Technical Overview

MOX OPEN CONTROLLER

MOX

Contents

Features

The MOX Open Controller system is the high end of the MOX Products' range and has been designed with open standards in mind. Communications to plant and field I/O as well as to the SCADA/HMI system is available through Ethernet TCP/IP as well as many of the leading fieldbus offerings.

Reliability of the installation is ensured with MOX Open Controller providing full system redundancy with changeover occurring inside one scan of the processor.

Powered by a AMD 500 MHz processor, the MOX Open Controller can process applications more efficiently than a typical PLC or DCS system, while simultaneously performing I/O scans, solving logic, maintaining peer-to-peer and peer-to-host communications and synchronising primary and back-up controllers.

The MOX system supports MOX 603 Modular I/O as standard in either Stand Alone mode or Rack Configuration mode. The inherent scalability of an integrated MOX Open Controller solution, ensures performance is maintained from a system as small as one I/O block to as large as thousands of I/O, without the need to change the system architecture.

With MoxGRAF, application debugging does not require the developer to return to the basic process control logic. Errors are detected and corrected or prompted with the correct use of each language during development. The extensive hypertext based on-line help system includes a thorough cross-reference explanation of the IEC 61131-3 standard.

MODULAR CONSTRUCTION

OPEN SYSTEMS INTERCONNECTION

FULL SYSTEM REDUNDANCY

EXPANDABLE AND SCALABLE I/O ARCHITECTURE

ENTERPRISE READY SOLUTION

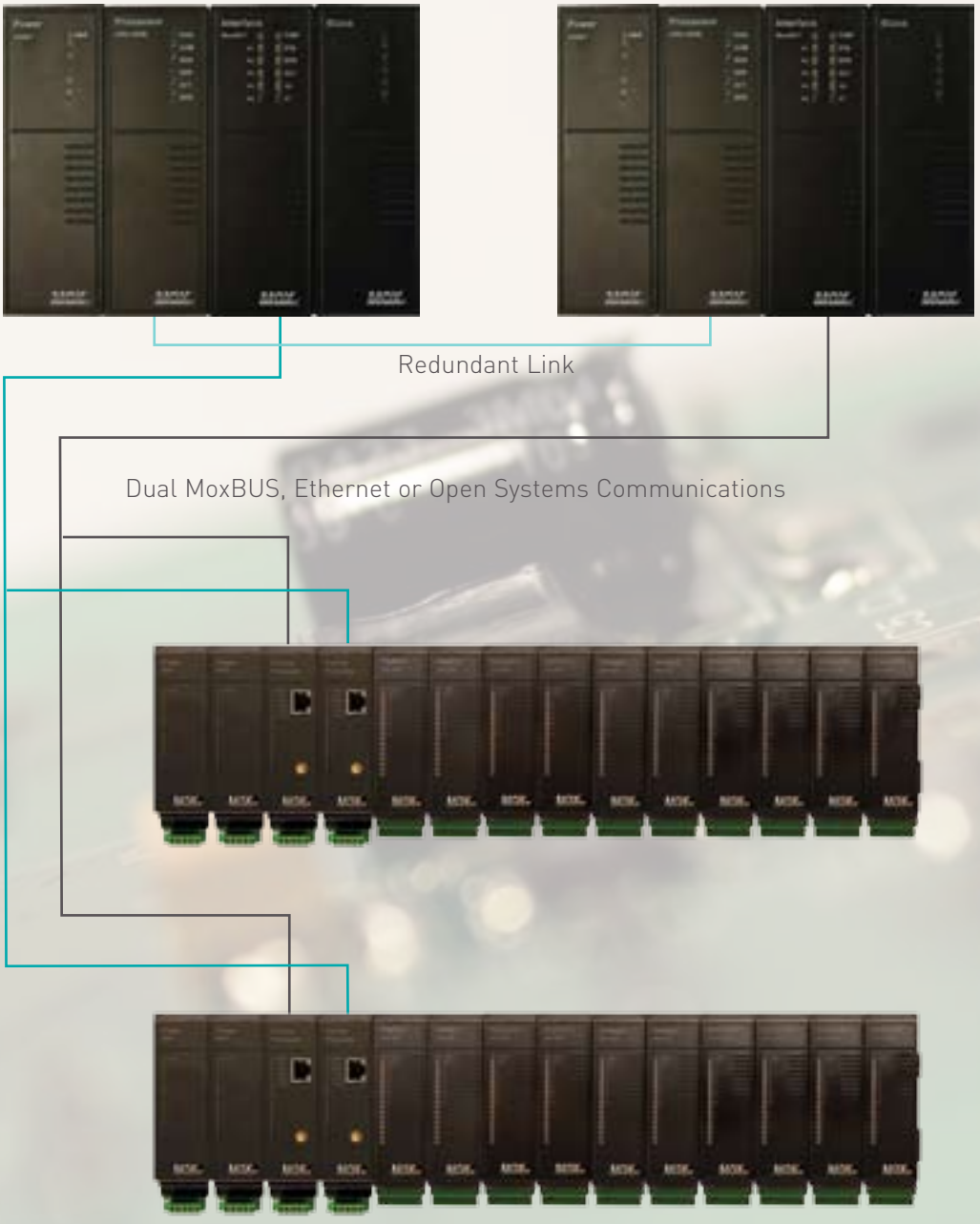
REAL TIME PROCESSING PLATFORM

INTEGRATED IEC 61131-3 DEVELOPMENT ENVIRONMENT

SUPPORT OF VARIOUS COMMUNICATIONS STANDARDS

MOX Open Controller is a leading edge Distributed Control System. MOX Open Controller, together with its integrated IEC61131 software forms a high performance and flexible control solution.

MOX Open Controller in Hot Standby Configuration



Applications

The MOX Products' range is planned technology that is pre-integrated to fit the entire spectrum of your control needs. The MOX system is packed with high performance building blocks that fit together perfectly to create a powerful and flexible automation system.

The MOX system provides full redundancy at all levels. A redundant system consists of dual processors, power supplies and MoxBUS Interface modules. This enables the MOX Open Controller to be used in the most mission critical processes within heavy industrial applications.

Fast scan rates, true 16-bit A/D precision, over-voltage isolation protection, wide operating temperature range and various form factors fulfil many application specific requirements. MOX Open Controller allows tighter, more accurate control of the process, with a positive impact on the quality of your product.

The MOX system provides all the functionality required from a fully integrated control solution. A fully scalable architecture allows the system to be expanded as required thus protecting the initial investment.

POWER GENERATION

OIL AND GAS PRODUCTION

MINING AND MINERALS PROCESSING

PETROCHEMICAL AND CHEMICAL REFINING

COMPLEX MANUFACTURING AND PROCESS CONTROL

MOX Open Controller provides real time access to your operational data and control of your system at both local and remote installations.

MOX Open Controller

Architecture

MODULAR CONSTRUCTION

OPEN SYSTEMS INTEGRATION

REDUNDANT CONFIGURATIONS

EXPANDABLE SOLUTION

The MOX Open Controller system provides a flexible, high performance, high-speed and economical control solution.

The CPU is a high performance AMD 500MHz processor containing a floating point processor (FPU), 128M Bytes of RAM, 1G Bytes of Flash and a real time clock.

The operator station uses any industry standard HMI/SCADA Software and communicates with the MOX Open Controller by Ethernet.

The MOX Open Controller supports a number of I/O communications protocols including Modbus over TCP/IP, MoxBUS, ProfiBUS as well as numerous third party fieldbus I/O communications standards.

The redundant link provides interconnection of two MOX Open Controller sets across a high speed proprietary communications bus. The level of redundancy may then be extended to the HMI layer as well as to the I/O System.

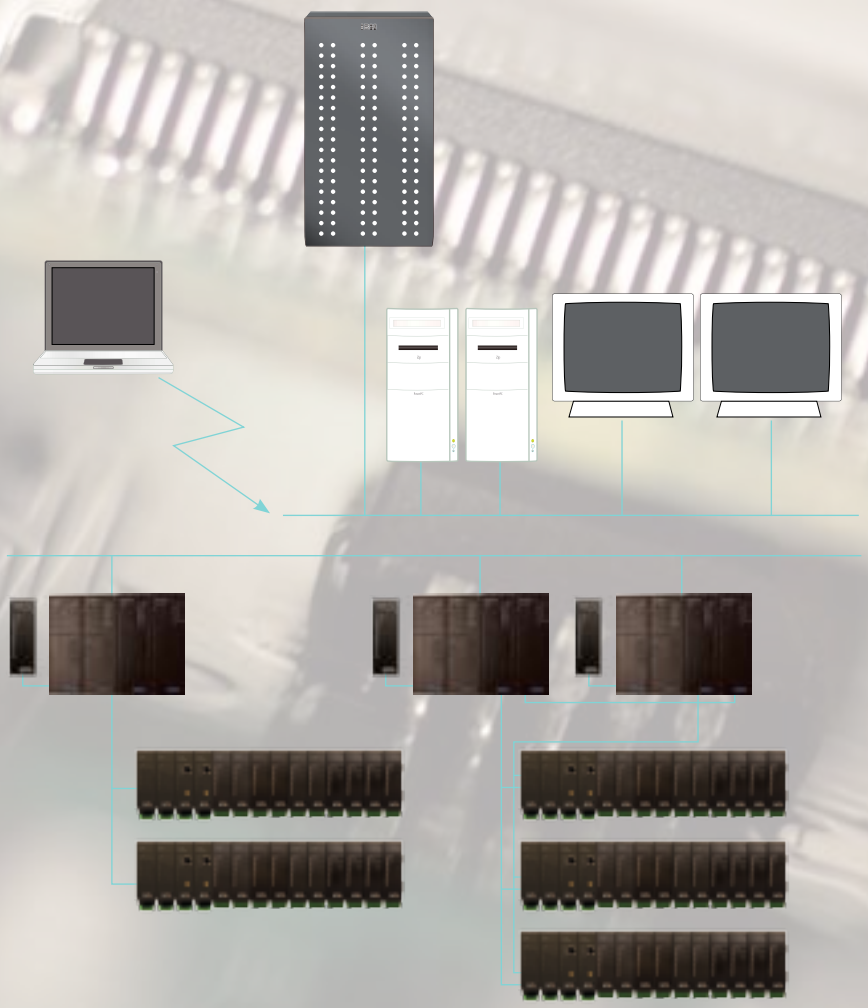
The MOX 603 Modular I/O Solution has been specifically designed to accommodate the needs of a MOX Open Controller installation. A wide range of flexible, high performance modules, including analog, digital, and specialty function modules, are available for connection to a variety of field I/O devices.

Each MOX Open Controller CPU can support a high I/O count in a number of communications configrurations. With the addition of peer to peer communication capability, the final solution may be a combination of a large number of MOX Open Controller CPUs, creating virtually unlimited I/O possibilities.

MOX Open Controller architecture consists of three distinctive and integrated high performance layers.

MOX Open Controller Total Solution, Typical Configuration

Layer 1: Distributed Servers/Operator Stations
Layer 2: AMD 500MHz Controller
Layer 3: High Speed Rack or Stand Alone I/O



Processor

MOX OPEN CONTROLLER DYNAMIC CPU

HIGH SPEED AMD PROCESSOR, 500MHZ

128MB OF RAM, REAL TIME CLOCK AND WATCH DOG TIMER

1 G BYTE OF FLASH MEMORY

OPERATING RANGE OF –20 TO +70 °C

LINUX OPERATING SYSTEM

MX601-5004

Functional Overview

The MX601-5004 Processor, or MOX Open Controller Dynamic CPU forms the heart of any standard MOX Open Controller solution. The embedded Pentium compatible Processor is equipped with 128MB of RAM and runs at 500MHz. Combined with the Real Time Linux Operating System and Application Environment, the Dynamic CPU provides high performance CPU capability for any large installation.

The system BIOS and operational parameters are located in Flash EPROM eliminating the risk of downtime due to battery failure. This ensures the system will continue to operate successfully without a battery if required.

The MOX Open Controller Dynamic CPU uses an 10/100Mbps port with integrated Ethernet security based on IEC17799. This provides a reliable and secure port for communications with the SCADA or HMI system. It also includes a Real Time Clock and Watch Dog timer for higher operational reliability.

Application

- The MOX Open Controller Dynamic CPU is designed for use in industrial control and automation applications not requiring a redundant solution. Generally, these would be non critical applications but still require a high speed and reliable solution.
- The HMI or SCADA System will be connected to the Processor module via the 10/100Mbps link in the module.
- The system is configured using the MoxIDE Integrated Development Environment, and programmed with MoxGRAF. This is done via Ethernet either locally, or at a remote location.

The MOX Open Controller Dynamic CPU is a High Speed AMD processor designed for installation in industrial control and automation applications.

Usage Notes

A functional MOX Open Controller solution requires, as a minimum, a 24Vdc Power Supply Module and a Processor Module. The two remaining slots may be used for any combination of modules.

The Processor Module may be installed in any slot of the MX601-6001 Four Slot Base. The power supply should be disconnected prior to installing the module.

A reset button is provided and using a set process, may be used to reset the system configuration parameters of the Dynamic CPU to default conditions.

Performance Specifications

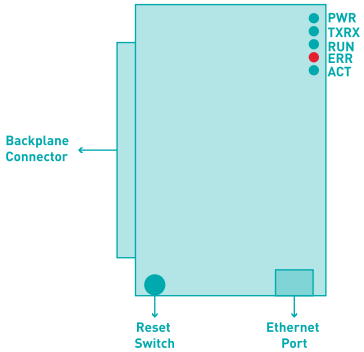
CPU	AMD GEODE™ LX800
CPU Speed	500 MHz
RAM	128MB
Flash Memory	1GB
Power Supply	Rack powered by 601 PSU
Power consumption	<6W
System reset to default	Supported with Reset Button
Operating System	Linux

Environmental Specifications

Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 90% non-condensing

Communications

HMI Communications	100Mbps
HMI Connectivity	RJ45 Port
Backplane Comms	CPU Managed



Processor

DYNAMIC CPU + RDN

HIGH SPEED AMD PROCESSOR, 500MHZ

128MB OF RAM, REAL TIME CLOCK AND WATCH DOG TIMER

1GB OF FLASH MEMORY

OPERATING RANGE OF –20 TO +70 DEG C

LINUX OPERATING SYSTEM

SEQUENCE OF EVENTS APPLICATIONS FEATURES

FIBRE OPTIC REDUNDANT LINK

MX601-5002

Functional Overview

The MOX Open Controller Dynamic CPU+RDN, forms the heart of a comprehensive MOX Open Controller solution. The embedded AMD Processor is equipped with 128MB of RAM and runs at a speed of 500MHz.

The system BIOS and operational parameters are located in Flash EPROM eliminating the risk of downtime due to battery failure. This ensures the system will continue to operate successfully without a battery if required.

The MX601-5002 Processor adds redundant capability to the offering of the MX601-5004 Processor. The base system includes an Ethernet (10Base-T) port with integrated Ethernet security based on IEC17799, Real Time Clock and Watch dog timer. The MOX Open Controller Dynamic CPU+RDN includes a Fibre Optic Port for connection to a Redundant Hot Standby Controller. In Sequence of Events applications, it is essential that time is synchronized to the millisecond. The Processor module includes a GPIO port that will synchronize the time and date in all SOE field I/O.

Application

- The Processor is designed for use in large heavy industry control and automation applications requiring a dual redundant hot-standby solution. This makes the processor ideal for mission critical plant operation.
- The HMI or SCADA System will be connected to the Processor via the 100Mbps Ethernet link in the module.
- The system is configured using the MoxIDE Integrated Development Environment, and programmed with MoxGRAF. This is done via Ethernet either locally, or at a remote location.

The MOX OC Dynamic CPU + RDN is a High Speed AMD processor designed for heavy industry mission critical control and automation applications.

Usage Notes

A functional MOX Open Controller solution requires, as a minimum, a 24Vdc Power Supply Module and a Processor Module. The two remaining slots may be used for any combination of modules.

The Processor Module may be installed in any slot of the MX601-6001 Four Slot Base. The power supply should be disconnected prior to installing the module.

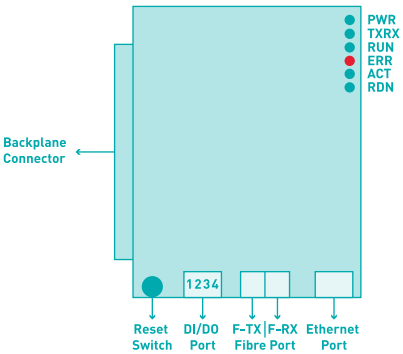
A reset button is provided and using a set process, may be used to reset the system configuration parameters of the Dynamic CPU+RDN to default conditions.

Where dual redundant processors are used, they are connected via the Fibre Optic Link port on the base of the processor module.

When an SOE solution is implemented, synchronization is maintained through the GPIO port on the base of the processor module.

Performance Specifications

CPU	AMD GEODE™ LX800
CPU Speed	500 MHz
DRAM	128MB
Flesh Memory	1GB
Power Supply	Rack powered by 601 PSU
Power Consumption	<6W
System Reset to Default	Supported with Reset Button
Operating System	Linux



Environmental Specifications

Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 90% non-condensing

Communications

HMI Communications	10/100Mbps
HMI Connectivity	RJ45 Port
Redundant Processor Comms	100Mbps
Redundant Connectivity	Fibre Port
SOE Synchronisation	Terminal Connector to CPE/OC
Backplane Comms	CPU managed

24Vdc PSU

MOX OPEN CONTROLLER SYSTEM 24VDC PSU

EFFICIENT 50W CAPACITY SUITABLE FOR ANY CONFIGURATION

BUILT-IN OVERCURRENT, OVERVOLTAGE AND THERMAL PROTECTION CIRCUITS

REVERSE INPUT PROTECTION

DUAL REDUNDANT POWER SUPPLIES MAY BE INSTALLED

MX601-5101

Functional Overview

The MX601-5101 is a one size fits all Power Supply Module for the MOX Open Controller solution. Any configuration of MOX Open Controller racks can be supplied from a single MX601-5101 Power Supply. The MX601-5101 Power Supply Module is also suitable in configurations where dual power supplies are specified, to increase the reliability of the installation.

The MX601-5101 Power Supply Module is designed for use with the MX601-6001 Four Slot Base. It may be installed in any slot of the base to power the Processor and I/O Interface Modules.

Application

- The MX601-5101 uses a removable three pin connector for wiring of the module. This provides for easy cabling of the system and convenient installation into the cabinet.
- The MX601-5101 Module may be installed by simply pressing into the base. It may then be immediately powered up for testing or commissioning. If required, the module may be removed just as easily.
- Once satisfied with the installation, the module may then be firmly secured to the base using integrated mounting screws.

The MX601-5101 Power Supply provides a reliable dual power solution for any MOX Open Controller configuration.

Usage Notes

A functional MOX Open Controller solution requires, as a minimum, a 24Vdc Power Supply Module and a CPU Module. The two remaining slots may be used for any combination of modules. A second power supply module may be installed to offer greater reliability in a single CPU Solution. When installing dual modules, the Ground pin of the two modules should be connected together.

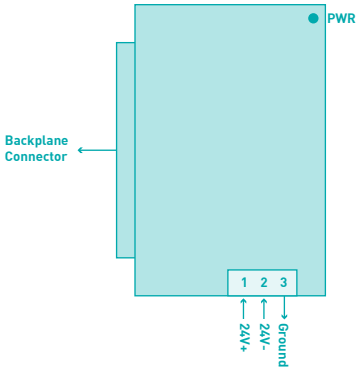
The power module must be installed prior to applying the 24Vdc Input power. The input power should also be disconnected from the module prior to removing the module from the rack. Where two modules are present, power need only be disconnected from the module being installed or removed.

Performance Specifications

Input Voltage	24Vdc
Output Power	50W (10A @ 5Vdc)
Ripple Voltage	80mV
Efficiency	87%
Zero Load Dissipation	3.4W

Environmental Specifications

Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 90% non-condensing



Profibus I/O Interface

MOX OPEN CONTROLLER PROFIBUS IOIF MODULE

PROFIBUS DP OPEN SYSTEMS PROTOCOL

USES STANDARD PROFIBUS DP CONNECTORS AND CABLE

PROVIDES AN INTERFACE TO MOX AND 3RD PARTY PRODUCTS

MX601-5202

Functional Overview

The MX601-5202 Profibus I/O Interface Module provides a path of communications between a MOX Open Controller Processor and a Profibus DP plant or field I/O sub-system. The Profibus DP protocol is an Open Systems Protocol preferred by a large number of integration engineers and end users. MOX Products, as an Open Systems Solution Provider, has provided the Profibus I/O Interface Module as one of a number of choices for field I/O connectivity.

The MX601-5202 Profibus I/O Interface Module communicates with the Processor Module across the four slot base, and directly to the field I/O Profibus Communications Processor Modules.

Up to two I/O Interface Modules, of any type, may be installed in any slot of the MX601-6001 Four Slot Base. This allows for separation of the field I/O communication channels if required.

Application

- The MX601-5202 Profibus I/O Interface Module is suitable for specialized solutions where Profibus DP communications to the field I/O is a necessity.
- The Profibus I/O Interface Module allows a MOX Open Controller solution to be installed in a plant with pre-existing Profibus DP Field I/O.
- Up to 31 racks of MOX 603 I/O may be connected to one Profibus I/O Interface Module. If MOX 603 I/O is used, a Profibus DP Communications Processor Module must be used. Each MOX 603 I/O rack may contain up to 10 MOX 603 I/O Modules. Where other Profibus DP I/O is used, standard Profibus DP rules apply.

The MX601-5202 Profibus I/O Interface Module provides a Open Systems communications interface for MOX Open Controller solutions containing a MOX 603 or any other Profibus DP field I/O solution.

Usage Notes

Generally, a functional MOX Open Controller solution will contain at least one I/O Interface Module. One or any combination of two I/O Interface Modules may be installed in the final solution.

For Profibus DP I/O solutions, it is recommended that standard Profibus DP connectors and cables be used. This will ensure maximum reliability of the final solution.

The MX601 Modules are installed easily by pressing into the base and may be immediately powered up for testing or commissioning. If required, they may be removed just as easily once the power is removed.

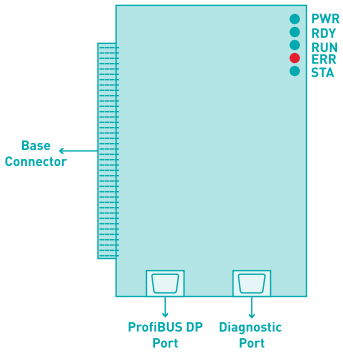
Once satisfied with the installation, the modules may then be firmly secured to the base using integrated mounting screws.

Performance Specifications

Power consumption	3W
Communications	12Mbps
Protocol	ProfiBUS DP
Connection type	DB-9
Diagnostic Port Connection	DB-9
603 I/O connectivity	31 I/O racks per module 10 Modules per rack, any mix

Environmental Specifications

Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 90% non-condensing

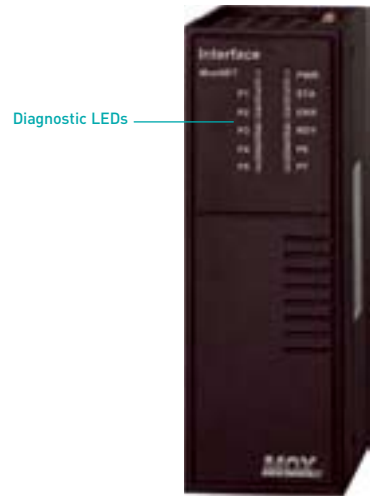


MoxNET

7 Port MoxNET Interface
MX601-5207

The MX601-5207 MoxNET device allows connection to MX603 IO module networks. There are 7 RJ45 Ethernet ports which all support 10/100Mbps and full/half duplex auto-negotiation.

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

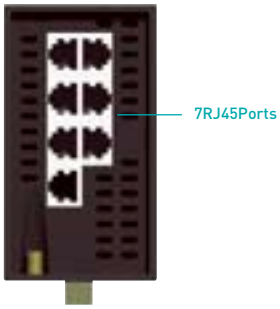


Power Specifications

Power Dissipation	<5W

Communications Specifications

10/100Mbps RJ45 Ports	7



RJ45 Port Characteristics

10/100Mbps autp-negotiation	Yes
Full/Half Duplex auto-negotiation	Yes
Auto-MDIX	Yes
Flow Control	802.3x
Collision	Drop frame after 16 collisions or collision continues for 512 bit frames

Environmental Conditions

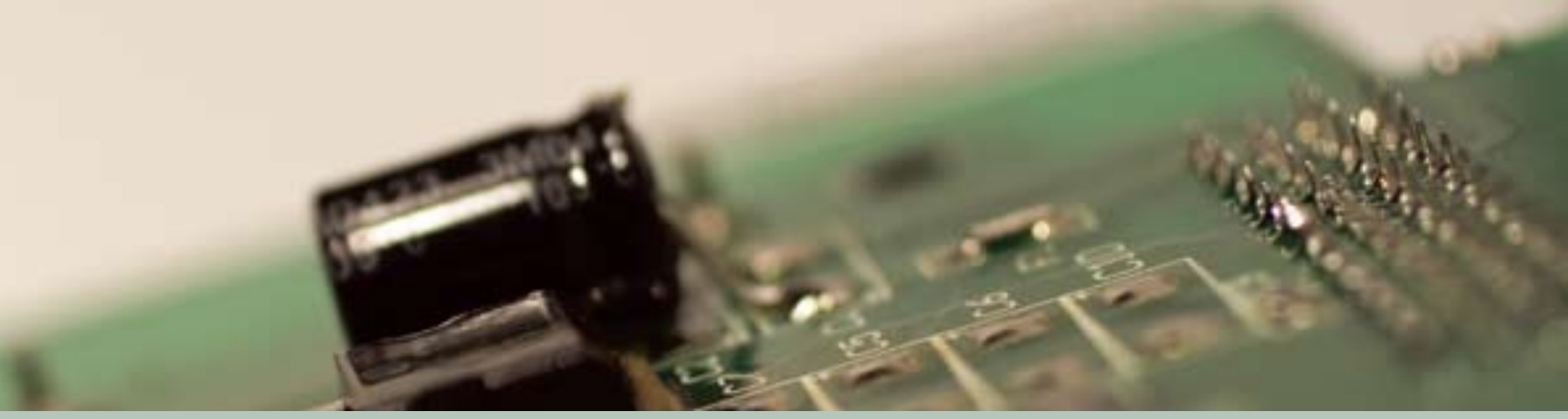
Operating Temperature	-20 to 70°C
Storage Temperature	-40 to 85°C
Relative Humidity	5 to 90% non-condensing

7 RJ45 ETHERNET PORTS

10/100MBPS AUTO-NEGOTIATION PORTS

DIAGNOSTIC AND COMM LEDS

128K STORE AND FORWARD MODE BUFFER

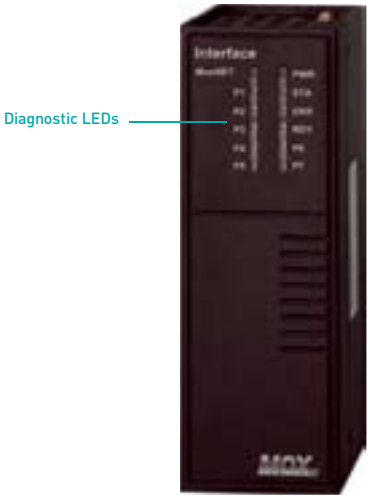


7 Port MoxNET Interface

MX601-5208

The MX601-5208MoxNET device allows connection to MX603 IO module networks. There are 6 RJ45 Ethernet ports and 1 Fibre port. All RJ45 Ethernet ports support 10/100Mbps and full/half duplex auto-negotiation. The Fibre port is a duplex 100 base-LX10 port.

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



Power Specifications

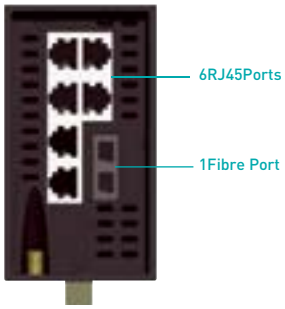
Power Dissipation	<7W

Communications Specifications

10/100Mbps RJ45 Ports	6
100Mbps Duplex Fibre Port	1

RJ45 Port Characteristics

10/100Mbps autp-negotiation	Yes
Full/Half Duplex auto-negotiation	Yes
Auto-MDIX	Yes



Fibre Port Characteristics

Connector Type	SC
Wavelength	1300nm
Fibre Mode	Single Mode Fibre

Common Port Characteristics

Flow Control	802.3x
Collision	Drop frame after 16 collisions or collision continues for 512 bit frames
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

Four Slot Base

FOUR SLOT BASE

MODULES MAY BE INSTALLED IN ANY SLOT

SUPPORTS DUAL REDUNDANT POWER SUPPLIES

UP TO TWO I/O INTERFACE MODULES

MX601-6001

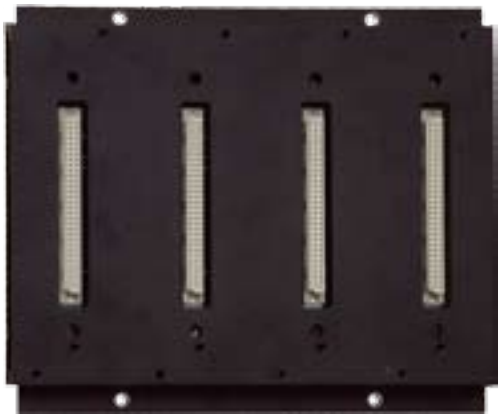
Functional Overview

The MX601-6001 is a Four Slot Base for the MOX Open Controller solution. It provides a common slim line base system for use with any combination of modules available to the MOX Open Controller. All MX601 modules may be installed in any slot of the base.

The base will support up to two 24VDC Power Supply Modules (MX601-5101) in dual redundant configuration. The base will also support up to two I/O Interface Modules (MX601-52XX), to enhance the field communications capability of the installed solution.

Application

- The integrated four hole mounting plate provides easy installation of the slim line MX601-6001 base into any cabinet.
- The MX601 Modules are installed easily by pressing into the base and may be immediately powered up for testing or commissioning. If required, they may be removed just as easily once the power is removed.
- Once satisfied with the installation, the modules may then be firmly secured to the base using integrated mounting screws.



The MX601-6001 Four Slot Base provides a slim line base solution for any combination of MOX 601 Open Controller Modules.

Usage Notes

A functional MOX Open Controller solution requires, as a minimum, a 24Vdc Power Supply Module and a CPU Module. The two remaining slots may be used for any combination of modules. A second power supply module may be installed to offer greater reliability in a single CPU Solution.

It is not possible to install two CPU Modules in the same base. For increased reliability and redundancy, a second base containing a second CPU Module will be required. The system will then be configured in hot-standby redundant configuration.

Performance Specifications

Power Supply

Rack powered by 601 PSU/s

Module Slot Options

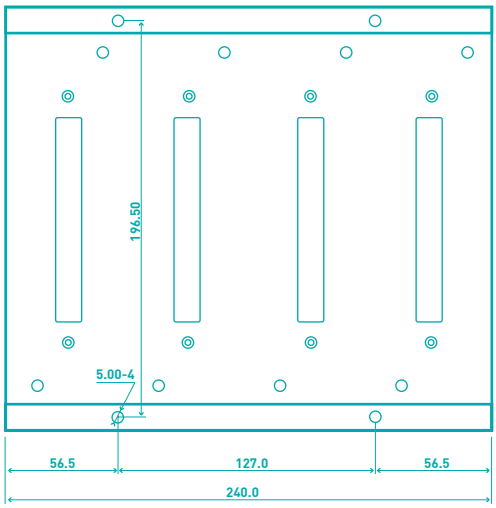
4

Module Mounting Requirements

User desired

PSU Redundancy

Supported



Environmental Specifications

Operating Temperature

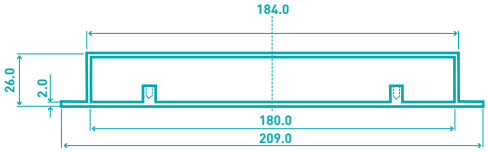
-20 to 70 °C

Storage Temperature

-40 to 85 °C

Humidity

5 to 90% non-condensing



Communications

MOX Open Controller CPU Manages Backplane Communications

MX603
CPE Module

MOX COMMUNICATIONS PROCESSOR MODULES

10 MOX 603 I/O MODULES PER RACK, IN ANY MIX

MOXBUS, PROFIBUS OR ETHERNET COMMUNICATIONS

FIBRE OPTIC PORT AVAILABLE ON CPE MODULE

DIRECT INTERFACE TO MOX CONTROLLERS

DUAL REDUNDANT COMMUNICATIONS

LARGE QUANTITY OF DIAGNOSTIC INFORMATION

MX603-30XX

Functional Overview

A MOX Open Controller requires a highly functional and reliable plant or field I/O solution. The MOX 603 Modular I/O System provides the most effective solution available. MOX 603 I/O may be installed in Rack Configuration in a MOX Open Controller solution. In these installations, a MOX 603 Communications Processor (MOX CPE) provides the interface between the MOX Open Controller I/O Interface and the field I/O modules.

Communications

For MOX Open Controller Solutions, various MOX CPE Modules are available, depending on the required I/O Interface. Several options are available including MoxBUS Ethernet and several combination modules.

The MOX CPE modules utilise an open systems architecture giving third party host controllers an open interface and therefore unlimited connectivity to the MOX 603 Modular I/O system.

Architecture

The MOX CPE Module may be installed in single or dual redundant configurations. Various levels of redundancy may be achieved depending on the configuration of the MOX Open Controller and on the particular CPE modules selected. For complete redundancy, a system will contain dual communications paths between the I/O Modules and a redundant pair of host controllers as well as redundant power supplies.

Various configurations and numbers of I/O racks are supported depending upon the CPE model selected.

See the MOX603 Modular I/O Technical Overview for various configuration examples.

The MX603-30XX Communications Processor Module provides a highly functional and reliable plant or field I/O Processor for MOX Open Controller Solutions.

MX603-3010 CP Module - Ethernet	
Performance Specifications	
Power Consumption (Zero Load)	< 2W
Communications	10Mbps
Connection Type	RJ45
603 I/O Connectivity	10 I/O per rack, any mix
RJ45 to System Isolation	1000Vrms

MX603-3011 CP Module - Ethernet, MoxBUS	
Performance Specifications	
Power Consumption (Zero Load)	< 3.3W
Communications	10Mbps
Connection Type	RJ45, SMA
603 I/O Connectivity	10 I/O per rack, any mix
RJ45 to System Isolation	1000Vrms
SMA to System Isolation	1000Vrms

MX603-3012 CP Module - Ethernet, Fibre	
Performance Specifications	
Power Consumption (Zero Load)	< 4W
Communications	10Mbps
Connection Type	RJ45, Fibre
603 I/O Connectivity	10 I/O per rack, any mix
RJ45 to System Isolation	1000Vrms

MX603-3013 CP Module - Ethernet, Fibre, MoxBUS	
Performance Specifications	
Power Consumption (Zero Load)	< 5.3W
Communications	10Mbps
Connection Type	RJ45, Fibre, SMA
603 I/O Connectivity	10 I/O per rack, any mix
RJ45 to System Isolation	1000Vrms
SMA to System Isolation	1000Vrms

Environmental Specifications	
Operating Temperature	-20 to 70 °C
Storage Temperature	-40 to 85 °C
Humidity	5 to 90% non-condensing

Please consult the MOX 603 I/O Technical Overview for additional information.

MoxGRAF

MoxGRAF is a flexible development environment for designing powerful applications simply and without knowledge of complex, high-level computer languages. The user friendly structured programming methodology and intuitive graphical and textual editors for six automation languages, results in robust applications developed with simplicity and in the shortest possible timeframe.

With MoxGRAF, application debugging does not require the developer to return to the basic process control logic nor to remember the exact syntax of all languages. At all stages of the development, checks are performed on the program and language specific syntax. Errors are detected and corrected or the user is prompted with the correct use of each language.

The extensive hypertext based on-line help system includes a thorough cross-reference explanation of the IEC 61131-3 standard.

MoxGRAF also features powerful self–documenting capability. The document generator builds a complete, coherently grouped printed document of all project items and provides a history of their modification.

Both graphical and textual programs may be included in the final documentation, as can the overall project architecture, I/O wiring lists, dictionaries, cross-references and more.

DELIVERS OPEN AUTOMATION SOLUTIONS

IEC 61131-3 COMPATIBLE APPLICATIONS DEVELOPMENT

COMPREHENSIVE ON-LINE HELP SYSTEM

FIVE IEC LANGUAGES PLUS FLOW CHART

DECREASED DEVELOPMENT TIME

POWERFUL AND ROBUST DEVELOPMENT TOOLSET

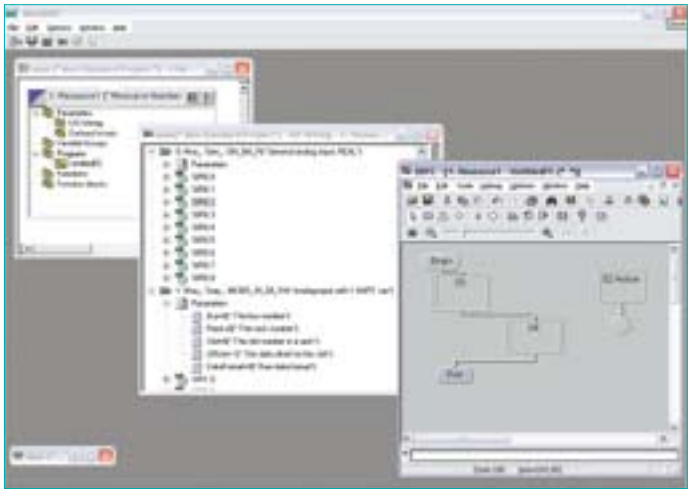
USER DEFINABLE FUNCTION BLOCKS

Accelerate the development of your application with the promise of a complete IEC 61131-3 programming environment.

MoxGRAF Functions

These are special functions supported by the MoxGRAF system. These functions are developed for specific applications and industry groupings. The functions are pre-defined and do not have to be declared in the library.

MoxGRAF Special Functions	
MoxPID	Process loop control algorithm
MoxPIDII	Process loop control algorithm
Eth2Com	Ethernet to Serial Gateway
ModNetM	MODNET master function block
MoxGetTime	Get time
MoxSetTime	Set time
SysInfo	System Information
DTime	Digital Data Delay
Socket	TCP/IP Operation



MoxGRAF

Standard Operators

The following are standard operators of all of the IEC 61131 programming languages.

Data Manipulation	
1 Gain	Assignment
NEG	Analog Negation
Boolean Operations	
& (AND)	Boolean AND
<-1 (OR)	Boolean OR
-1 (XOR)	Boolean Exclusive OR
NOT	Boolean Negation
Arithmetic Operations	
+	Addition
-	Subtraction
*****	Multiplication
/	Division
Comparison Tests	
<	Less Than
<-	Less or Equal to
>	Greater Than
>-	Greater or Equal to
=	Is Equal to
<>	Is not Equal to

Data Conversion	
BOO	Convert to Boolean
ANA	Convert to Integer Analog
REAL	Convert to Real Analog
TMR	Convert to Timer
MSG	Convert to Message
Logical Operators	
AND_MASK	Analog Bit to Bit AND Mask
OR_MASK	Analog Bit to Bit OR Mask
XOR_MASK	Analog Bit to Bit Exclusive OR Mask
NOT_MASK	Bit to bit Negation
Other	
CAT	Message Concatenation
SYSTEM	System Access
OPERATE	Operate I/O Channel

Instruction List Operators

These are additional operators associated and supported by the MoxGRAF Instruction List Programming Language.

Operator	
LD	Load Operand
ST	Stores Current Result
S	Sets to TRUE
R	Sets to FALSE
CAL	Calls a Function
JMP	Jumps to a Label
RET	Returns from Sub-program
)	Executes Delayed Operation
Function	Calls a Function or Sub-function
AND	Boolean AND
&	Boolean AND
OR	Boolean OR
XOR	Exclusive OR
ADD	Addition
SUB	Subtraction
MUL	Multiplication
DIV	Division
GT	Test: >
GE	Test: >=
EQ	Test: =
LE	Test: <=
LT	Test: <
NE	Test: <>

MoxGRAF

Standard Functions

These are standard functions supported by the MoxGRAF system. Such functions are pre-defined and do not have to be declared in the library.

Math	
ABS	Absolute Value
EXPT	Exponent
LOG	Logarithm
POW	Power Calculation
SQRT	Square Root
TRUNC	Truncate Decimal Part
Trigonometric	
ACOS	Arc Cosine
ASIN	Arc Sine
ATAN	Arc Tangent
COS	Cosine
SIN	Sine
TAN	Tangent
Register Control	
ROL	Rotate Left
ROR	Rotate Right
SHL	Shift Left
SHR	Shift Right

Data Manipulation	
MIN	Minimum
MAX	Maximum
LIMIT	Limit
MOD	Modulo
MUX4	Multiplexer (4 entries)
MUX8	Multiplexer (8 entries)
ODD	Odd Parity
RAND	Random Value
SEL	Binary Selector
Data Conversion	
ASCII	Character ASCII Code
CHAR	ASCII Code Character
String Management	
DELETE	Delete Sub-string
INSERT	Insert String
FIND	Find Sub-string
MLEN	Get String Length
LEFT	Extract Left
MID	Extract Middle
REPLACE	Replace Sub-string
RIGHT	Right of a String

Standard Function Blocks

These are standard function blocks supported by the MoxGRAF. Such function blocks are pre-defined and do not have to be declared in the library.

Booleans	
SR	Set Dominant Bistable
RS	Reset Dominant Bistable
R_TRIG	Rising Edge Detection
F_TRIG	Falling Edge Detection
SEMA	Semaphore
Counting	
CTU	Up Counter
CTD	Down Counter
CTUD	Up-down Counter
Timers	
TON	On-delay Timing
TOF	Off-delay Timing
TP	Pulse Timing
Integer Analogs	
CMP	Full Comparison Function Block
STACKINT	Stack of Integer Analogs

Real Analogs	
AVERAGE	Running Average over N Samples
HYSTER	Boolean Hysteresis on Difference of Reals
LIM_ALRM	High/low Limit Alarm with Hysteresis
INTEGRAL	Integration Over Time
DERIVATE	Differentiation According to Time
Signal Generation	
BLINK	Blinking Boolean Signal
SIG_GEN	Signal Generator

Ordering

MOX Open Controller		
Controller Modules	**Main Feature**	**Part Number**
MOXoc Dynamic CPU	2x Ethernet	**MX601-5004**
MOXoc Dynamic CPU + RDN	1x Ethernet, Optical RDN Link, SOE Sync Port	**MX601-5002**

Power Supply Modules	**Main Feature**	**Part Number**
MOXoc System 24Vdc PSU	Accepts wide input range of 18-30 Vdc	**MX601-5101**

I/O Interface Modules *	**Main Feature**	**Part Number**
MOXoc PROFIBUS IOIF (Twisted Pair)	Bus Interface Module supporting PROFIBUS DP I/O	**MX601-5202**
MOXoc MOXNET IOIF (7 x RJ45)	Bus Interface Module supporting MOXNET (7E)	**MX601-5207**
MOXoc MOXNET IOIF (6 x RJ45, 1 x Fiber)	Bus Interface Module supporting MOXNET (6E1F)	**MX601-5208**

Communication Options	**Main Feature**	**Part Number**
MOXNET Switch (8 x RJ45)	8x RJ45 auto 10/100Mbps ports half and full duplex	**MX606-3403**
MOXNET Switch (8 x RJ45, 1 x Fiber)	8x RJ45 auto 10/100Mbps ports half and full duplex, 1x single mode fiber port (1300nm) duplex 100BASE-LX10	**MX606-3401**

Other Modules	**Main Feature**	**Part Number**
MOXoc Blank Module	Module for filling an empty slot on MOXoc	**MX601-5401**

Other Components	**Main Feature**	**Part Number**
MOXoc 4-Slot Backplane	Accepts 4 modules in any order, accepts dual PSU modules	**MX601-6001**

MOX Software Configurator	Main Feature	Part Number
MoxGRAF V4.x (128pt Licence)	Parallel Port Dongle, Limit of 128 I/O	**MX602-0011-003**
MoxGRAF V4.x (Unlimited Licence)	Parallel Port Dongle, Unlimited I/O	**MX602-0011-004**
MoxGRAF V4.x (128pt Licence)	USB Port Dongle, Limit of 128 I/O	**MX602-0011-005**
MoxGRAF V4.x (Unlimited Licence)	USB Port Dongle, Unlimited I/O	**MX602-0011-006**

Cables and Connectors	Main Feature	Part Number
Ethernet 1m STP Patch Lead	1m Cat 5 E STP patch cable with RJ45 Connectors	**MX603-00-13020**
Ethernet 3m STP Patch Lead	3m Cat 5 E STP patch cable with RJ45 Connectors	**MX603-00-13021**
Ethernet 5m STP Patch Lead	5m Cat 5 E 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 Angled Connector up to 12Mbps	Integrated Termination Resistor, Spring Cage Connector	**MX603-00-16506**

MOX603 PSU + CPE Modules
Please see MOX603 Modular I/O Ordering Guide

* Up to two IOIF modules may be installed per system.
For pricing, please contact MOX Group or your distributor. Delivery time is ex stock or 12 weeks if out of stock.
For urgent delivery, please contact MOX Group or your distributor.

MOX Group is Australia's leading developer and manufacturer of smart products for infrastructure control and industrial automation.

With offices and factories throughout the world, MOX Group has grown to become an industry leader in supplying smart technologies and innovative solutions for a broad range of applications across the globe. MOX Group prides itself on core principles of design innovation and technological excellence.

To find out more about MOX Group visit **www.mox.com.au**

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