

MOX Open Controller

User Guide

0809-601-2301



Preface

Scope of the User Guide

This MOX Open Controller User Guide presents a general overview, as well as detailed description of the MOX Open Controller, including hardware installation guidelines as well as software configuration information.

The guide has been organized for the integrator, and it is expected that the user is an engineer, technician, electrician or similar with an understanding of the operating and programming requirements of the MOX system and I/O option cards.

Related Documents

A MOX system 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 603 Rack Base IO User Guide
- MoxIDE User Guide
- MoxGRAF User Guide
- MOX CP User Guide
- MOX CPP 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 procedure.

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1 Overview

1.1 Introduction

The MOX Open Controller (OC) system is the high end of the MOX product range and contains a high performance CPU capable of high speed Real Time Processing. It is a leading edge control system that incorporates many of the current control system developments and trends.

The MOX Open Controller's open standards compatibility includes: Ethernet TCP/IP, MODBUS TCP/IP communications, IEC61131-3 compatibility, standard field bus interface capability, etc.

Typically, a MOX OC system installation consists of a MOX Open Controller and a number of racks of Communications Processors and I/O modules.

With choices from single distributed I/O to the largest systems, the MOX system is packed with high performance building blocks that fit together perfectly to create powerful and flexible automation systems. The MOX product family is planned technology that is pre-integrated to fit the entire spectrum of your control needs.

1.2 Key Features

- ❖ Modular and open architecture
- ❖ Large system performance
- ❖ Full system redundancy at all levels
- ❖ Scalable architecture. Supports as small as one I/O block to as large as thousands of I/O without changing the system architecture
- ❖ Compatible and transportable software for HMI and control programs
- ❖ Combination of the functionality and performance of DCS and PLC
- ❖ Support of more than one field bus standards and technologies
- ❖ High performance and flexible high density rack I/O and remote brick I/O
- ❖ Integrated field wiring terminals

1.3 CE Notice

1.3.1 *Standards and Approvals*

CE Approval

The MOX Open Controller System satisfies requirements of the EC Directives listed below:

- 2006/95/EC “Electrical Equipment Designed for Use within Certain Voltage Limits” (Low-Voltage Directive)
- 2004/108/EC “Electromagnetic Compatibility” (EMC Directive)

Use in Industrial Environments

MOX products are designed for industrial applications.

Application Field	Noise Emission Requirements	Noise Immunity Requirements
Industry	EN 61000-6-4: 2007	EN 61000-6-2: 2005

Table 1 Use in Industrial Environments

Use in Residential Areas

To operate a MOX Open Controller System in a residential area, its RF emission must comply with Limit Value Group 1 Class A to EN 55011:2007.

The following measures are recommended to ensure the interference complies with limit value class B:

- The MOX Open Controller System must be installed within grounded cabinets.

1.3.2 *Electromagnetic Compatibility*

Definition

Electromagnetic compatibility (EMC) is the ability of an electrical installation to function satisfactorily in its electromagnetic environment without interfering with that environment.

The MOX Open Controller System also satisfies requirements of EMC legislation for the European domestic market. Compliance of the MOX Open Controller System with specifications and directives on electric design is prerequisite.

Pulse-shaped Disturbance

The following table shows the EMC compatibility of the MOX Open Controller System in areas subject to pulse-shaped disturbance.

Pulse-shaped Disturbance	Test Voltage
Electrostatic Discharge to IEC 61000-4-2	Air Discharge: $\pm 8\text{kV}$ Contact Discharge: $\pm 4\text{kV}$
Burst Pulses (high-speed transient disturbance) to IEC 61000-4-4	2 kV (power supply lines) 2 kV (signal lines > 3m) 1 kV (signal lines < 3m)
High-energy single pulse (surge) to IEC 61000-4-5	0.5 kV DC Power Supply Lines (Line to line and line to earth). 1 kV Signal / Data Line > 3m (line to earth).

Table 2 Pulse-shaped Disturbance

Sinusoidal Disturbance

The following table shows the EMC compatibility of the MOX Open Controller System in areas subject to sinusoidal disturbance.

Sinusoidal Disturbance	Test Values
RF Radiation (electromagnetic fields) to IEC 61000-4-3	10 V/m, with 80% amplitude modulation of 1kHz in the 80MHz to 1000MHz and 3 V/m 1.4GHz to 2GHz range.
RF conductance on cables and cable shielding to IEC 61000-4-6	Test voltage 10V, with 80% amplitude modulation of 1 kHz in the 150KHz to 80MHz range.

Table 3 Sinusoidal Disturbance

Emission of Radio Interference

Electromagnetic interference to EN 55011: Limit Class A, Group 1 (measured at a distance of 10m).

Frequency	Noise Emission
30 MHz to 230 MHz	< 40 dB ($\mu\text{V/m}$)Q
230 MHz to 1000 MHz	< 47 dB ($\mu\text{V/m}$)Q

Table 4 Radiation Emission

Noise emission of PSU port to EN 55011: Limit value class A, Group 1.

Frequency	Noise Emission
0.15 MHz to 0.5 MHz	< 79 dB ($\mu\text{V/m}$) Q < 66 dB ($\mu\text{V/m}$) M
0.5 MHz to 5 MHz	< 73 dB ($\mu\text{V/m}$) Q < 60 dB ($\mu\text{V/m}$) M
5 MHz to 30 MHz	< 73 dB ($\mu\text{V/m}$) Q < 60 dB ($\mu\text{V/m}$) M

Table 5 Conductive Emission

2 Familiarization

2.1 Introduction

A MOX Open Controller typically includes one Four Slot Base, one or two Power Supply Modules, one CPU Module, one or two Interface Modules and one Blank Module in case there is a blank slot. A number of combinations are available depending upon the user requirements. The following is a general list of components available.

- Four Slot Base
- Power Supply Module
- CPU Module
 - One on-board Ethernet port used for system configuration, programming and HMI communications
 - Optional redundancy port for connection with a standby MOX Open Controller
- Interface Module
 - MoxBUS
 - PROFIBUS – DP
 - MoxNET
- Blank Module

Product No.	Item	Main Feature
MX601-5002	CPU	Metal Case, 10/100Mbps Ethernet, Optical RDN link, SOE Sync Port
MX601-5004	CPU	Metal Case, two 10/100Mbps Ethernet ports, SOE Sync Port
MX601-5101	Power	Metal Case, Power Supply with 24VDC input
MX601-5201	MoxBUS Interface	Metal Case, Interface module supporting MOX 603 Rack base I/O, SMA connector
MX601-5202	PROFIBUS DP Interface	Metal Case, Interface module supporting PROFIBUS DP slave
MX601-5207	MoxNET Interface	Metal Case, Interface module supporting MOX 603 rack base I/O, 7 RJ45 ports
MX601-5208	MoxNET Interface	Metal Case, Interface module supporting MOX 603 rack base I/O, 6 RJ45 ports, 1 Fibre port
MX601-5401	Blank	Metal Case, module for filling an empty slot
MX601-6001	Base	Four slot base, accepts dual PSU modules

Table 6 MOX Open Controller Major Components

2.2 MOX Open Controller Familiarization

The diagram below illustrates various components associated with a typical MOX Open Controller. Certain application specific options will provide a particular combination of these components.

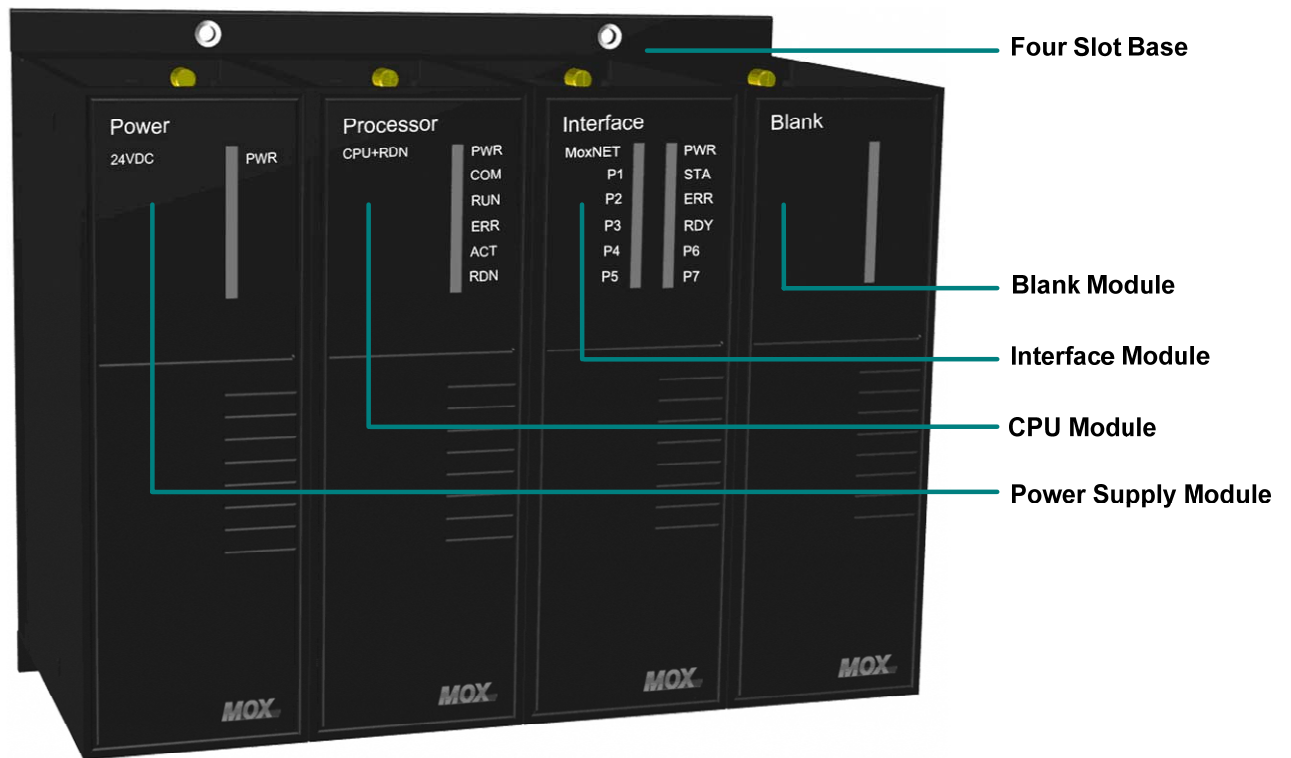


Figure 1 MOX Open Controller Typical Components

2.3 MOX Open Controller Components

2.3.1 *MX601-6001 Four Slot Base*

A Four Slot Base provides mounting space for the required Power Supply Module and Processor Module. The two remaining slots may be fitted with a combination of two Interface modules (PROFIBUS DP or MoxBUS). Alternatively, if a slot is unused, a Blank module should be fitted to keep the controller clean and neat.

The Four Slot Base also supports dual Power Supply Modules. Any two slots on the base can be used for the allocation of the two Power Supply Modules.

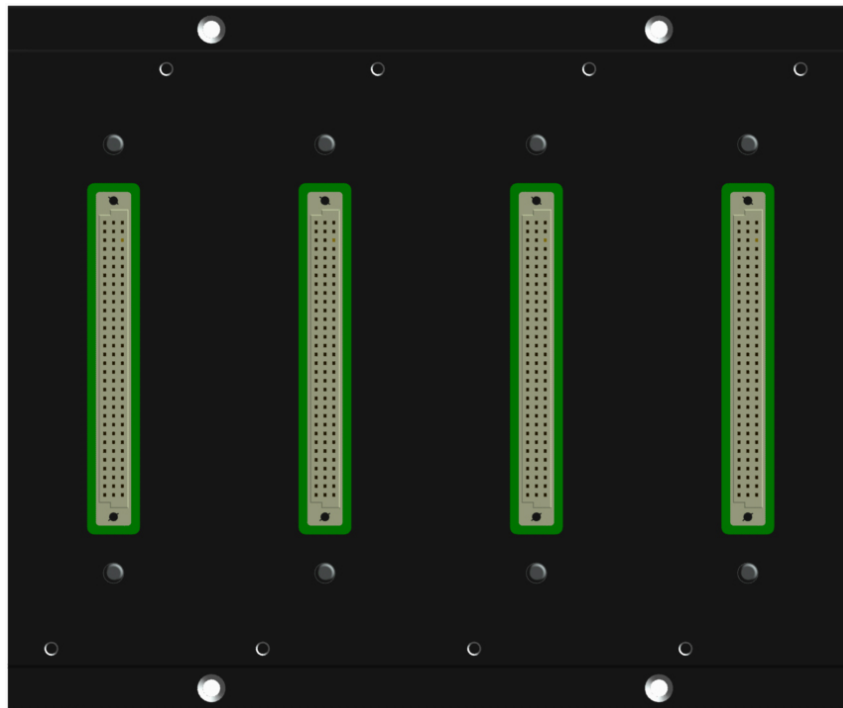


Figure 2 **MX601-6001 Four Slot Base Familiarization**

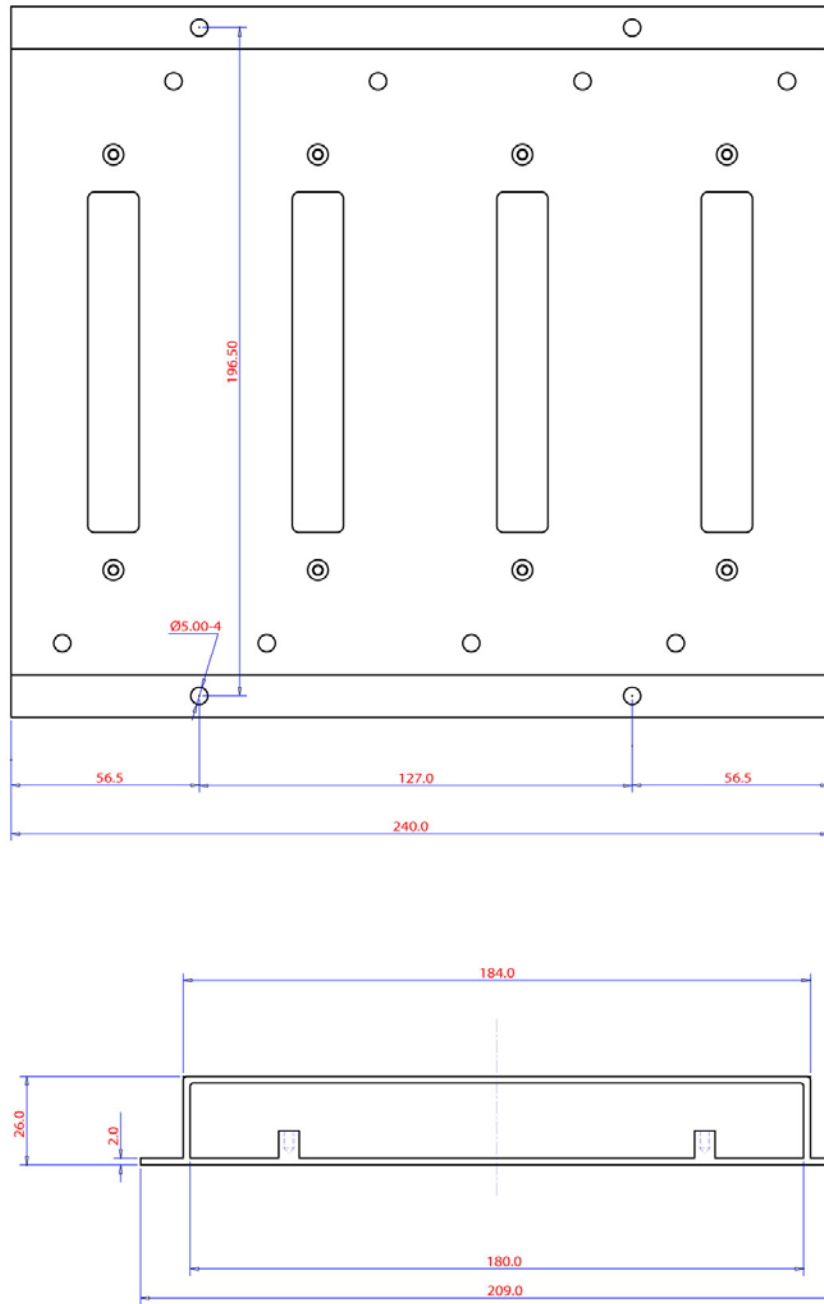


Figure 3 MX601-6001 Four Slot Base Dimensions

2.3.2 MX601-5101 Power Supply Module

The Power Supply Module provides power to each module slot in the base.

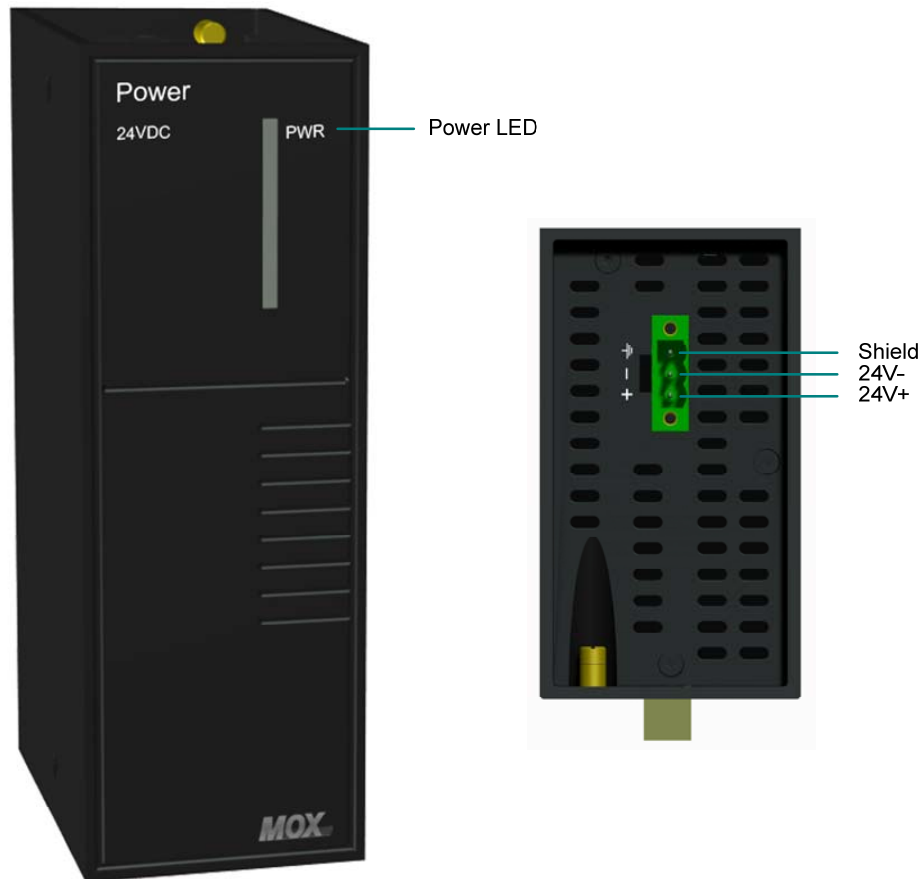


Figure 4 MX601-5101 Power Supply Module Familiarization

Specifications

Input Information	
External power supply	20VDC to 30VDC
Power Supply Capability	50W
Reverse input protection	Yes
Other Information	
Efficiency	83% (Max)
Dissipation at zero load	3.4W
Supports redundancy	Yes
Environmental Conditions	
Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Relative Humidity	5 to 95%, non-condensing

Table 7 MX601-5101 Power Supply Module Specifications

Diagnostic LEDs

LED	Description
PWR	Power of the Module

Table 8 MX601-5101 Power Supply Module Diagnostic LEDs

The PWR LED is provided on the Power Supply Module to indicate correct operation and power output from the unit.

Power Redundancy

The MOX Power Supply Module can be installed in a redundant configuration on a single four slot base. This gives increased security as one Power Supply Module can fail and the system will still operate correctly.

Before powering up the system, ensure that both Power Supply modules are installed and cabled, for correct use. None of the MOX Open Controller modules are hot swappable. If one of the Power Supply modules should fail, all power to the Open Controller must be removed before the module can be swapped out for repair. For correct power cabling in a redundant configuration, please refer to the figure below:

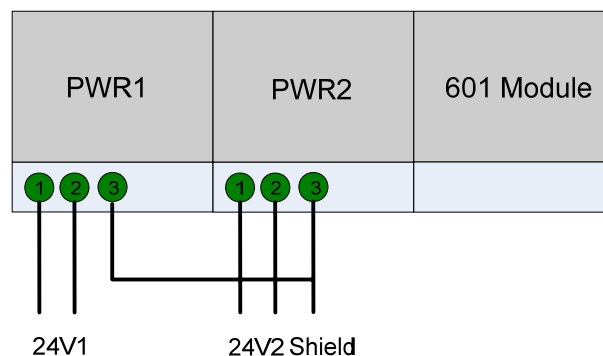


Figure 5 MX601-5101 Power Supply Module Redundant Power Cabling

2.3.3 Processor Modules

There are two types of processor modules supported by the MOX Open Controller:

- MX601-5002 CPU with built-in redundant control module (optical link) and SOE sync
- MX601-5004 CPU with two RJ45 Ethernet ports and SOE sync

Either module plugs directly into any slot of the Base.

2.3.3.1 MX601-5002 CPU

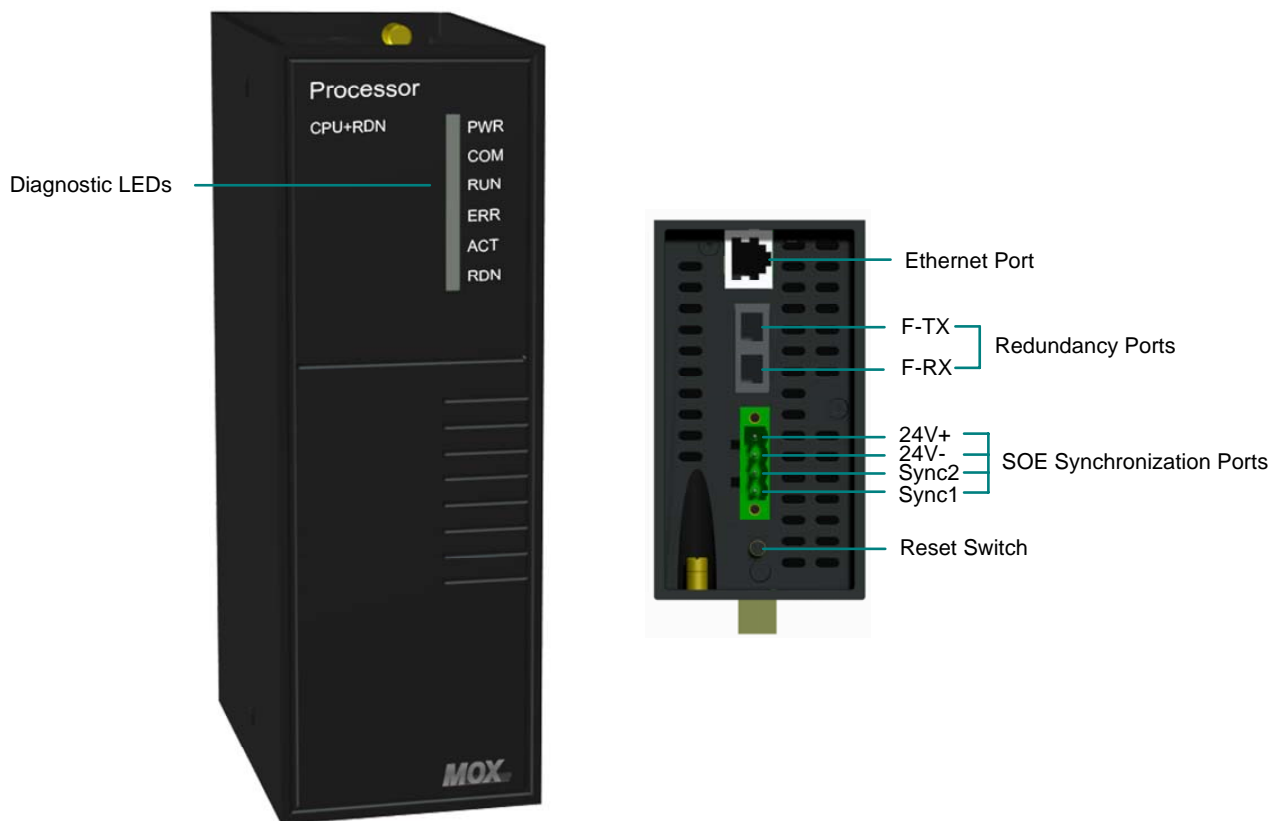


Figure 6 MX601-5002 CPU Familiarization

Specifications

Power Specifications	
Power Voltage	5VDC
Power Dissipation within Module	<6W
CPU Specifications	
Processor	AMD Geode™LX800
Clock Speed	500MHz
RAM	128M
Flash	1GB
Communication Specifications	

Ethernet	10/100Mbps RJ45
Redundancy Port	100Mbps Fibre
Other Features	
SOE Support	SOE Synchronization
Reset Switch	Reset to factory settings
Environmental Conditions	
Operating Temperature	-20 to 70°C
Storage Temperature	-40 to 85°C
Relative Humidity	5 to 95%, non-condensing

Table 9 MX601-5002 CPU Specifications

Diagnostic LEDs

The description of the diagnostic LEDs on the front panel is displayed below:

LED	State	Description
PWR	ON	Module power is on
	OFF	Module power is off
COM	Flash	Receiving or transmitting data
	OFF	No communication
RUN	ON	Processor is running normally
	Flash 0.5Hz	No MoxGRAF code
	OFF	System not started
ERR	ON	I/O communication error
	OFF	I/O communication is ok
ACT	ON	CPU is active, partner CPU is also alive
	Flash 2Hz	CPU is active, partner CPU is lost
	Flash 0.5Hz	CPU is standby, partner CPU is lost
	OFF	CPU is standby, or in single configuration
RDN	Flash	Redundant communication is active (when the redundant kit is fitted to the CPU Module or the CPU has redundant functionality.)

Table 10 MX601-5002 CPU Diagnostic LEDs

The onboard Ethernet port of the CPU module can be used as a programming port for the MoxIDE and MoxGRAF configuration software. The interface can also be used for communications to HMIs, please refer to 7.2.



*The factory set default IP address of the Ethernet port is **192.168.1.91**.*

Connection to the Ethernet port requires Cat.5 STP (Shielded Twisted Pair) cable and it is required for noise vulnerable installation. The maximum communication distance is 100 meters.

Redundancy Port

The ability to have redundant Open Controllers is achieved via the MOX OC CPU and onboard redundancy module. Two MOX Open Controllers using the MX601-5002 CPU modules can be interconnected for redundant communications.

While the active processor is running the control application, the backup processor is in “hot standby” mode and is continuously updated by an automatic check pointing procedure. At any failure, an automatic and bump-less change over will occur.

After redundancy switch, the backup controller takes control of the field I/O.

The Fibre port, one TX and one RX port (SC Duplex connector) are used to connect two CPU modules for redundant communications. The fibre communication speed is 10/100Mbps.

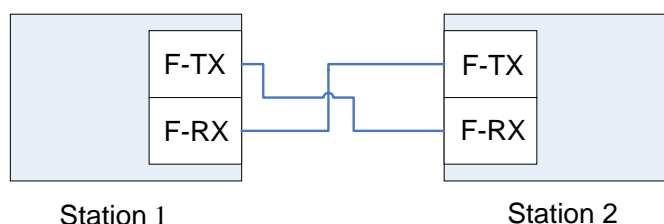


Figure 7 MX601-5002 CPU Redundant Connection

The MOX system’s solid redundancy implementation is transparent to the control program. A simple configuration step is all that is required to enable the redundancy.



Please note that two CPUs in the redundant structure are required to have the software and hardware in the same version number.

Reset Switch

The MX601-5002 CPU module is supplied with a reset switch which is used to reset the system configuration parameters to a default state.

To activate a reset of the controller’s current configuration, the user should power cycle the system. While the CPU is rebooting, hold the reset switch in until the RUN LED is active (flashing).

The reset operation will set the following parameters to their default settings:

- 1) Set the default IP address configuration for the OC:
 - a. Communication port: 192.168.1.91/255.255.255.0
 - b. Redundancy port: 192.168.0.91/255.255.255.0
 - c. MoxBUS port: 192.168.199.199/255.255.255.0
- 2) Remove the run time code (MoxGRAF program) from the controller
- 3) Remove user configuration

SOE Synchronization

The MX601-5002 CPU module supports a SOE Sync port. The provided sync signal is isolated from the system and is used to support the SOE time sync function. For more information about SOE synchronization, please refer to chapter 6.

2.3.3.2 MX601-5004 CPU

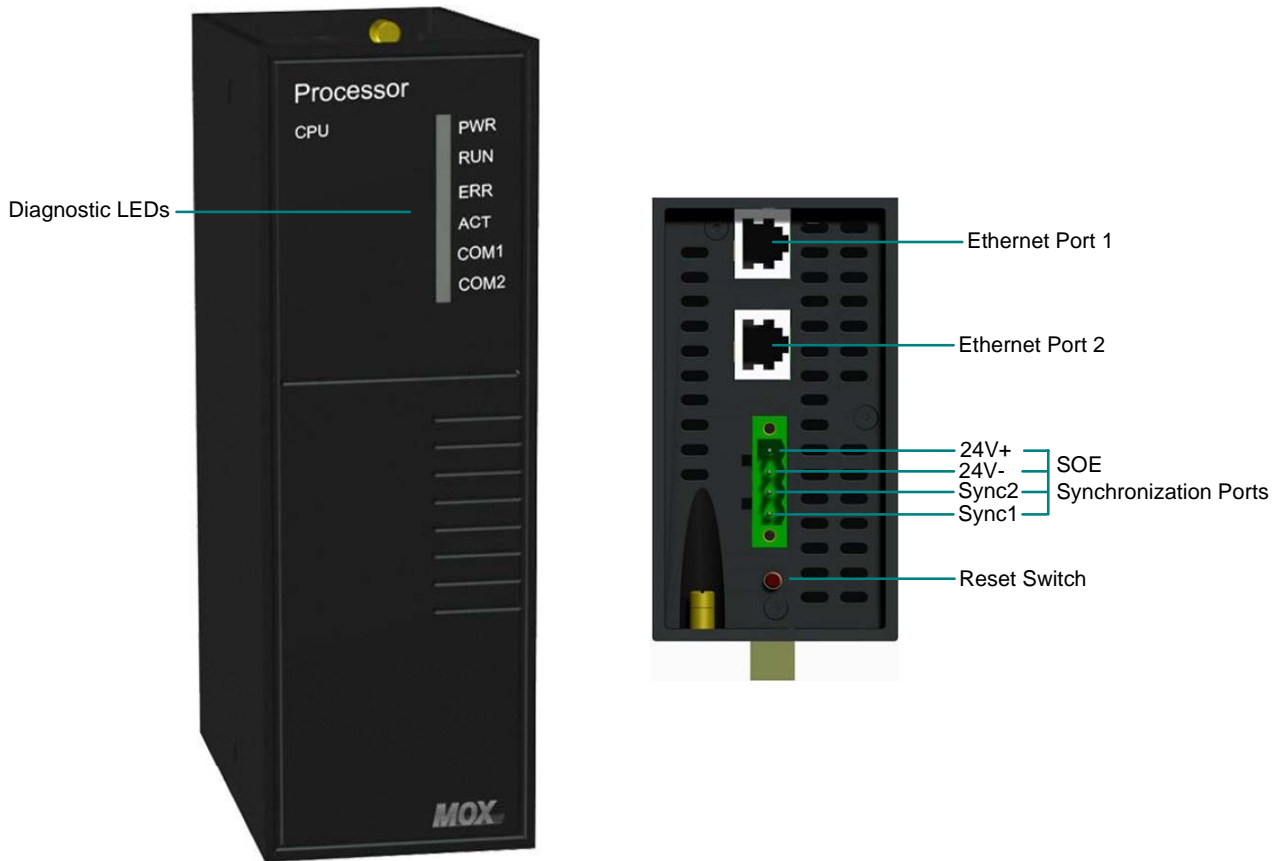


Figure 8 MX601-5004 CPU Familiarization

Specifications

Power Specifications	
Power Voltage	5VDC
Power Dissipation within Module	<6W
CPU Specifications	
Processor	AMD Geode™LX800
Clock Speed	500MHz
RAM	128M
Flash	1GB
Communication Specifications	
Ethernet Ports	10/100Mbps RJ45 × 2
Other Features	
SOE Support	SOE Synchronization
Reset Switch	Reset to factory settings
Environmental Conditions	
Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Relative Humidity	5 to 90%, non-condensing

Table 11 MX601-5004 CPU Specifications

Diagnostic LEDs

The description of the diagnostic LEDs on the front panel is displayed below:

LED	State	Description
PWR	ON	Module power is on
	OFF	Module power is off
RUN	ON	Processor is running normally
	Flash 0.5Hz	No MoxGRAF code
	OFF	System not started
ERR	ON	I/O communication error
	OFF	I/O communication is ok
ACT	ON	CPU is active, partner CPU is also alive
	Flash 2Hz	CPU is active, partner CPU is lost
	Flash 0.5Hz	CPU is standby, partner CPU is lost
	OFF	CPU is standby, or in single configuration
COM1	Flash	Receiving or transmitting data
	OFF	No communication
COM2	Flash	Receiving or transmitting data
	OFF	No communication

Table 12 MX601-5004 CPU Diagnostic LEDs

Ethernet Port

The onboard Ethernet ports of the CPU module can be used as the programming ports for the MoxIDE and MoxGRAF configuration software. The interface can also be used for communications to HMI's, please refer to 7.2.



The factory set default IP address of the Ethernet port 1 is **192.168.1.91**.
The factory set default IP address of the Ethernet port 2 is **192.168.0.91**.

Connection to an Ethernet switch/hub for 10/100Mbps operation requires Cat.5 STP (Shielded Twisted Pair) cable and it is required for noise vulnerable installation. The maximum communication distance is 100 meters.

Reset Switch

Similar with MX601-5002 CPU, a reset switch is also provided to reset the system configuration parameters. The operation procedure is the same as MX601-5002 CPU.

The reset operation will set the following parameters to their default settings:

- 1) Set the default IP address configuration for the OC:
 - a. Ethernet Port 1: 192.168.1.91/255.255.255.0
 - b. Ethernet Port 2: 192.168.0.91/255.255.255.0
- 2) Remove the run time code (MoxGRAF program) from the controller
- 3) Remove user configuration

SOE Synchronization

The MX601-5004 CPU module supports a SOE Sync port. The provided sync signal is isolated from the system and is used to support the SOE time sync function. For more information about SOE synchronization, please refer to chapter 6.

2.3.4 Communication Interface Modules

There are four types of communication interface modules supported by the MOX Open Controller:

- MX601-5201 MoxBUS Interface Module
- MX601-5202 PROFIBUS DP Master Module
- MX601-5207 MoxNET module with 7 RJ45 ports
- MX601-5208 MoxNET module with 6 RJ45 ports and 1 Fibre port

2.3.4.1 MX601-5201 MoxBUS Interface

The MoxBUS Interface (MX601-5201) module connects to a MOX 603 I/O system network. It has one SMA connector and supports a transmission rate of 10Mbps.

Up to 12 racks of MOX 603 rack base I/O may be connected to one MoxBUS Interface. Each rack may contain up to 10 MOX 603 rack base I/O modules.



Figure 9 MX601-5201 MoxBUS Interface Familiarization

Specifications

Power Specifications	
Power Dissipation within Module	<3W
Communication Specifications	
Communication Rate	10Mbps
Protocol	MoxBUS
Connection Type	SMA
Environmental Conditions	
Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Relative Humidity	5 to 90%, non-condensing

Table 13 **MX601-5201 MoxBUS Interface Specifications**

Diagnostic LEDs


LED	Description
PWR	Module Power
STA	Communications Link Status
TXD	Transmit Communication
RXD	Receive Communication
ERR	Communications Error

Table 14 **MX601-5201 MoxBUS Interface Diagnostic LEDs**

- The PWR LED is ON when the module is powered on.
- The STA LED is ON when cyclic I/O data exchange is running.
- The TXD LED will FLASH when the controller is transmitting data to connected I/O modules.
- The RXD LED will FLASH when receiving information from the connected MoxBUS CP modules.
- The ERR LED is ON when there is a communications error.

2.3.4.2 MX601-5202 PROFIBUS DP Interface

The PROFIBUS DP interface (MX601-5202) module is connected to field I/O modules via a 9-pin D-Sub female connector with RS485 optical isolation. The link has a transmission rate of up to 12Mbps.



The MOX Open Controller supports max 2K input and 2K output data size per PROFIBUS DP master card.

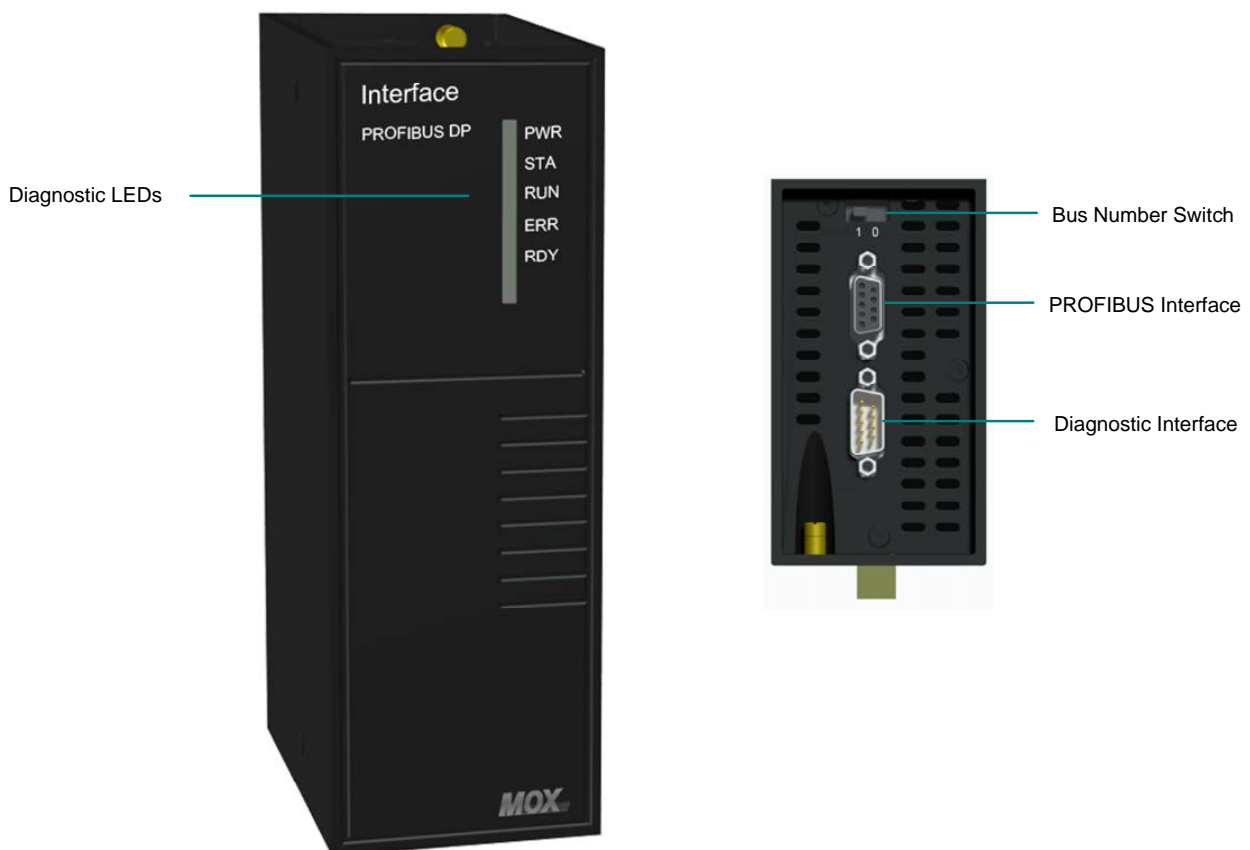


Figure 10 MX601-5201 PROFIBUS DP Interface Familiarization

Specifications

Power Specifications	
Power Dissipation within Module	<3.2W
Communication Specifications	
Communication Rate	12Mbps
Protocol	PROFIBUS DP
PROFIBUS DP Port	DB9, Female
Diagnostic Port	DB9, Male
Environmental Conditions	
Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Relative Humidity	5 to 90%, non-condensing

Table 15 MX601-5201 PROFIBUS DP Interface Specifications

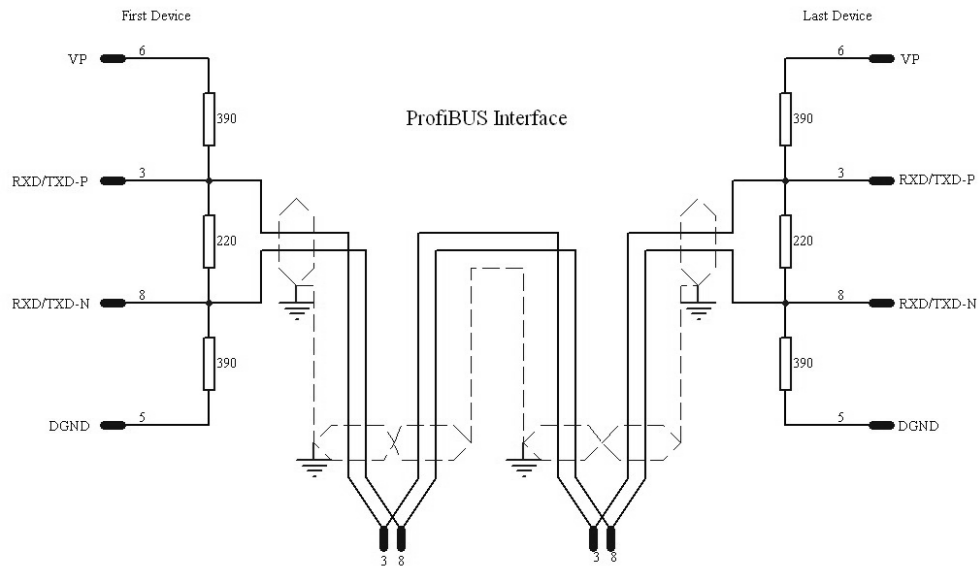


Figure 11 PROFIBUS DP Cable Interface Specifications



*In order to minimize cable reflections and ensure a defined terminated level on the transmission cable, the PROFIBUS DP connectors on both ends of each PROFIBUS DP network should have their termination resistors switched to **ON**.*

The female DB9 connector is used to connect the bus cable to the desired node. The pin assignments on the PROFIBUS DP port are as follows.

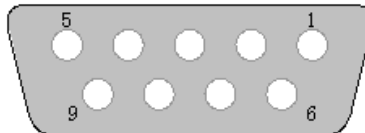


Figure 12 PROFIBUS DP Port Pin Numbering

The following table gives description of each pin:

Pin #	Signal	Description
1	SHIELD	Shield or protective ground
2	NC	N/A
3	DATA+	Transmit/receive data, positive, B cable
4	NC	N/A
5	GND	Data transfer potential (reference potential for VCC)
6	VCC	Supply voltage positive(P5V)
7	NC	N/A
8	DATA-	Transmit/receive data, negative, A cable
9	NC	N/A

Table 16 Pin Assignment of PROFIBUS DP Port

Diagnostic LEDs

LED	Description
PWR	Module Power
STA	Communications Link Status
ERR	Communications Error
RUN	Communications Activity Status
RDY	Module Activity Status

Table 17 MX601-5201 PROFIBUS DP Interface Diagnostic LEDs

- The PWR LED is ON to indicate the module is powered on.
- The STA LED is ON when DP master is holding the PROFIBUS DP token and is able to transmit telegrams. For single DP master application, this LED should always be ON if there is no error.
- The ERR LED is ON when device finds a communication problem to at least one PROFIBUS DP slave device or has detected a short circuit; OFF when there is no error.
- The RUN LED is ON for communications, periodic FLASH for stopped communications or ready for communication but not connected to any Slave, random FLASH during Power up for missing or faulty configuration, random FLASH during Runtime for host watchdog timeout, and OFF for no communication.
- The RDY LED is ON if the module is ready, periodic FLASH for bootstrap mode, random FLASH for hardware or system error, and OFF for no power supply or hardware defect.

Bus Number Switch

With Bus Number Switch, maximum 2 PROFIBUS DP interface (MX601-5202) modules could be used in single Open Controller system, one is switched as "0" (default) and the other as "1". After setting the Bus Number Switch to "0" or "1", the bus number parameter of corresponding I/O device should also be configured to the same value in MoxGRAF. The following figure demonstrates the case "0".

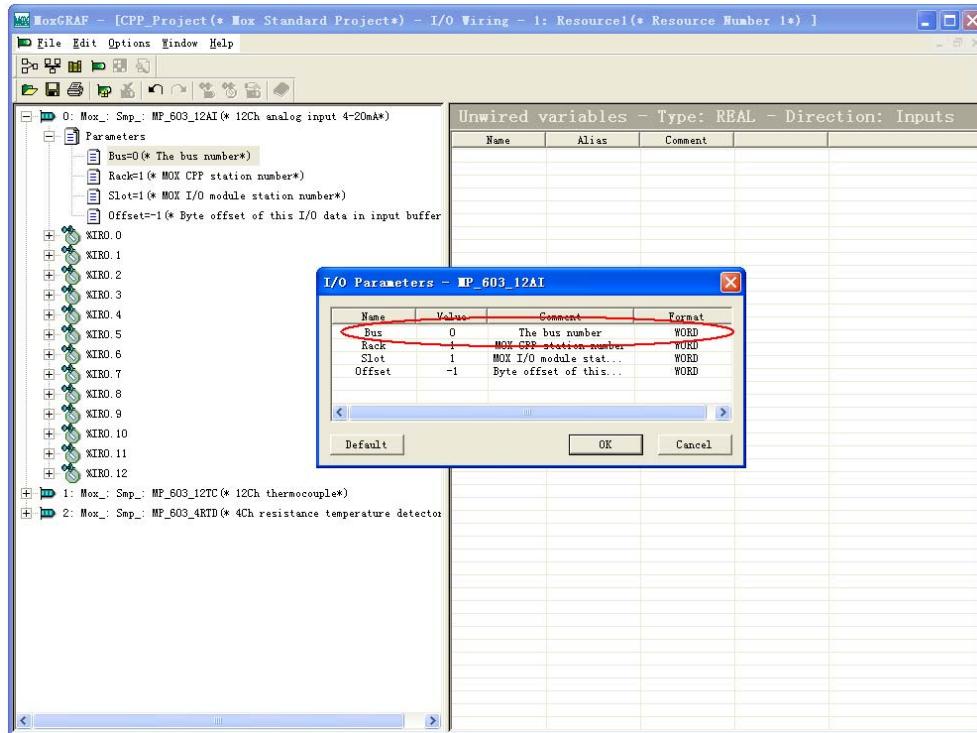


Figure 13 MX601-5201 PROFIBUS DP Interface Bus Number Configuration

2.3.4.3 MX601-5207 MoxNET Interface

The MX601-5207 MoxNET module connects to a MOX 603 I/O system network via 7 RJ45 ports. All RJ45 ports support 10/100Mbps and full/half duplex auto-negotiation.

This module has 128K bytes of RAM which is used to buffer the Ethernet frame data from all ports. It works in store and forward mode.

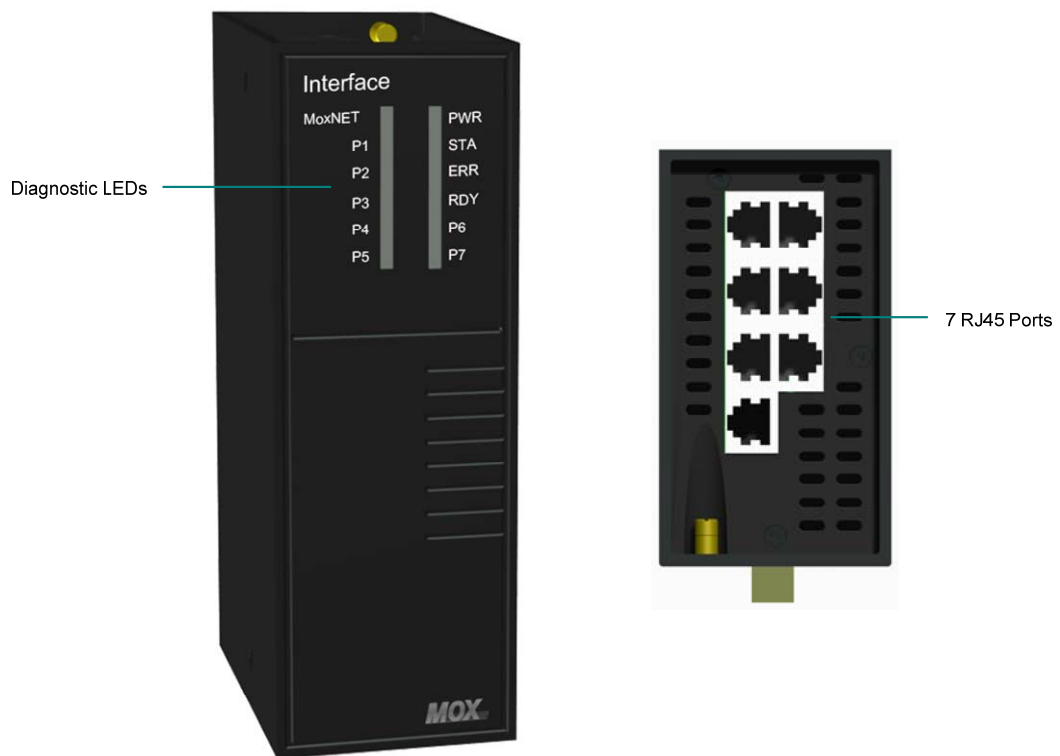


Figure 14 MX601-5207 MoxNET Interface Familiarization

Specifications

Power Specifications	
Power Dissipation within Module	<5W
Communication Specifications	
10/100Mbps RJ45 Port	7
RJ45 Port Characteristic	
10/100Mbps auto-negotiation	Yes
Full/Half Duplex auto-negotiation	Yes
Auto-MDIX	Yes
Flow Control	802.3x
Collision	Drop frame after 16 collisions or collision continues 512 bit times
Broadcast	5% broadcast frames allowed
Environmental Conditions	
Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Relative Humidity	5 to 90%, non-condensing

Table 18 MX601-5207 MoxNET Interface Specifications

Diagnostic LEDs

LED	Description
PWR	Module Power
STA	Communications Link Status
ERR	Communication Error
RDY	Hardware Status
P1	RJ45 Port1 Link/ACT Status
P2	RJ45 Port2 Link/ACT Status
P3	RJ45 Port3 Link/ACT Status
P4	RJ45 Port4 Link/ACT Status
P5	RJ45 Port5 Link/ACT Status
P6	RJ45 Port6 Link/ACT Status
P7	RJ45 Port7 Link/ACT Status

Table 19 MX601-5207 MoxNET Interface Diagnostic LEDs

- The PWR LED is ON when the module is powered on.
- The STA LED is ON when cyclic I/O data exchange is running.
- The ERR LED is ON when at least one of the configured MOX Communications Processors is offline. The colour of this LED is red.
- The RDY LED is ON when the hardware is ready.
- The P1~P7 LED is ON when the RJ45 port is connected to the network, periodic FLASH when the port is in communication status.

2.3.4.4 MX601-5208 MoxNET Interface

The MX601-5208 MoxNET module connects to a MOX 603 I/O system network via 6 RJ45 ports and 1 Fibre port. All RJ45 ports support 10/100Mbps and full/half duplex auto-negotiation. The Fibre port is a duplex 100base-LX10 port.

This module has 128K bytes of RAM which is used to buffer the Ethernet frame data from all ports. It operates in store and forward mode.



Figure 15 MX601-5208 MoxNET Interface Familiarization

Specifications

Power Specifications	
Power Dissipation within Module	<7W
Communication Specifications	
10/100Mbps RJ45 Port	6
100Mbps Duplex Fibre Port	1
RJ45 Port Characteristic	
10/100Mbps auto-negotiation	Yes
Full/Half Duplex auto-negotiation	Yes
Auto-MDIX	Yes
Fibre Port Characteristic	
Connector Type	SC
Wave Length	1300nm
Fibre Mode	Single mode Fibre
Common Port Characteristic	
Flow Control	802.3x
Collision	Drop frame after 16 collisions or collision continue 512bit times
Broadcast	5% broadcast frames allowed
Environmental Conditions	
Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Relative Humidity	5 to 90%, non-condensing

Table 20 MX601-5208 MoxNET Interface Specifications

Diagnostic LEDs

LED	Description
PWR	Module Power
STA	Communications Link Status
ERR	Communication Error
RDY	Hardware Status
P1	RJ45 Port1 Link/ACT Status
P2	RJ45 Port2 Link/ACT Status
P3	RJ45 Port3 Link/ACT Status
P4	RJ45 Port4 Link/ACT Status
P5	RJ45 Port5 Link/ACT Status
P6	RJ45 Port6 Link/ACT Status
P7	Fibre Port Link/ACT Status

Table 21 MX601-5208 MoxNET Interface Diagnostic LEDs

- The PWR LED is ON when the module is powered on.
- The STA LED is ON when cyclic I/O data exchange is running.
- The ERR LED is ON when at least one of the configured MOX Communications Processors is offline. Its colour is red.
- The RDY LED is ON when the hardware is ready.
- The P1~P7 LED is ON when the RJ45 port or Fibre port is connected to the network, periodic FLASH when the port is in communication status.

2.3.5 ***MX601-5401 Blank Module***

Blank module MX601-5401 is required when there is empty slot in the four slot base.



Figure 16 **MX601-5401 Blank Module Familiarization**

3 Installation and Handling Considerations

3.1 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 the 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

3.2 Environmental Precautions

To extend the life of the MOX system, 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 system 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, dry environment.

3.3 Installation Considerations

Correct placement of the MOX Open Controller 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.

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

The MOX Open Controller includes four 5mm mounting holes in each corner of the base. ***Appropriately sized mounting screws should be inserted in each of the four holes when installing the unit.*** The minimum recommended screw size is 3mm 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 with the MOX Open Controller four slot base and should be used to ensure correct drilling of the mounting holes and positioning of the MOX Open Controller.

The enclosure may also contain an AC power supply, expansion MOX 603 I/O modules, terminal strips, circuit breakers and other equipment required in the installation. All items should be appropriately mounted and spaced to ensure good ventilation.

The diagram below provides a typical layout for a MOX Open Controller enclosure.

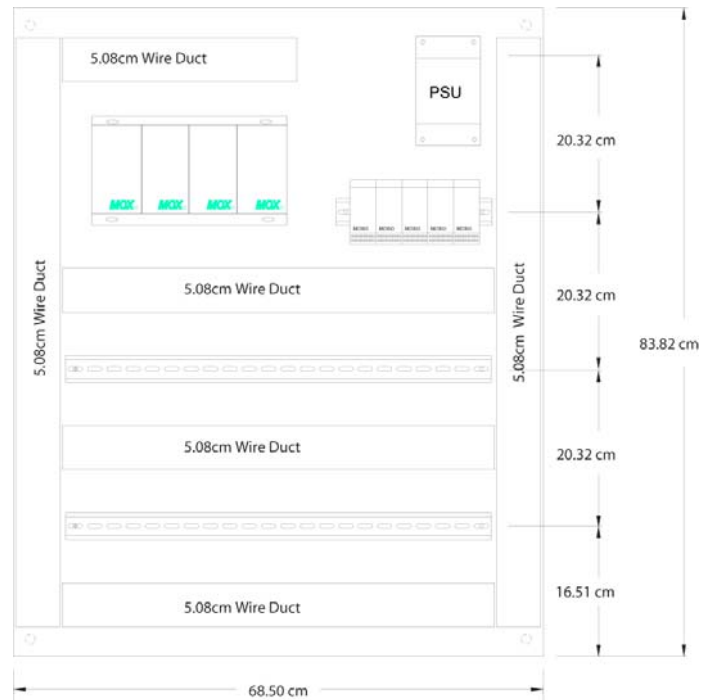


Figure 17 Sample Panel Layout For a 36" x 30" Enclosure

3.3.1 Installing Four Slot Base

The four slot base should be installed onto a solid framework or back plate. Generally, the system will be installed into an electrical cabinet or enclosure. To install the four slot base

- Use the Base as an initial template to gauge distances and correct positioning. All four screw holes should be utilised to ensure a solid installation
- Ensure hole centres are drilled correctly as per the dimensions provided below



Remember when tapping screw threads the drill size must be smaller than the required thread depth.

- Mount the four slot base and ensure all mounting screws are firmly seated
- Install each module in turn ensuring both top and bottom screws of the module are firmly seated



Ensure the module guide holes are positioned at the top of the base when mounting

3.3.2 Installing Open Controller Modules

Only after successful mounting of the base should the installation of the modules be attempted. This will ensure there is no interference with the modules when attempting to mount the base.



If you have mounted the base with the alignment holes located at the bottom of the base the Open Controller will be upside down. Please correct this before proceeding.

To mount a module to the Open Controller base, please follow the steps below:

- 1) Ensure that the alignment pin matches the alignment hole in the base.
- 2) Place the module into its slot position loosely. Do not attempt to force the module into place at this stage.
- 3) Ensure that the module is positioned correctly before proceeding.
- 4) Start to insert the module into the base socket.



If at any stage the module becomes difficult to insert, stop, remove it and check the connector pins to ensure they are all aligned.

- 5) Once the back of the module is flush against the base, screw in the top and bottom screws.

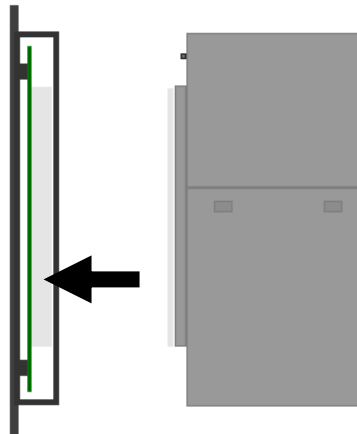


Figure 18 MOX OC Module Installation Recommendations

3.3.3 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.

- Provide adequate spacing of components within an enclosure. This 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 system.
- Recommended DIN rail spacing is 200mm. This spacing allows room for wire duct to be installed without obstructing field wiring installation.
- 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.

3.3.4 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 System. Be sure that debris (metal chips, wire strands, etc.) does not fall into the MOX System. 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.

3.3.5 Power Isolation

When removing power, interruption of the DC side of the power supply rather than the AC line side is a better option as it avoids the additional discharge delay of the power supply.

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

3.3.6 Terminal Connector

Ensure all power including the MOX system unit supply and field I/O supply is removed from the connector before removing or inserting the terminal connector. When you remove or insert the connector 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

3.3.7 Grounding Considerations

In solid-state control systems, grounding helps limit the effects of noise due to electromagnetic interference (EMI). 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 system also assists in shielding the circuitry.

For the Power module MX601-5101, please make sure that the Shield pin is connected to ground.

3.4 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 aluminium conduit in non-critical areas.
- Use plastic connectors to couple between aluminium 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.



It is highly recommended to adopt the STP cat5 for Ethernet RJ45 port.

4 Simple System Configuration

4.1 MoxIDE Settings

All MOX Open Controller modules are supplied with one RJ45 Ethernet port. IP communication parameters are assigned in the MoxIDE software.

Within MoxIDE select **Tools | IPConfig** to open the IP configuration application, please refer to the figure below.



Before proceeding ensure that the Open Controller Ethernet port is connected to the communication network. Also ensure that the connected PC has the ability to access subnet "192.168.1.xxx".

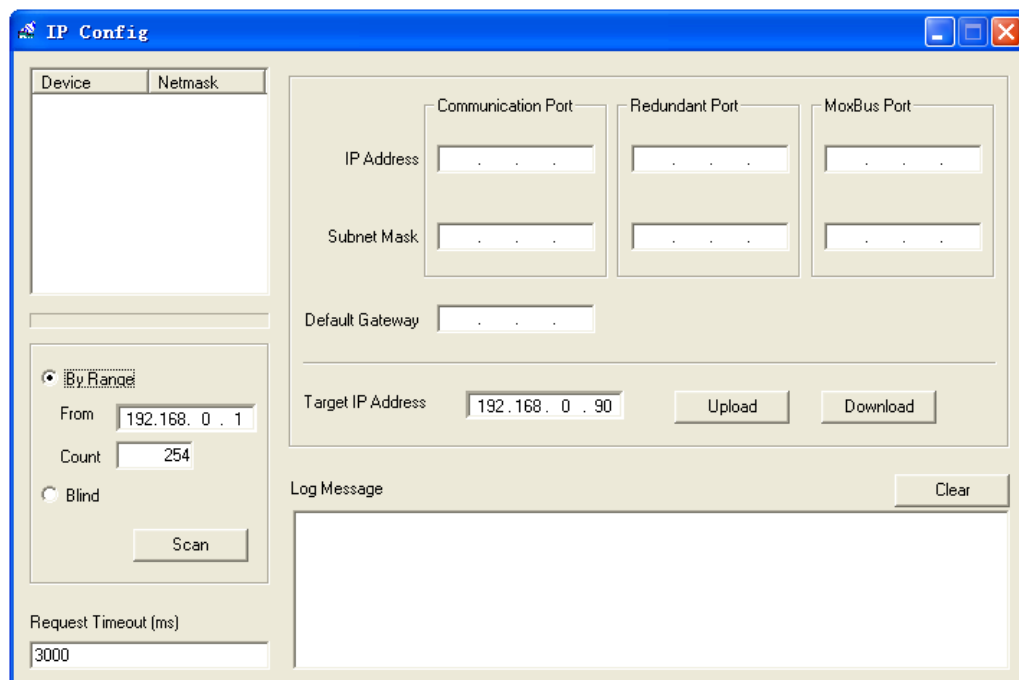


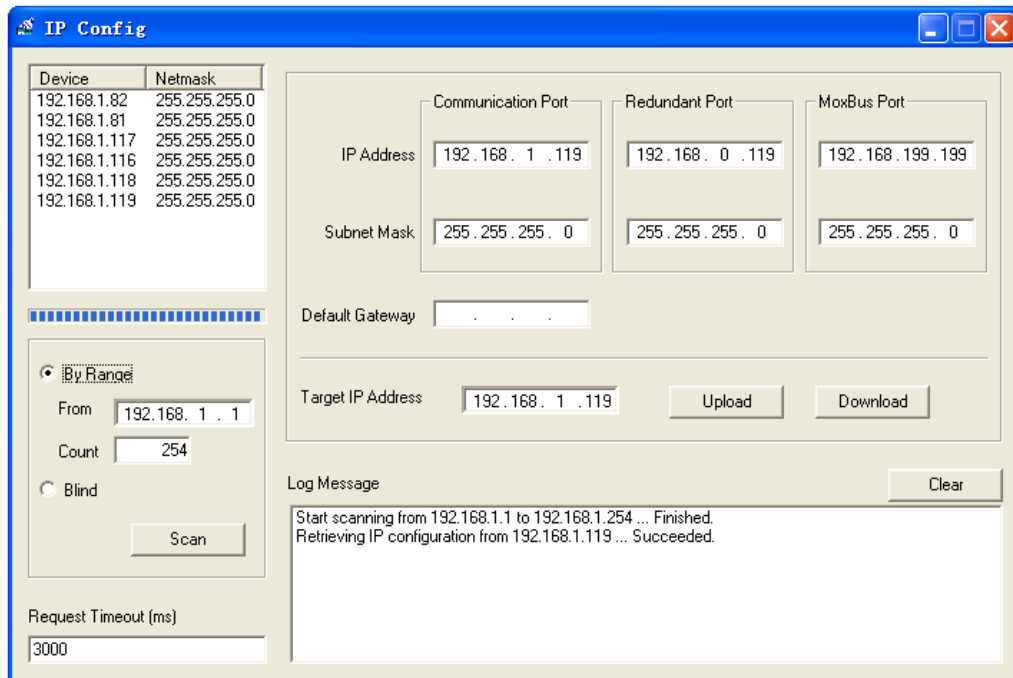
Figure 19 IP Configuration Application

If you are unsure what the current IP address of the controller is, you can scan all connected MOX OC using this tool. There are two ways to scan connected devices, **By Range** and **Blind**.

By Range: The "From" field specifies the sub network and the starting host. The "Count" field specifies the scanning range. For example, fill the "From" field with "192.168.1.1" and "Count" field with "254", then click the "Scan" button to scan the host from 192.168.1.1 to 192.168.1.254. If any OC is detected, its IP address will be displayed in the list window at the upper left corner.

Blind: Select “Blind” and click the “Scan” button. With Blind scan, IPConfig has the ability to detect all physically connected OCs.

If you know the IP address, simply type it into the “Target IP Address” field or double click a detected controller. Click the “Upload” button and the controller’s communication ports information will be shown.



The screenshot shows the IP Config application window. On the left, there is a table of detected devices:

Device	Netmask
192.168.1.82	255.255.255.0
192.168.1.81	255.255.255.0
192.168.1.117	255.255.255.0
192.168.1.116	255.255.255.0
192.168.1.118	255.255.255.0
192.168.1.119	255.255.255.0

Below the table, there are radio buttons for "By Range" (selected) and "Blind". The "By Range" section has fields for "From" (192.168.1.1) and "Count" (254). The "Blind" section has a "Scan" button. At the bottom left, there is a "Request Timeout (ms)" field set to 3000.

The main configuration area on the right has three columns for "Communication Port", "Redundant Port", and "MoxBus Port". Each column has fields for "IP Address" and "Subnet Mask". The "Communication Port" fields are set to 192.168.1.119 and 255.255.255.0. The "Redundant Port" fields are set to 192.168.0.119 and 255.255.255.0. The "MoxBus Port" fields are set to 192.168.199.199 and 255.255.255.0. There is also a "Default Gateway" field.

At the bottom right, there is a "Target IP Address" field set to 192.168.1.119, with "Upload" and "Download" buttons. Below this is a "Log Message" section with a "Clear" button. The log message reads: "Start scanning from 192.168.1.1 to 192.168.1.254 ... Finished. Retrieving IP configuration from 192.168.1.119 ... Succeeded."

Figure 20 IP Configuration Application with Uploaded Information

The **Communication Port** is the Ethernet port of the controller. To change its IP address, modify the IP information found within the **Communications Port** box.

The **Redundant Port** is the SC pair Fiber port on the CPU module. It is recommended that the network identifier field of Redundant Port IP address be identical to that of Communication Port.

The **MoxBUS Port** is located on the MoxBUS Interface module. The MoxBUS Port IP address subnet must be set identical to the connected CP module’s IP address subnet. The factory default is 192.168.199.199.

The subnet of IP address of these three ports must be different. It is highly recommended to keep the subnet of the Communication Port and the Redundant Port, and the complete IP address of the MoxBUS Port as factory default. If alteration of the IP address is required, ensure that a valid IP address is allocated. Allocating an illegal IP address, e.g. 192.168.0.0, will result in an error message.

After successful downloading of the new IP address by clicking “Download” button, performing a full reboot of the MOX Open Controller is required before the new IP address takes effect. The timeout length may need to be altered depending on the size of the connected network architecture.

4.2 MoxGRAF Settings

The MoxGRAF software is used to create program code for MOX Controllers. Open MoxGRAF and create a new project for the connected MOX Open Controller.

Select **File | New** from within the MoxGRAF Projects 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 **MoxStandardPrj** 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.

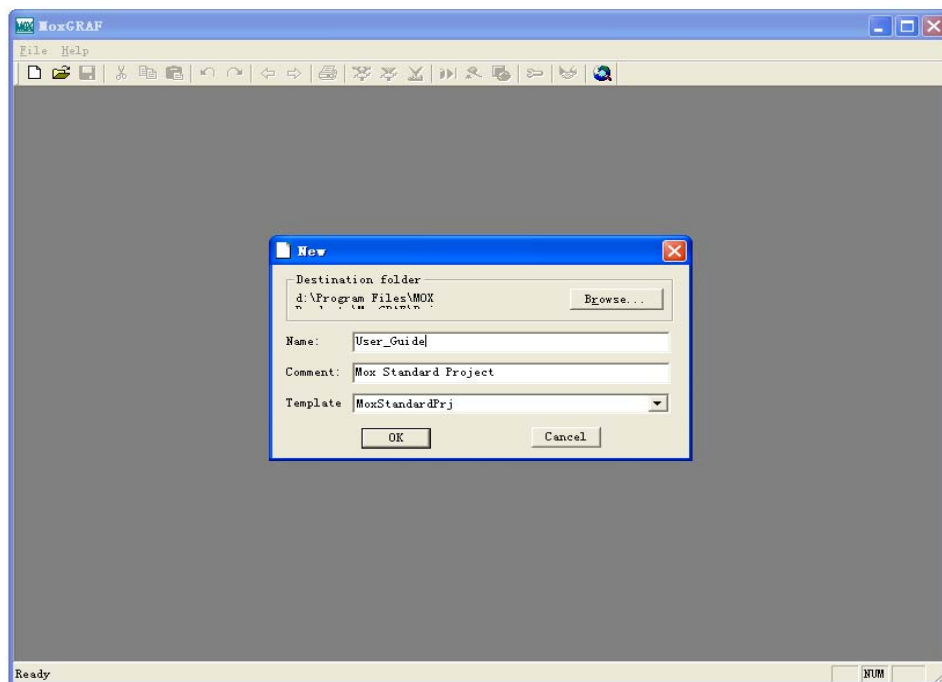


Figure 21 MoxGRAF Project Creation Screen

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

4.3 MOX Open Controller Communication Protocols

The MOX Open Controller supports two communications protocols from a HMI:

- MODBUS TCP/IP - common industry communications protocol
- MoxDRV (Ethernet) - MOX proprietary communications protocol

For configuration information of these two protocols, please refer to the MODBUS Configuration Guide and the MOX Driver Configuration Guide for different drivers of HMI.

5 MOX Open Controller Redundancy

5.1 How MOX Open Controller Redundancy Works

5.1.1 Definitions

- Primary controller - the controller is configured for primary control
- Standby controller - the controller is configured for standby control
- Active state - the controller has control of the system, not necessarily the primary controller
- Inactive state - the controller is waiting to take control of the system, whilst being continually updated with variable information

5.1.2 Controller Operation

A redundant MOX OC system comprises of a primary and a standby controller. Both controllers are interconnected for synchronisation communications. The controller in the inactive state will not operate control code; however variable values are continually synchronized with the *active state* controller, performed on each scan of the *active state* controller.

When both controllers are powered on simultaneously, the primary controller will take control of the system by entering the active state, unless there is a fault with it or its connected I/O network.

If communications with the monitoring HMI are lost with controller in the active state, read and write operations on variables can be performed *via* the controller in the inactive state.

LED Description	Controller State
RUN LED ON, ACT LED ON	Active state controller
RUN LED ON, ACT LED OFF	Inactive state controller

When the *active state* controller fails, e.g. power failure or CPU failure, the *inactive state* controller will take control of the system. The new active controller will also display that it is missing its redundant partner. When the failed controller is repaired and returned to operational state it will remain in the inactive state until it is required to take control.

LED Description	Controller State
RUN LED ON, ACT LED Flashing	Active state controller, and redundant partner is lost

5.1.3 Full-scale Redundancy

The MOX redundant system provides redundancy at all levels:

Items	Redundant	Note
Power	Yes	Separate 24VDC supplies are recommended for the primary and standby CPU's for robust redundancy
CPU	Yes	Redundant controllers running in active and inactive states
Data Highway	Yes	Ethernet TCP/IP
I/O Module Communications	Yes	MOX 603 I/O
I/O Field Connection	Yes	MOX 603 I/O
I/O Module Power	Yes	MOX 603 I/O

Table 22 MOX Controller Redundancy Levels

5.2 Redundancy Configuration using MoxGRAF

The primary and standby controllers must be configured when programming. In the **Link Architecture**, right click on the top of the **Resource1 (*Resource Number 1*)** window and select **Properties**.

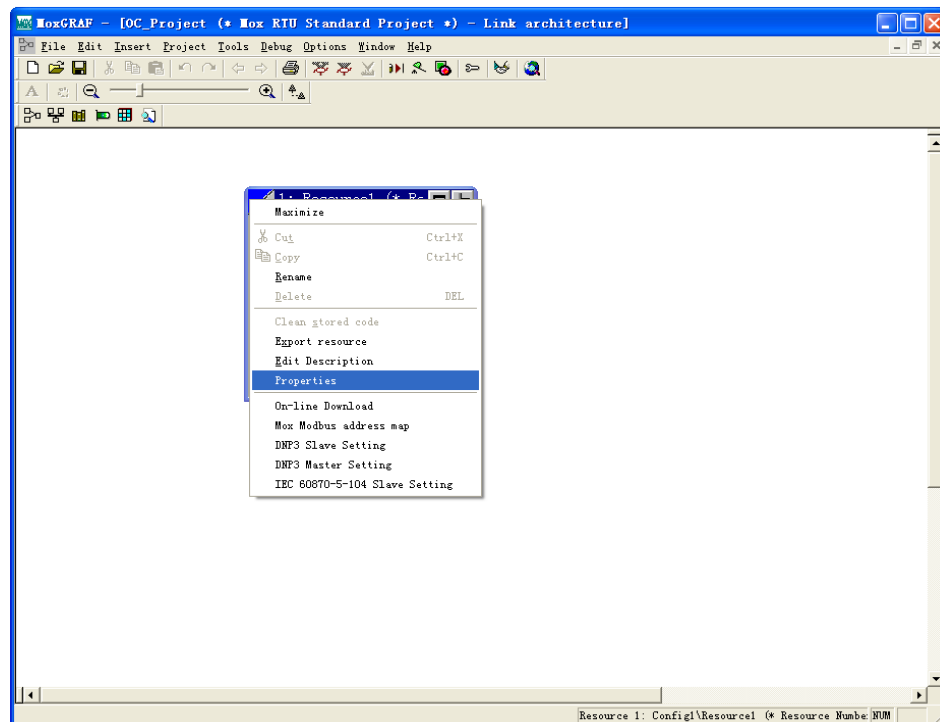


Figure 22 Resource1 Properties

Set the **Redundancy Value** to "1" to enable redundancy function. Set the **Primary Addr** and **Standby Addr** to the IP address of the desired controller's redundant port. Select **Apply** and exit the **Resource Properties** window.

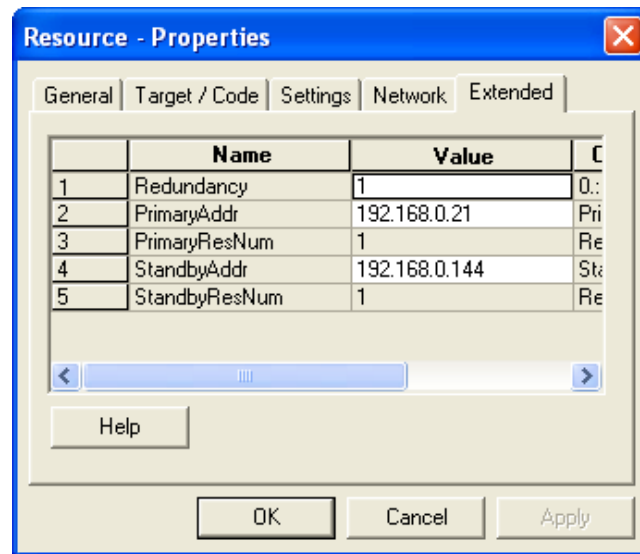


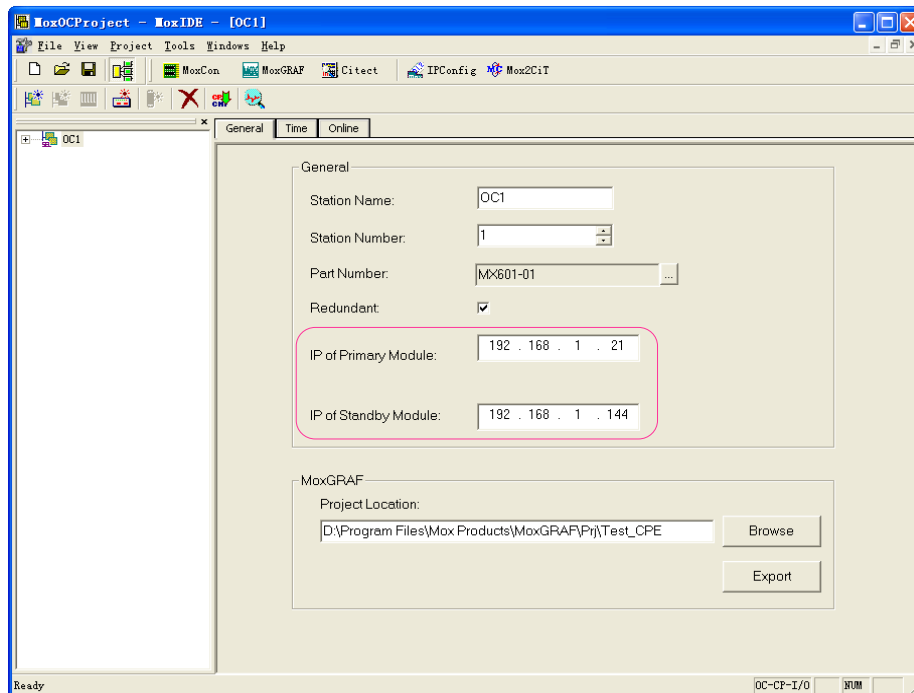
Figure 23 Resource Properties

Downloading the program is required to be performed only on the active controller, as active controller will seek out the inactive partner and download the program to it.

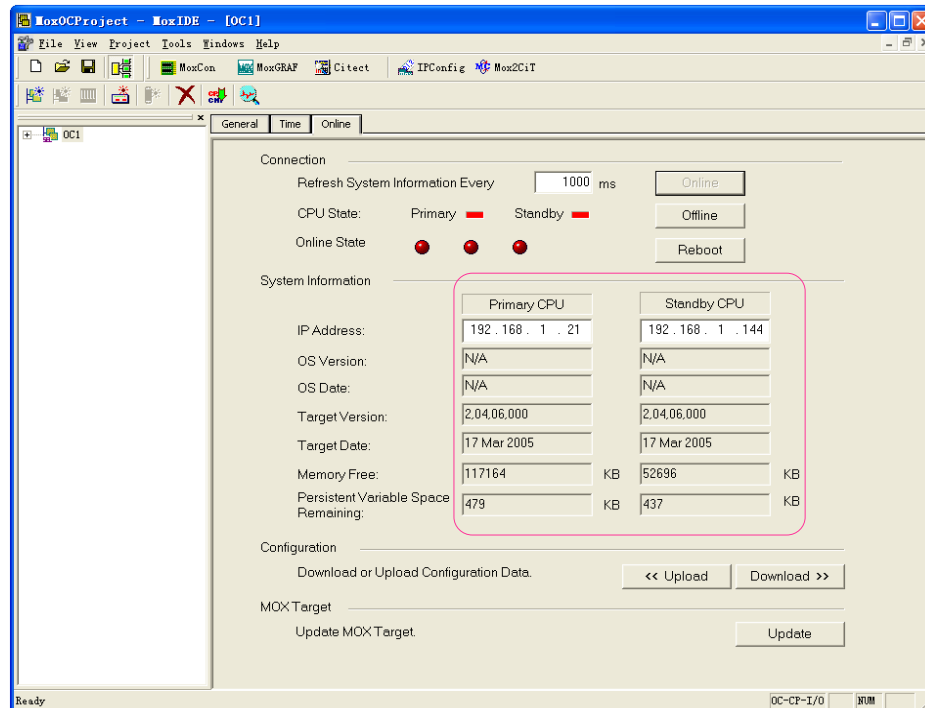
5.3 Redundant System Information

To check redundant system information, please follow the instructions below:

Open MoxIDE, Under a MOX OC Project, check the “Redundancy” box within “General” page and input IP address of primary and standby modules.



Select the “Online” tab and click the “Online” button in this interface and the system information of primary and standby CPUs will be shown.



Within this page, when you upload and download configuration data by clicking “Upload” and “Download” buttons, the action only takes effect on the Primary CPU.

6 SOE Synchronization

Time synchronization is a key function for SOE, which includes: when a MOX OC synchronizes a SOE module, when a MOX OC synchronizes another MOX OC and when a MOX OC is synchronized by an NTP server.

A MOX OC can synchronize all SOE modules slaved by this OC. It can also synchronize other OCs and SOE modules slaved by them. The synchronization is controlled by the MoxGRAF device "MX603_8SOE_TS". The user program sets the synchronization parameters and command with the channel of this device. There is only one "MX603_8SOE_TS" module in a MoxGRAF project.

A MOX OC can work in one of the following three modes:

- 1) Local Mode
- 2) Network Slave Mode
- 3) Network Master Mode

When a MOX OC works in local mode, it sends a synchronization signal to the SOE modules via a SOE synchronization line and sends the time stamp to the SOE module via the communication line.

When a MOX OC works in network master mode, it sends a synchronization signal to the SOE modules via the SOE synchronization line and to other OCs via the OC synchronization line. At the same time, it sends the time stamp to the SOE module and other OCs via communication.

When a MOX OC works in network slave mode, if it gets a synchronization signal from the OC sync line and it will relay the signal to the SOE modules via the SOE synchronization line. After it gets a synchronization time stamp from the network, it will also forward the time stamp to the SOE modules.

The following wiring diagram is an example where SOE synchronization is required among several OC systems.

- OC11, OC12 and SOE11 are in one system
- OC2, SOE21 and SOE22 are in another system
- OC3 and SOE31 are in another system

The synchronization master OC is used as a time reference. Connected OCs and SOE modules receive their system time from this master OC. Every OC can be set as synchronization master to its connected SOE modules, however only one OC can be set as the synchronization master for the overall system.

As shown below, the synchronization master OC11 sends a synchronization signal to SOE modules via the "Sync1" line and to other OCs via the OC synchronization line "Sync2". At the same time, it sends a time stamp to other OCs via the communication line and SOE modules slaved by them.

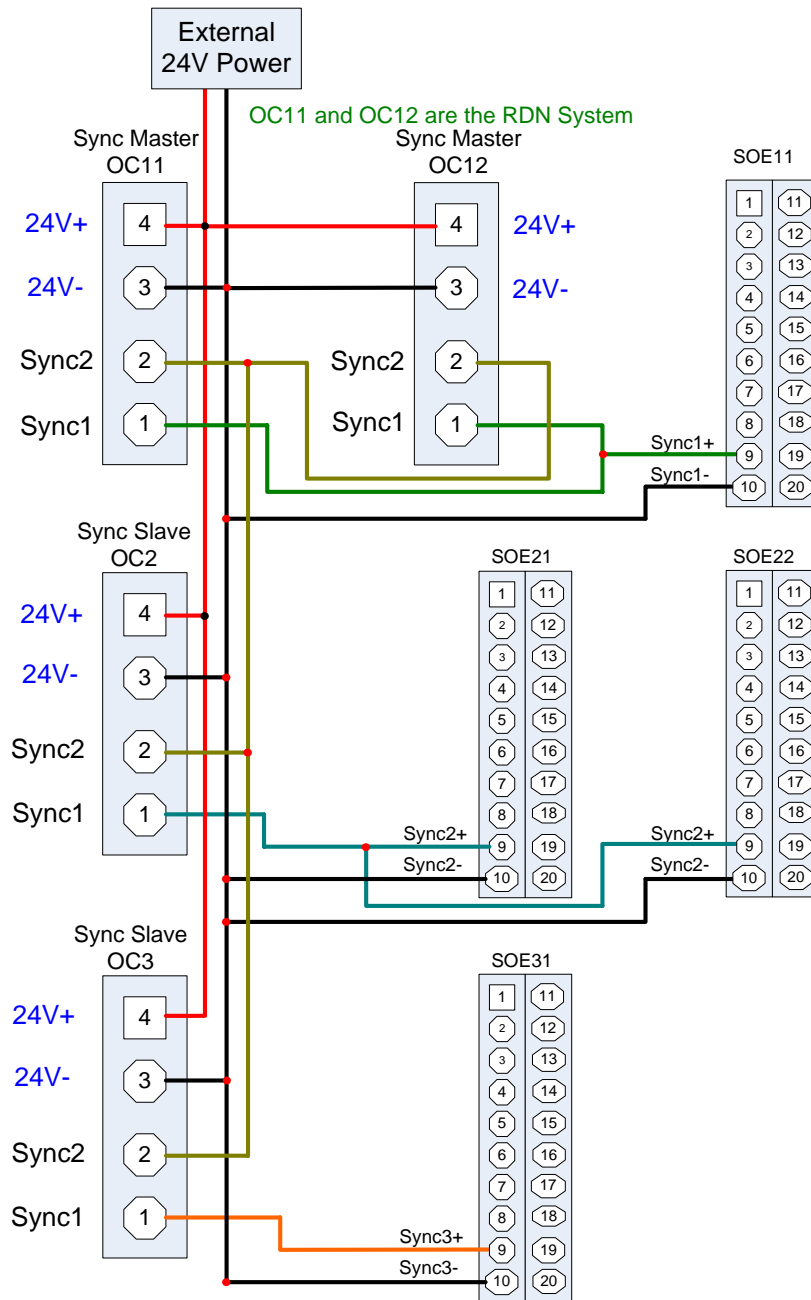


Figure 24 Example OC & SOE Synchronization Wiring

To add a device “MX_603_8SOE_TS” in MoxGRAF, refer to the following figure:

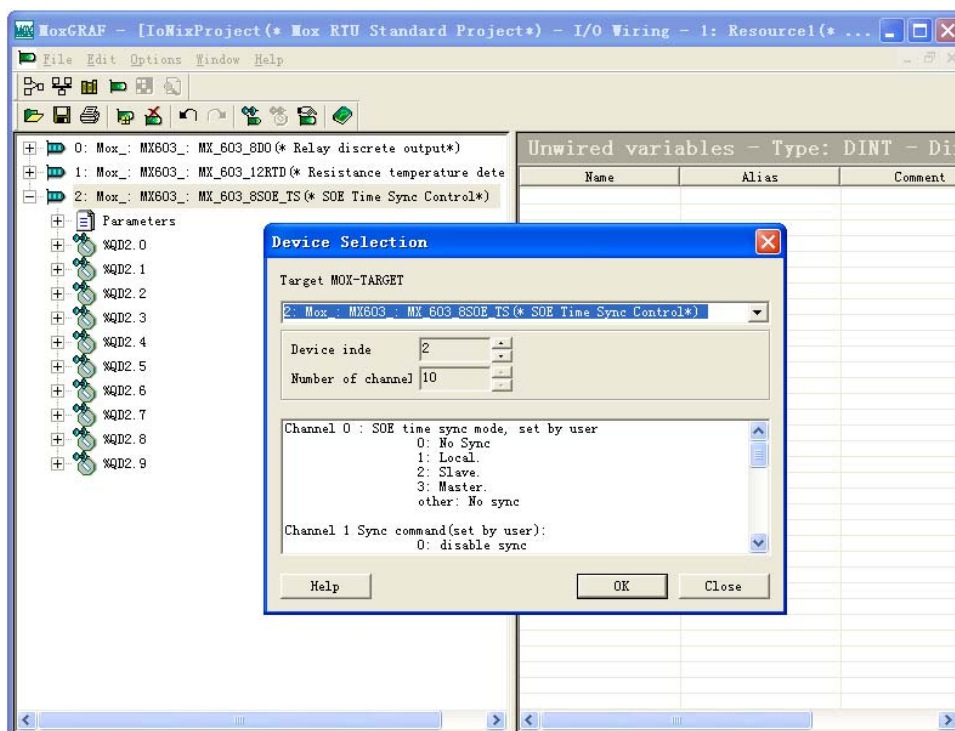


Figure 25 Device MX_603_8SOE_TS in MoxGRAF

Definitions for each channel of the device “MX603_8SOE_TS” are as follows:

Channel	Description	Value
Channel 0	SOE time sync mode	Set by user: 0: No Sync 1: Local 2: Slave 3: Master Other: No sync
Channel 1	Sync command, set by user	0: disable sync 1: Sync cyclic 2: Trigger a sync Other: No sync
Channel 2	Sync master ID	Set by user
Channel 3	Cycle (in seconds)	Min = 15; Default = 15
Channel 4	Timeout (in seconds)	Must be 3 seconds greater than Cycle
Channel 5	Synchronization Count	Set by driver
Channel 6	Last Sync master ID	Set by driver
Channel 7	Last time	Last synchronization time, seconds from 01/01/1970, set by driver
Channel 8	Lastms	Last synchronization time, ms, set by driver
Channel 9	Reserved	

Table 23 Channel Definition for Device MX_603_8SOE_TS

For more detailed operation information about MoxGRAF, please refer to the *MoxGRAF User Guide*.

7 Typical System

7.1 MOX Open Controller to MOX 603 I/O Modules

7.1.1 Cable Considerations

The MOX Open Controller communicates with connected I/O modules via the Interface module. The interface module comes in many different configurations and depends on the specific requirements of the application. Below is a table of Interface modules and the respective Communications Processors that they communicate to:

MOX Open Controller Interface Module	Communications Processors		Connection Method
MoxBUS (MX601-5201)	MOX 603 CPE	MX603-3011	MoxBUS SMA Cable
		MX603-3012	
		MX603-3013	
		MX603-3014	
PROFIBUS DP (MX601-5202)	MOX 603 CPP	MX603-3020	PROFIBUS DP Cable
MoxNET (MX601-5207)	MOX 603 CPE	MX603-3010	STP Cable with RJ45
MoxNET (MX601-5208)	MOX 603 CPE	MX603-3010	STP Cable with RJ45 MoxBUS Fibre Cable
		MX603-3012	
		MX603-3013	

Table 24 MOX Open Controller I/O Interface and Respective CP

The following table gives details about related cables and connectors:

Cables and Connectors	Description	Part Number
MoxBUS 1m Drop Cable	1m Drop Cable with SMA connectors	MX603-00-13003
MoxBUS 5m Drop Cable	5m Drop Cable with SMA connectors	MX603-00-13004
MoxBUS T-Connector	Tap Connector for connecting Drop Cable to Trunk Cable (KJK)	MX603-00-13039
MoxBUS T-Connector	Tap Connector for connecting Drop Cable to Trunk Cable (JKK)	MX603-00-13042
MoxBUS Terminator	50 ohm Terminator for MoxBUS Cabling	MX603-00-13043
Ethernet 1m STP Patch Lead	1m IEEE 802.3 STP Patch cable with RJ45 Connectors	MX603-00-13020
Ethernet 3m STP Patch Lead	3m IEEE 802.3 STP Patch cable with RJ45 Connectors	MX603-00-13021
Ethernet 5m STP Patch Lead	5m IEEE 802.3 STP Patch cable with RJ45 Connectors	MX603-00-13022
Optical Cable Kit 1m	2x 1m Optical Link Cables with SC Connectors	MX603-00-13050
Optical Cable Kit 5m	2x 5m Optical Link Cables with SC Connectors	MX603-00-13051
PROFIBUS DP Angled Connector up to 12Mbps	Integrated Termination Resistor, Spring Cage Connector	MX603-00-16506

Table 25 MOX Open Controller Related Cables and Connectors

7.1.2 MoxIDE Settings

Up to 12 racks of MOX 603 I/O may be connected to one MoxBUS Interface Module. Each rack may contain up to 10 MOX 603 I/O Modules.



Ensure the MOX Open Controller's MoxBUS IP address is in the same subnet as the connected MOX CP modules before continuing. Please refer to the MOX 603 CP User Guide for its factory default IP address.

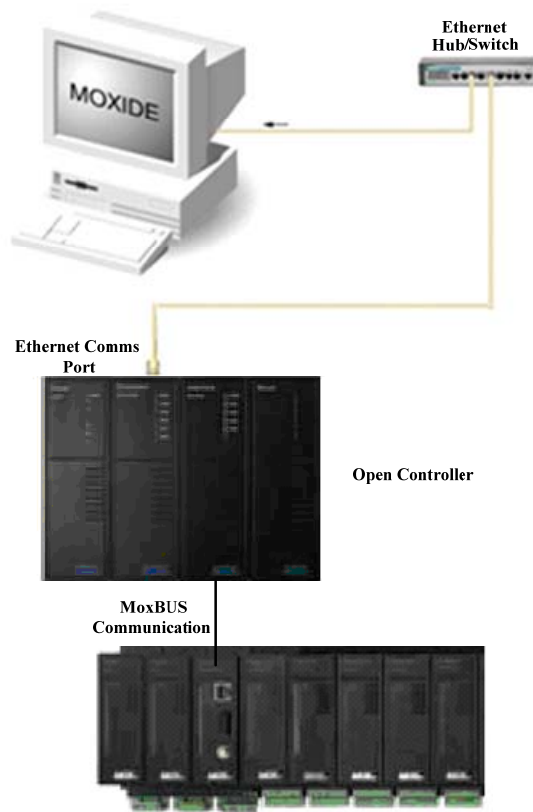


Figure 26 Example MOX OC to CP & I/O Network

To change the IP address of the MoxBUS port, please refer to 4.1. It is strongly recommended that default IP address of MoxBUS port **NOT** be changed.

MoxIDE is required when configuring a communication network consisting of MOX 603 CP and I/O modules. MoxCON is used for configuring systems consisting of MOX 603 CPP and I/O.

There are two methods of configuring your network architecture within MoxIDE:

- 1) Connect your network hardware. Use MoxIDE to scan the network architecture for an automatic software configuration.
- 2) Create an empty configuration in MoxIDE and then add corresponding devices manually.

To scan your physically connected network, select the controller displayed in the network tree. Select **Project | Scan Device** to start the scan process. A window will be displayed similar to the figure shown below requesting the range of connected MOX CP modules.

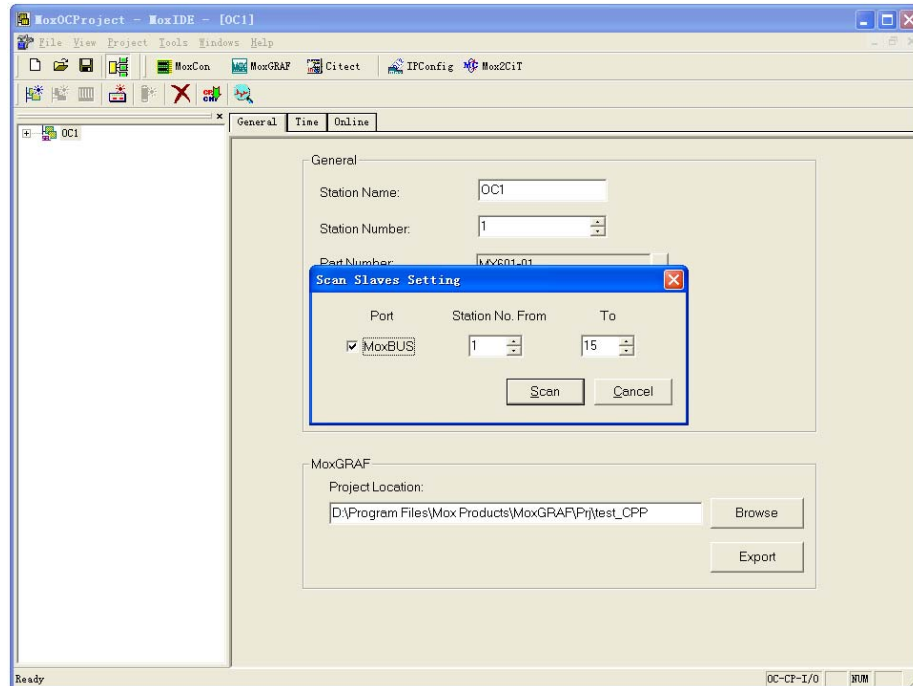


Figure 27 Scan Slave Range

The scan function will scan all connected CP modules in the user defined range. The maximum number of CPs is 15. Once all connected CP modules are identified, the scan function will then scan all I/O modules connected to each identified CP.

When the scan function has finished, a prompt will appear querying if you wish to upload all found modules and their information to the network tree. Select "Accept" if you want the information uploaded otherwise select "Cancel".

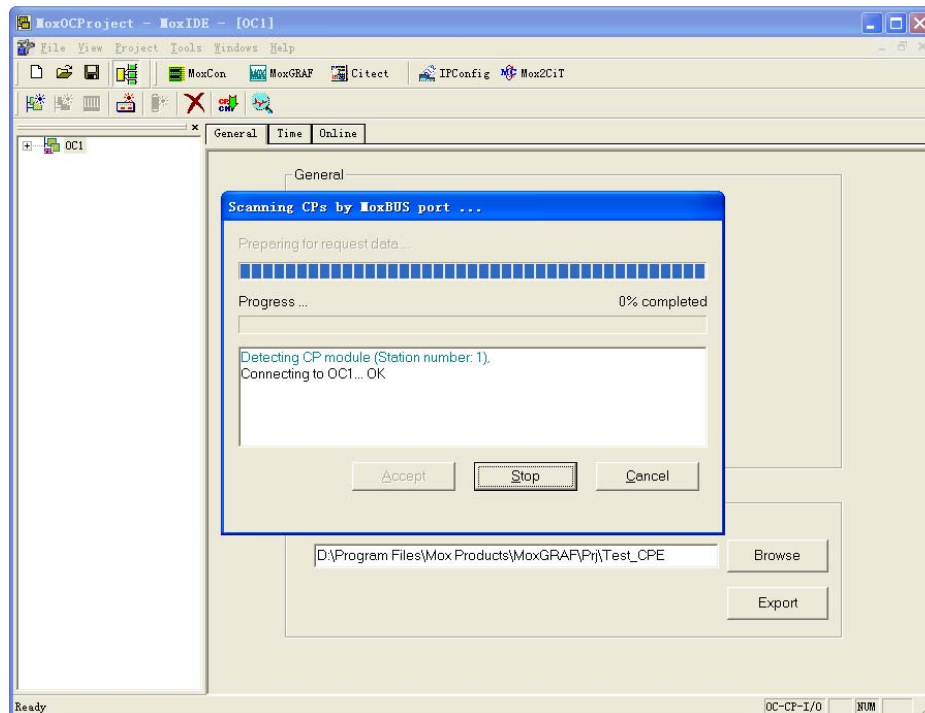


Figure 28 Uploading MOX CP and MOX IO modules

If at any time the network architecture changes, simply use the scan function again to upload the new configuration.

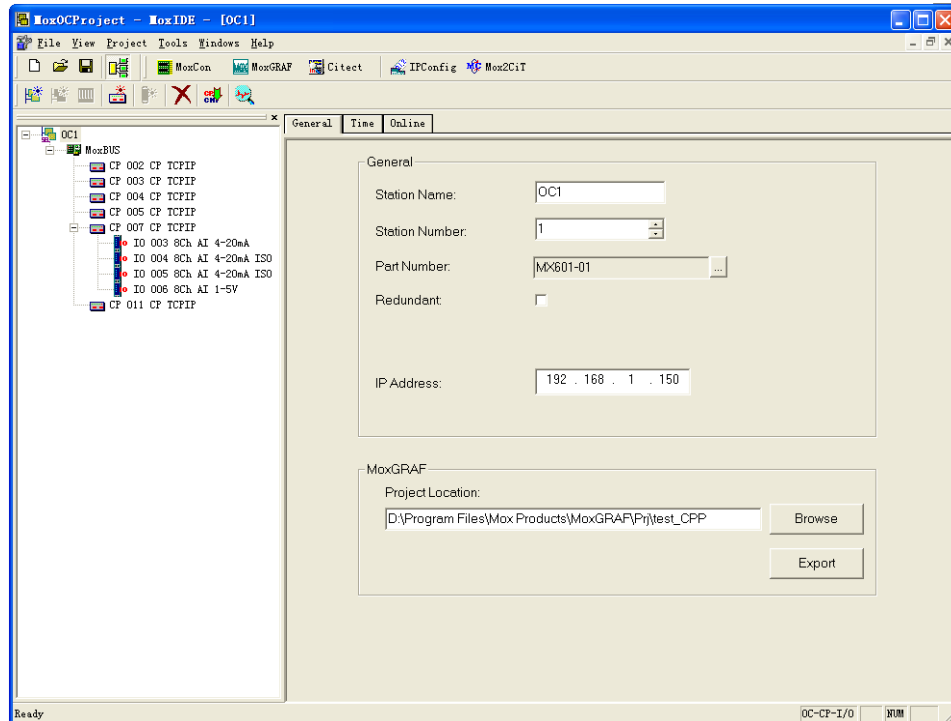


Figure 29 **Uploaded Network Tree**

Once the required architecture is reached and all physically connected MOX I/O and CP modules have been recognized and uploaded into the network tree, make sure that each individual MOX I/O module is configured to meet its operational requirements. For more information about configuring I/O modules, please refer to the MOX 603 Rack Base I/O User Guide.

The next step is to download all the I/O rack network information to the connected CPs. Select the desired CP then the “Configuration” Tab and click the “Download Enable CPCONFG” button to download the CP CONfiguration File (CPCONF).

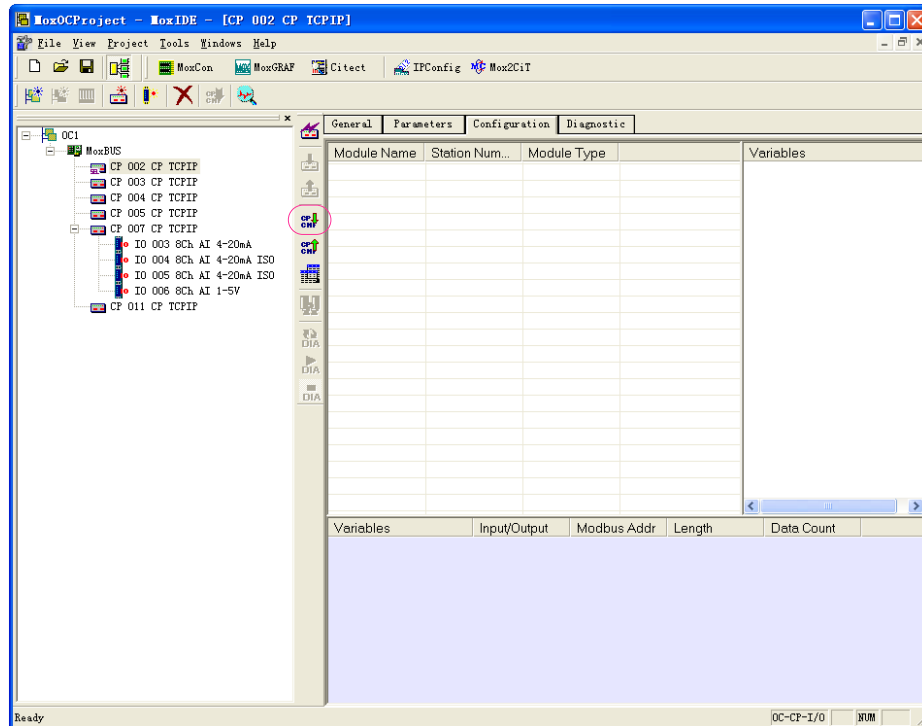


Figure 30 Download and Enable CPMCONF

Once all connected CP modules have their CPMCONF downloaded, the network architecture can be exported into MoxGRAF. Select OC and under the “General” Tab there is a section dedicated to MoxGRAF. Select the “Browse” button and search for the *.mdb file of the MoxGRAF program that you have previously created. This is typically located in "C:\Program Files\MOX Products\MoxGRAF\Prj\".

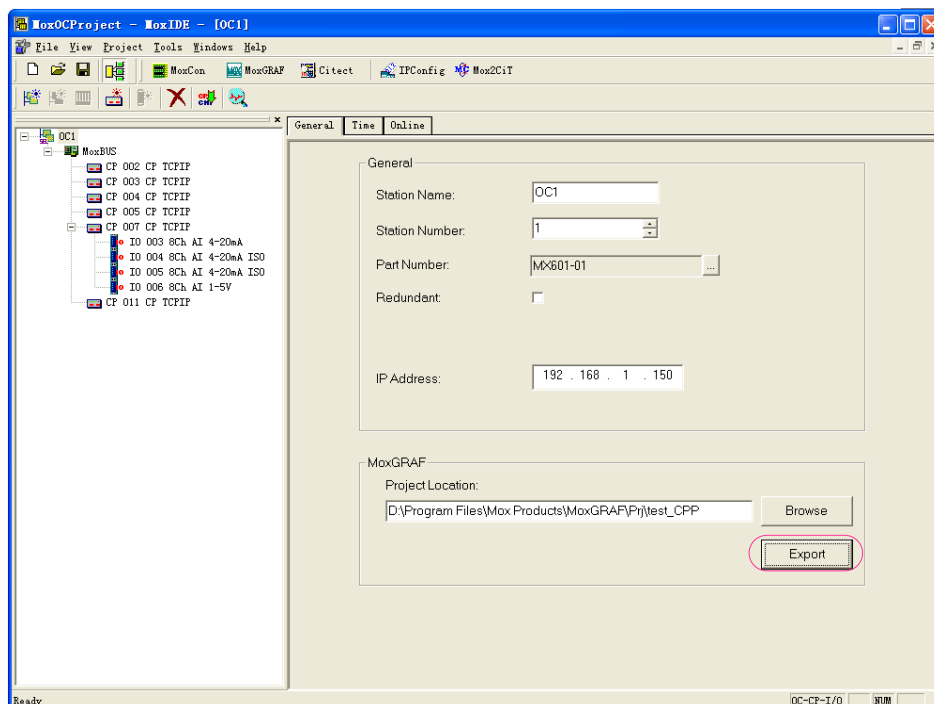


Figure 31 MoxIDE to MoxGRAF Link

Once the filename of the MoxGRAF project is opened, click on the “Export” button to start the exporting process.

7.1.3 MoxGRAF Settings

Open the MoxGRAF Project and open the **I/O Wiring** page to view the newly imported device software card drivers. Expand the network tree of each module and connect all variables to their required device channels and compile and download the program to the MOX Open Controller.

7.2 MOX OC to HMI Communications

The MOX Open Controller has the ability to communicate with higher-level HMI (Human Machine Interface) software packages. There are numerous HMI software packages widely used for Supervisory Control and Data Acquisition (SCADA) of industrial processes. These SCADA packages enable the user to visualize graphically what the process controller (MOX OC) is controlling and its current operational state. This includes the ability to read and write data to and from the MOX OC in real time.

The preference over one HMI for another is purely dependent on the user. The MOX OC can be used in conjunction with any HMI that supports the required communication protocols:

- MODBUS TCP/IP - common industry communications protocol
- MoxDRV (TCP/IP protocol) - MOX proprietary protocol

Appendix A Updating the Target

As the MOX OC's onboard Operating System (OS) is updated with bug corrections or extended functionality, new "target" (OS) updates become available. The following chapter details the procedure required to perform the update to your MOX OC.

- 1) In your MoxIDE project select the MOX OC in the network tree.

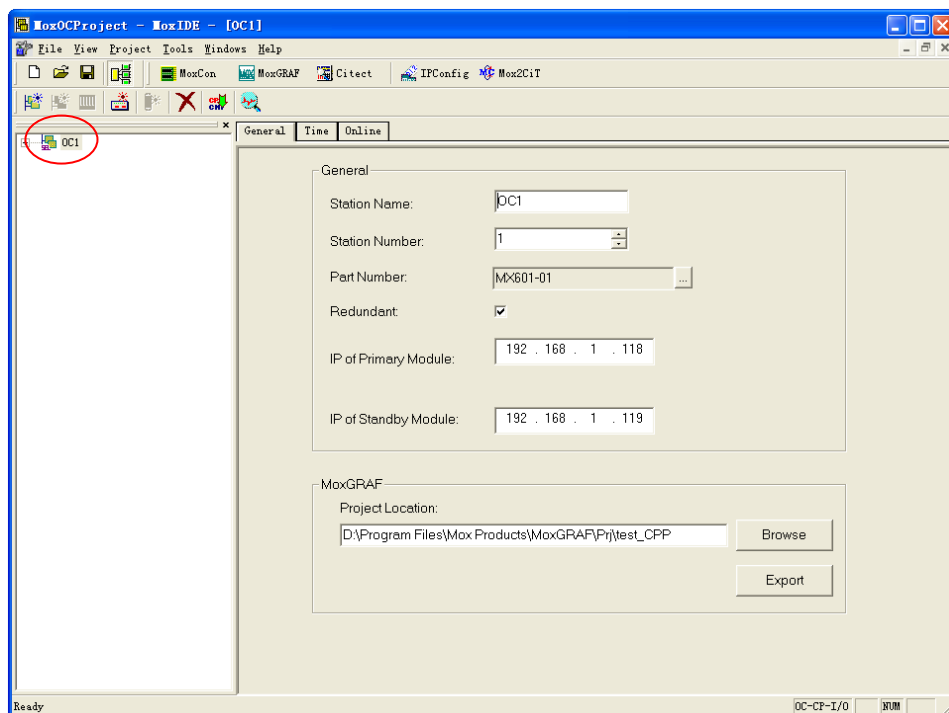


Figure 32 MOX OC Selection

- 2) Select the **General Tab**. This page will display the OC's properties, including station information, as shown in the above figure.
- 3) Select the **Online Tab**; this will display a window similar to the following.

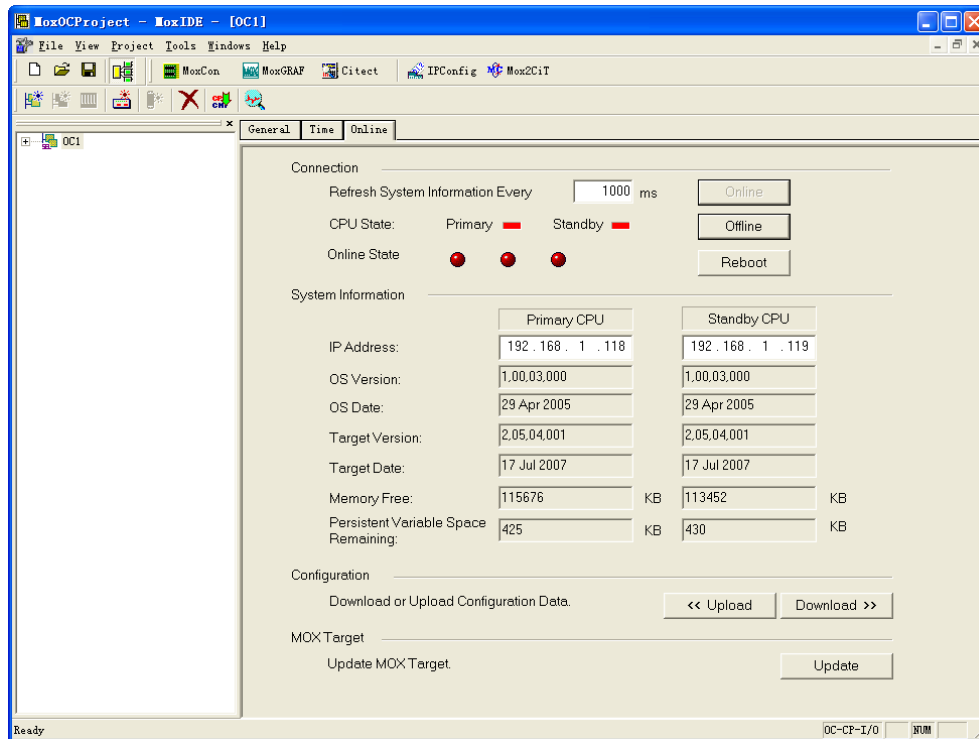


Figure 33 MOX OC Online Information

- 4) Select the **“Online”** button, this will connect to the MOX OC and read all of its target information and display it to the screen.
- 5) Select the **“Update”** button; this will display a window similar to the following.

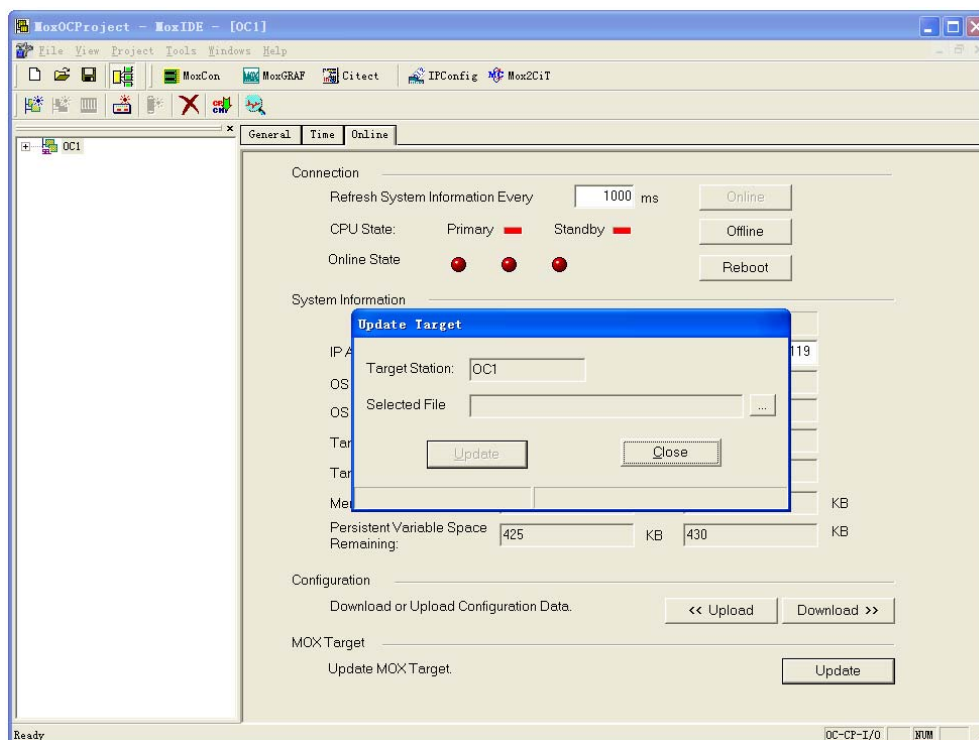


Figure 34 Opening the Update Target File

- 6) Click the browse button at the right end of the **Selected File** item. This will open a window that will allow you to search for the required file.



Different modules of the MOX OC have different Operating Systems, be sure that the update file that you are selecting to use matches the Operating System that is currently active on your MOX OC.

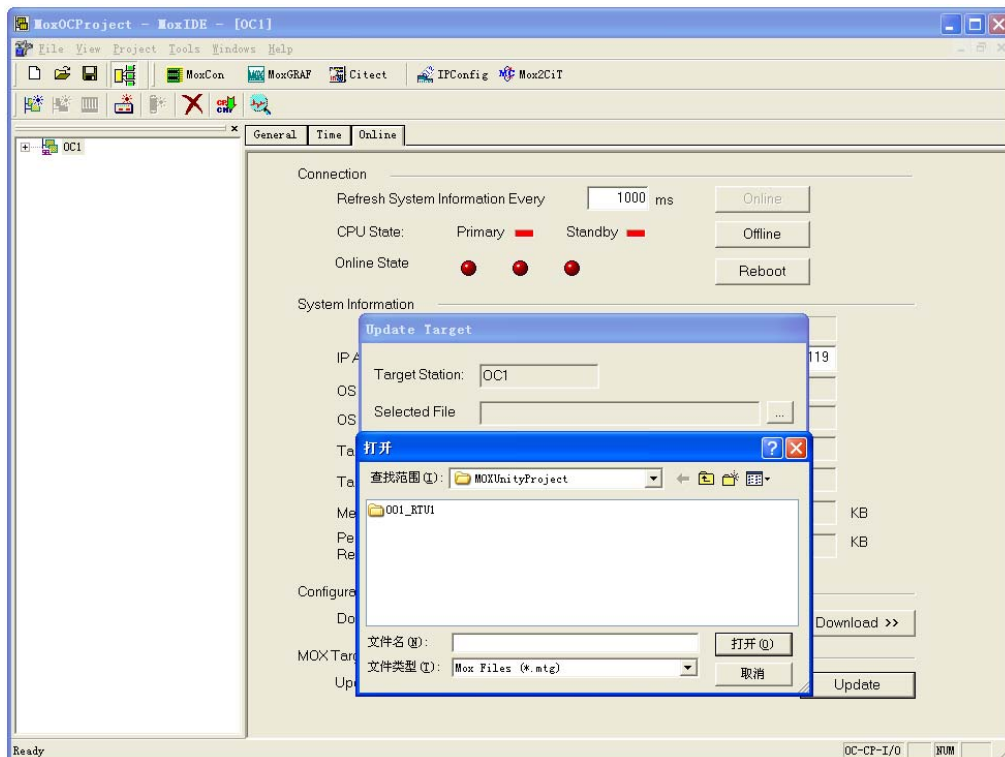


Figure 35 Selecting Update Target File

- 7) Select the desired file, ensuring that it is the correct target update for the MOX OC and select **“Open”** to return to the previous window.
- 8) The **“Update”** button will now be useable. Select the **“Update”** button and wait until conformation that the MOX OC target has been updated.

The update tool will not reboot the MOX OC so you will have to perform a hardware reboot. This is done by removing the power to the MX- PWDC module and waiting until it comes back online before any operations can be performed.

Appendix B 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 authorisation. The purchaser will prepay all freight charges to return any products with a valid return authorisation 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.

Warranty will be void if case is opened without manufacturer's consent.

Contact Details

To obtain support for MOX products, call MOX Group on the following numbers 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 authorised 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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