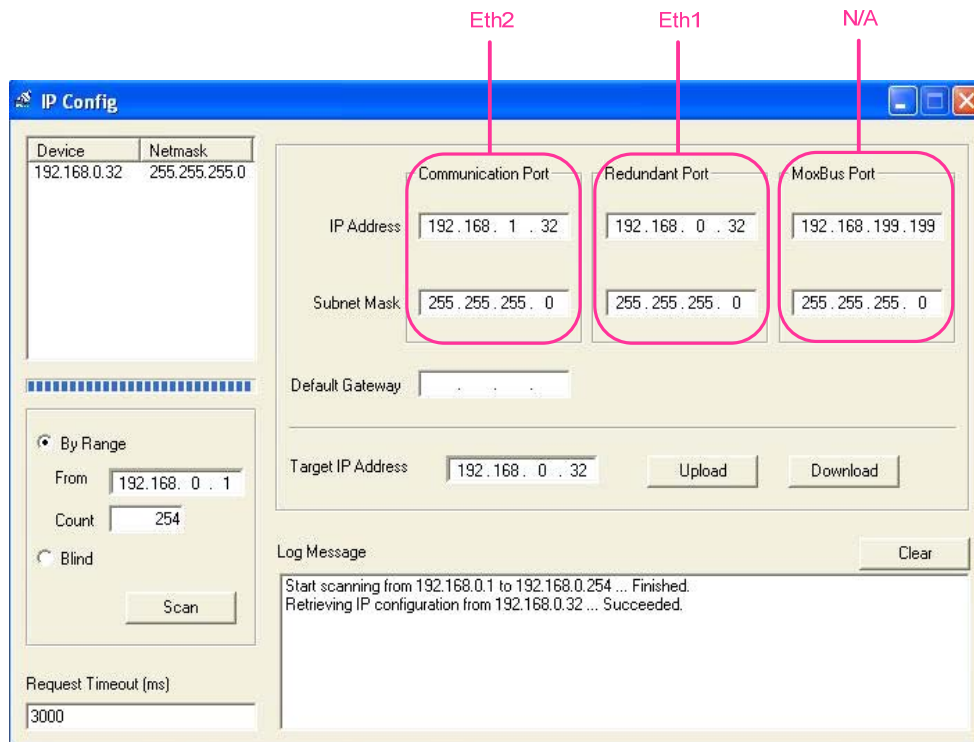


If alteration of the IP address is required, ensure that a valid IP address is allocated. Allocating an unreachable IP address, e.g. 192.168.0.0, will result in system failure.



*The **Request Timeout** may need to be altered depending on the size of the connected network architecture.*

The relationship between Eth1, Eth2 and IPConfig is demonstrated in the figure below. Once you have changed the Ethernet port address to the desired IP, select the “**Download**” button.



The screenshot shows the 'IP Config' window. It has a table on the left with 'Device' and 'Netmask' columns. The main area has three columns for 'Communication Port', 'Redundant Port', and 'MoxBus Port'. Each column has fields for 'IP Address' and 'Subnet Mask'. Below these are fields for 'Default Gateway', 'Target IP Address', and buttons for 'Upload' and 'Download'. At the bottom, there is a 'Log Message' section with a 'Clear' button. Annotations include pink boxes around the port configuration sections and pink lines pointing to them with labels 'Eth2', 'Eth1', and 'N/A'.

Device	Netmask
192.168.0.32	255.255.255.0

Communication Port	Redundant Port	MoxBus Port
IP Address: 192.168.1.32	IP Address: 192.168.0.32	IP Address: 192.168.199.199
Subnet Mask: 255.255.255.0	Subnet Mask: 255.255.255.0	Subnet Mask: 255.255.255.0

Default Gateway: []

Target IP Address: 192.168.0.32 [Upload] [Download]

Log Message: [Clear]

Start scanning from 192.168.0.1 to 192.168.0.254 ... Finished.
Retrieving IP configuration from 192.168.0.32 ... Succeeded.

Request Timeout (ms): 3000 [Scan]

2.2.6.2. PROFIBUS DP Configuration

“MOXCON” is a utility used to modify the network architecture between the MOX Gateway PROFIBUS DP and external I/O. For detailed information about “MOXCON”, refer to “MOXCON User Guide”.

“MOXCON” uses GSD (Generic Station Description) files to determine device description data which is required for all PROFIBUS DP devices. The GSD file is used to identify and configure any PROFIBUS DP device in an open system. It is an ASCII file and could be read with any text editor.

For MX602-3212-01 MOX Gateway PROFIBUS DP, the GSD file is identified as “HIL_069E.GSD”.



*“HIL_069E.GSD” must be available in the **Fieldbus\PROFIBUS\GSD** folder under the MOXCON installation directory before any PROFIBUS DP Gateway configuration can be done.*

The following procedure gives a configuration process outline:

- 1) Create a new MOXCON project by selecting **File->New** from the menu, the following dialog box will be displayed, choose "**PROFIBUS**" then click "**OK**".

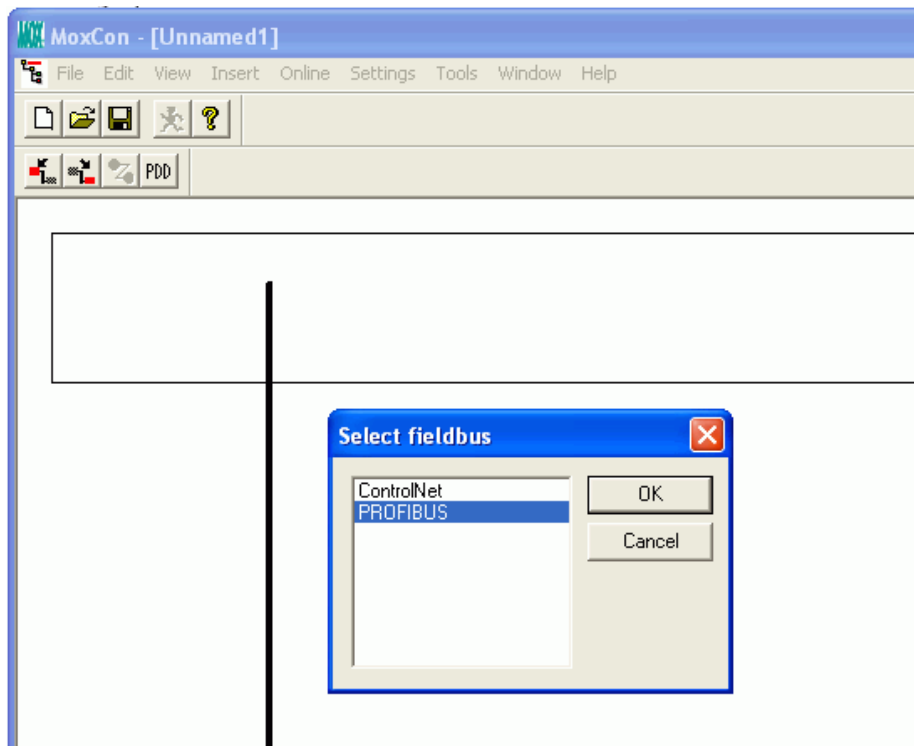


Figure 3 Set up a New Project

- 2) Insert a Master device by selecting **Insert->Master** from the menu. You can see an "**M**" letter attached to the mouse pointer, then click on the blank area.

For MX602-3212-01, the PROFIBUS DP Master with Identification number "0x069E" should be used. Click "**Add>>**" then "**OK**".

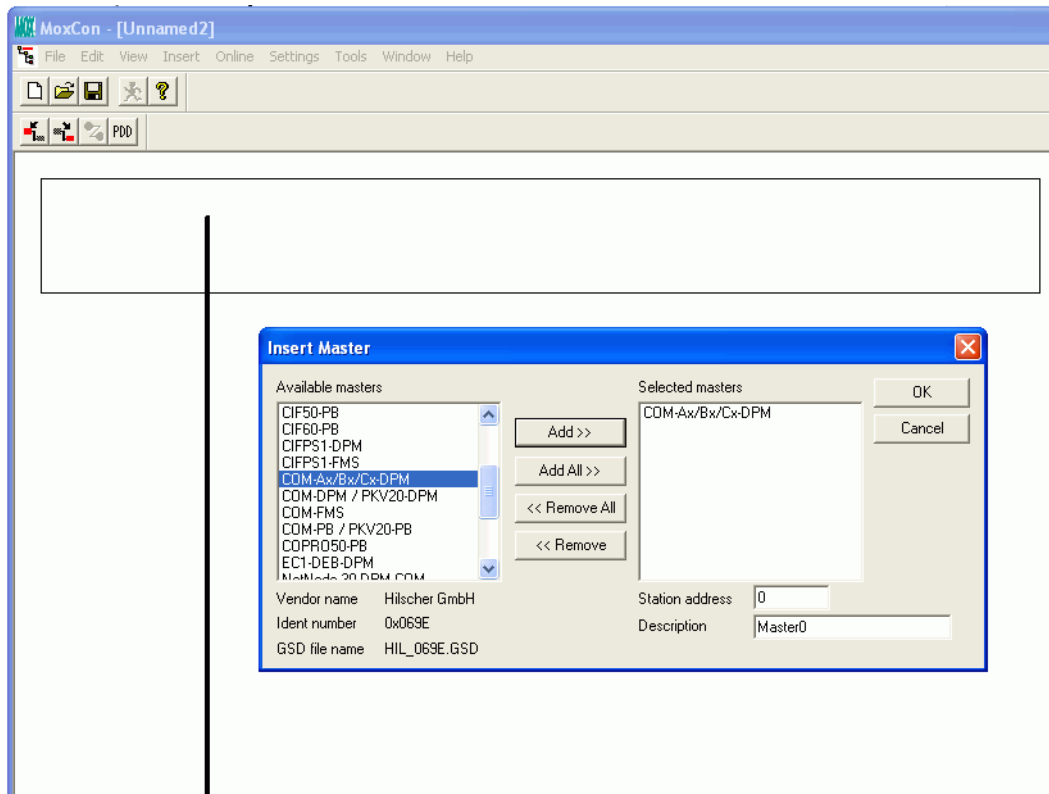


Figure 4 Add PROFIBUS Master

- 3) Set the PROFIBUS DP Gateway connection driver to Serial or TCP/IP by selecting **Settings->Device Assignment** from the menu. Select **"CIF TCP/IP Driver"** and then click **"OK"**.

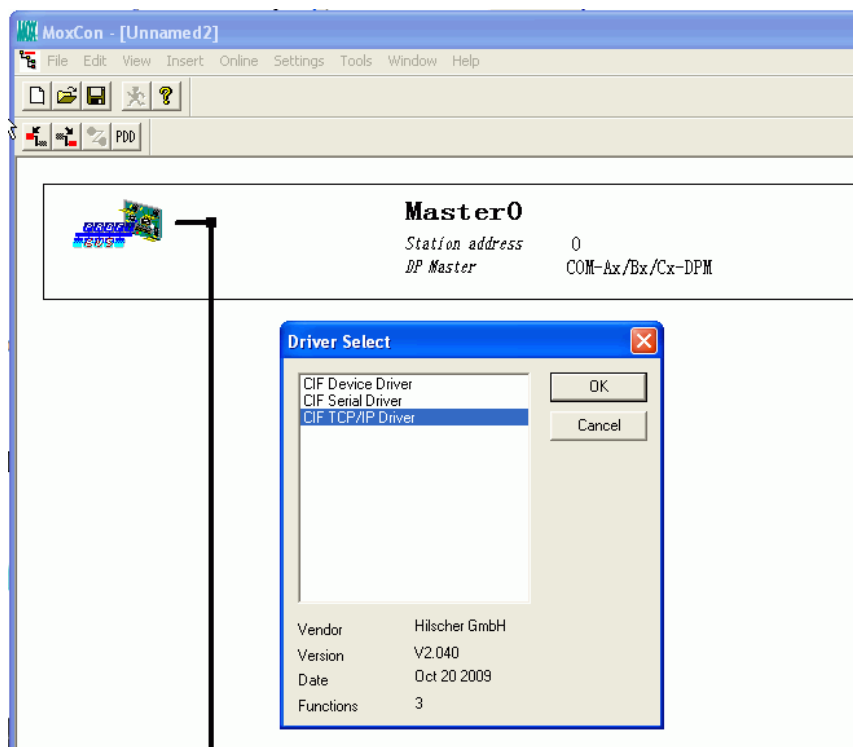
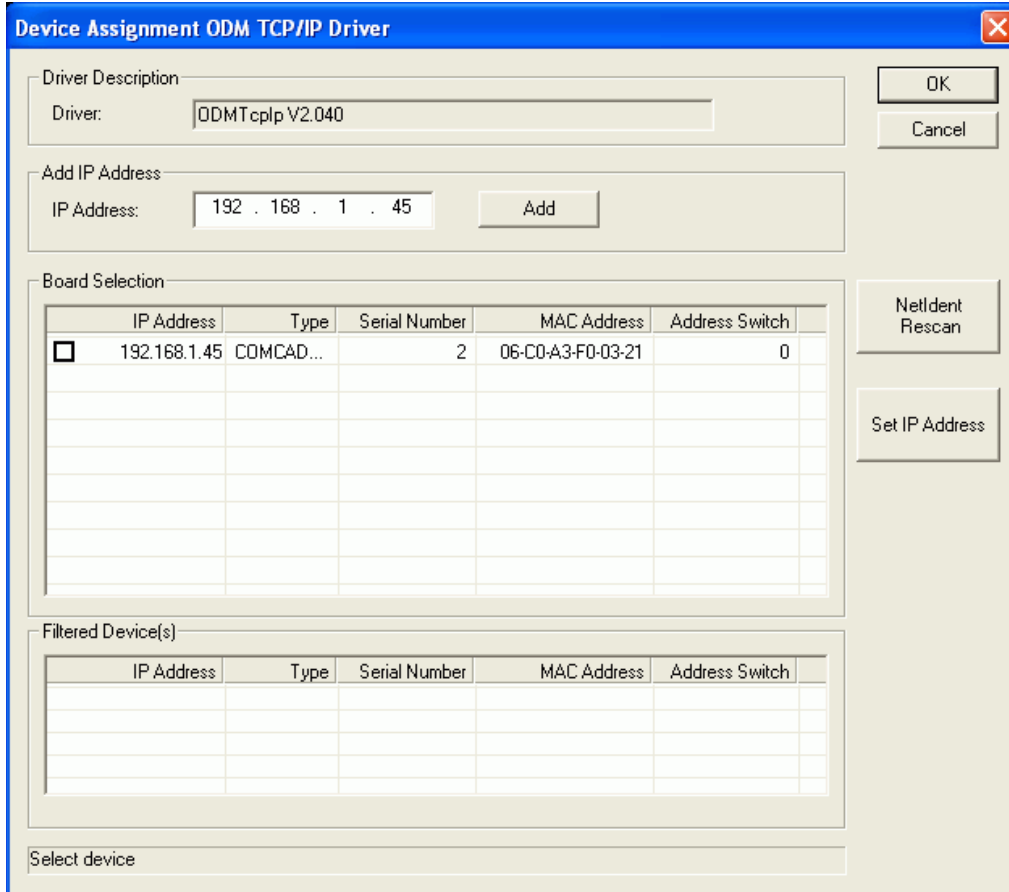


Figure 5 Set PROFIBUS DP Gateway Connection Driver



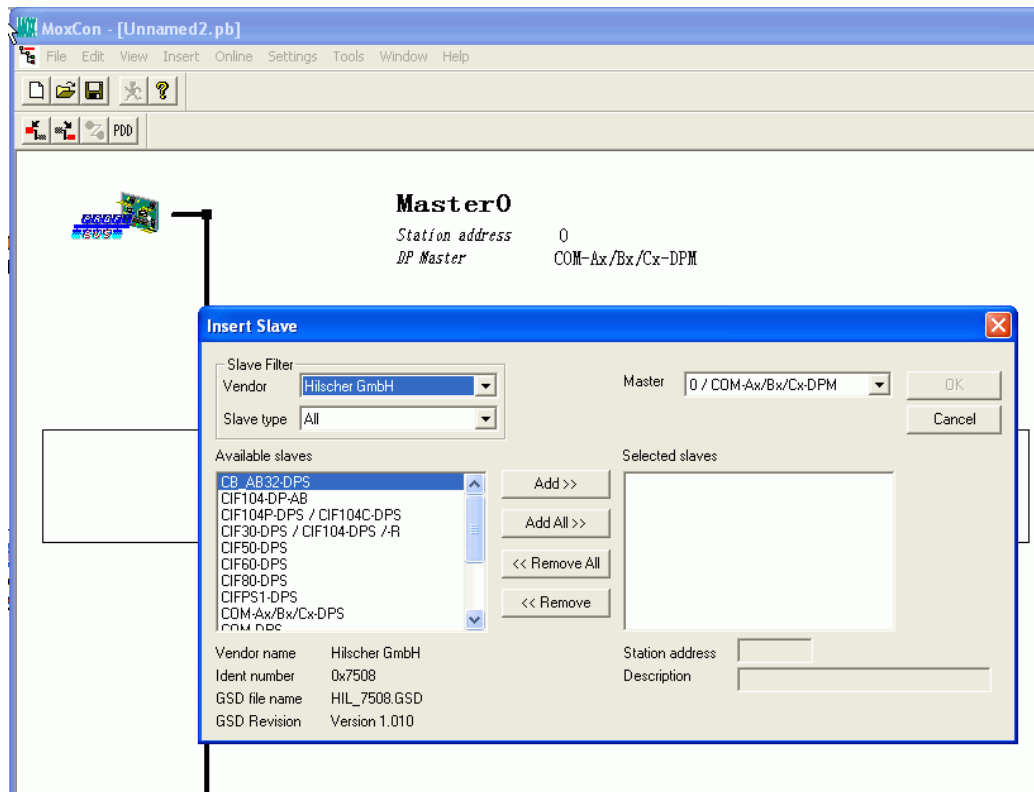
The dialog box is titled "Device Assignment ODM TCP/IP Driver". It contains several sections:

- Driver Description:** A text field labeled "Driver:" containing "ODMTcplp V2.040".
- Add IP Address:** A text field labeled "IP Address:" containing "192 . 168 . 1 . 45", followed by an "Add" button.
- Board Selection:** A table with columns: IP Address, Type, Serial Number, MAC Address, and Address Switch. The first row is checked and contains: 192.168.1.45, COMCAD..., 2, 06-C0-A3-F0-03-21, and 0.
- Filtered Device(s):** An empty table with the same columns as Board Selection.
- Buttons:** "OK", "Cancel", "NetIdent Rescan", and "Set IP Address".
- Select device:** A text field at the bottom.

Figure 6 Set IP Address and Connect to Gateway

Fill in the **IP Address** of the PROFIBUS DP Gateway. Click "Add" to connect to the controller. Once connected, the information will be displayed in the **Board Selection** frame. Check the box and click **OK**.

- 4) To link a complete network of devices that are connected to the PROFIBUS DP Gateway select **Online->Automatic Network Scan** from the menu, or add expected devices manually one by one. All PROFIBUS DP slave devices' GSD files must be available in the **Fieldbus\PROFIBUS\GSD** folder under the MOXCON installation directory.



2.2.6.3. Serial Port Configuration

To configure the serial port's communication parameters of the PROFIBUS DP Gateway controller, start "MOXIDE".

Select "**Connect via RTU and CP to I/O**" option. Type in a relevant project name and select "**OK**".

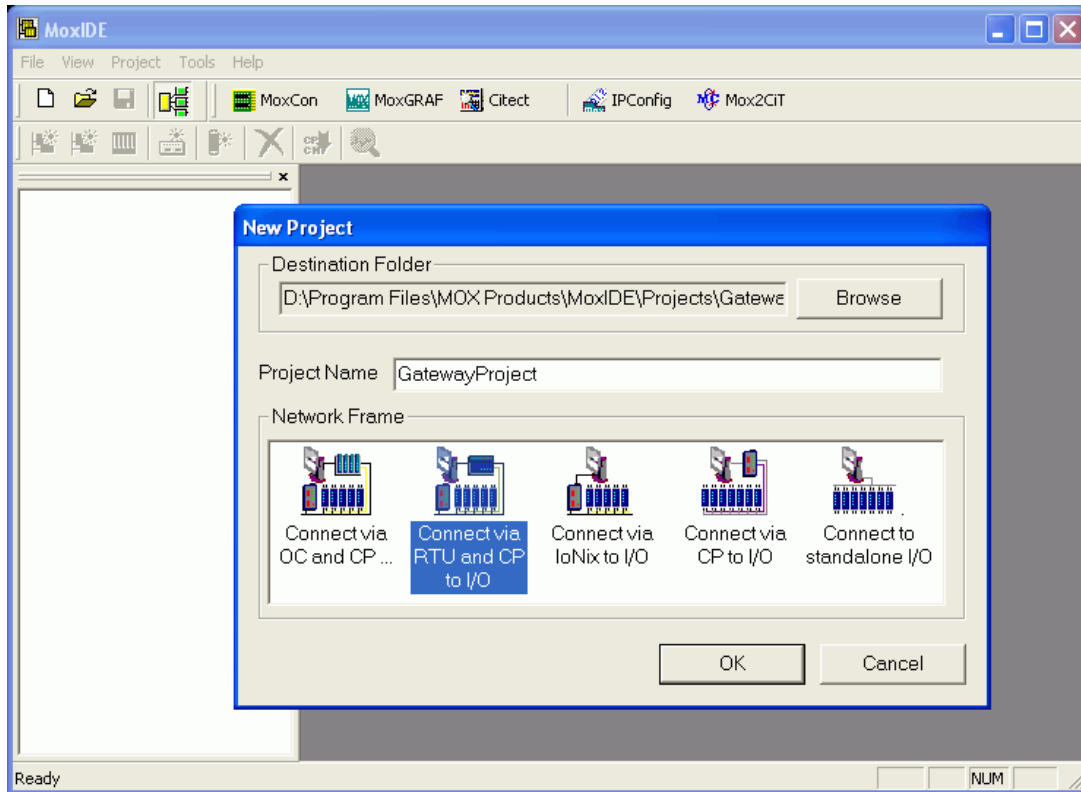


Figure 7 Build a New Project in MOXIDE

Click on the desired MOX Gateway, i.e. RTU in the visual network tree. Select the **“Ports”** tab on the Module Description Window to display the port information.

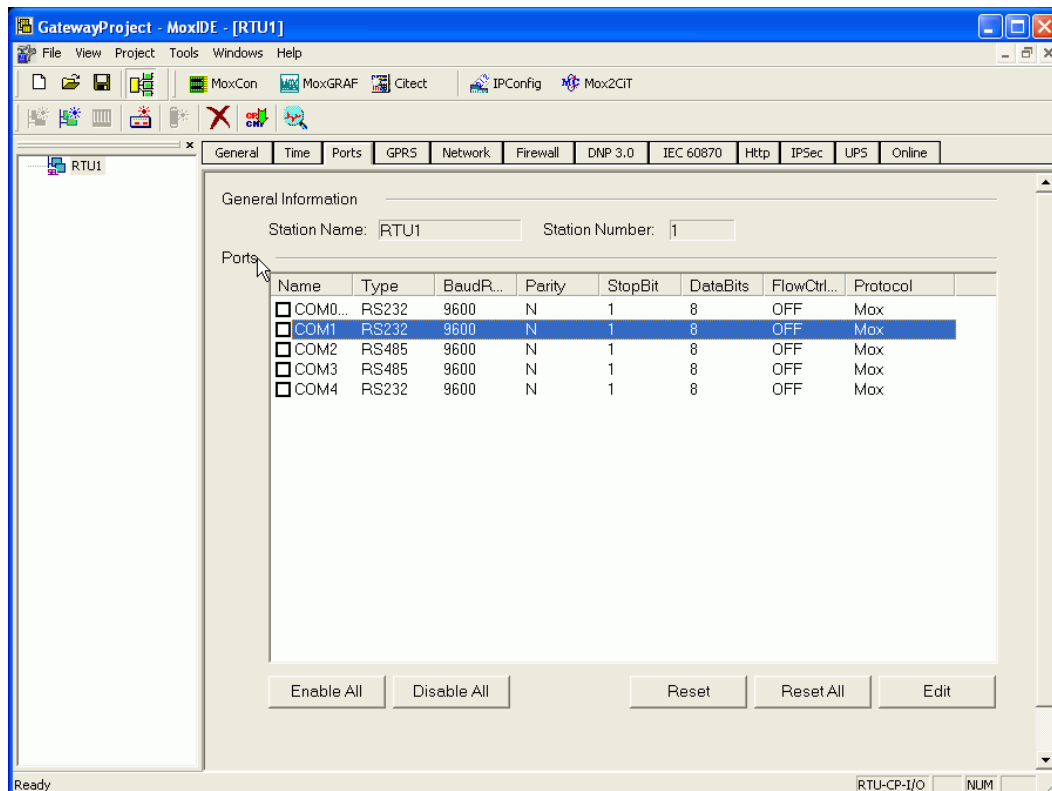


Figure 8 Serial Port Configuration Page

To find out what the connected MOX Gateway's serial port configuration is, click on the **"Online"** tab. Select the **"Online"** button to create a communication link with the Gateway via its Ethernet connection.

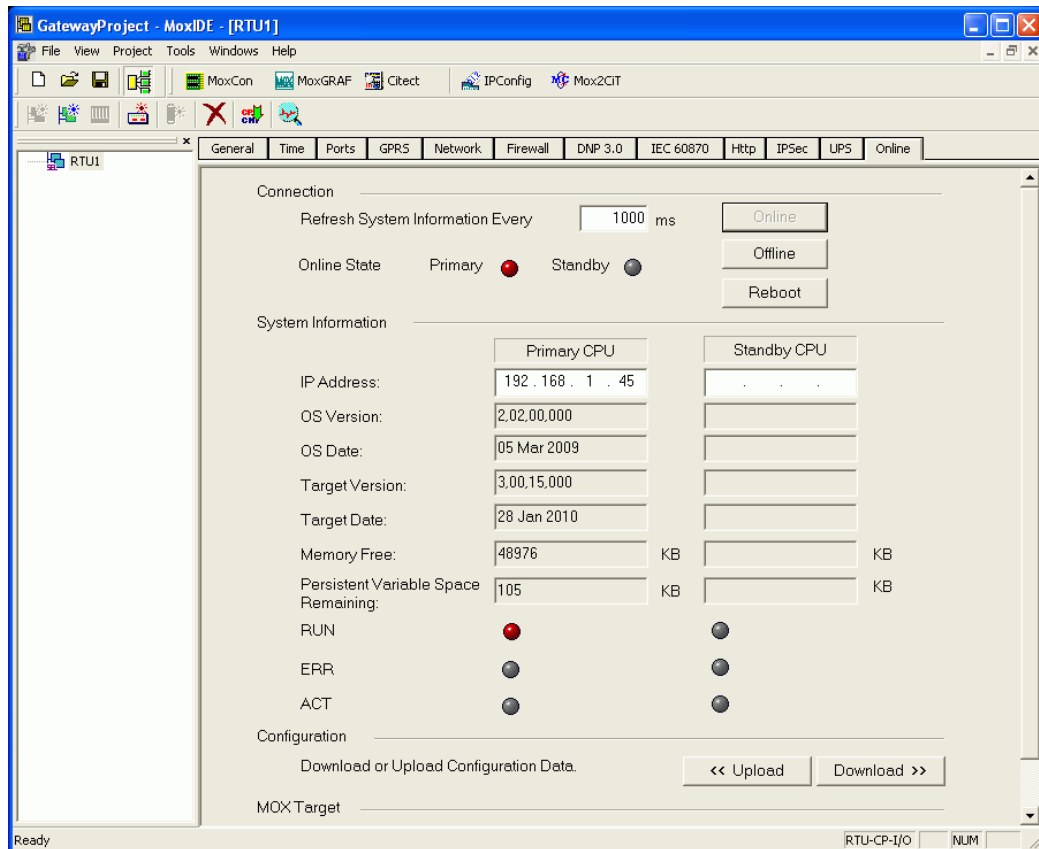


Figure 9 Online Page

Once connection has been established, the MOX Gateway's onboard information will be displayed on the screen. This is an indication that the communication link has been established. Click on the **"<< Upload"** button and select the **"General"** option to upload all port information to MOXIDE. Return to the **"Ports"** tab to view the current serial port parameters.

Select a serial port and double click on it to open its communication parameters. This will display a window similar to figure below.

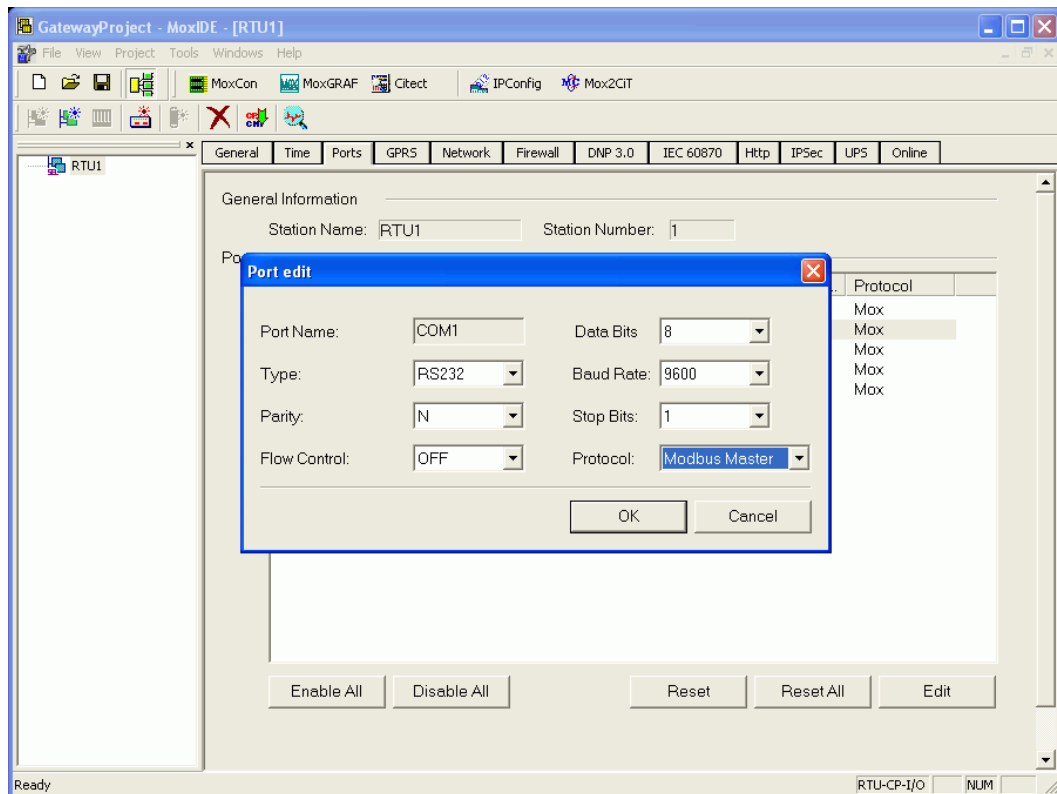


Figure 10 Altering COM1 Settings

Select the “**Type**” prompt and scroll down to the desired format to choose a type of communication. All other communication parameters of that port are alterable as well, e.g. Baud rate, Parity, Flow Control, Stop Bits and Protocol.

Once all the desired serial ports have been configured return to the “**Online**” tab. The new port information will update automatically within MOXIDE on leaving the Ports page. Select the “**Online**” button to establish a connection with the controller. Click on the “**Download >>**” button and select the “**General**” option to download all port information to the desired Gateway. This will display a progress window. When the downloading process is completed, close the progress window and click the “**Offline**” button to disconnect with the Gateway.



Wait a minimum of 30 seconds after performing a full reboot on the MOX Gateway.

There are a number of selectable protocols that the user can choose from when setting serial port communication parameters. The following table shows a description of each protocol and its intended use:

Protocol	Definition	Description
Mox	MODBUS Slave	Communication with a MODBUS Master device.
MODBUS Master	MODBUS Master	Communication with MODBUS slave devices.
MODBUSa Master	MODBUS ASCII	Communication with a visual slave device, e.g. LCD screen.

	Master	
MODBUSa Slave	MODBUS ASCII Slave	Communication with a touch screen master device.
Transparent	N/A	Ethernet to Serial communication between two MOX Gateway devices.
MODNET	MODBUS TCP/IP	Ethernet to Serial Gateway.
DNP	DNP 3.0	Distributed Network Protocol (Slave communications only supported)

Table 11 Serial Communication Protocol Definitions

2.3 PROFIBUS DP (MX602-30-05-08-00/MX602-30-05-08-02)

The MOX PROFIBUS DP Gateway controllers with part number MX602-30-05-08-00 and MX602-30-05-08-02 are supplied with up to two serial communications ports, one PROFIBUS DP port, one diagnostic port and two Ethernet ports.

The major difference between MX602-30-05-08-02 and MX602-30-05-08-00 is that the former can be fitted with an onboard GSM/GPRS module.

2.3.1 Familiarization

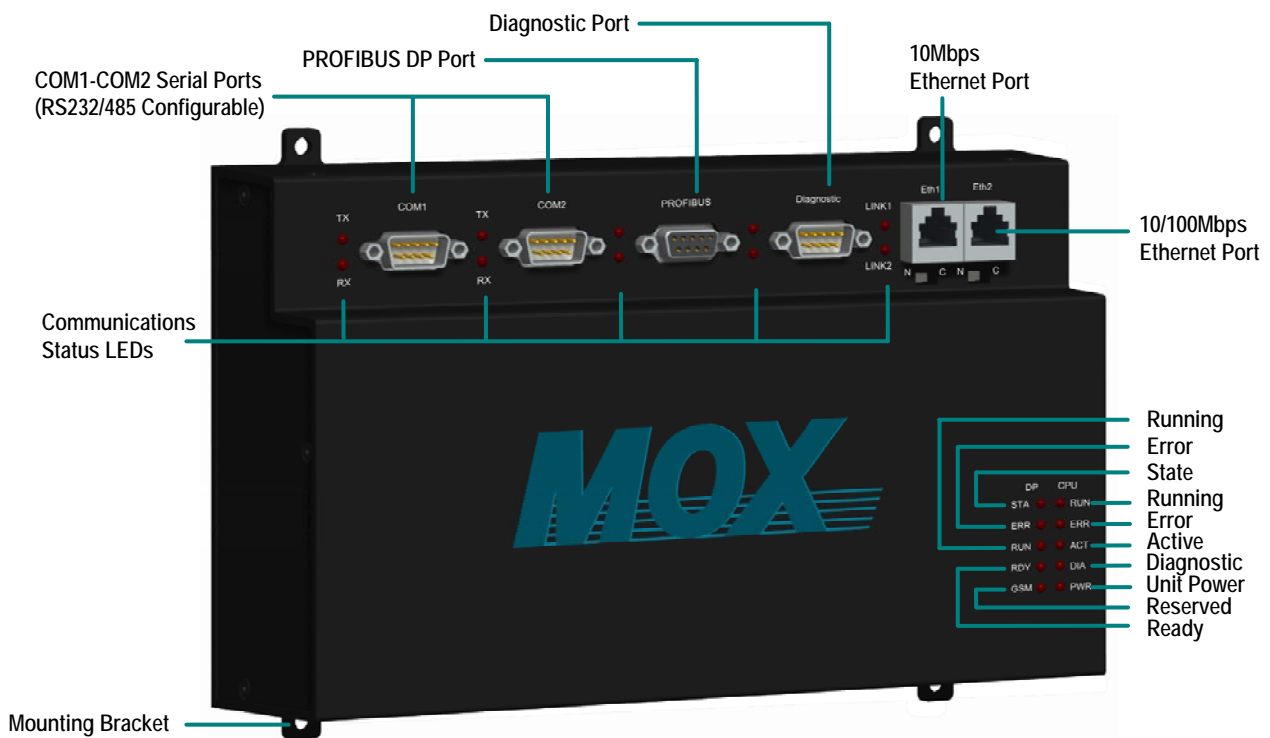


Figure 11 MX602-30-05-08-00 MOX Gateway PROFIBUS DP Familiarization



Figure 12 MX602-30-05-08-02 MOX Gateway PROFIBUS DP (GSM/GPRS) Familiarization

2.3.2 Key Features

- PROFIBUS DP Master
- Two RS232/RS485 Ports
- One PROFIBUS DP port, one Diagnostic port
- One 10Mbps Ethernet port, one 10/100Mbps Ethernet port
- GSM/GPRS
- Non-volatile state data storage

2.3.3 Datasheet

Power Requirements	
Power Input Range	+24VDC (18~30VDC)
CPU Specifications	
Processor	486
Clock Speed	133MHz
SDRAM	32M
Communication Specifications	

PROFIBUS DP	1 x PROFIBUS DP Port 1 x Diagnostic Port
Serial	2 x RS232/RS485 selectable ports
Ethernet	1 x 10Mbps port
	1 x 10/100Mbps port
GPRS/GSM	Available for MX602-30-05-08-02
Environmental Conditions	
Operating Temperature	-20~70 °C
Storage Temperature	-40~85 °C
Relative Humidity	5~95%, non-condensing

Table 12 **MX602-30-05-08-xx MOX Gateway PROFIBUS DP Datasheet**

2.3.4 LED Indication

LED	State	Description
RUN	ON	CPU is running normally.
	OFF	System does not start.
	Flashing in 0.5Hz	No MOXGRAF code (control code).
ERR	ON	Communication error.
	OFF	Communication OK.
ACT	OFF	Reserved.
DIA	Flashing in 0.5Hz	System is running.
	OFF	System not started.
PWR	ON	Module is powered on.
	OFF	Module is powered off.

Table 13 **PROFIBUS DP Gateway LED of CPU Column**

LED	State	Description
RUN ERR	ON OFF	CPU is running normally
RUN ERR	Flashing in 0.5Hz OFF	There is no MOXGRAF code present
RUN ERR	ON ON	CPU is running normally, but with I/O communication error

Table 14 **PROFIBUS DP Gateway CPU State Trouble Shooting**

LED	State	Description
STA	ON	Send data or token
	OFF	No token
ERR	ON	PROFIBUS DP error
	OFF	No error
RUN	ON	Communication running
	OFF	No communication
	Flashing cyclic	Communication stopped
	Flashing irregular	Missing or faulty configuration
RDY	ON	PROFIBUS DP is ready
	OFF	Hardware defect
	Flashing irregular	Hardware or system error

Table 15 PROFIBUS DP Gateway LED of DP Column

State	Description
OFF	GSM module is OFF or running in SLEEP, Alarm or Charge-only mode
600ms ON / 600ms OFF	No SIM card is inserted or no PIN is entered, or network search in progress, or ongoing user authentication, or network login in progress
75ms ON / 3s OFF	Logged to network (monitoring control channels and user interactions). No call in progress
75ms ON / 75ms OFF / 75ms ON / 3s OFF	One or more GPRS contexts are activated
Flashing	Indicates GPRS data transfer: When a GPRS transfer is in progress, the LED goes on within one second after data packets were exchanged. Flash duration is approximately 0.5s
ON	Depends on type of call: Voice call: Connected to remote party Data call: Connected to remote party or exchange of parameters while setting up or disconnecting a call

Table 16 PROFIBUS DP Gateway GSM Status LED

Type	LED	Status	Description
RS232	TX	OFF	No communication
		Flash	There is attempted outgoing communication
	RX	OFF	No communication
		Flash	There is attempted incoming communication

RS485	TX	Disabled	
	RX	OFF	No communication
		Flash	There is attempted communication
Ethernet	LINK1	ON	Connected to another Ethernet device
	LINK2		

Table 17 PROFIBUS DP Gateway Communication Status LED

2.3.5 Communication Ports

2.3.5.1. PROFIBUS DP Port

Symbol	Description
Data+	Non invert receiver input and non invert driver output of Data
Data-	Invert receiver input and invert driver output of Data
GND	Ground
VCC	Power supply (Positive)

Table 18 Signal Description of PROFIBUS DP

2.3.5.2. RS232/RS485 Port

COM1 and COM2 can be used as RS232 or RS485 port based on different configurations. They are D type connectors. The asynchronous rate of the serial ports is programmable up to 115,200bps.

RS232 Serial Communication Pin Assignments		
Pin	Signal	Function
1	CD	Data Carrier Detect
2	RXD	Receive Data
3	TXD	Transmit data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

Table 19 Serial Port Connector in RS232 mode


RS485 Serial Communication Pin Assignments		
Pin	Signal	Function
1	DATA-	Transmit/Receive Data
2	DATA+	Transmit/Receive Data

3 – 4		N/A
5	GND	N/A
6 – 9		N/A

Table 20 Serial Port Connector in RS485 Mode

2.3.5.3. Ethernet Port


The module provides one 10Mbps Ethernet port and one 10/100Mbps Ethernet port which are marked as Eth1 and Eth2.

	<i>The factory default IP address of the Eth1 is 192.168.0.32</i>
	<i>The factory default IP address of the Eth2 is 192.168.1.32</i>

2.3.6 Configuration

The configuration procedures are similar with MX602-3212-01, so please refer to 2.2.6 Configuration for the detailed information.

For the MX602-30-05-08-00 and MX602-30-05-08-02 MOX Gateway PROFIBUS DP, the GSD file is identified as “**SAS_7507.GSD**” and its format is based on the standard IEC 61784-1:2002 Ed 1 CP 3/1.

	<i>“SAS_7507.GSD” must be available in the Fieldbus\PROFIBUS\GSD folder under the MOXCON installation directory, before any PROFIBUS DP Gateway configuration can be done.</i>
---	---

2.4 ControlNET (MX602-30-05-10-00)

ControlNET is a serial communication system for transmitting “Scheduled Data”. These data are continuously transmitted and are available to the application in a configurable time interval. The transmission of “Unscheduled Data” is NOT supported.

The bus cable is a standard RG-6 coaxial cable with an impedance of 75Ohm. At least one “Tap” is required for each participant. A Tap is a passive device and connects the ControlNET device with the network via a 1m drop line. The tap allows devices to be removed or inserted while the network is powered without any impact of the bus communication.

Over the Network Access Port (NAP), special ControlNET diagnostic tools can be connected. The cable must be shielded and no longer than 10m.

2.4.1 Familiarization

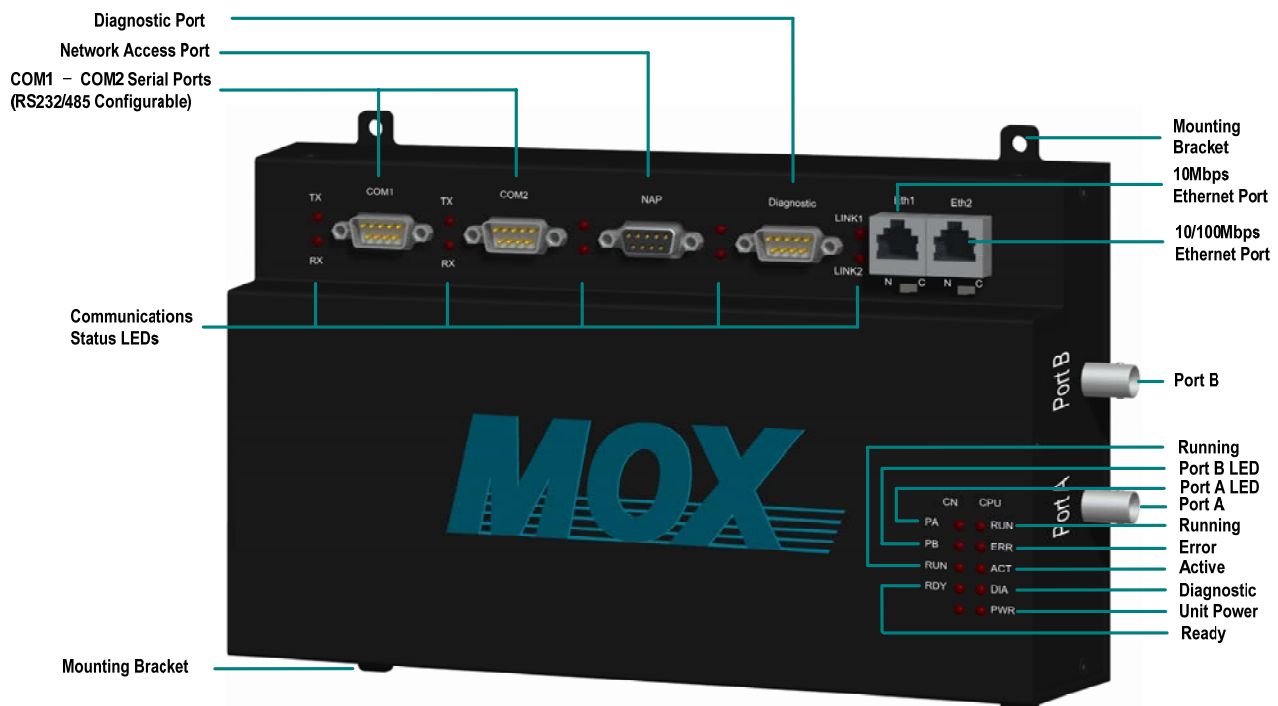


Figure 13 MX602-30-05-10-00 MOX Gateway ControlNET Familiarization

2.4.2 Key Features

- Two RS232/RS485 Ports
- One Network Access port, one Diagnostic port
- One 10Mbps Ethernet port, one 10/100Mbps Ethernet port
- Non-volatile state data storage

2.4.3 Datasheet

Power Requirements	
Power Input Range	+24VDC (18~30VDC)
CPU Specifications	
Processor	486
Clock Speed	133MHz
SDRAM	32M
Communication Specifications	
Port A, Port B	2 x Channels
Serial	2 x RS232/RS485 selectable ports
Ethernet	1 x 10Mbps port
	1 x 10/100Mbps port
Environmental Conditions	
Operating Temperature	-20~70 °C
Storage Temperature	-40~85 °C
Relative Humidity	5~95%, non-condensing

Table 21 MX602-30-05-10-00 MOX Gateway ControlNET Datasheet

2.4.4 LED Indication

LED	State	Description
PA Or PB	ON	Normal Operation
	Flash	Invalid link configuration Link fault or no MAC frames are received Temporary channel error or listen only
	OFF	No token
RUN	ON	Communication is running
	OFF	No communication
	Flashing cyclic	Communication is stopped
	Flashing irregular	Missing or faulty configuration
RDY	ON	ControlNET is ready
	OFF	Hardware defect
	Flashing irregular	Hardware or system error

Table 22 ControlNET Gateway LEDs (CN Column)

LED	State	Description
PA PB	ON ON	Failed link interface
PA PB	Flash Flash	Self test or bad node configuration
PA PB	OFF OFF	Reset or no power

Table 23 ControlNET Gateway Port A and Port B LED State Trouble Shooting

LED	State	Description
RUN	ON	CPU is running normally
	OFF	System not started
	Flashing in 0.5Hz	There is no MOXGRAF code (control code) present
ERR	ON	Communication error
	OFF	Communication OK

Table 24 ControlNET Gateway LED of CPU Column

LED	State	Description
RUN ERR	ON OFF	CPU is running normally
RUN ERR	Flashing in 0.5Hz OFF	There is no MOXGRAF code present
RUN ERR	ON ON	CPU is running normally, but with I/O communication error

Table 25 ControlNET Gateway CPU State Trouble Shooting

Type	LED	Status	Description
RS232	TX	OFF	No communication
		Flash	There is attempted outgoing communication
	RX	OFF	No communication
		Flash	There is attempted incoming communication
RS485	TX	Disabled	
	RX	OFF	No communication
		Flash	There is attempted communication
Ethernet	LINK1	ON	Connected to another Ethernet device

	LINK2		
--	-------	--	--

Table 26 ControlNET Gateway Communication Status LEDs

2.4.5 Configuration

The following procedure gives a configuration process outline within “MOXCON”.

- 1) Create a new MOXCON project by selecting **File->New** from the menu, the following dialog box will be displayed, choose “**ControlNet**” then click “**OK**”.

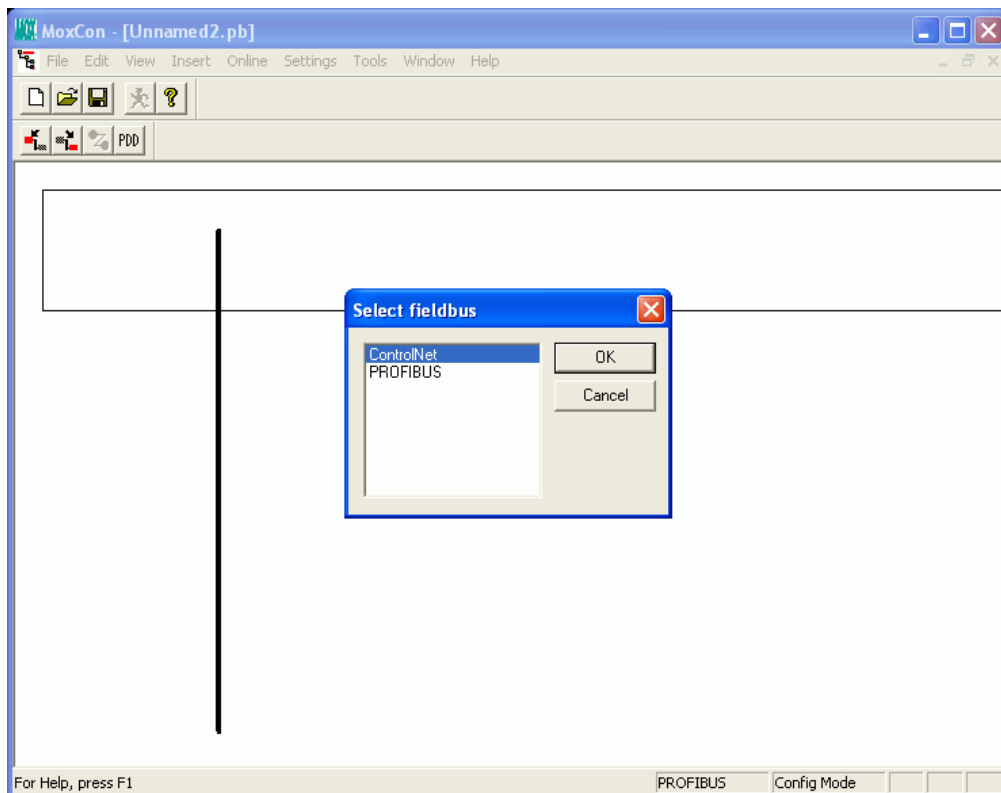


Figure 14 Set up a New ControlNET Project

- 2) Select “CIF30-CNS” from the available devices. Click “Add>>” to add it to the selected devices.

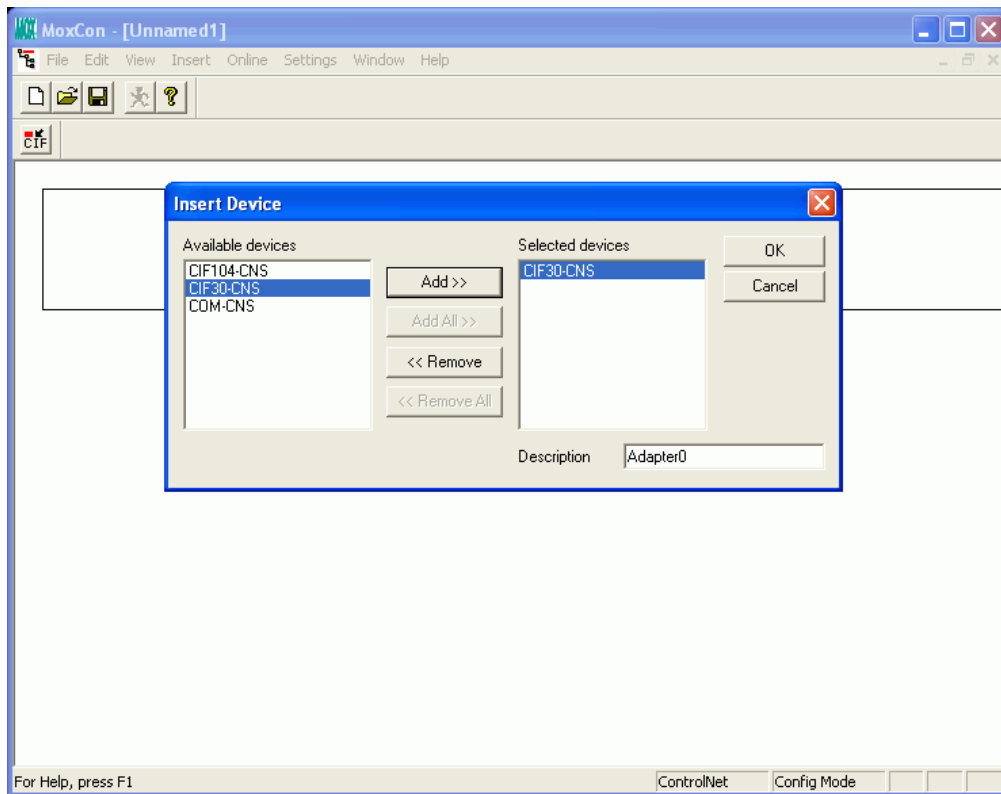


Figure 15 Add Device

- 3) Set MAC ID and I/O Size. The maximum Input length and Max Output length are both 240 words.

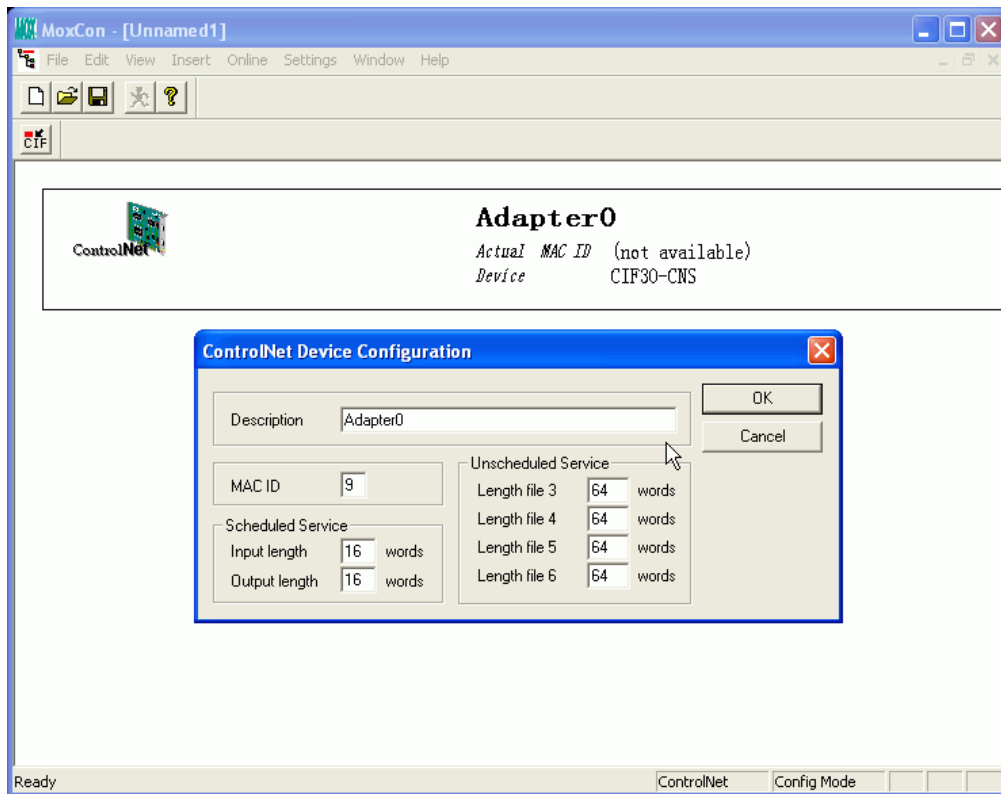
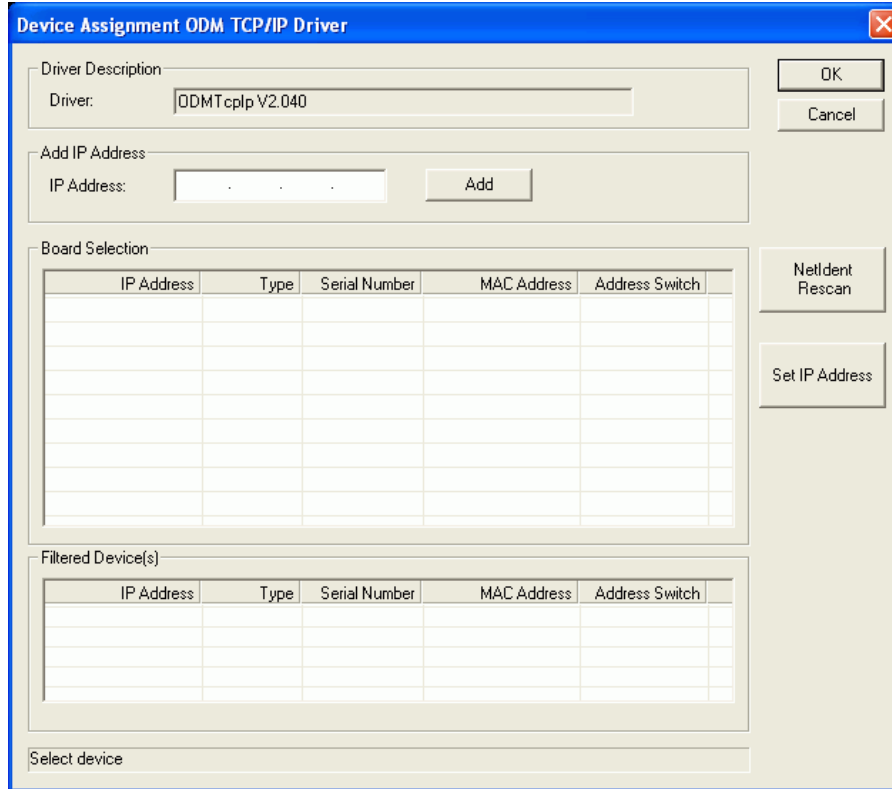


Figure 16 ControlNET Device Configuration

- 5) Set the ControlNET Gateway connection driver to Serial or TCP/IP by selecting **Settings->Device Assignment** from the menu. Select "**CIF TCP/IP Driver**" and then click "**OK**". Enter the IP address and click "**Add**" to connect to the gateway.




The dialog box is titled "Device Assignment ODM TCP/IP Driver". It contains the following sections:

- Driver Description:** A text field labeled "Driver:" containing "ODMTcplp V2.040".
- Add IP Address:** A text field labeled "IP Address:" followed by an "Add" button.
- Board Selection:** A table with 5 columns: IP Address, Type, Serial Number, MAC Address, and Address Switch. The table is currently empty.
- Filtered Device(s):** A table with the same 5 columns as Board Selection, also currently empty.
- Buttons:** "OK", "Cancel", "NetIdent Rescan", and "Set IP Address".
- Select device:** A text field at the bottom.

Figure 17 Set IP Address and Connect to Gateway

The configuration procedure of serial ports and Ethernet ports is the same as that of PROFIBUS DP; please refer to the related chapter of 2.2 PROFIBUS DP (MX602-3212-01)

	<i>The factory default IP address of the Eth1 is 192.168.0.32</i>
	<i>The factory default IP address of the Eth2 is 192.168.1.32</i>

2.4.6 Redundancy

Redundant Media Path: The MOX ControlNet Gateway provides two redundancy communication ports, Port A and Port B. So the redundant media path option is supported. Each message is transmitted simultaneously on both paths. Receiving nodes compare the quality of the two signals and accept the better signal.

2.5.3 Datasheet

Power Requirements	
External Power Supply	+24VDC (18~30VDC)
UPS Battery Charger	12VDC Lead Acid Battery
CPU Specifications	
Processor	486
Clock Speed	133MHz
SDRAM	32M
Communication Specifications	
Serial	4 x RS232/RS485 selectable ports
Ethernet	1 x 10Mbps port
	1 x 10/100Mbps port
Environmental Conditions	
Operating Temperature	-20~70°C
Storage Temperature	-40~85°C
Relative Humidity	5~95%, non-condensing
GPRS Operating Temperature	-20~55°C

Table 27 MX602-30-05-15-00 MOX Gateway Serial Datasheet

2.5.4 LED Indication

LED	Color	Description
TMP	Red	High Temperature Alarm
GSM	Red	Global System for Mobile Communications
UPS	Red	Uninterruptible Power Supply
RUN	Red	Running Status
ERR	Red	Communication Error Status
DIA	Red	Error Detection
PWR	Red	Power Supply

Table 28 Serial Gateway General LEDs

LED	State	Description
RUN	ON	CPU is running normally
	OFF	System not started
	Flashing in 0.5Hz	There is no MOXGRAF code (control code) present
ERR	ON	Communication error
	OFF	Communication OK

Table 29 Serial Gateway CPU LED Indication

LED	State	Description
RUN ERR	ON OFF	CPU is running normally
RUN ERR	Flashing in 0.5Hz OFF	There is no MOXGRAF code present
RUN ERR	ON ON	This CPU is running normally, but with I/O communication error

Table 30 Serial Gateway CPU State Trouble Shooting

Type	LED	Status	Description
RS232	TX	OFF	No communication
		Flash	There is attempted outgoing communication
	RX	OFF	No communication
		Flash	There is attempted incoming communication
RS485	TX	Disabled	
	RX	OFF	No communication
		Flash	There is attempted communication
Ethernet	LINK1	ON	Connected to another Ethernet device
	LINK2		

Table 31 Serial Gateway Communication Status LEDs

2.5.5 Configuration

The configuration procedure of the serial ports and the Ethernet ports is the same as that of the PROFIBUS DP Gateway; please refer to related chapter of 2.2 PROFIBUS DP (MX602-3212-01)



*The factory default IP address of the Eth1 is **192.168.0.32***

*The factory default IP address of the Eth2 is **192.168.1.32***

2.6 EtherNet/IP (MX602-3212-07)

EtherNet/IP (Ethernet/Industrial Protocol) is a communication system suitable for the industrial environments. EtherNet/IP allows industrial devices to exchange time-critical application information. These devices include simple I/O devices such as sensors or actuators, as well as complex control devices such as robots, programmable logic controllers, welders, and process controllers.

EtherNet/IP Gateway controller is a device to perform protocol conversion between EtherNet/IP and MODBUS TCP/IP, DNP, IEC, etc. It supports up to two 10/100M EtherNet/IP ports, two isolated RS485 serial communications ports, two 10/100M Ethernet ports, and one RS232 serial port.

MOX Gateway EtherNet/IP (602-3212-07) acts as a slave in the EtherNet/IP network.

2.6.1 Familiarization

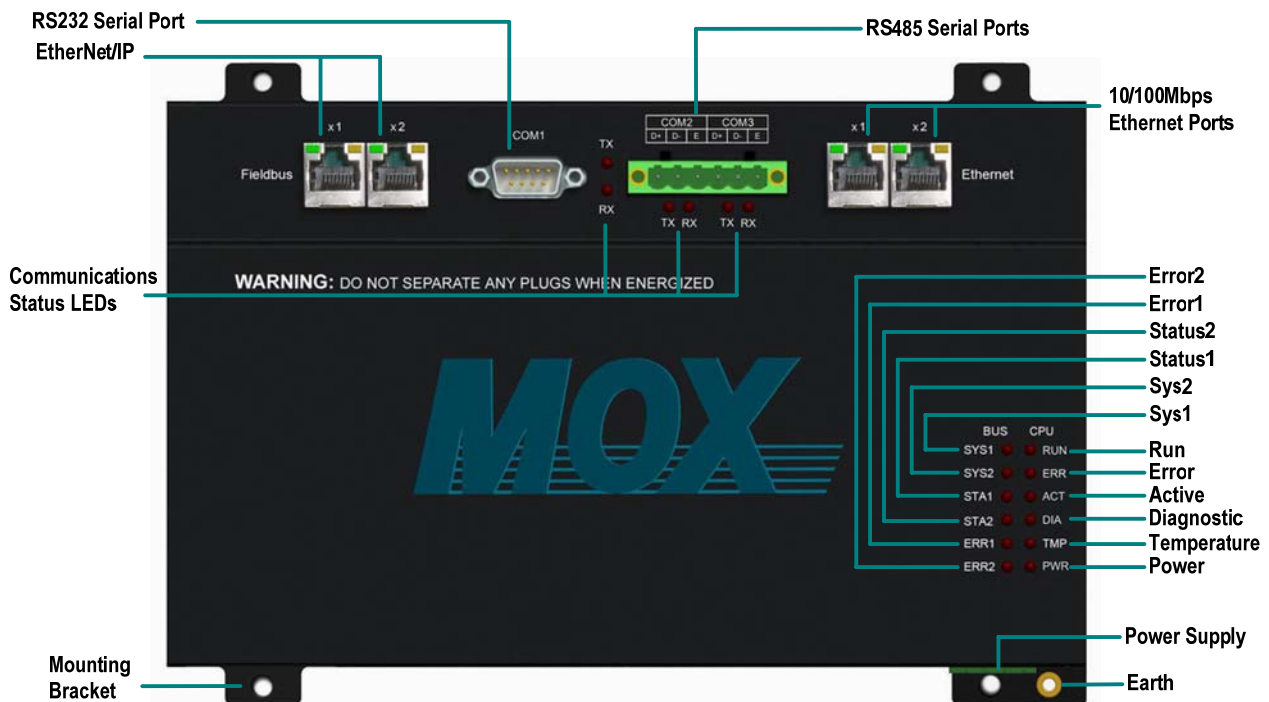


Figure 19 MX602-3212-07 MOX Gateway EtherNet/IP Familiarization

2.6.2 Key Features

- ARM9 based CPU up to 400MHz
- Two isolated RS485 ports and one RS232 port
- Two 10/100M Ethernet ports with AUTO-Negotiation and AUTO-MDIX function
- Two RJ45 connectors for EtherNet/IP
- Non-volatile state data storage

- CPU operating temperature measurement

2.6.3 Datasheet

Power Requirements	
Power Input Range	+24VDC (9~30VDC)
Power Dissipation	<5W
Onboard Fuse	Yes
Fuse Type	51NM-0080H
Fuse Value	0.8A 250V
CPU Specifications	
Clock Speed	400MHz
DDR RAM	128MBytes
Flash Memory	256MBytes
Communication Specifications	
Ethernet	2 x 10/100Mbps Ethernet ports
	Auto-Negotiation
	Isolation Voltage: 1500Vrms
RS485	2 x RS485 ports
	Baud Rate: 1200bps ~ 115200bps
	Isolated Voltage: 2500Vrms
RS232	1 x RS232 port
	Baud Rate: 1200bps ~ 115200bps
EtherNet/IP	2 x 10/100M EtherNet/IP
	Auto-Negotiation
	Isolation Voltage: 1500Vrms
Temperature Characteristic	
Temperature Monitor	Yes
Temperature Alarm	Yes
Environmental Conditions	
Operating Temperature	-20~70°C
Storage Temperature	-40~85°C
Relative Humidity	5~95%, non-condensing

Table 32 MX602-3212-07 MOX Gateway EtherNet/IP Datasheet

2.6.4 Communication Ports

2.6.4.1. EtherNet/IP Port

The module has two RJ45 connectors designed for EtherNet/IP connection. In the application, either of the two ports can be connected to an EtherNet/IP network. However, they cannot be used at the same time.

2.6.4.2. RS232 Port

One RS232 communication port marked COM1 is provided. It is a male D type connector. The asynchronous rate of this serial port is programmable up to 115,200bps.

Pin No.	Signal	Description
1	DCD	Carrier Detector
2	RXD	Receive Data
3	TXD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RING	Ring Indicator

Table 33 Signal Description of RS232

2.6.4.3. RS485 Port

The module has two RS485 communication ports identified as COM2 and COM3. The asynchronous rates of the RS485 ports are programmable respectively up to 115,200bps. All the RS485 ports are 2500Vrms isolated to the system.


Symbol	Description
D+	Non invert receiver input and non invert driver output of Data
D-	Invert receiver input and invert driver output of Data
E	Frame ground

Table 34 Signal Description of RS485

2.6.4.4. Ethernet Ports

The module provides two 10/100M Ethernet ports which are marked as x1 and x2. Both the Ethernet ports support auto-negotiation function which can automatically configure the port to take the maximum advantage of their abilities.

The two Ethernet ports are 1500Vrms isolated to the system.

	<p>The factory default IP address of the Eth1 is 192.168.1.32</p> <p>The factory default IP address of the Eth2 is 192.168.0.32</p>
---	---

2.6.5 LED Indication

LED	State	Description
RUN	ON	CPU is running normally
	OFF	System does not start
	Flashing in 0.5Hz	No MOXGRAF code (control code)
ERR	ON	Communication error
	OFF	Communication OK
PWR	ON	Module is powered on
	OFF	Module is powered off

Table 35 EtherNet/IP Gateway LED of CPU Column

LED	State	Description
RUN ERR	ON OFF	CPU is running normally
RUN ERR	Flashing in 0.5Hz OFF	There is no MOXGRAF code present
RUN ERR	ON ON	CPU is running normally, but with I/O communication error

Table 36 EtherNet/IP Gateway CPU State Trouble Shooting

LED	State	Description
SYS1	ON	Operating system running
SYS1 SYS2	BLINKING	Bootloader is waiting for firmware
SYS2	ON	Bootloader is waiting for software
SYS1 SYS2	OFF	Power supply for the device is missing or hardware defect
STA1	ON	Device operational: If the device is operating correctly, the LED shall be on
	FLASHING	Standby: If the device has not been configured, the LED shall be flashing
ERR1	ON	Major fault: If the device has detected a non-recoverable major fault, the LED shall be steady on
	FLASHING	Minor fault: If the device has detected a recoverable minor fault, this LED shall be flashing. NOTE: An incorrect or inconsistent configuration would be considered a minor fault
STA1 ERR1	FLASHING	Self-test: While the device is performing its power up testing, the two LEDs shall be flashing
STA1 ERR1	OFF	No power: If no power is supplied to the device, the two LEDs shall be off

STA2	ON	Connected: If the device has at least one established connection (even to the Message Router), the LED shall be steady on
	FLASHING	No connections: If the device has no established connections, but has obtained an IP address, the LED shall be flashing
ERR2	ON	Duplicate IP: If the device has detected that its IP address is already in use, the LED shall be on
	FLASHING	Connection timeout: If one or more of the connection in which this device is the target has timed out, the LED shall be flashing.
STA2 ERR2	FLASHING	Self-test: While the device is performing its power up testing, the two LEDs shall be flashing
STA2 ERR2	OFF	Not powered, no IP address: If the device does not have an IP address (or is powered off), the two LEDs shall be off

Table 37 EtherNet/IP Gateway LED of BUS Column

LED	State	Description
TX	ON	Serial port is transmitting data in high speed
	OFF	Serial port is idle
	Flashing	Serial port is transmitting data in low speed
RX	ON	Serial port is receiving data in high speed
	OFF	Serial port is idle
	Flashing	Serial port is receiving data in low speed

Table 38 EtherNet/IP Gateway RS232/RS485 Serial Port LEDs

LED	State	Description
LINK (Green)	ON	Connection is linked
	OFF	No connection is linked
ACT (Yellow)	Flashing	Transmitting or receiving data
	OFF	No data transmitted or received

Table 39 EtherNet/IP Gateway Ethernet/EtherNetIP LEDs

2.6.6 Configuration

2.6.6.1. MOXIDE

The following figure shows the interface to configure MOX EtherNet/IP Gateway in MOXIDE.

General	Time	Ports	GPFS	Network	Firewall	DNP 3.0	IEC 60870	Http	IPSec	UPS	EIP	Online
---------	------	-------	------	---------	----------	---------	-----------	------	-------	-----	-----	--------

IP Settings

☐ BootP
☐ DHCP
☒ Fixed Addresses

IP Address: . . .

Network Mask: . . .

Gateway Address: . . .

Operation Mode:

Data Length

Length of Input Data: Length of Output Data:

Figure 20 EtherNet/IP Gateway Warm Start Parameters Setting

Warm start parameters of the EtherNet/IP gateway can be changed using MOXIDE and downloaded to the gateway. Reboot the gateway so that the parameters can take effect.

The detailed information of each parameter in the configuration page is shown below.

- BootP: set the IP address, activate / deactivate the BootP protocol.
- DHCP: set the IP address, activate / deactivate the DHCP protocol.
- Fixed Addresses: activate/deactivate fixed IP settings.
 - IP Address: IP address of the EtherNet/IP station.
 - Network Mask: Network mask of the EtherNet/IP station.
 - Gateway Address: Gateway address of the EtherNet/IP station.
- Operation Mode: operation mode of the EtherNet/IP station (Speed/Duplex mode, Auto negotiation).
- Data Length
 - Length of Input Data: data length in Bytes (editable), ranging from 1 to 504
 - Length of Output Data: data length in Bytes (editable), ranging from 1 to 504

2.6.6.2. MOXGRAF

MOXGRAF provides the following I/O devices for the EtherNet/IP data access.

Mox_: NETX_: NETX_AI_I (*NETX General analog input, INT16*)
 Mox_: NETX_: NETX_AI_L (*NETX General analog input, INT32*)
 Mox_: NETX_: NETX_AI_R (*NETX General analog input, REAL*)
 Mox_: NETX_: NETX_AO_I (*NETX General analog input, INT16*)
 Mox_: NETX_: NETX_AO_L (*NETX General analog input, INT32*)
 Mox_: NETX_: NETX_AO_R (*NETX General analog input, REAL*)
 Mox_: NETX_: NETX_DI (*NETX General digital input*)
 Mox_: NETX_: NETX_DO (*NETX General digital output*)

All devices have the same “Offset” value. The offset is counted in byte from zero. The maximum value is limited to 504 byte.

The channel number of each device is set by users; the range is from 2 to 33. The first channel is the status channel. If there is an error in EtherNet/IP communication, this channel will be set to “1” for analog devices or “TRUE” for digital devices.

MOX EtherNet/IP Gateway could be integrated into an EtherNet/IP network as a GENERIC slave module. At the same time, “MOX Gateway EtherNetIP Slave.EDS”, as the device identification file, is also available for system configuration tool.

This EDS file is at /Fieldbus/EtherNetIP folder within MOXIDE installation directory; or contact your local MOX provider to get it.

3 Installation

Within this chapter are detailed instructions on mounting, installing and cabling of the MOX Gateway.

3.1 Handling Considerations

3.1.1 *Electrostatic Discharge*

Integrated circuits or semiconductors may be severely damaged by electrostatic discharge. This may be caused if the terminal connector pins come in contact with an electrostatically charged object such as hands or clothing. Follow these guidelines when you handle the module.

- Touch a grounded object to discharge static potential.
- Do not touch the terminal connector pins.
- Do not touch circuit components inside the unit.
- Always work with the unit on a grounded surface.

3.1.2 *Environmental Precautions*

To extend the life of the MOX Gateway, take the following precautions:

- Avoid storing or operating the device where it could be exposed to a corrosive atmosphere.
- Protect from moisture and direct sunlight.

The MOX Gateway has been designed for use in an industrial environment when installed in accordance with these instructions. Within this environment, the equipment is still intended for installation in a clean and dry location.

3.2 Mounting the MOX Gateway and Associated Components

Correct placement of the MOX Gateway is necessary to avoid overheating due to lack of ventilation. Placement errors should be avoided by using the dimensional specifications provided. Adequate ventilation should be provided to avoid overheating and spacing between components should allow for a suitable working environment.

3.2.1 Installation Considerations

The MOX Gateway should be mounted directly to the sub-panel of an electrical enclosure.

5mm mounting holes are located in each corner of the base of the MOX Gateway. ***Appropriately sized mounting screws should be inserted in each of the four holes when installing the unit.*** The recommended screw size is 5mm x 12mm (1/8" x 1/2").



Do not attempt to drill out the mounting holes to increase the usable screw size. Increasing the mounting holes size decreases the strength of the mounting bracket.



A mounting template is provided within this guide and should be used to ensure correct drilling of the mounting holes and positioning of the MOX Gateway.

The enclosure may also contain terminal strips, circuit breakers and other equipment required in the installation. All items should be appropriately mounted and spaced to ensure good ventilation.

3.2.2 Preventing Excessive Heat

For most applications, normal convective cooling keeps the controller within the specified operating range. The following should be considered to ensure that the specified operating range is maintained.

- Providing adequate spacing of components within an enclosure is usually sufficient for heat dissipation. Maintain spacing from enclosure walls, wire ways, adjacent equipment, etc. of 50 mm on all sides of the MOX Gateway.
- If particularly high or low ambient temperatures occur, additional cooling or heating provisions should be provided.
- In some applications, a substantial amount of heat is produced by other equipment inside or outside the enclosure. In this case, place blower fans inside the enclosure to assist in air circulation and to reduce "hot spots" near the controller.
- Do not bring unfiltered outside air into the enclosure. Place the controller in an enclosure to protect it from a corrosive atmosphere. Harmful contaminants or dirt could cause improper operation or damage to components.

3.2.3 Installation Cleanliness

During installation and placement of items within the cabinet, do not install any components until all drilling is complete. Also, strip and trim cables well away from the MOX Gateway. Be sure that debris (metal chips, wire strands, etc.) does not fall onto the MOX Gateway's terminal connections. Such debris could cause damage on power-up. Once wiring is complete, ensure that the unit is free of all metal fragments and other objects that may interfere with correct operation.

3.2.4 Mounting the Controller

The controller should be horizontally screw mounted within an enclosure using the following guidelines:

- Print out the included template or create a template for the MOX Gateway from the dimensions provided within this document.
- Secure the template to the mounting surface whilst ensuring spacing guidelines are followed. (The controller may be mounted in any orientation)
- Drill correctly sized holes for the MOX Gateway and all other equipment to be installed in the cabinet.
- Mount the cable ducting.
- Mount the power supply and other components.
- Mount the MOX Gateway.

3.2.5 Typical MOX Gateway Dimensions

All MOX Gateways have the following dimensions although communication configuration options differ from those displayed.

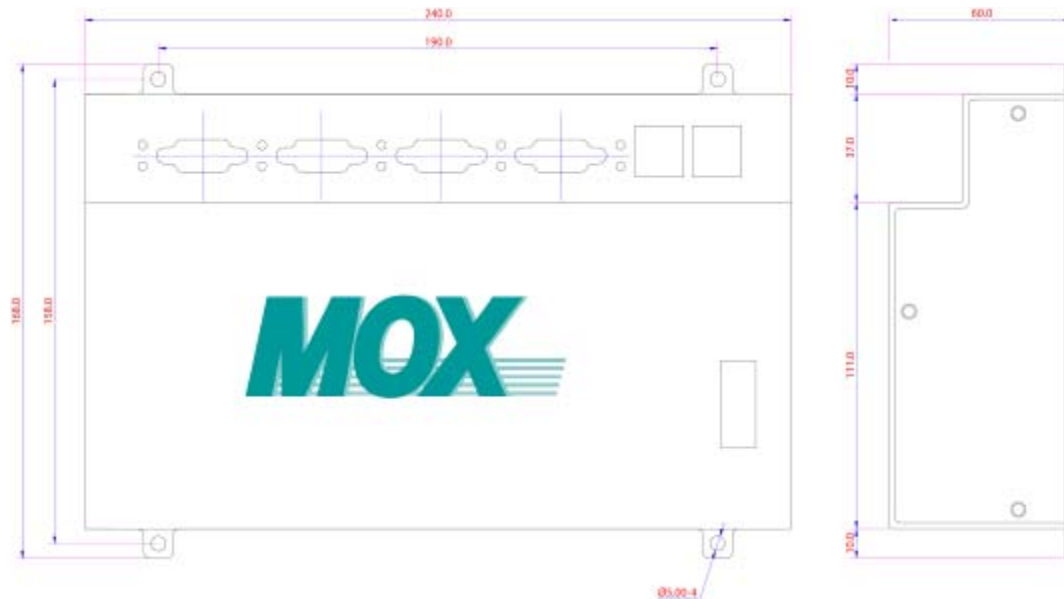


Figure 21 Typical MOX Gateway Dimensions

3.2.6 Terminal Connector

Ensure all power sources, including the MOX Gateway unit supply and the field I/O supply, are isolated from the terminal connector before removing or inserting the terminal connector.



Always isolate the supply power before removal or insertion of connectors. When you remove or insert the connectors with power applied, an electrical arc may occur.

An electrical arc can cause personal injury or damage to property by:

- Sending an erroneous or excessive signal to your system's field devices
- Causing damage to the product through line spikes
- Cause excessive wear on module contacts due to the electrical arcing
- Create electrical resistance from worn contacts

3.2.7 Grounding Considerations

In solid-state control systems, grounding helps limit the effects of noise due to electromagnetic interference (EMI). It is highly recommended to run a ground connection from any mounting point of the controller to the ground connection point of the cabinet.

The metal construction of the MOX Gateway also assists in shielding the circuitry.

3.3 Cable Path Considerations

When installing communications cables, the path of the cables should be planned to avoid electrical interference. Follow these guidelines to reduce electrical interference:

- Keep the communication cable at least 1.52m from any electric motors, transformers, rectifiers, generators, arc welders, induction furnaces, or sources of microwave radiation.
- If you must run the cable across power feed lines, run the cable at right angles to the lines.
- If you do not run the cable through a contiguous metallic wire way or conduit, keep the communication cable at least 150mm from AC power lines of less than 20A, 300mm from lines greater than 20A, but only up to 100kVA, and 600mm from lines of 100kVA or more.
- If you run the cable through a contiguous metallic wire way or conduit, keep the communication cable at least 80mm from AC power lines of less than 20A, 150mm from lines greater than 20A (but only up to 100kVA), and 300mm from lines of 100kVA or more.

Running the communication cable through conduit provides extra protection from physical damage and electrical interference. If you route the cable through conduit, follow these additional recommendations:

- Use ferromagnetic conduit near critical sources of electrical interference. You can use aluminum conduit in non-critical areas.
- Use plastic connectors to couple between aluminum and ferromagnetic conduit. Make an electrical connection around the plastic connector (use pipe clamps and the heavy gauge wire or wire braid) to hold both sections at the same potential.
- Ground the entire length of conduit by attaching it to the building earth ground.
- Do not let the conduit touch the plug on the cable.
- Arrange the cables loosely within the conduit. The conduit should contain only serial communication cables.
- Install the conduit so that it meets all applicable codes and environmental specifications.

3.3.1 Minimizing Electrical Noise on Analog Signal Lines

Analog input channels employ digital high frequency filters that significantly reduce the effects of electrical noise on input signals. However, because of the variety of applications and environments where analog controllers are installed and operating, it is impossible to ensure that the input filters will remove all environmental noise. Several specific steps can be taken to help reduce the effects of environmental noise on analog signals:

- Install the MOX Gateway in a properly rated (i.e. NEMA) enclosure.
- Use Belden cable #8761 for wiring the analog channels making sure that the drain wire and foil shield are properly earth grounded at one end of the cable.
- Route the Belden cable separate from any other wiring. Additional noise immunity can be obtained by routing the cables in grounded conduit.

- Periodically check the system operation, particularly when new machinery or other noise sources are installed near the system.

3.3.2 Analog Signal Cable Grounding

Use shielded communication cable (Belden #8761). The Belden cable has two signal wires (black and clear), one drain wire and a foil shield. The drain wire and foil shield must be grounded at one end of the cable. We recommend grounding the shield to the case of the signal source, so energy coupled to the shield will not be delivered to signal source's electronics.



Do not ground the drain wire and foil shield at both ends of the cable.

3.4 Power

3.4.1 Power Requirement

The MOX Gateway requires 18-30VDC from an external 12W (min) DC power module. This recommendation is for a single MOX Gateway. If your implementation makes use of a redundant controller, the wattage of the external DC power module will have to meet the complete installations wattage requirement.

3.4.2 Power Isolation

When removing power from the device, interruption of the DC side of the power supply is preferred. This avoids the additional discharge delay of the power supply if the AC line is connected.

Always fuse the AC line of the power supply and place the main power isolation switch where operators and maintenance personnel have quick and easy access to it. If you mount an isolation switch inside the controller enclosure, place a handle on the outside of the enclosure to switch the isolator, so that you can disconnect power without opening the enclosure.

3.4.3 Power Consumption Calculations

To calculate the current requirements, add the wattage required for the MOX Gateway, and then divide the total wattage by the DC power source voltage. Then add any current needed for user instrumentation loops. Ensure your power supply is sufficiently sized to suit the power requirements of your system.

The following power consumption calculations only involve the relevant MOX Gateway options. For an all incorporated system power consumption calculation, please see the relevant guides for power consumption information.

Device	Max. Power Consumption(mW)
Processor & Motherboard without UPS battery connected	7500
Onboard GPRS/GSM modem module option	8400
PROFIBUS DP Module	3800
ControlNET Module	1200
Serial	7500

Table 40 Power Consumption of Modules

Totaling Power Requirements

To adequately meet the needs of the system, it is important to determine the total power consumption. For total power consumption, add all system device power consumption values together, be sure to add the power consumption (in mW) of any non MOX devices used in the same power system.

Convert the total value (in mW) to Watts by dividing it by 1000.

$$\text{mW} / 1000 = \text{Watts}$$

For selecting an adequate power supply, use a safety factor (SF) of 1.25 to account for losses and other variables not factored into the power consumption calculations. To incorporate the safety factor, multiply the total power consumption (P) by 1.25.

$$\text{PSF} = P \times 1.25 = \text{Watts}$$

To convert PSF to current consumption in amps (ISF), divide PSF by the system voltage (V) of 24VDC.

$$\text{ISF} = \text{PSF} / V = \text{Amps}$$

3.4.4 DC Power Wiring (User DC Source)



Figure 22 MOX Gateway DC Power Wiring



To avoid electric shock or damage, power should only be applied after all wiring terminations are complete.

3.5 Installing Communication Cables

3.5.1 Serial Ports

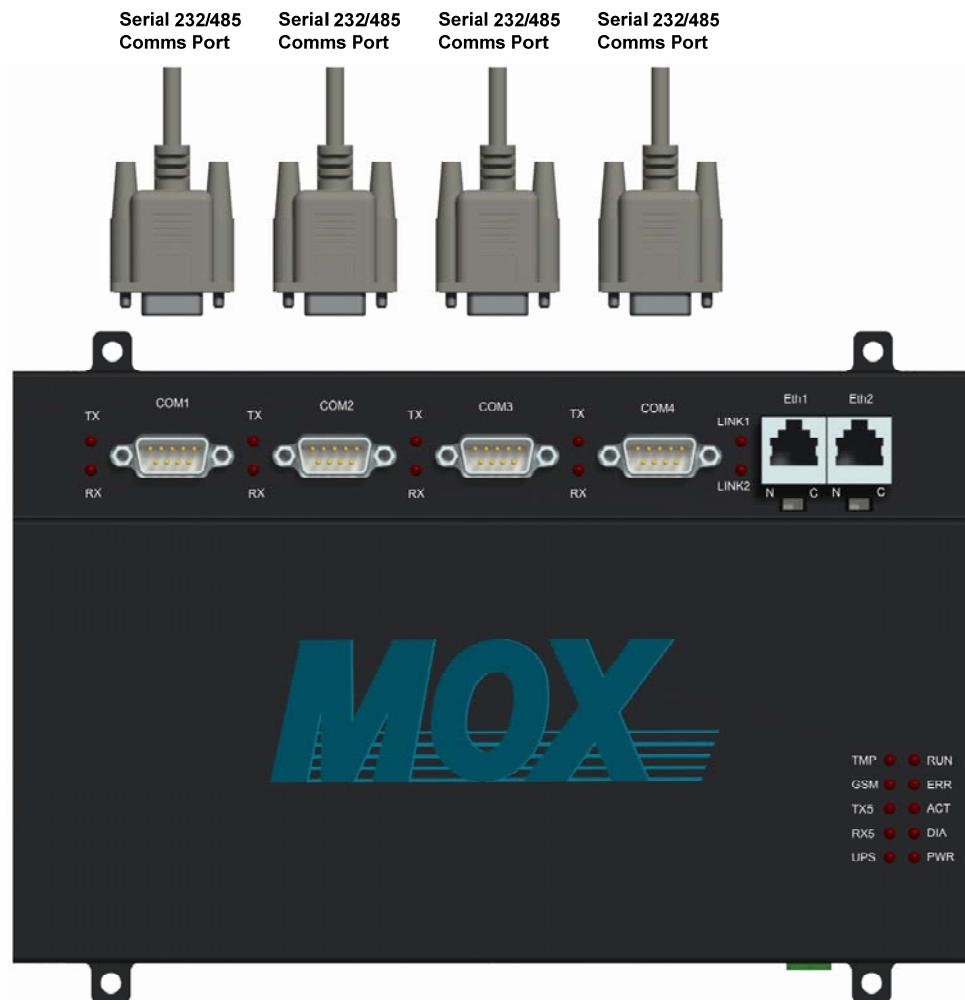


Figure 23 MOX Gateway Communication Cabling

The following tables detail the serial port connector assignment in RS232 and RS485 modes:

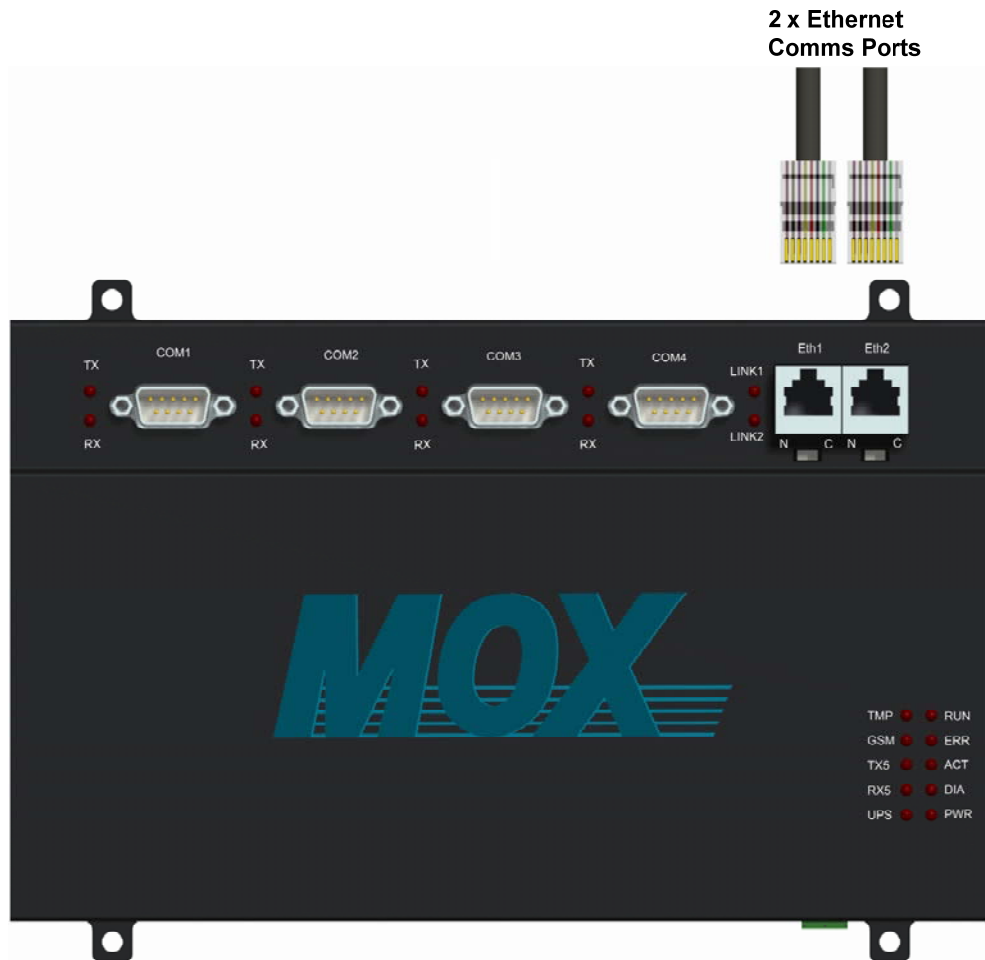
RS232 Serial Communications Pin Assignments		
Pin	Signal	Function
1	CD	Data Carrier Detect
2	RXD	Receive Data
3	TXD	Transmit data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

Table 41 Serial Port Connector in RS232 mode

RS485 Serial Communications Pin Assignments		
Pin	Signal	Function
1	DATA-	Transmit/Receive Data
2	DATA+	Transmit/Receive Data
3 – 4		N/A
5	GND	N/A
6 – 9		N/A

Table 42 Serial Port Connector in RS485 mode

3.5.2 Ethernet Ports



CAT5 STP (Shielded Twisted Pair) cable is recommended for connection to a switch for 100Mbit/s or 10Mbits operation. The maximum length between the hub and the MOX Gateway is 100 meters in all cases, when using high quality 10/100Base-T STP cabling. Please refer to Ethernet standards documentation or the documentation for your Ethernet communication devices for more details.

3.5.3 GSM/GPRS

The MOX Gateway has the option of an installed onboard GSM/GPRS modem. The modem uses an internal communication port and can be quickly setup using MOXIDE software. The modem requires 50ohm antenna for correct operation. The Gateway is supplied with a 900/1800 portable antenna. If this does not meet your requirements, there is also a 900/1800 mobile antenna that can be purchased from MOX Group, enabling you to place it up to two meters away from the Gateway.

Characteristics	Specifications
Features	Dual-band EGSM900 and GSM 1800
Data	Circuit Switched Data (CSD) up to 14.4 kbps Unstructured Supplementary Service Data (USSD) Coding schemes CS1, CS2, CS3, CS4 PPP-stack
Output Power	Class 4 (2W) at EGSM900 Class 1 (1W) at GSM1800
Approval	R&TTE GCF

Table 43 Optional Onboard GSM/GPRS Modem Specifications



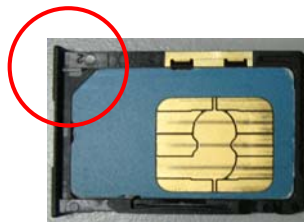
Figure 24 MOX Gateway with GSM/GPRS

Before powering on the MOX Gateway ensure that the GSM/GPRS antenna is firmly attached. Do not over tighten the antenna causing the mounting socket to continually spin. This will shear the internal antenna cable off the back of the mounting socket leaving the GSM/GPRS module inoperative.

The GSM/GPRS modem also requires a service provider's SIM card to enable connection with the GSM/GPRS network. Remove the SIM socket located from the side of the Gateway by pushing in the spring-loaded catch with a small screwdriver or equivalent.



With the metal contacts face-up, align the notch on the SIM card with the notch on the SIM socket and insert the SIM card. If it is inserted correctly, you should still be able to see the metal contacts after inserting the card onto the SIM socket.



Re-insert the SIM socket into the MOX Gateway ensuring that the metal contacts on the SIM card are face-up.



3.6 Applying Power

After all field wiring is installed, power up the Gateway and related peripherals. Observe the status LEDs on the Gateway. Normal start-up conditions for the MOX Gateway will result in the following final conditions.

- 1) On power up, the PWR LED will display and will remain on continually. If the PWR LED is not displayed, remove power from the Gateway and double check your wiring. If your wiring is correct, confirm that the user supplied 24VDC power source is supplying the system with the correct voltage and at the correct polarity.
- 2) A short period of time after power has been supplied to the MOX Gateway; the RUN LED will be illuminated.
 - If there is no application program, the RUN LED will start flashing.
 - If there is an application program, the RUN LED will remain on continuously.



4 Configuration with MOXGRAF

For a MOX Gateway, protocol conversion is implemented through variables bindings within MOXGRAF. The following chapter gives a detailed introduction to the procedure.

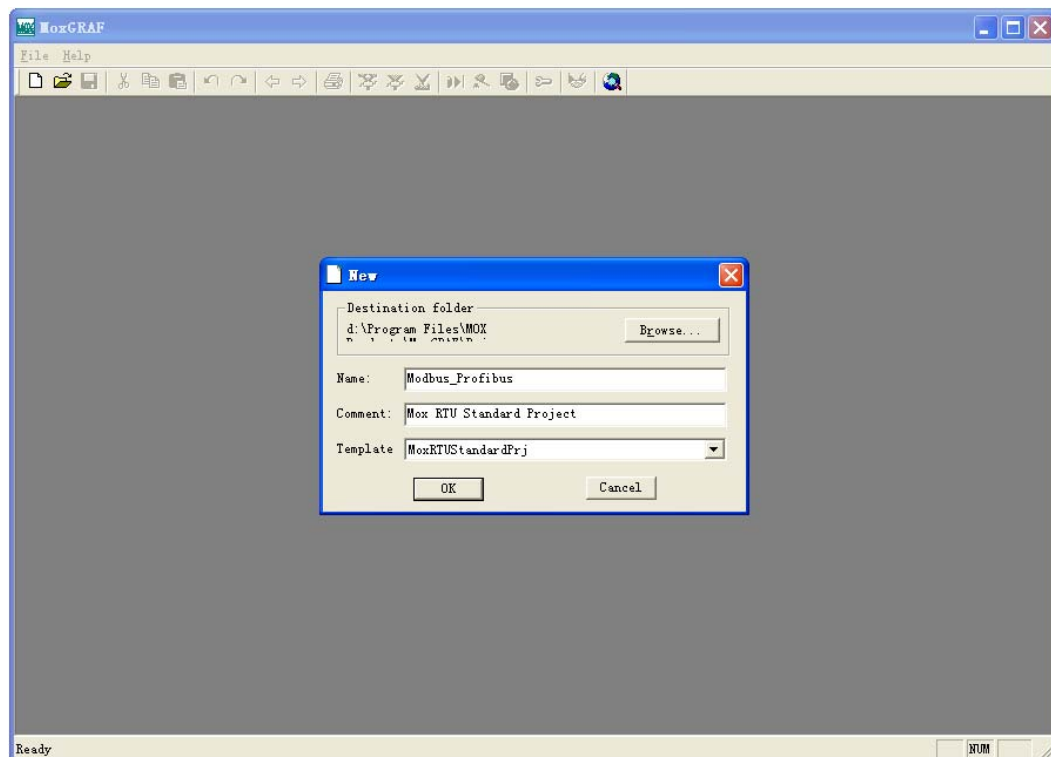
4.1 Create New Project

Open MOXGRAF and create a new project. Select **File | New** from the MOXGRAF Project Management window.

Enter a name for the new project you wish to create. The name must be less than 32 characters and consist only of alphanumeric characters. It is also recommended you use a meaningful name and one that follows a naming standard.



*You must select the **MoxStandardRTUPrj** Template before you can continue with programming. Ensure that you have changed to the correct template before selecting "OK".*

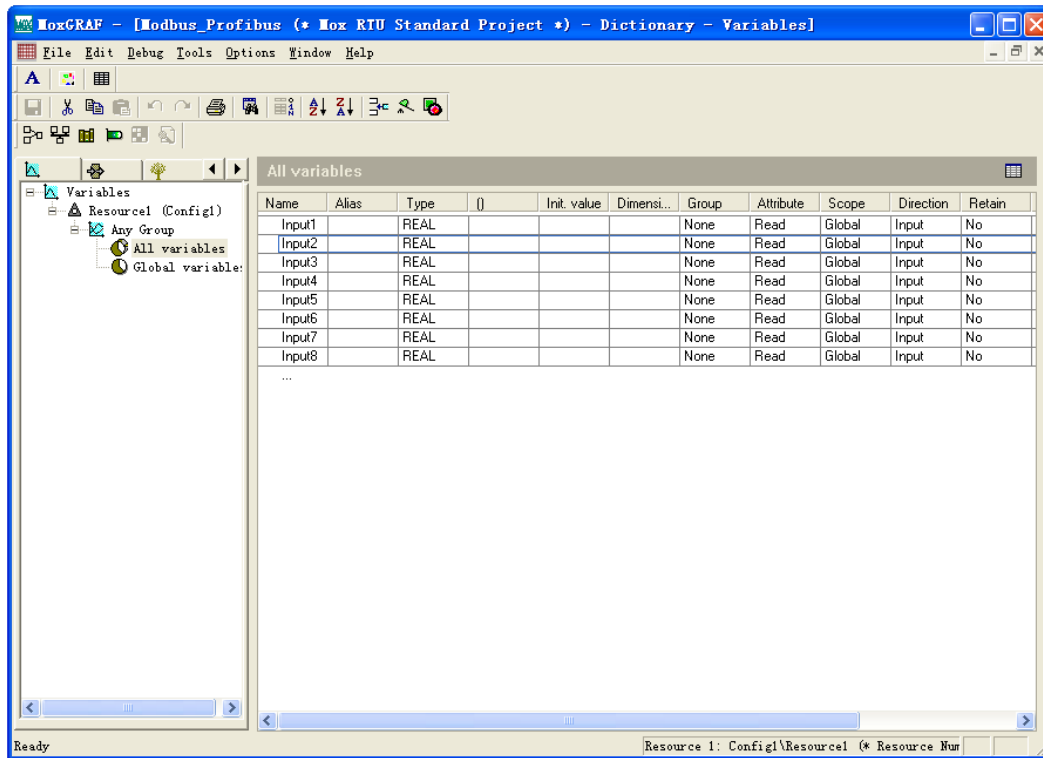


Upon creation of this new project, a directory entitled the same as the project title will be created and placed under the MOXGRAF directory structure where it can be easily accessed.

For further detailed information on the functionality, operational abilities and programming principles of the MOXGRAF software please refer to MOXGRAF User Guide.

4.2 Define Variables

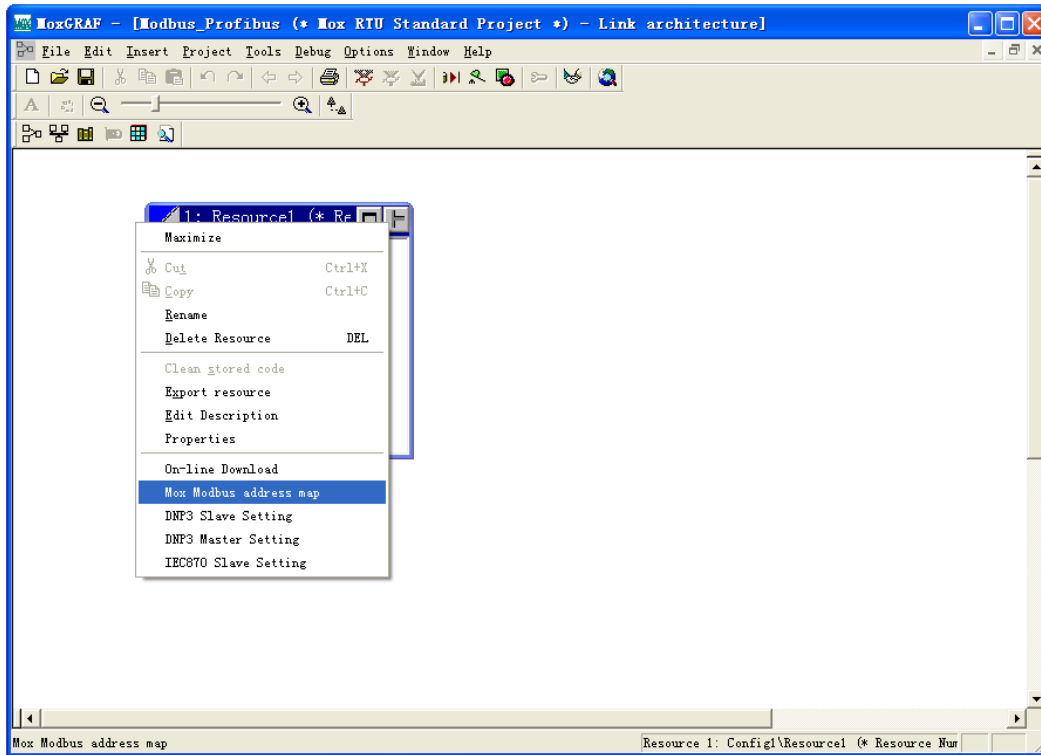
Defining the variables is achieved by selecting option **Project | Variables**. Open out the variable tree in the far left window. This will display a list of options for allocating variables.



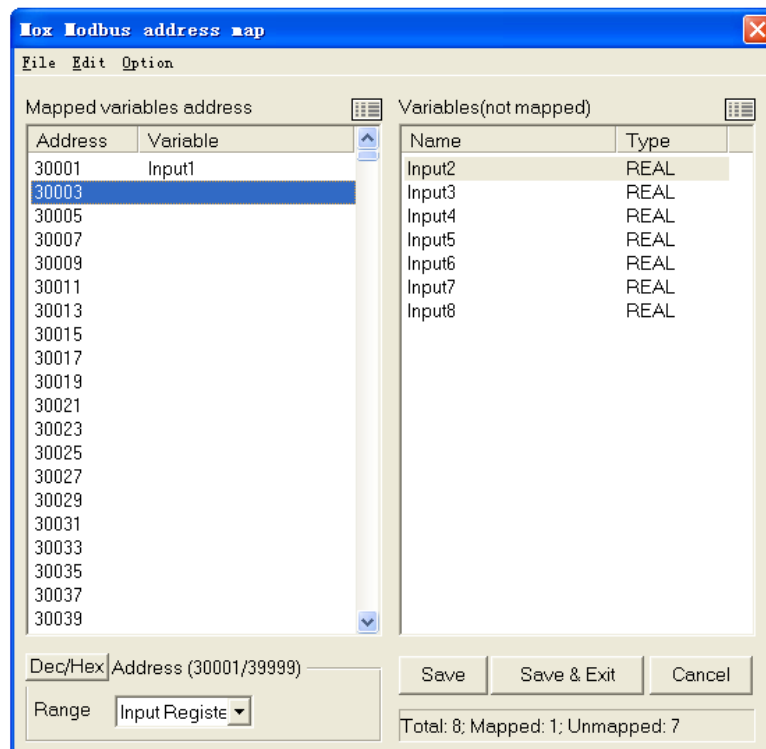
4.3 Variables Addressing

Take MODBUS variable addressing for example.

The MOX MODBUS address map is used to assign each variable with a MODBUS address. To open the MOX MODBUS address map utility, select **Tools | Mox Modbus address map**, or simply right click on the Resource window, then select **Mox Modbus Address map** from the list.



Select MODBUS address from the **Mapped variables address**, and then double click the variables from the **Variables (not mapped)** column. The variable will be bound to the selected address.

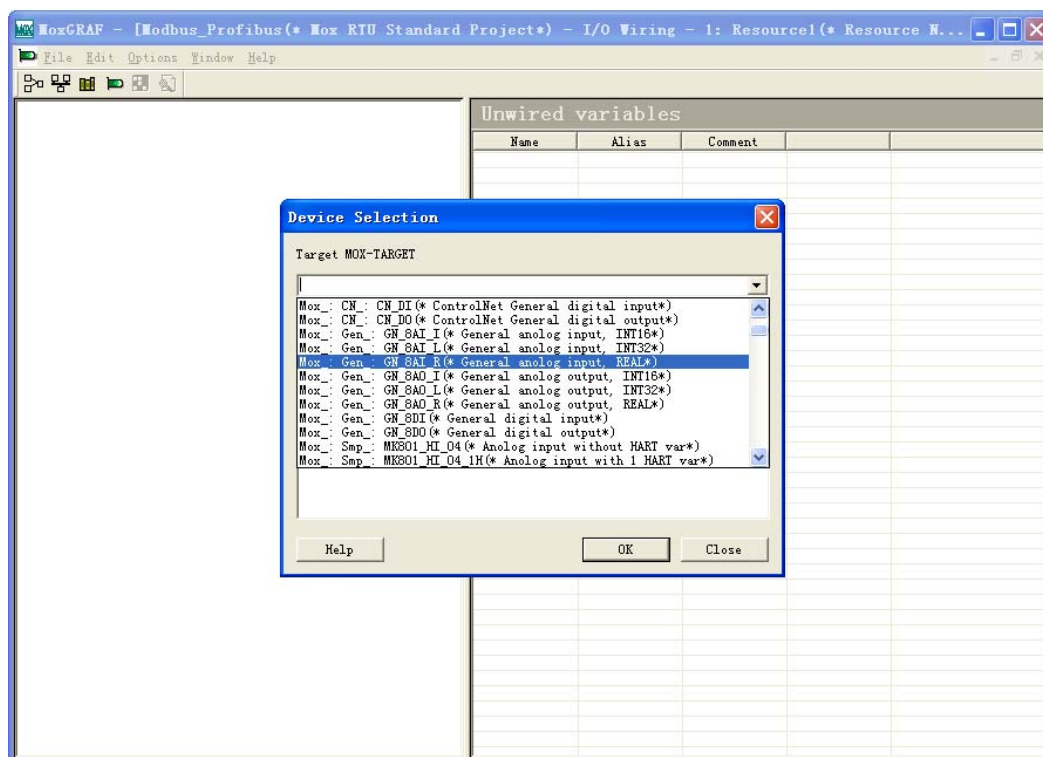


4.4 I/O Wiring

The aim of the I/O wiring and configuration operation is to establish a logical link between the variables of the application and the physical channels of the external I/O devices. To make this link, the user has to identify and set up all the I/O devices and bind the previously defined variables with the corresponding I/O channels.

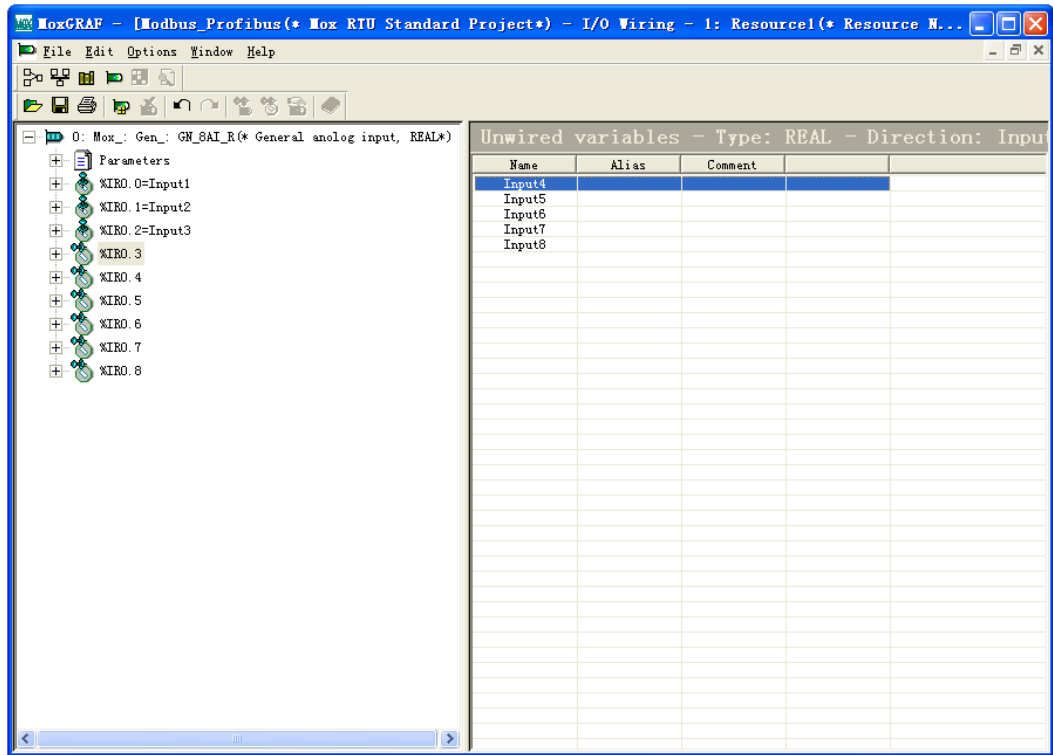
From within the MOXGRAF Programs window, select **Project | I/O Wiring**. Ensure that the Resource 1 (*Resource Number 1*) window is selected otherwise this option cannot be selected.

Within the MOXGRAF I/O Wiring window, select **Edit | Add Device**. You may also click on the corresponding icon on the toolbar. At the first prompt use the down arrow tab to display a list of all devices.



Select a desired channel of the I/O device and double click on the variable name in the **Unwired variables** window. This will move that variable out of that window and connect it to the selected channel.

The selected variable should now be connected to the channel. The variable can be unwired by double clicking on it in the connected window. It will then disconnect from the channel and appear in the unwired window.



5 Typical System

The figure shown below is the typical installation architecture of the MOX Serial Gateway. This method is generally utilized where specialized field devices transfer data and information to a host controller via a serial interface. In addition, the serial device may also receive commands from the host controller to modify configuration items or set points stored in the device. The Ethernet connection allows the serial devices to be directly accessed from the HMI if required.

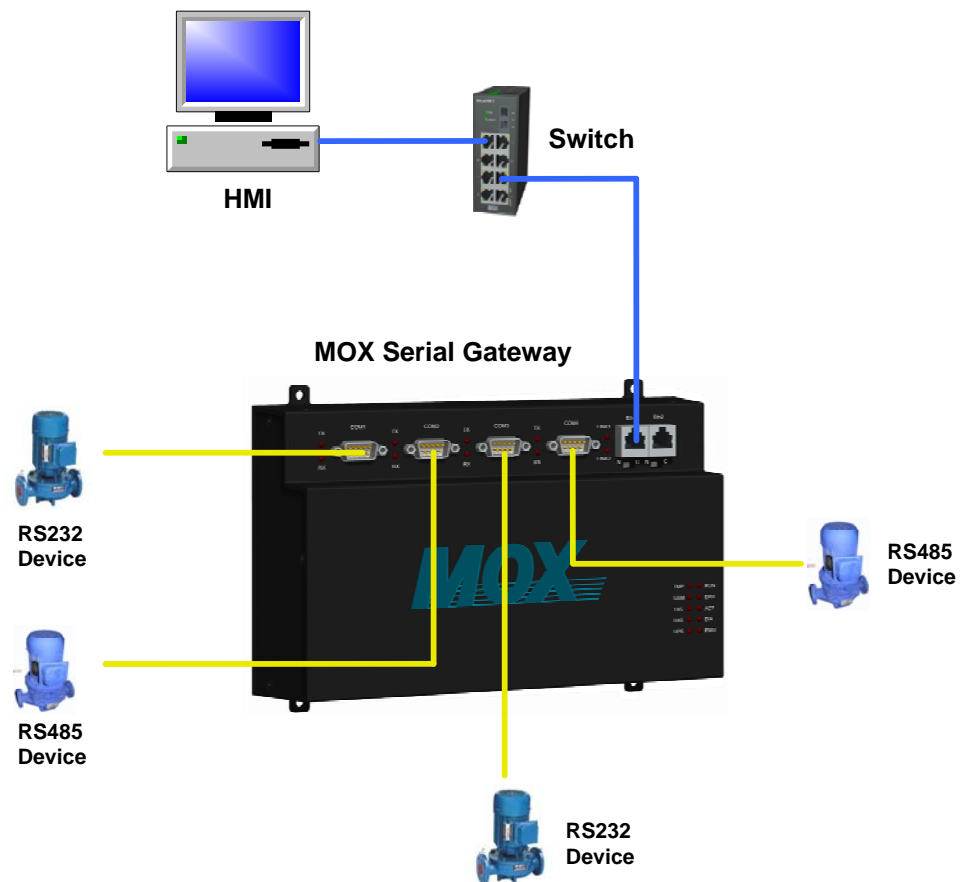


Figure 25 Typical System Architecture

Appendix A Product Support

Warranty Information

All MOX manufactured products are warranted to be free from defects in material and workmanship. Our obligation under this warranty will be limited to repairing or replacing, at our option, the defective parts within 1 year of the date of installation, or within 18 months of the date of shipment from the point of manufacture, whichever is sooner. Products may only be returned under authorization. The purchaser will prepay all freight charges to return any products with a valid return authorization number to the designated repair facility.

This limited warranty does not cover loss or damage that may occur in shipment of the goods or due to improper installation, maintenance, misuse, neglect or any cause other than ordinary commercial or industrial use. This limited warranty is in lieu of all other warranties whether oral or written, expressed or implied.

Liability associated with all MOX products shall not exceed the price of the individual unit that is the basis of the claim. In no event will there be liability for any loss of profits, loss of use of facilities or equipment or other indirect, incidental or consequential damages.

Contact Details

To obtain support for MOX products, contact MOX Group with following Email address or your designated support provider and ask for MOX Support.

E-mail Addresses

support@mox.com.au

sales@mox.com.au

Visit Our Web Page at

<http://www.mox.com.au>



Service Information

If you require service, contact your local MOX Group representative. A trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit, an RMA (Return Material Authorization) number will be provided.

All returned materials are tracked with our RMA system to ensure speedy service. You must include this RMA number on the outside of the box so that your return can be processed immediately.

Your MOX Group authorized applications engineer will complete an RMA request for you. If the unit has a serial number, we will not need detailed financial information. Otherwise, be sure to have your original purchase order number and date purchased available.

We suggest that you provide a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RMA form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Most repairs are completed within two days. During busy periods, there may be a longer delay.

If you need a quicker turnaround, ship the unit to us by airfreight. We give priority service to equipment that arrives by overnight delivery. Many repairs received by midmorning (typical overnight delivery) can be finished the same day and returned immediately.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience

Please fill in the following information and keep this manual with your MOX system for future reference:

P.O. #: _____ Date Purchased: _____

Purchased From: _____



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