ioPAC 8500 Hardware User's Manual

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www.moxa.com/product

ioPAC 8500 Hardware User's Manual

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❒ **Hardware Block Diagrams**
  ➢ ioPAC 8500 CPU Board Block Diagram
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  ➢ Product Selection Guide
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Overview

The ioPAC 8500 modular type controllers use an ARM9 based industrial grade CPU for the system, with ARM Cortex™ M4 based CPUs used for the modules. The controllers have 2, 5, or 9 I/O slots for 85M series modules. The USB bus between the controller CPU and module CPUs transmits data at up to 200 Mbps, and the dual CPU architecture supports a 40 kHz analog input sampling rate, pre-recording of analog input data, and millisecond timestamp. The ioPAC 8500 supports C/C++ and IEC 61131-3 programming capability, rail-level surge and ESD protection, a -40 to 75°C operating temperature range, anti-vibration, hot-swappability of modules, two 10/100 Mbps Ethernet ports with two MACs (Port Trunking ready), and two 3-in-1 serial ports. With Moxa's Active OPC Server and DA-Center, the ioPAC 8500 series provides a comprehensive solution for data acquisition and control applications in harsh environment.

Package Checklist

ioPAC 8500

The ioPAC 8500 ships with the following items:
- ioPAC 8500 controller
- Serial console cable (C/C++ models only)
- Documentation and software CD

85M Modules

85M modules ships with the following items:
- 85M module
- Serial cable: CBL-M44M9x4-50 (85M-5401-T only)

Optional Accessories (can be purchased separately)

- DK-DC50131-01: DIN-rail mounting kit, 50 x 131 mm

- WK-75: Wall-mounting kit, 2 plates with 8 screws

- CBL-M12D(MM4P)/RJ45-100 IP67: 4-pin D-code M12-to-RJ45 CAT5E UTP Ethernet cable, 100 cm, IP67 waterproof

- CBL-RJ458P-100: 8-pin RJ45 CAT5 Ethernet cable, 100 cm

- CBL-F9DPF1x4-BK-100: Serial console cable

- CBL-M44M9x4-50: DB44 to 4-port DB9 female serial cable

- 85M-BKTES: Empty slot covers (3 per order)

Appearance and Dimensions

Appearance

ioPAC 8500 Modular Head

The following figures depict ioPAC 8500 modular heads. There are two types of modular heads, both have dual Ethernet ports but one is RJ45 and the other is M12.
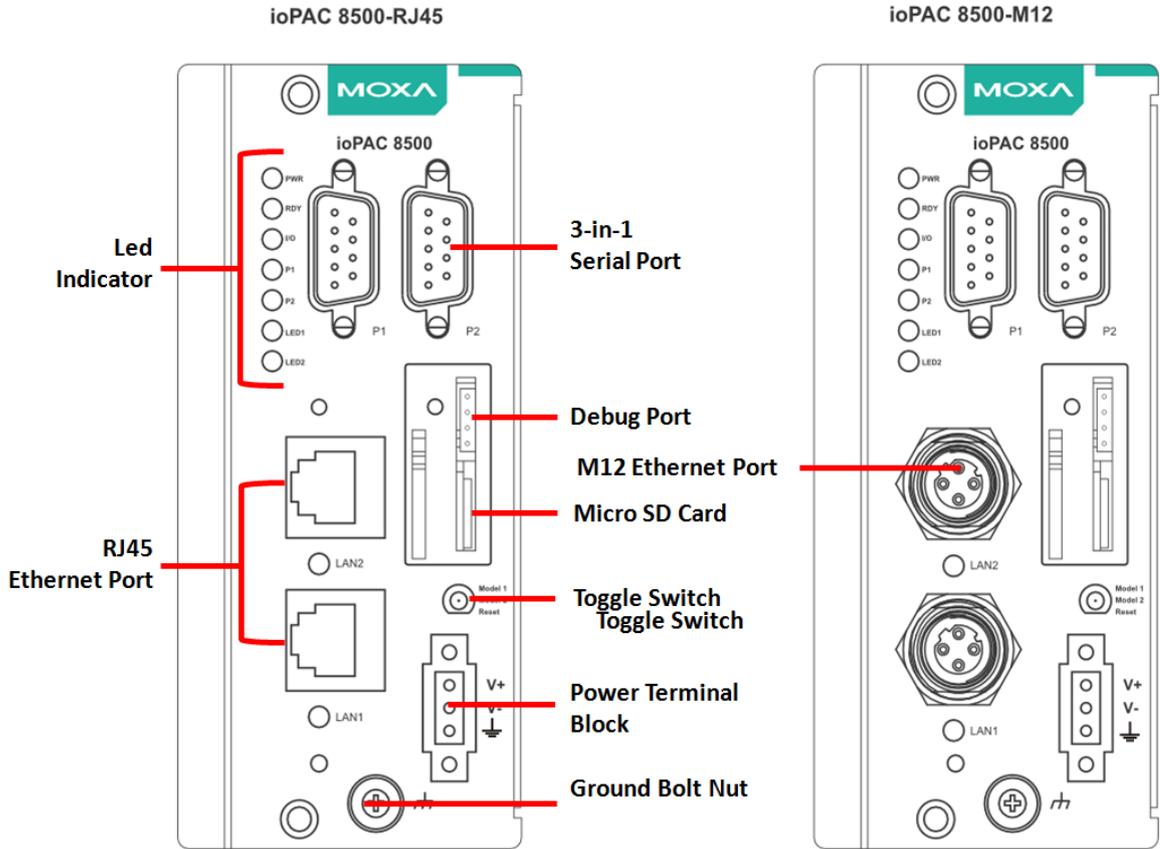
Dimensions (unit: mm(inch))

ioPAC 8500-2
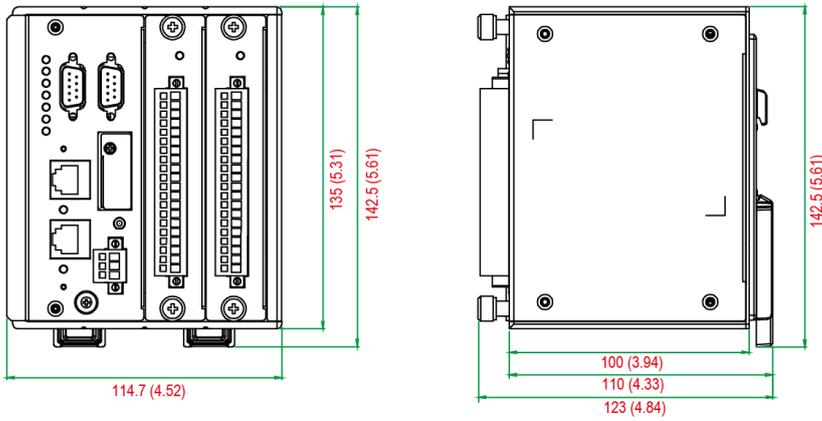
ioPAC 8500-5
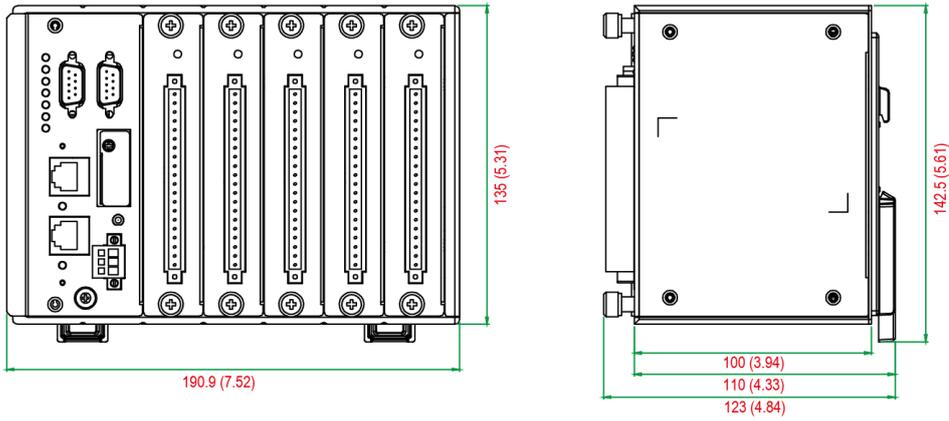
ioPAC 8500-9
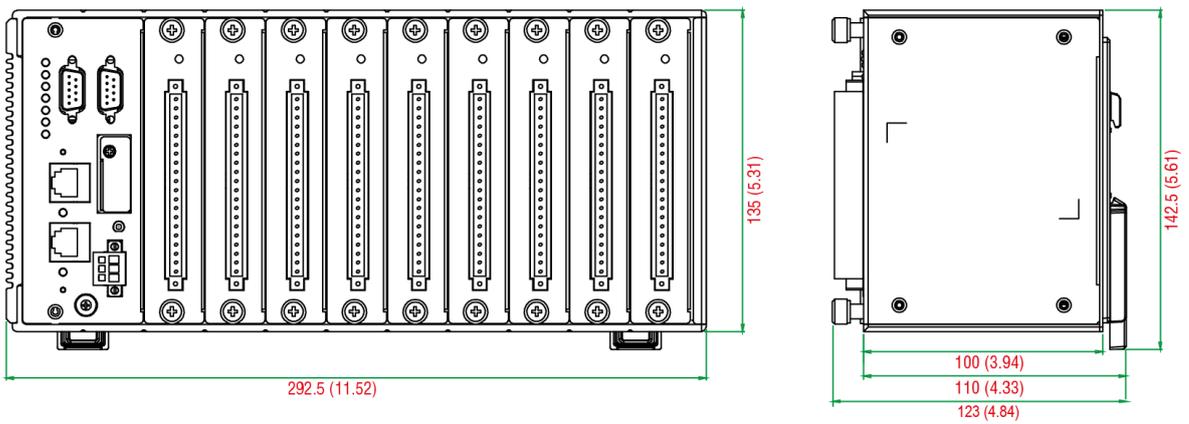
Hardware Block Diagrams

ioPAC 8500 CPU Board Block Diagram
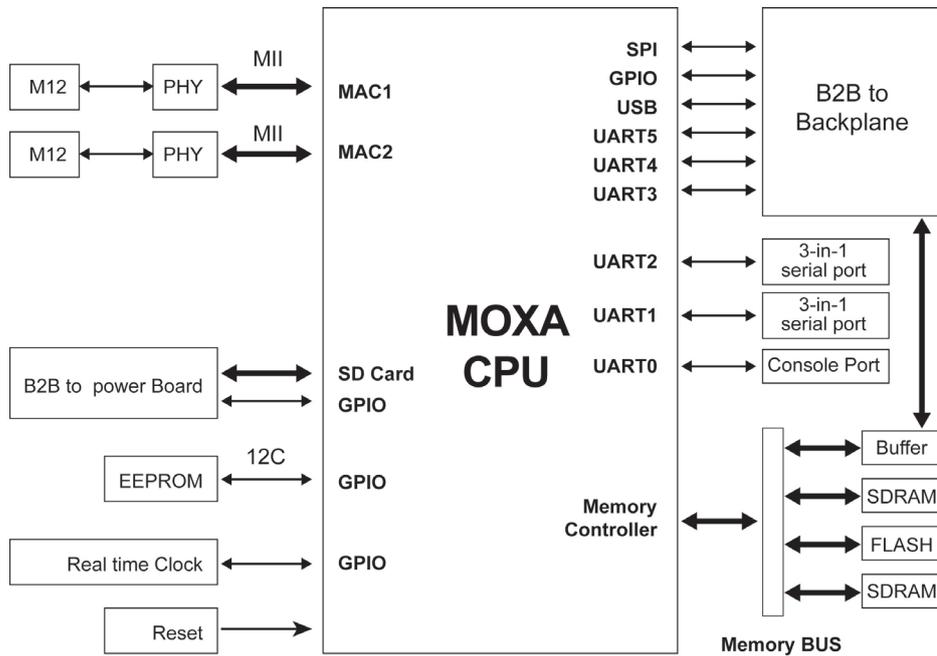
Product Hardware Specifications

Product Selection Guide

Model Name	Description
ioPAC 8500-2-RJ45-C-T	2 slots, RJ45, C/C++
ioPAC 8500-5-RJ45-C-T	5 slots, RJ45, C/C++
ioPAC 8500-9-RJ45-C-T	9 slots, RJ45, C/C++
ioPAC 8500-2-M12-C-T	2 slots, M12, C/C++
ioPAC 8500-5-M12-C-T	5 slots, M12, C/C++
ioPAC 8500-9-M12-C-T	9 slots, M12, C/C++
ioPAC 8500-2-RJ45-IEC-T	2 slots, RJ45, IEC
ioPAC 8500-5-RJ45-IEC-T	5 slots, RJ45, IEC
ioPAC 8500-9-RJ45-IEC-T	9 slots, RJ45, IEC
ioPAC 8500-2-M12-IEC-T	2 slots, M12, IEC
ioPAC 8500-5-M12-IEC-T	5 slots, M12, IEC
ioPAC 8500-9-M12-IEC-T	9 slots, M12, IEC

NOTE   Conformal coating available on request.

Specifications

Computer
Main CPU: ARM9 based CPU, 32-bit/192 MHz
I/O CPU: ARM Cortex M4 based CPU, 32-bit/80MHz
OS: Linux
Clock: Real-time clock with battery backup
Memory:
• SDRAM: 64 MB
• Flash: 32 MB
• SRAM: 256 KB (battery backup lasts for 1 week)
• microSD™ Slot: Up to 32 GB (SDHC compatible)
Note: For units operating in extreme temperatures, industrial grade, wide-temperature microSD cards are required.
Backplane Bus Speed: Up to 200 Mbps for all slots

Ethernet Interface
LAN: 2 x 10/100 Mbps, 2 MACs (IPs), RJ45 or M12
Protection: 1.5 kV magnetic isolation

Serial Communication
Interface:
• 2 RS-232/422/485 ports, software selectable (DB9 male)
• 1 RS-232 debug port (4-pin connector)
Serial Line Protection: 8 kV ESD for all signals

Serial Communication Parameters
Parity: None, Even, Odd
Data Bits: 7, 8
Stop Bits: 1, 2
Flow Control: RTS/CTS, XON/XOFF
Baudrate: 300 bps to 921.6 Kbps

Serial Signals
RS-232: TxD, RxD, DTR, DSR, RTS, CTS, DCD, GND
RS-422: Tx+, Tx-, Rx+, Rx-, GND
RS-485-4w: Tx+, Tx-, Rx+, Rx-, GND
RS-485-2w: Data+, Data-, GND

Software Characteristics
Automation Languages: C/C++, IEC 61131-3
Protocols: Modbus TCP/RTU (master/slave), SNMPv1, SNMPv2c, SNMPv3, TCP/IP, UDP, DHCP, BOOTP, SNTP, SMTP

Power Requirements
Power Input: 24 VDC nominal, 9 to 48 VDC
Note: Compliant with EN 50155 at 24 VDC
Current for I/O Modules: 5 A @ 3.3 VDC (max.)
Power Consumption: 3.65 W @ 24 VDC

Physical Characteristics
Housing: Aluminum
Dimensions:
• 2-slot version: 114.7 x 135 x 100 mm (4.52 x 5.31 x 3.94 in)
• 5-slot version: 190.9 x 135 x 100 mm (7.52 x 5.31 x 3.94 in)
• 9-slot version: 292.5 x 135 x 100 mm (11.52 x 5.31 x 3.94 in)
Weight:
• 2-slot version: 1300 g
• 5-slot version: 2000 g
• 9-slot version: 2575 g

Mounting: DIN rail mounting (standard), wall mounting (optional)

Connector: Spring-type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C (-40 to 176°F)

Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Shock: IEC 60068-2-27

Vibration: IEC 60068-2-6

Altitude: Up to 2000 m

Note: Please contact Moxa if you require products guaranteed to function properly at higher altitudes.

Standards and Certifications

Safety: UL 508

EMC: EN 55032, EN 55024

EMI: FCC Part 15 Subpart B Class A, CISPR 22

EMS:

IEC 61000-4-2 ESD: Contact: 6 kV; Air: 8 kV

IEC 61000-4-3 RS:

   80 MHz to 1000 MHz: 3 V/m

   1400 MHz to 2100 MHz: 3 V/m

   2100 MHz to 2700 MHz: 1 V/m

IEC 61000-4-4 EFT: Power: 1 kV; Signal: 0.5 kV

IEC 61000-4-5 Surge: Power: 2 kV (L-PE), 1 kV (L-L); Signal: 1 kV (L-L), 2 kV (L-PE)

IEC 61000-4-6 CS: 3 V

IEC 61000-4-8 PFMF: 3 A/m

Rail Traffic: EN 50155*, EN 50121-3-2, EN 50121-4

*Complies with a portion of EN 50155 specifications.

Note: Please check Moxa's website for the most up-to-date certification status.

MTBF (mean time between failure)

Time: 859,979 hrs.

Standard: Telcordia SR332

Warranty

Warranty Period: 5 years

Details: See www.moxa.com/warranty

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Installation

This chapter includes instructions on how to install the ioPAC 8500.

The following topics are covered in this chapter:

❒ **Basic Installation**

➢ DIN Rail Installation Procedure

➢ Wall-Mounting Kit Installation Procedure

➢ Module Installation Procedure (Power-Off)

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❒ **Configuring Power**

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➢ IEC-61131-3 Compliant LEDs: R/S and ERR

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➢ Connecting to a Serial Device

➢ Serial Console (Debug Port)

❒ **Battery**

Basic Installation

DIN Rail Installation Procedure

Installing the ioPAC 8500 on a DIN Rail

The DIN rail attachment plate should already be fixed to the back panel of the ioPAC 8500 when you take it out of the box. If you need to reattach the DIN rail attachment plate to the ioPAC 8500, be sure the spring-loaded bracket is situated towards the bottom, as shown in the figures below.

NOTE	A wall mount kit can be purchased separately.

STEP 1: If the spring-loaded bracket is locked in place, push the recessed button to release it. Once released, you should feel some resistance from the spring as you slide the bracket up and down a few millimeters in each direction.

Spring-loaded bracket

Recessed button
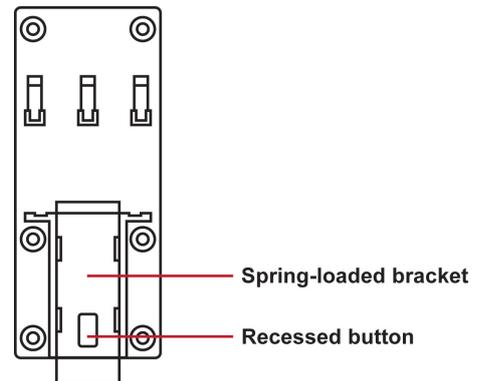
STEP 2: Insert the top of the DIN rail into the top slots on the DIN rail attachment plate.
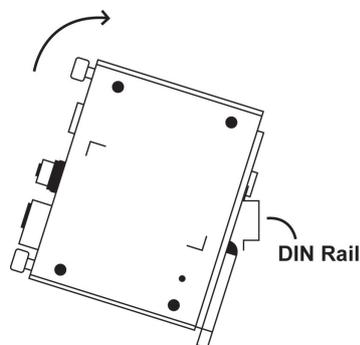
DIN Rail

STEP 3: The DIN rail attachment unit will snap into place as shown in the illustration below.
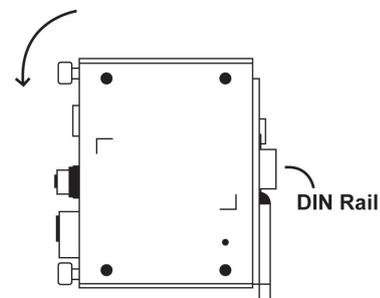
DIN Rail

Removing the ioPAC 8500 from a DIN Rail

To remove the ioPAC 8500 from a DIN rail, use a screwdriver to push down the spring-loaded bracket until it locks in place, as shown in the diagram at the right. Next, rotate the bottom of the switch upwards and then remove the switch from the DIN rail.

DIN Rail
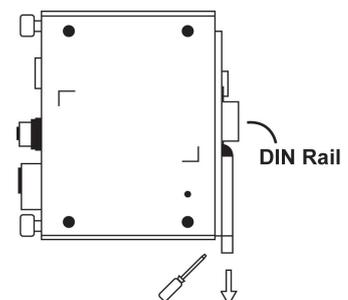
Wall-Mounting Kit Installation Procedure

If required for your application, the wall-mounting kit can be purchased separately as an optional accessory.

STEP 1: Use screws to attach the wall-mounting kit to the back of the ioPAC 8500, as shown below:
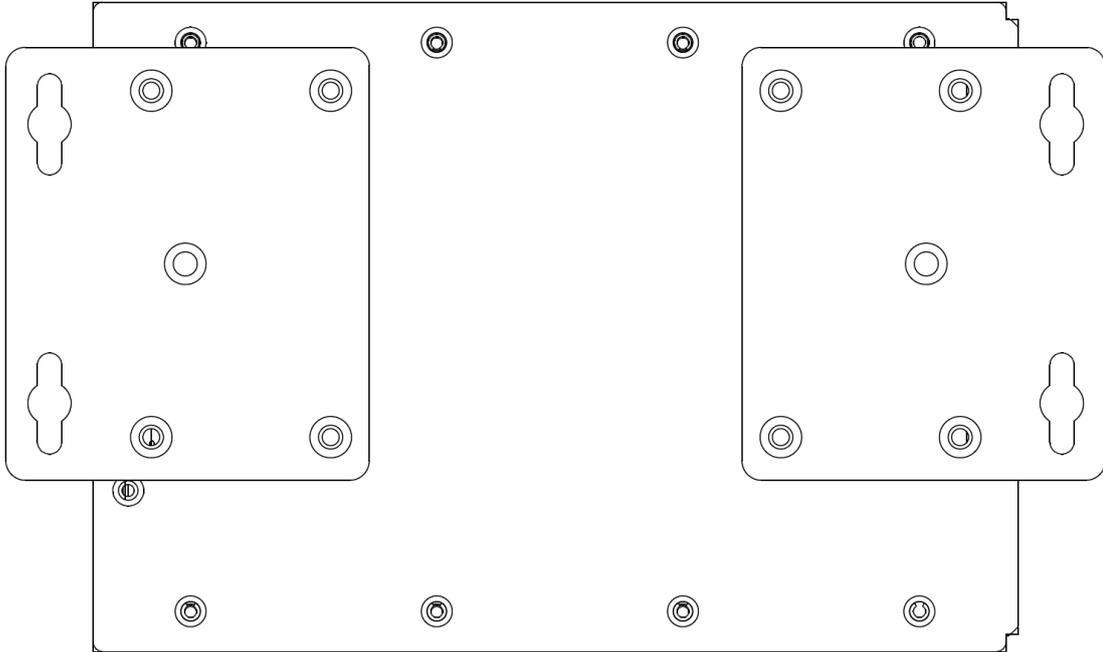
STEP 2: Use screws to fix the wall-mounting kit to a wall.
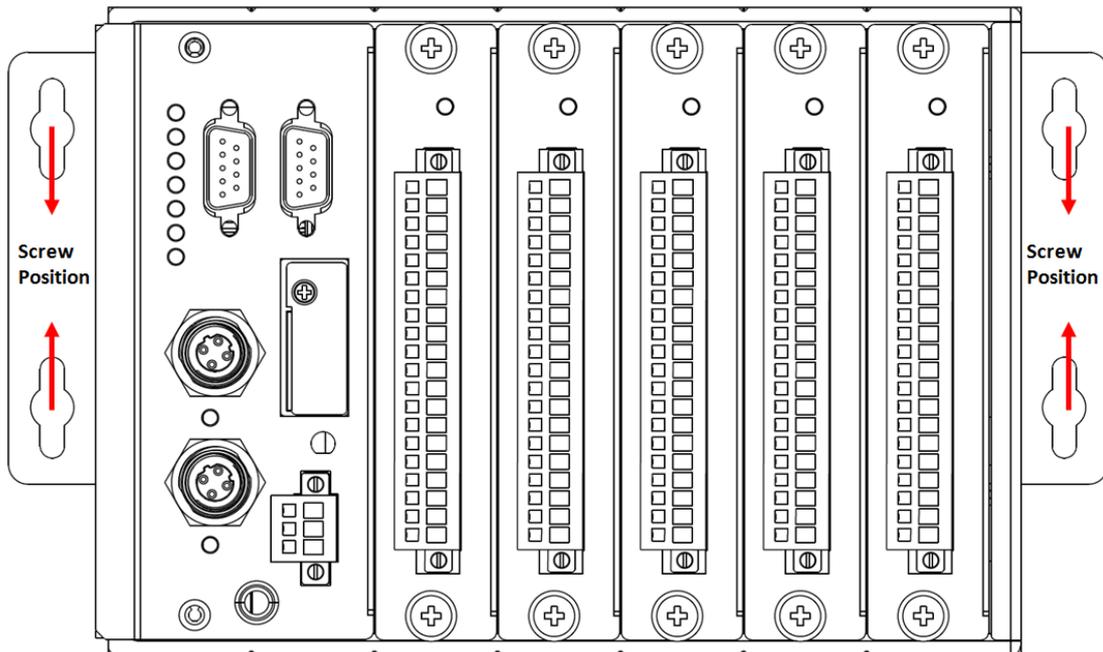
Module Installation Procedure (Power-Off)

Moxa's ioPAC 8500 controllers come with 2, 5, or 9 slots for 85M-series modules. Use the following procedure to install modules when your system is powered off.

Step1: Install the module into the ioPAC 8500 system. The module's PCB should align with the edge of the frame. Push the module into the slot and make sure the module is plugged into the backplane.

Step2: Fasten the two screws using 3.5±0.5 kg of torque.

Module Installation Procedure (Power-On)

All ioPAC 8500 modules are hot-swappable, which means that you can safely install, remove, and replace modules while the system is powered o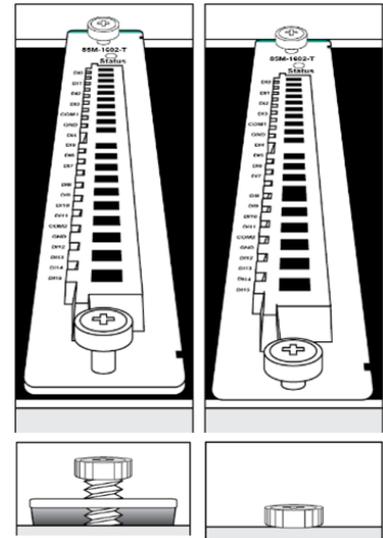n. When a module is removed or installed when the system is powered on, the module head stops processing and registers the newly installed or recently removed module, and scans for a configuration change. There is no disruption to normal operation during module insertion or removal.

After installing a new module, it could take about ten seconds for the system to recognize and activate the module, at which point the module's LED will turn green.

WARNING

When the system is powered on, do not install more than one module at a time. If you need to install multiple modules, wait until the most recently installed module's LED turns GREEN before installing the next module.

Configuring Power

Powering on the ioPAC Controller

The ioPAC controller can receive power from a 9 to 48 VDC power source, and is compliant with EN 50155 at 24 VDC. Input power is applied to the positive (V+) and negative (V-) terminals on the connector.

- When the input voltage is below the minimum recommended voltage the ioPAC will turn off.
- The ioPAC has reverse protection and power input over-voltage protection, allowing it to resist a maximum voltage of 60 V, and the ioPAC's power input over-current fuse protection specification is 5 A.
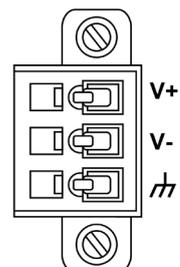
After connecting the Moxa ioPAC controller to the power supply, it will take 30 to 60 seconds for the operating system to boot up. The green Ready LED will illuminate continuously until the operating system is ready.

ATTENTION

This product is intended to be supplied by a Listed Power Unit with output marked "LPS" and rated for 9-48 VDC (minimum requirements). For railway rolling stock applications, these devices must be supplied by a galvanic isolated power supply with design based on the EN 50155 standard.

Installing a microSD Card

The ioPAC is equipped with one slot for a microSD card. The card reader slot is located inside the ioPAC device, so you will need to unscrew and remove the card cover to install your microSD card. When inserting a microSD card, remember to keep the front edge of the card facing down.

Follow these steps to remove or install a microSD card:

1. Remove the screw holding the card cover in place.
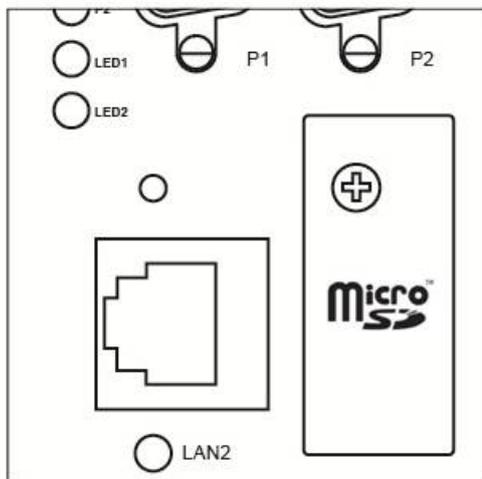
2. (a) Insert the microSD card into the microSD card slot, or
    (b) Remove the microSD card from the microSD card slot.
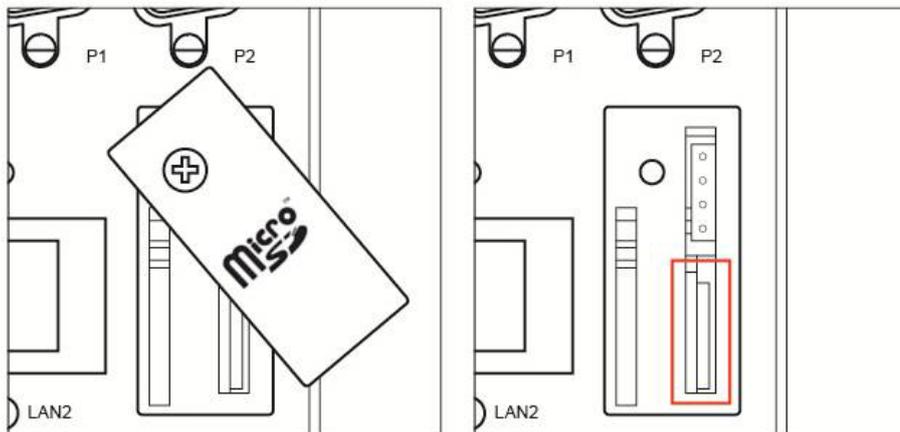
3. Fasten back the screw holding the card cover in place.

ioPAC 8500 LED Indicators

There are 9 LEDs on the ioPAC controller.

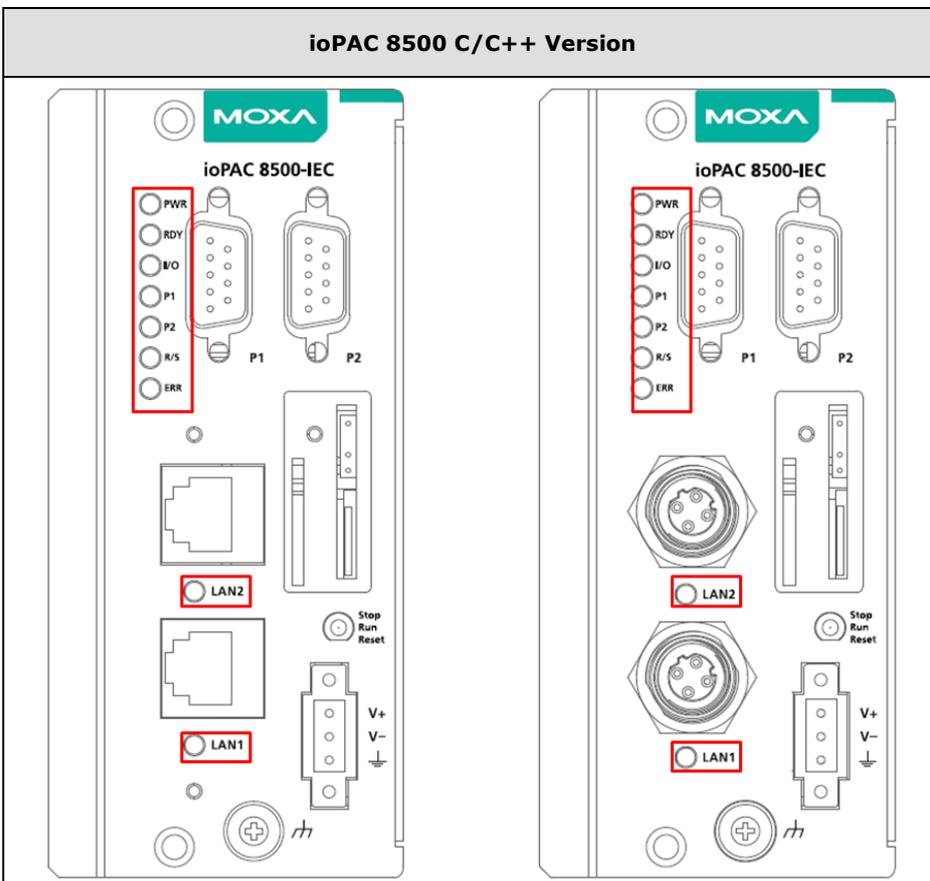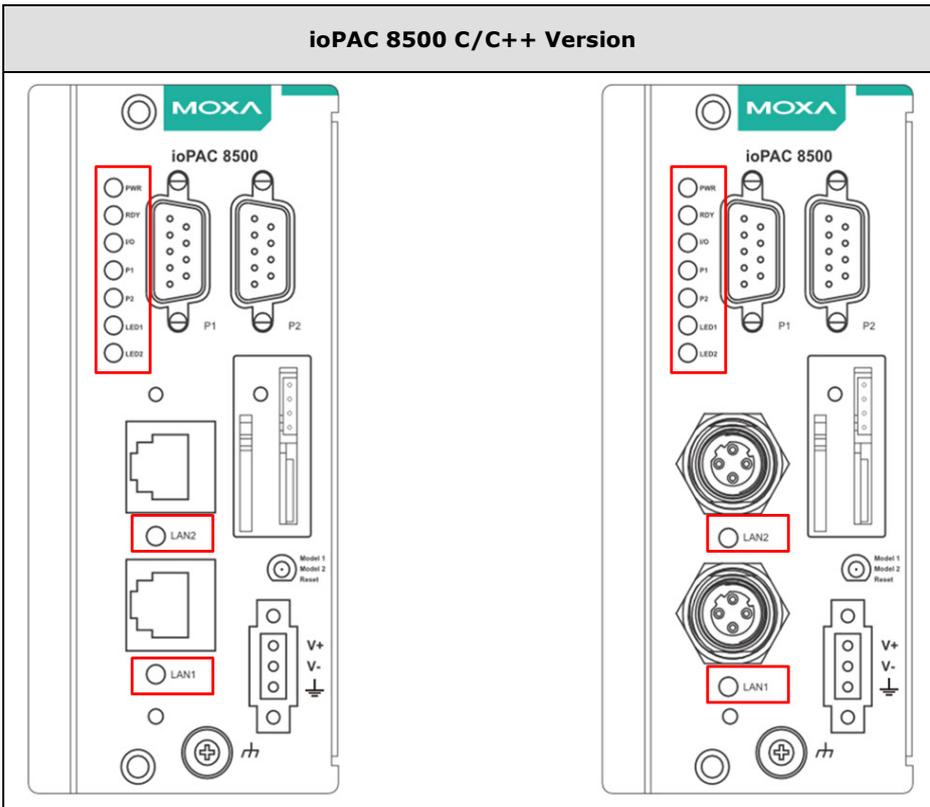| Category	Label	Usage	
System	PWR	System Power	**On:** Power On
			Off: Power Off
	RDY	System (Kernel) Ready	**Green:** System Ready
			Blinking Green: System is booting up
			Red: System error, firmware upgrade, or reset procedure underway
			Blinking Red: Factory reset triggered
	I/O	Expansion Status (on Head)	**Green:** Expansion configuration OK
			Red: Expansion configuration failed
			Off: No module connected
	Status	Expansion Status (on Module)	**Green:** Expansion mode ready
			Red: Expansion mode failed
			Off: Not connected
C/C++ Version	LED1, LED2	User-Defined	User-Defined
IEC Version	R/S	Run/Stop Mode	**Green:** The CPU is executing PRDK.
			OFF: The CPU has stopped / is not executing PRDK.
	ERR	Error	**Red:** System / I/O / services error
			OFF: No error (auto update if error fixes)
Communication	LAN1, LAN2	Ethernet Connection	**Green:** 100Mb
			Amber: 10Mb
			Blinking: data transmitting
			Off: disconnected
	P1, P2	Serial Connection	**Green:** Transmitting data (Tx)
			Amber: Receiving data (Rx)
			Off: disconnected

System LEDs

PWR (Power LED)

The Power (PWR) LED indicates the status of the system power. When the system is on, this LED will turn green, and when the system power is off this LED will be off.

RDY (Ready LED)

The Ready (RDY) LED indicates the status of the system's kernel. When the LED is green the system kernel is ready. When the LED is green and blinking, the system's kernel is booting-up. When the Ready (RDY) LED is red, there is either a system error or the system is being reset to factory defaults. When the Ready LED is red and blinking, the device's factory default mode has been triggered.

IO (Expansion Module LED)

The IO LED on the module indicates the status of the expansion modules. When the LED is green, all expansion module configurations are okay, and when the LED is red, at least one of the expansion modules failed to configure properly.

C/C++ Version LEDs: LED1 and LED2

The ioPAC controller allows the user to custom configure these two LEDs (through the software interface). Refer to the **C/C++ Sample Code Programming Guide for ioPAC RTU Controllers** for details.

IEC-61131-3 Compliant LEDs: R/S and ERR

The ioPAC controller supports IEC-61131-3-compliant Run/Stop and Error (ERR) LEDs for ISaGRAF-specific notifications. These LEDs are not user configurable.

Communication LEDs

P1 and P2

The ioPAC controller comes with two serial connections. P1 and P2 represent the status of each serial connection. When the LED is green, the ioPAC is transmitting data (Tx). When the the LED is amber, the ioPAC is receiving data (Rx). When the LED is blinking randomly, data is either being transmitted or received. For example, if P1 is blinking and is green, the ioPAC is transmitting data.

When the LED is off, the serial connection is disconnected.

LAN1 and LAN2

The ioPAC controller comes with two Ethernet ports, with the LAN1 and LAN2 LEDs used to represent the status of the two connections. When the LED is green, data is transmitting at 100 Mbps. When the LED is amber, data is transmitting at 10 Mbps. When the LED is blinking, data is being transmitted. When the LED is off, there is no Ethernet connection, or the Ethernet connection has been disconnected.

The Toggle Switch

The toggle switch functions differently depending on the programming language set your ioPAC model is configured for.

In IEC-61131-3 Models

For IEC-61131-3 models, the toggle switch is a simple run/stop switch for IEC programs. Users can enable or disable it through RTUxpress. The default setting is disabled.

In C/C++ Models

On models that use the C language set, the toggle switch is programmable, giving integrators and end-users a switch that can trigger one of two operation modes (refer to the **C/C++ Sample Code Programming Guide for ioPAC RTU Controllers** for details).

Toggle Switch: Factory Reset Process

Use the following procedure to reset the ioPAC to the factory defaults. Note that when you reset the ioPAC, all of your tag definitions, software programs, and files will be deleted, and the service and runtime engine will be restarted.

1. When the system is booting up and the RDY LED is blinking GREEN, hold the toggle switch in the "reset" position.
2. Continue to hold toggle switch until the "RDY" LED turns a solid RED, and then release the toggle switch. It will take around 90 seconds to complete the factory reset process.
3. When the "RDY" LED starts blinking GREEN (indicating that the kernel is rebooting), the factory mode is completed.

NOTE	Do NOT power off, operate, or connect any devices when the **RDY** LED is a solid **red**. The factory reset function is only activated when the system is booting up.

Connecting to the Network

Ethernet Communication

Connections to the LAN port are made through an RJ45 or M12 connector on the module. The wiring and pin connections for these connectors are described in separate sections below.

- **TCP/IP Settings:** Dual Speed Functionality: The ioPAC 8500's Ethernet ports auto negotiate with the connected devices and then use the fastest data transmission rate supported by both devices. The following table shows the TCP/IP parameters supported by the LAN port. Default values are set when a Factory Reset is performed on the controller.

LAN Port 1		LAN Port 2	
Parameter	**Supported Values**	**Parameter**	**Supported Values**
IP Address	Default: 192.168.127.254	IP Address	Default: 192.168.126.254
Subnet Mask	Default: 255.255.255.0	Subnet Mask	Default: 255.255.255.0
Gateway	Default: 0.0.0.0	Gateway	Default: 0.0.0.0

IP Address is the IP address of the controller.
Subnet Mask determines the subnet on which the controller is located.
Gateway determines how your controller communicates with devices outside its subnet. Enter the IP address of the gateway.
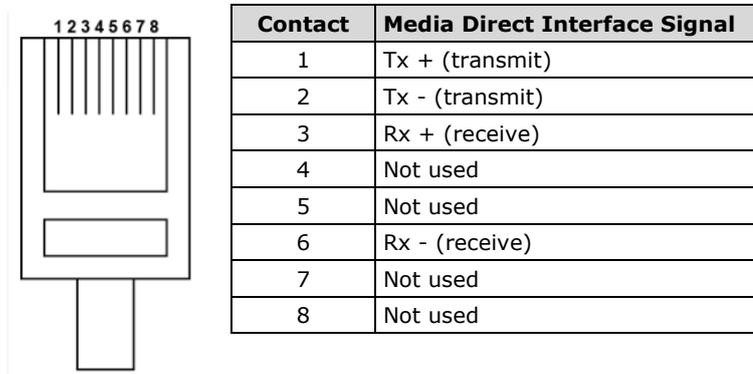The IP address, subnet mask, and gateway are static; contact your network administrator to obtain these addresses for the controller.

RJ45 Ethernet Connector

The ideal maximum cable length of a 10/100BaseT connection is 100 m (350 feet), but the actual limit could be longer or shorter depending on the amount of electrical noise in the environment. To minimize the amount of noise, Ethernet cables should not run parallel to power cables or other types of cables that generate electrical noise.

The following diagram and table shows the pin connections for the RJ45 Ethernet connector:

RJ45 Connector Pin Assignment

| Contact	Media Direct Interface Signal
1	Tx + (transmit)
2	Tx - (transmit)
3	Rx + (receive)
4	Not used
5	Not used
6	Rx - (receive)
7	Not used
8	Not used

M12 Ethernet Connector

The ioPAC 8500 has two 10/100BaseT(X) Ethernet ports that use 4-pin shielded M12 connectors with D coding. The 10/100T(X) ports located on the front panel of ioPAC 8500 are used to connect to Ethernet-enabled devices. Most users configure these ports for Auto MDI/MDI-X mode, in which case the port's pinouts are adjusted automatically depending on the type of Ethernet cable used (straight-through or cross-over), and the type of device (NIC-type or HUB/Switch-type) connected to the port.

- **The Auto MDI/MDI-X function** (M12 connector) allows users to connect the ioPAC 8500's 10/100BaseTX ports to any kind of Ethernet device, without needing to pay attention to the type of Ethernet cable being used for the connection. This means that you can use either a straight-through cable or cross-over cable to connect the ioPAC 8500 to Ethernet devices.

The following diagram and table shows the pin connections for the M12 Ethernet connector:

M12 Ethernet Connector Pin Assignments

| Male	Wire-Color	Bus	Reference
1	Orange	(+)	B
2	Not used	n.c	–
3	–	Shield	S
4	Blue	-1	A
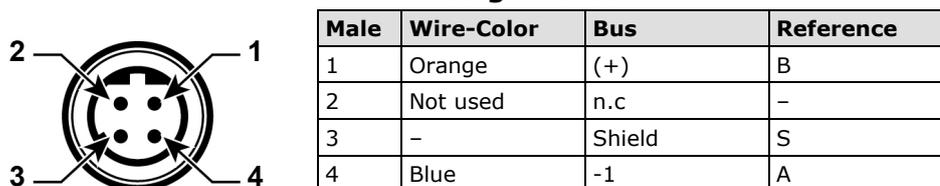
In what follows, we give pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch-type) ports. We also give cable wiring diagrams for straight-through and cross-over Ethernet cables.
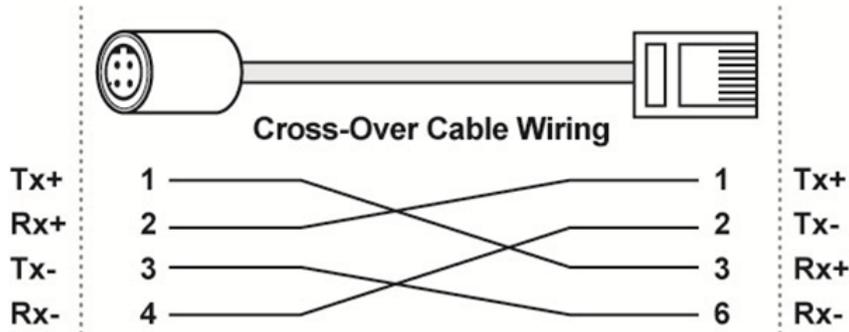
**M12 (4-pin, M) to M12 (4-pin, M) Cross-Over Cable Wiring**

Cross-Over Cable Wiring

Tx+	1	— ✕ —	1	Tx+
Rx+	2		2	Rx+
Tx-	3	— ✕ —	3	Tx-
Rx-	4		4	Rx-
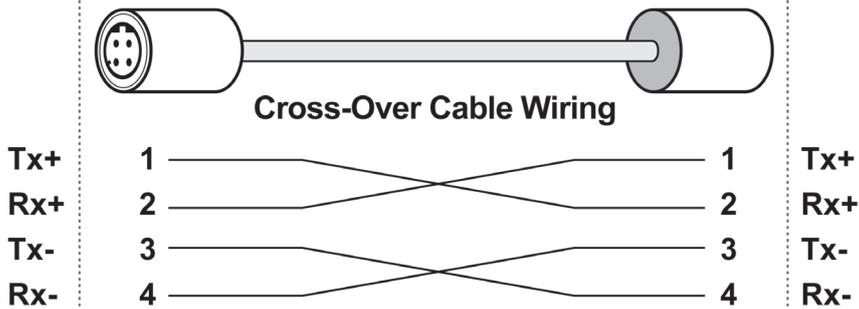
M12 (4-pin, M) to M12 (4-pin, M) Straight-Through Cable Wiring

Straight-Through Cable Wiring

Rx+	1	———	1	Rx+
Tx+	2	———	2	Tx+
Tx-	3	———	3	Tx-
Rx-	4	———	4	Rx-
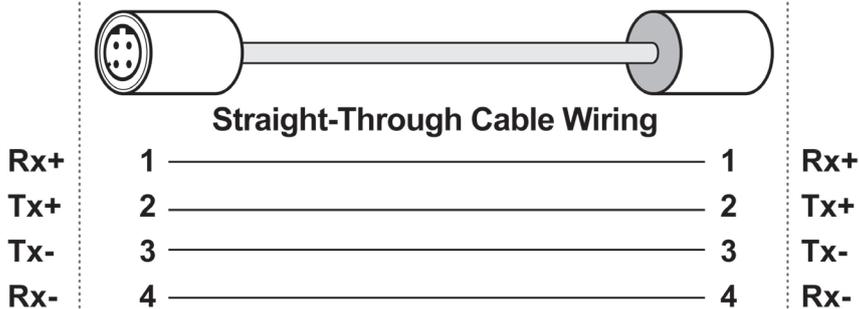
M12 (4-pin, M) to RJ45 (8-pin) Cross-Over Cable Wiring

Cross-Over Cable Wiring

Tx+	1		1	Tx+
Rx+	2		2	Tx-
Tx-	3		3	Rx+
Rx-	4		6	Rx-

M12 (4-pin, M) to RJ45 (8-pin) Straight-Through Cable Wiring

Straight-Through Cable Wiring

| Tx+ | 1 | | 1 | Tx+ |
Rx+	2		2	Tx-
Tx-	3		3	Rx+
Rx-	4		4	Rx-
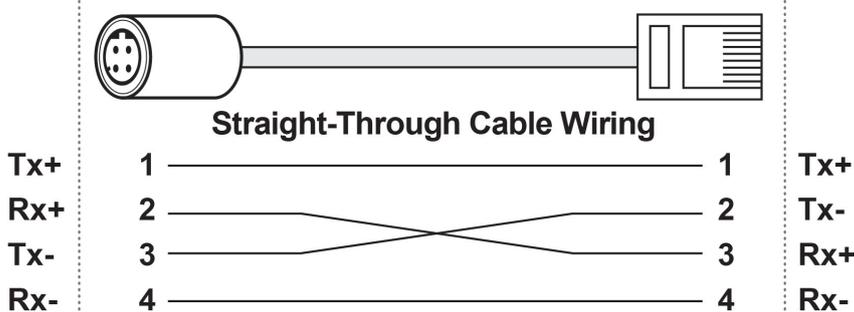
⚠️ **ATTENTION**

Configuring the two LAN ports on the same ioPAC RTU controller to the same network domain (e.g., 192.168.1.1 and 192.168.1.2) is not recommended.

Port Trunking

The ioPAC 8500 RTU controller has a **Port Trunking** function (active backup mode) that can convert two LAN-port IP addresses into one virtual IP address for easy SCADA integration and Ethernet redundancy. In the following diagram, both LAN ports on each ioPAC RTU controller are connected to a managed switch on an Ethernet network running SCADA software. For more details regarding configuration setup, refer to the **ioPAC RTU Software User's Manual.**

Single IP: 10.129.44.1

Single IP: 10.129.44.2
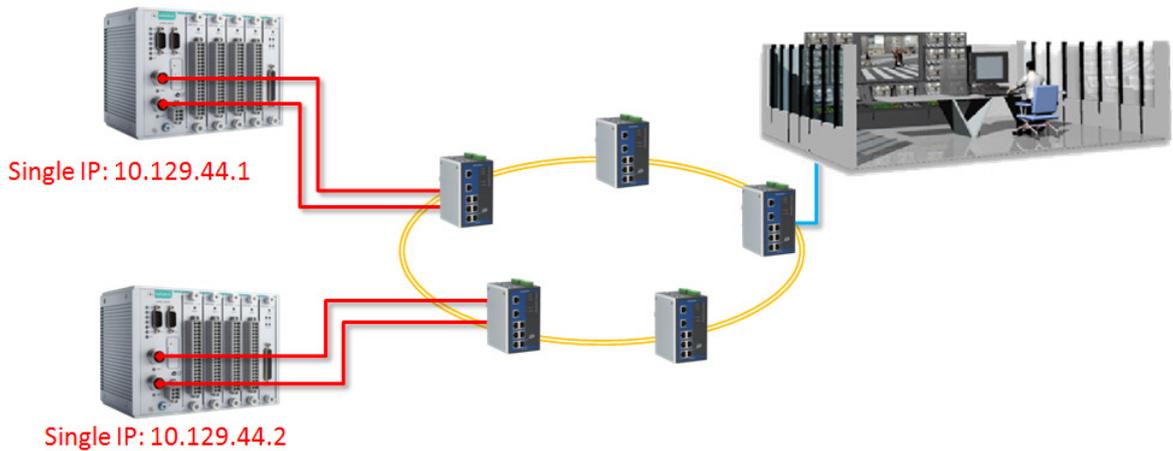
Serial Connectivity

Connecting to a Serial Device

The ioPAC RTU is equipped with two 3-in-1 serial ports that support RS-232/422/485, making it more convenient to connect field serial devices.
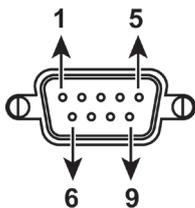

Pin	RS-232	RS-422 and 4-wire RS-485	2-wire RS-485
1	DCD	TxD-(A)	–
2	RXD	TxD+(B)	–
3	TXD	RxD+(B)	Data+(B)
4	DTR	RxD-(A)	Data-(A)
5	GND	GND	GND
6	DSR	–	–
7	RTS	–	–
8	CTS	–	–
9	RI	–	–

Serial Console (Debug Port)

The serial console gives users a convenient way of connecting to the RTU controllers. This method is particularly useful when using the computer for the first time. The serial console is also effective for connecting the Moxa RTU controllers when you do not know target network settings and IP addresses.
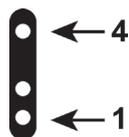
Step 1: To use the serial console, remove the cover from the front/top panel first.

Console Port for the ioPAC Series
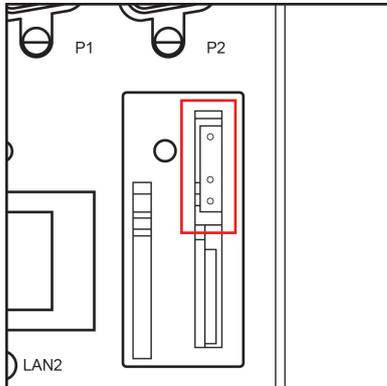
Step 2: Attach the 4-pin serial console cable to the console port. The following diagram shows the 4-pin serial connector and pin connections.

Pin Assignment for the Serial Console Port   **Serial Console Default Settings**

Pin	Definition
1	TxD
2	RxD
3	NC
4	GND

Parameter	Value
Baudrate	115200 bps
Parity	None
Data bits	8
Stop bits	1
Flow Control	None
Terminal	VT100

We recommend using Moxa PComm Terminal Emulator to connect to the serial console. The following steps describe how to connect the console.

1. Download Moxa PComm Lite from the Moxa website (www.moxa.com) or copy it from the following folder on the Documentation and Software CD: Software\utility\PComm\.

2. Install Moxa PComm Lite to the host Windows PC.

3. Run PComm Lite Terminal Emulator from **Start → Programs → PComm Lite Ver 1.x → Terminal Emulator**.

4. Click **Profile → Open**.

5. Specify which COM port is connecting to the Moxa RTU, and use the following configuration settings: 115200, 8, none, 1.
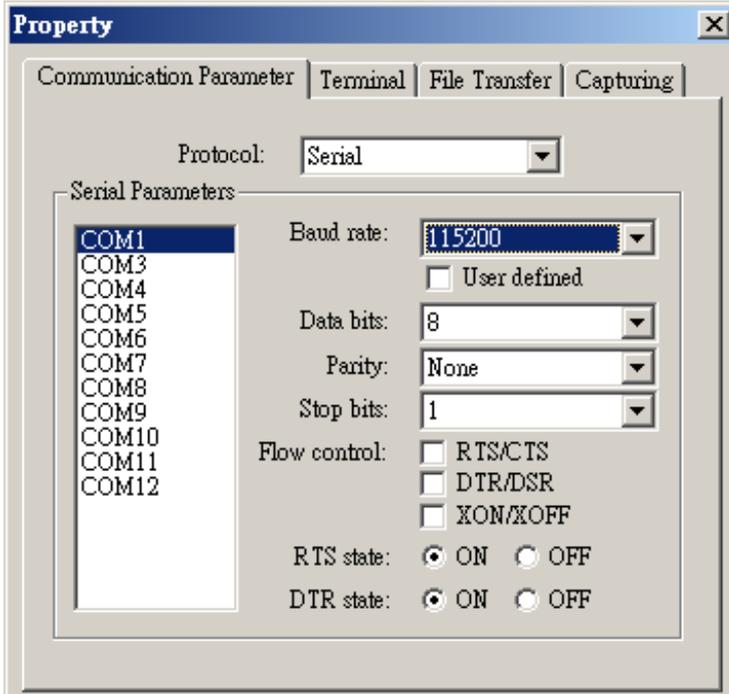
6. Click on the Terminal tab and configure the Terminal Type to VT100. Click **OK** to proceed.
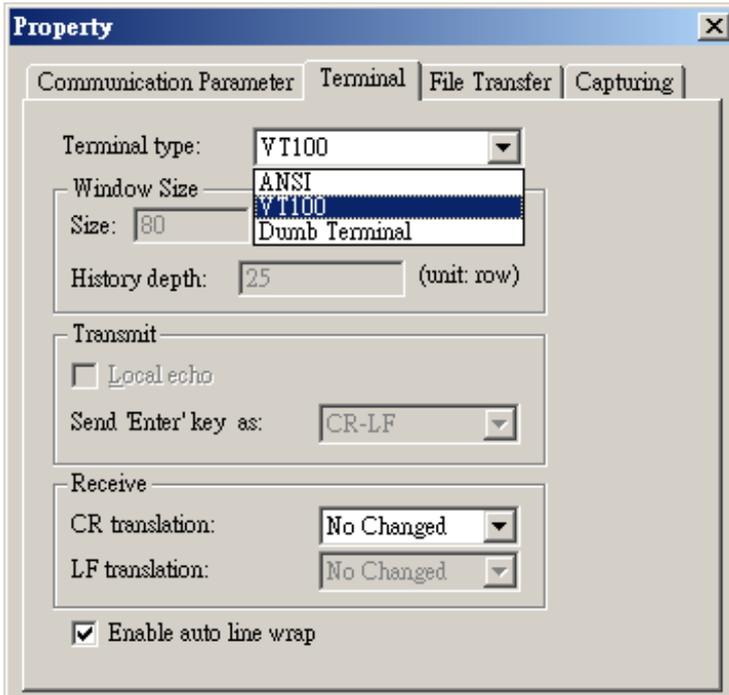
7. The serial console will be displayed on the terminal screen.

Battery

The ioPAC RTU controller is equipped with one built-in, rechargeable VL2020 3V battery for the SRAM and one BR2032 3V non-rechargeable battery for the Real Time Clock (RTC).

- Rechargeable battery (VL2020) for SRAM
    - ➢ Sustains at least 1 week without power supply
    - ➢ Capacity: 20 mAh
    - ➢ Typical consumption (@ 25°C): 4 μA
    - ➢ 5-year warranty
- Non-rechargeable battery (BR2032) for RTC
    - ➢ Sustains at least 5 years without power supply
    - ➢ Capacity: 195 mAh
    - ➢ Typical consumption (@ 25°C): 2 μA
    - ➢ 5-year warranty

⚠️ **Caution**

Do NOT attempt to replace the battery. Contact your local dealer for replacement assistance.

3

The RTUxpress Utility

In this chapter, we introduce Moxa's RTUxpress Utility. The ioPAC Series can be managed and configured over an Ethernet using RTUxpress, which provides easy access to all status information and ready-to-run service settings.

The following topics are covered in this chapter:

❒ **RTUxpress Introduction**
  ➢ Quick Start
  ➢ User Interface

❒ **Device and Service Configuration**
  ➢ Settings Page
  ➢ Log Message Window

RTUxpress Introduction

Moxa RTUxpress is a user-friendly and intuitive offline configuration tool for configuring Moxa's ioPAC Programmable Controllers. RTUxpress is provided free of charge, and can be upgraded for free when future upgrades become available. RTUxpress has a user-friendly interface for device setup, tag management, and service configuration.

The TagEasy feature implements tag-centric programming through RTUxpress, in which a "tag" links resources (DI, DO, AI, etc.) with ready-to-run services (alarms, logging, active tags, etc.).

For example, users can read a pre-defined DI tag to get the channel status, or change the value of a pre-defined internal variable to trigger a logging service.

From the point of view of the engineer responsible for programming, the focus has changed from incorporating lots of APIs to just configuring simple tags instead.

This change of focus greatly reduces the programming effort.

Moxa's ioPAC programmable controllers provide ready-to-run services, including alarms, data logging, and communication, to help programmers reduce the time and effort needed for program design. With Moxa's RTUxpress utility, programmers only need to configure the appropriate services, and then upload the configuration file to the ioPAC programmable controllers. Once ioPAC is configured, all of the services will be ready to run.
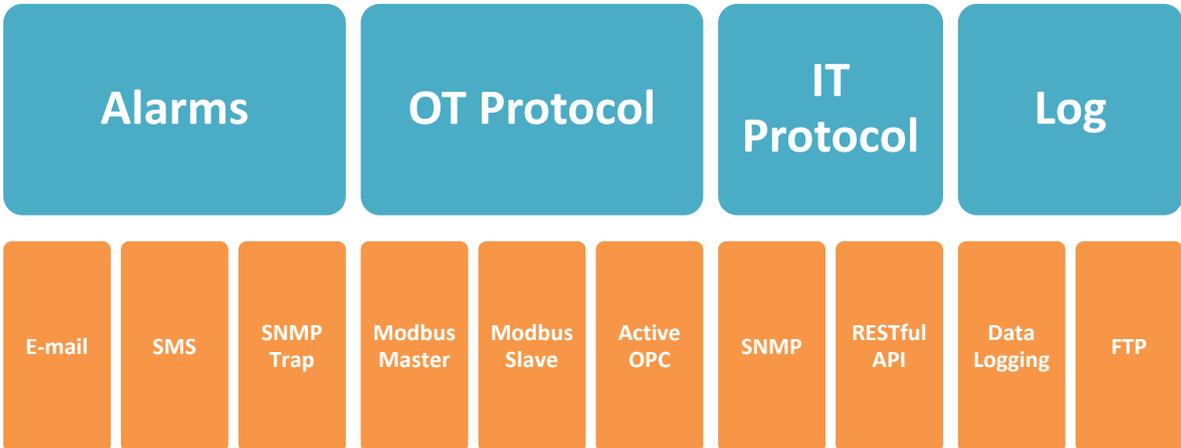
Quick Start

When you start RTUxpress, click on **New Project**, **Open Project**, or **Help**, located at the bottom of RTU Quick Start window. If do not want the Quick Start window to appear the next time you log in, select the **Do not show this Quick Start again** checkbox before proceeding.
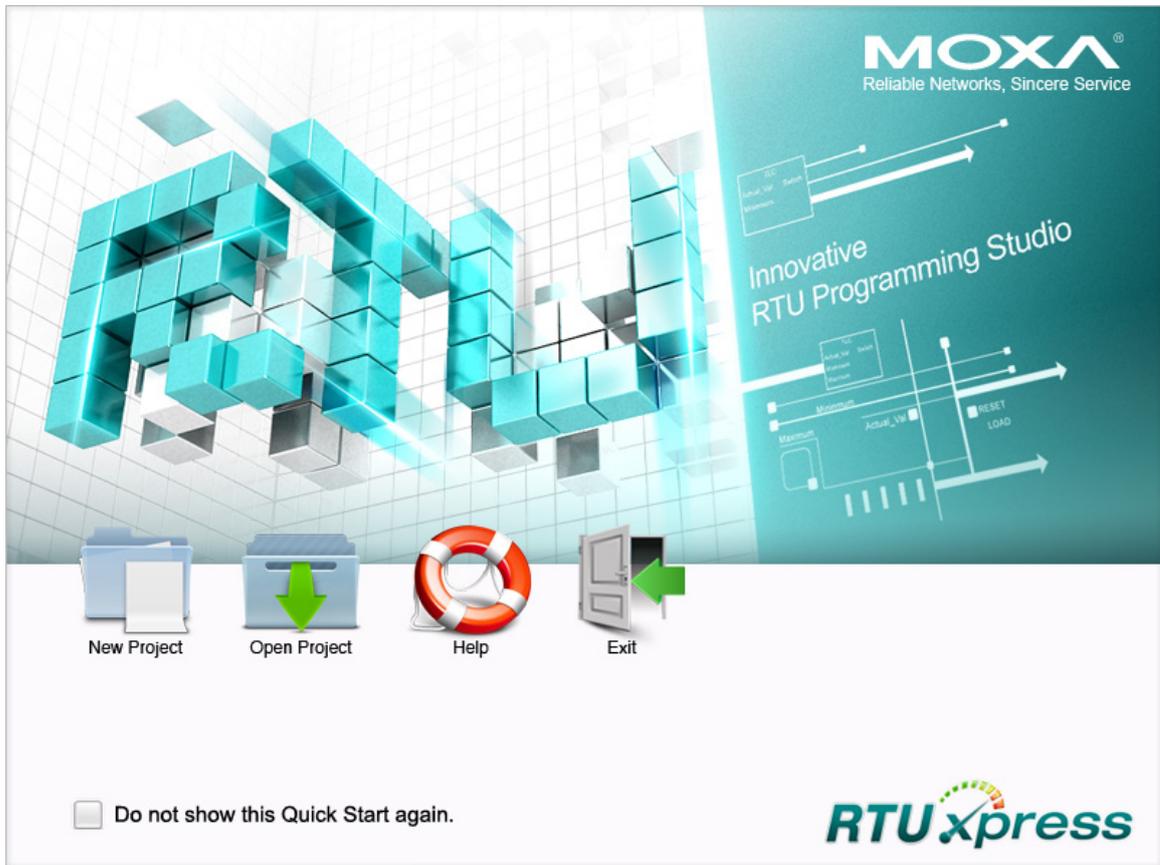

New Project

When you create a new ioPAC 8600 project for ioPAC 8600 device configuration, you can specify the **Project Name**, set the **Product Series** to ioPAC 8600, and choose the C/C++ or IEC 61131-3 programming language from the **Select Device** dropdown box. Click **OK** to proceed.
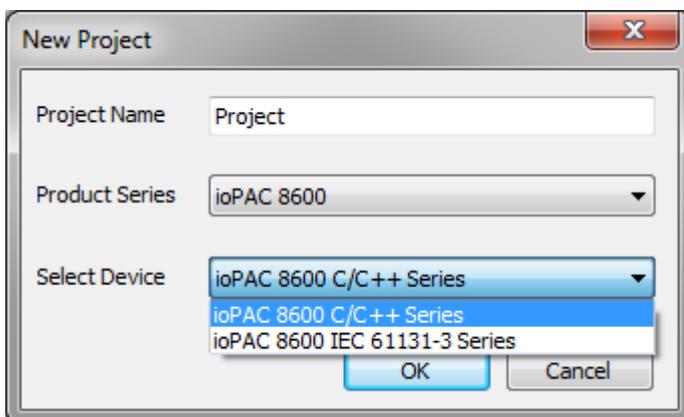
The **New CPU and Power Modules** dialog allows you to specify the characteristics of the backplane module you are using.

- Select the number of slots from the **No. of Slots** dropdown box.
  Three models are supported: 5 slots, 9 slots, 12 slots.
- Select the CPU model you are using from the **CPU module** dropdown box.
- Select the model of power module you are using from the **Power 1 Module** dropdown box.
- ioPAC 8600 9-slot and 12-slot backplane modules support redundant power modules. If you are using either a 9-slot or 12-slog module, you can select an additional power module from the **Power 2 Module** dropdown box.

NOTE	You must specify the same power module models in the Power 1 Module and Power 2 Module dropdown boxes.
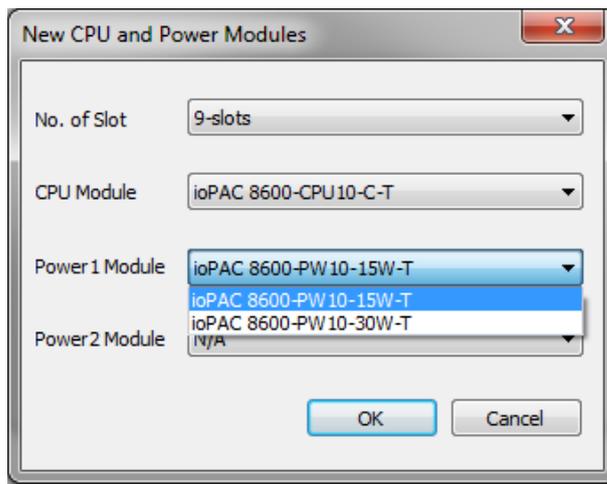
Open Project

When you click on the **Open Project** icon from the Quick Start interface, use the **Open** dialog to select which project you would like to open.
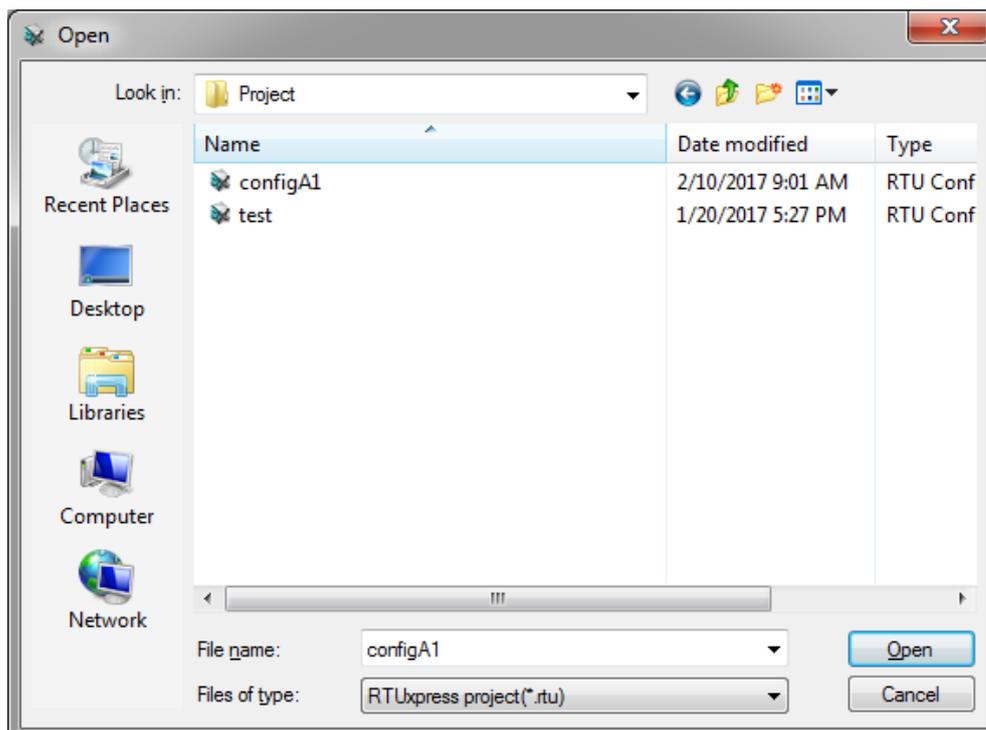
Help

Click the Help button to open the RTUxpress help utility, and then select a help topic from the left menu.
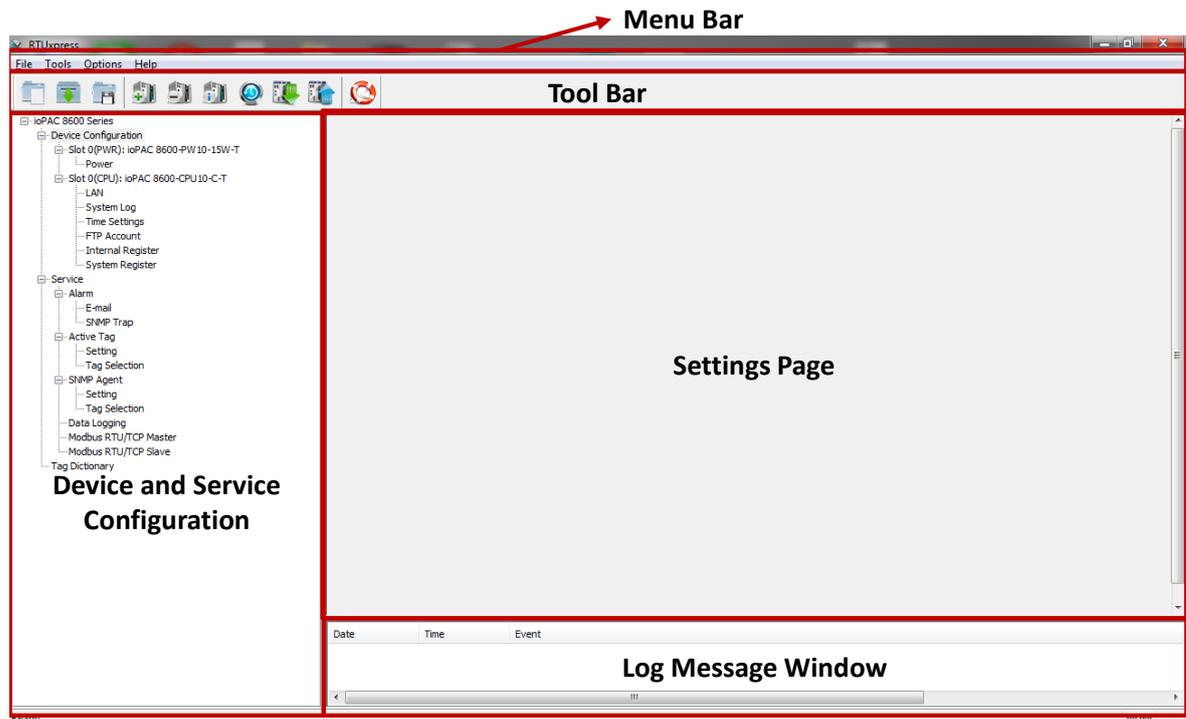

Exit

Click the **Exit** icon to close the RTUxpress utility.
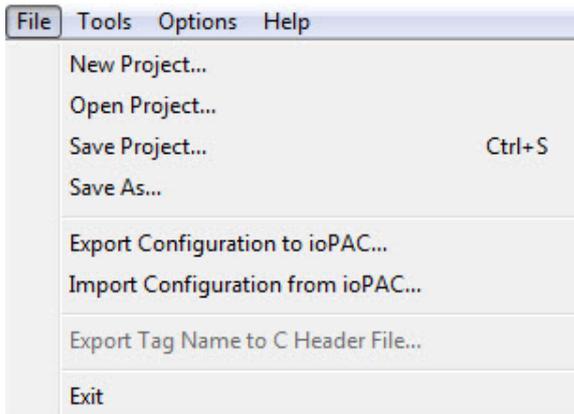
User Interface

The RTUxpress interface is divided into six main areas:

- Menu bar
- Tool bar
- Device configuration options
- Service configuration options
- Settings panel
- Log message panel

Menu Bar

File:

The following options are available under the **File** menu item:

- New Project: Create a new RTUxpress project
- Open Project: Open an existing RTUxpress project
- Save Project: Save the RTUxpress project that is currently opened
- Save As: Save the currently opened project as a new project
- Export Configuration to ioPAC: Export the configuration file to an ioPAC Programmable Controller
- Import Configuration from ioPAC: Import the configuration file from an ioPAC Programmable Controller
- Export Tag Name to C Header File: Export the tag name to a C header file for use in a C/C++ program
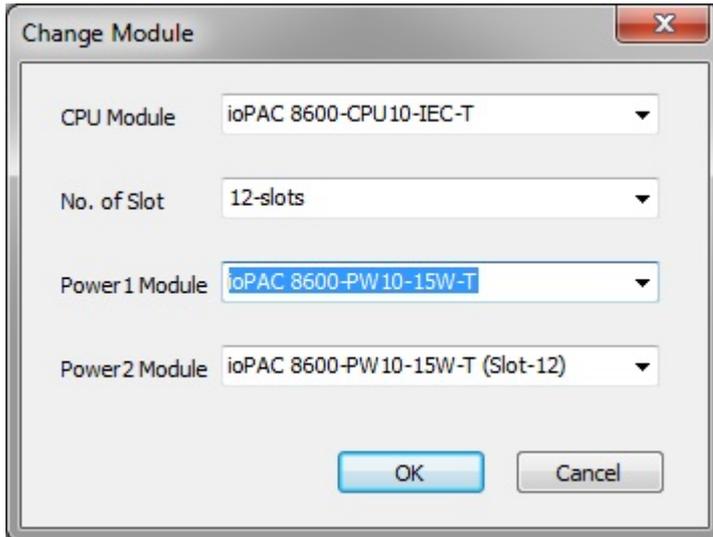- Exit: Close the RTUxpress utility

Tools:

The following options are available under the **Tools** menu item:

- Add Module: Add an ioPAC I/O module to the RTUxpress project
- Delete Module: Delete an ioPAC I/O module from the RTUxpress project

- Change CPU/Power Module: Change the CPU, Power, backplane settings for the RTUxpress project

- Device Information: Get the device information for a particular device
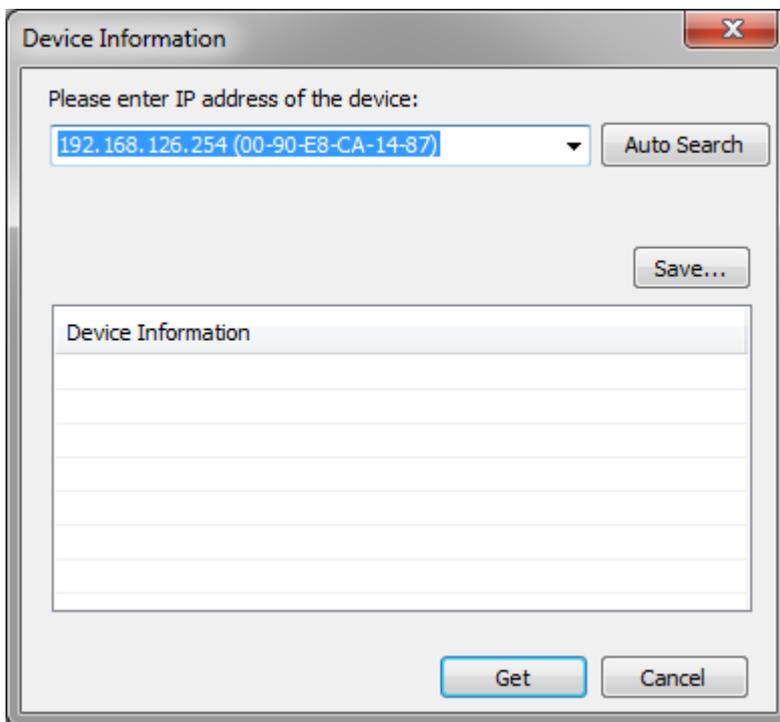
NOTE	A username and password are required to retrieve device information. the default Username/Password is moxa/moxa for the ioPAC 8600-CPU30 series and root/root for other ioPAC series products.

- Time Sync: Synchronize the device time with the PC's time, or set the time manually

- Modify Password: Modify the administrator password
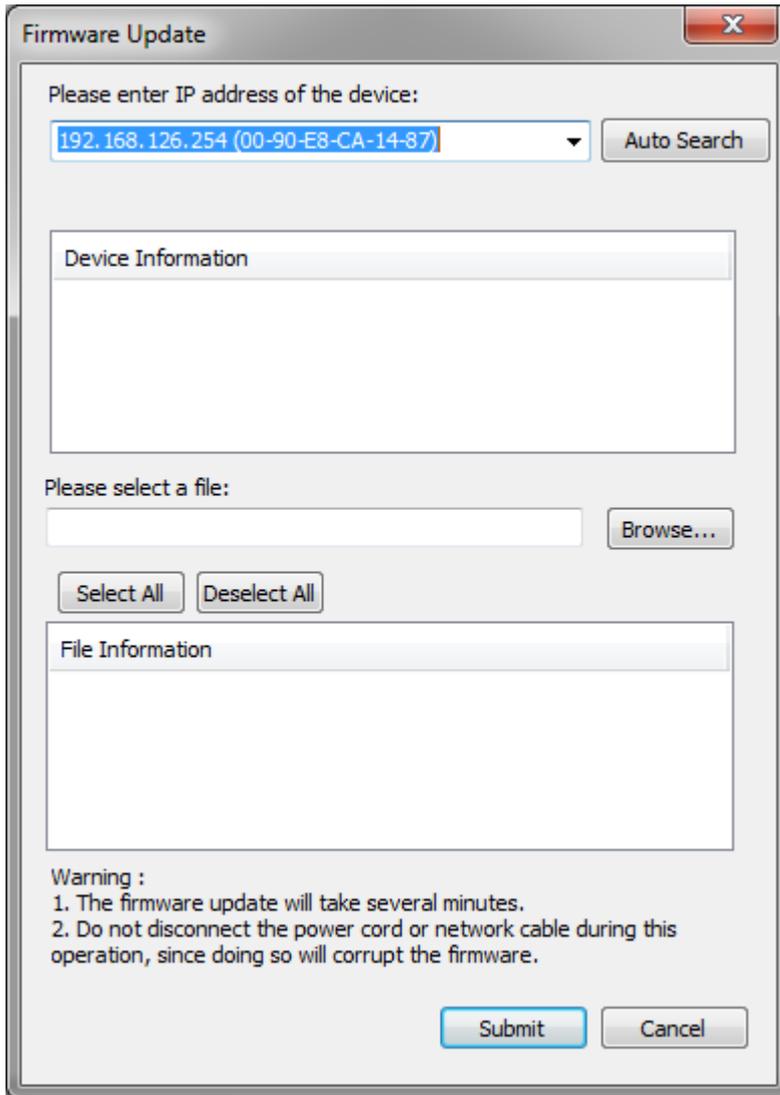
- Reboot Device: Reboot the ioPAC Programmable Controller
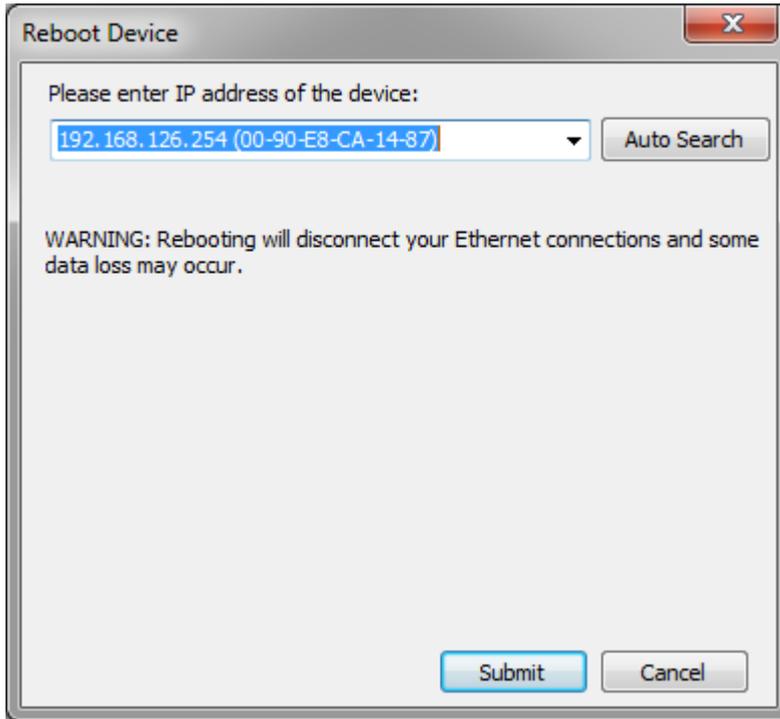
- Firmware Update: Upgrade the ioPAC Programmable Controller's firmware

- Factory Reset: Reset all settings and configurations to default settings

  IEC 61131-3 Setting:

  a. Resource information: Indicates how many resources are supported by the ioPAC and whether or not the resources are running.
  b. ISaGRAF Runtime Engine Reset to Default: Deletes all resources and programs in the ioPAC and restarts the ISaGRAF runtime engine.

- Online System Log: Users can change the system log settings online.
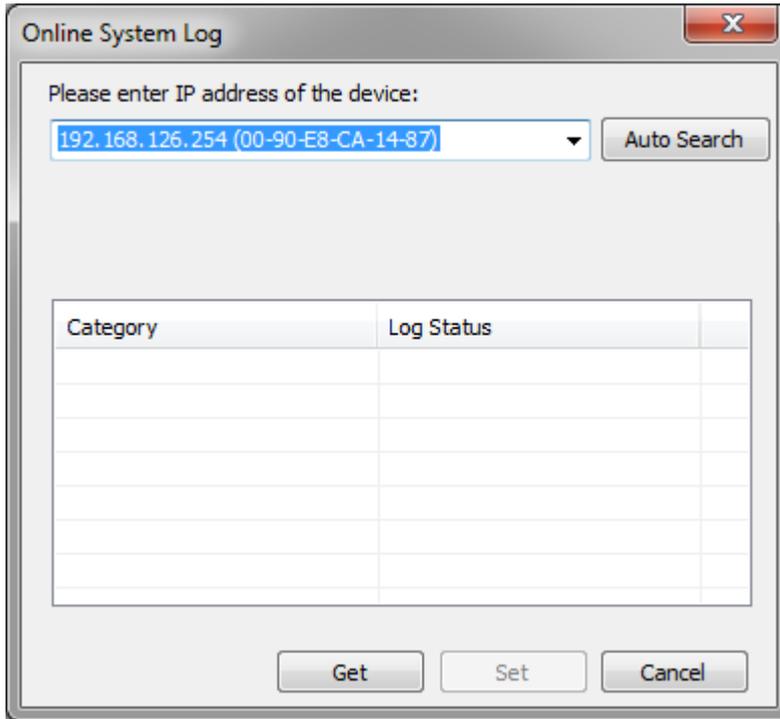
| NOTE	Enabling the log will affect device performance. However, we recommend enabling it so that runtime details will be logged when the ioPAC experiences unexpected errors.

- Diagnostic & Testing Tool: The tool can be used to pre-test or monitor the IO status of the device. Take the following steps to use the tool:

  Step 1: Start the tool, key in an IP address or auto search for a device, and then then click submit.
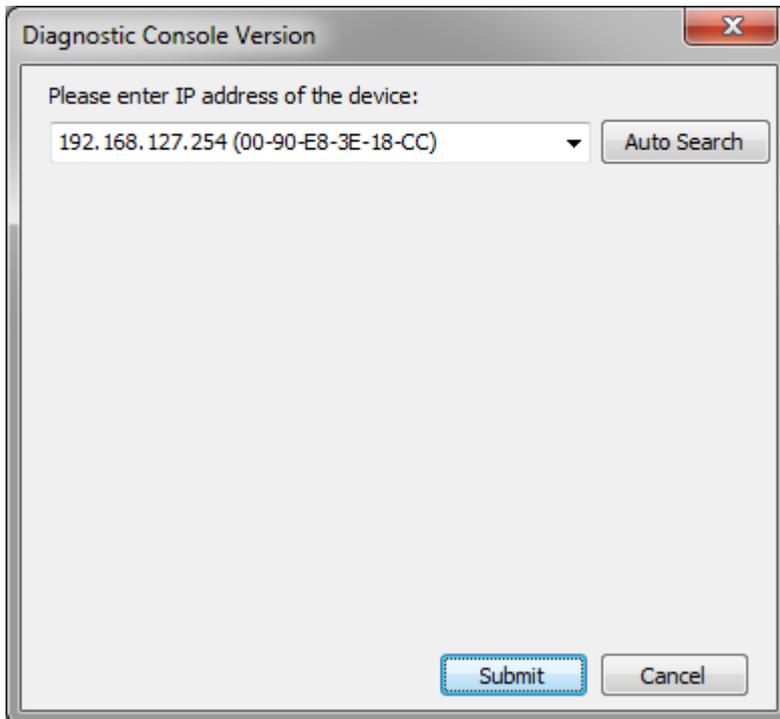
Step 2: When the Log in window appears, enter the user name and password to log in. RTUxpress will open PuTTY to establish an SSH connection between the ioPAC and the PC.
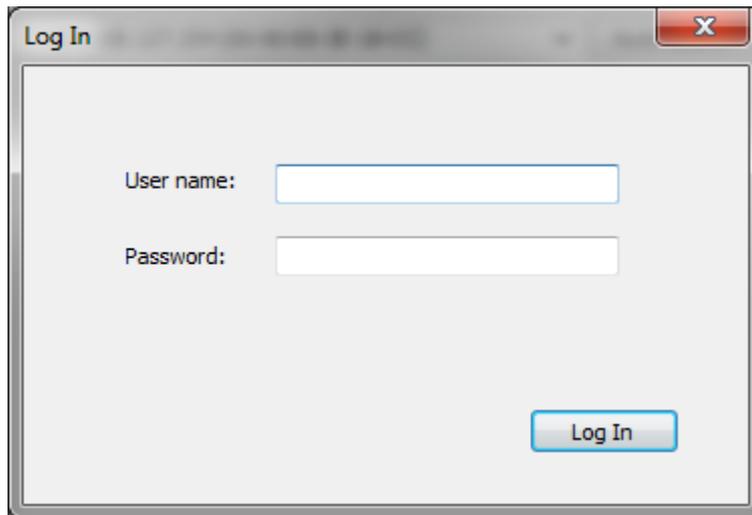

Step 3: When a connection has been established, the slot and API information will be displayed in the PuTTY window. Use the commands listed on the screen to monitor the device.
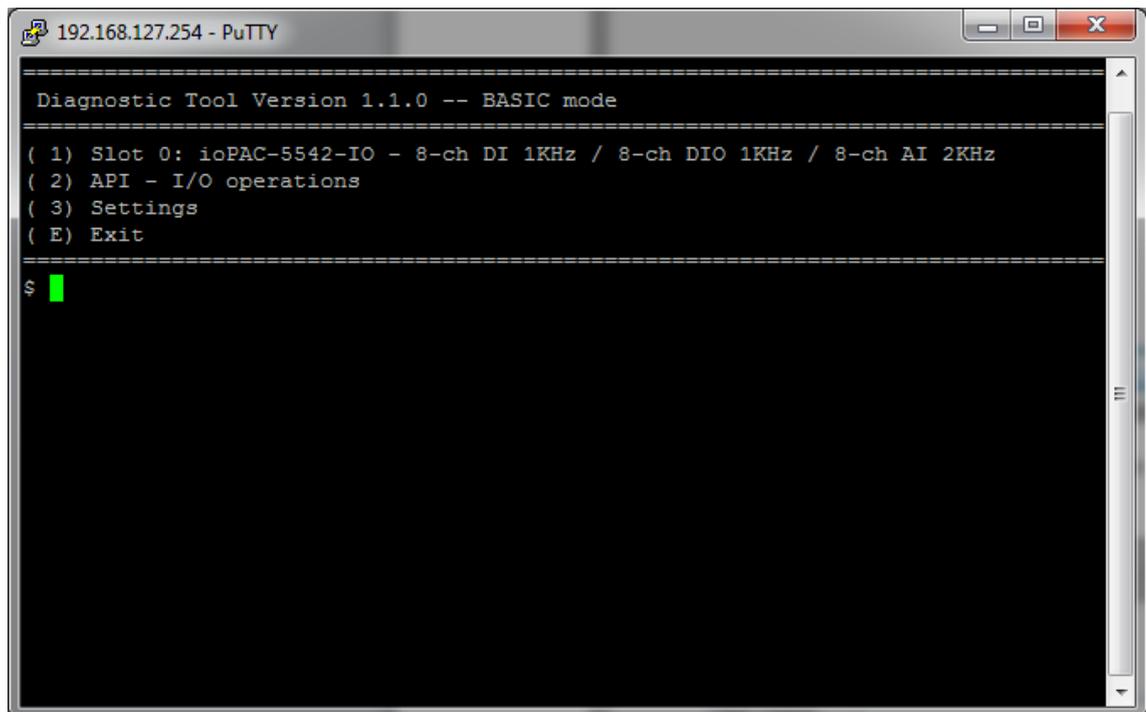
NOTE	The tool may affect the operation of the ioPAC. If you want to use the tool when the ioPAC is operating, we strongly suggest that you to stop the ioPAC first to avoid unexpected results.

Options:
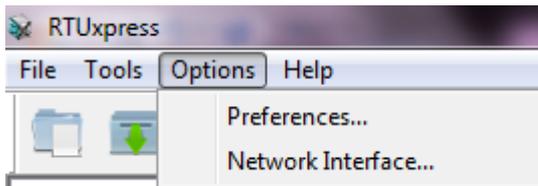
- Preferences: Allows you to configure the preferences shown below
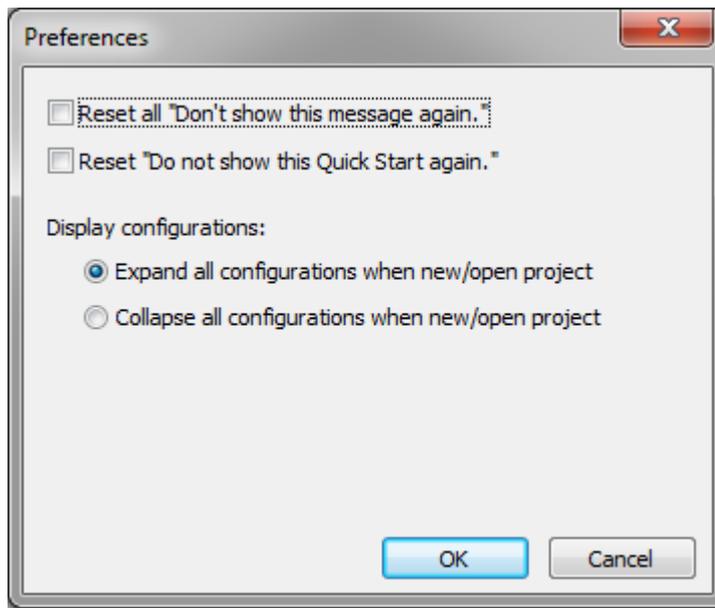
- Network Interface: Allows you to select the network interface

Help:
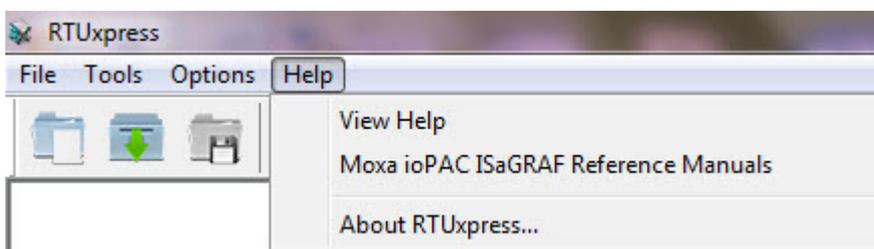
- View Help: Opens the **RTUxpress.chm** help utility
- Moxa ioPAC ISaGRAF Reference Manuals: Opens the **Moxa_ioPAC_ISaGRAF.chm** utility
- About RTUxpress: it will show the RTUxpress utility version

Tool Bar

New Project: Create a new RTUxpress project

Open Project: Open an existing RTUxpress project

Save Project: Save a currently opened RTUxpress project

Add Module: Add an ioPAC I/O module

Delete Module: Delete an ioPAC I/O module
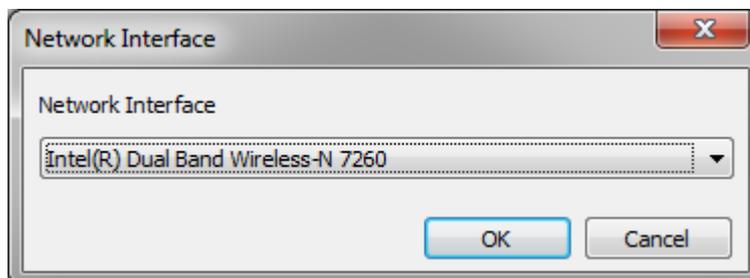
Device Information: Get device information

Time Sync: Device time synchronization

Export Configuration to ioPAC: Export a configuration file to the ioPAC Programmable controller

Import Configuration from ioPAC: Imports the configuration file from ioPAC Programmable Controller

Help: Opens the **RTUxpress.chm** help utility

Device and Service Configuration

Device Configuration is to configure ioPAC Programmable Controller settings and resources. You can configure the LAN, IO, an serial settings in the device's configuration section. Since the product has a modular design, a module's function settings will appear once the module has been added to the device.

ioPAC also provides services (Modbus, SNMP, Data Logging, etc.) to reduce the developer's effort. Configure the function in the service configuration page, and then upload the configuration to the device. The service will start working automatically.
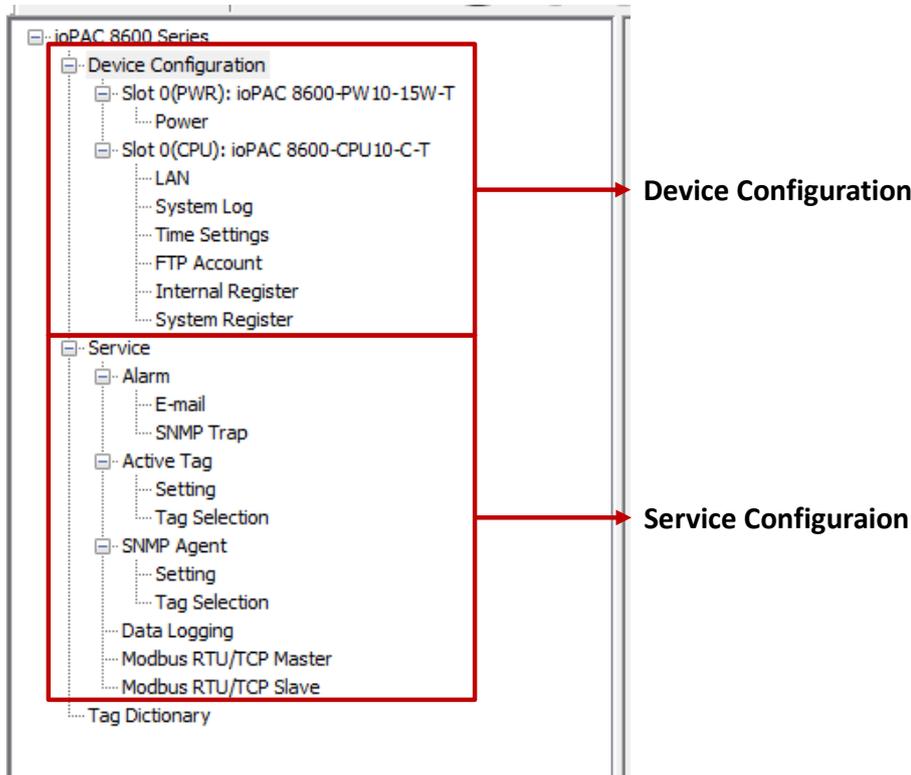
Settings Page

Detailed device and configuration settings will be displayed in this window. Check in RTUxpress's help file for the definition of each setting.

Log Message Window

Operation and message logs will be displayed in this window for reference.

4

85M Module Hardware Introduction

In this chapter, we provide the 85M modules' specifications.

The following topics are covered in this chapter:

❏ **85M Module Descriptions**
❏ **Common Specifications**
❏ **Module Specifications**
 ➢ 85M-1602-T: 16 DIs, sink/source, 24 VDC, dry contact
 ➢ 85M-2600-T: 16 DOs, sink, 24 VDC
 ➢ 85M-38XX-T: 8 AIs
 ➢ 85M-5401-T: 4 serial ports (RS-232/422/485 3-in-1)
 ➢ 85M-6600-T: RTDs
 ➢ 85M-6810-T: 8 TCs

85M Module Descriptions

The ioPAC 8500 controllers support the following modules.

Model Name	Description
85M-1602-T	16 DI, Sink/Source
85M-2600-T	16 DO, Sink
85M-3800-T	8 AI, 4-20 mA
85M-3810-T	8 AI, 0-10 V
85M-3801-T	8 AI 40 KHz, 4-20 mA
85M-3811-T	8 AI 40 KHz, 0-10 V
85M-5401-T	4 Serial Ports
85M-6600-T	6 RTD
85M-6810-T	8 TC

NOTE   Conformal coating available on request.

Common Specifications

The following are specifications common to all ioPAC 8500 modules.

Environmental Limits
Storage Temperature: -40 to 85°C (-40 to 185°F)
Ambient Relative Humidity: 5 to 95% (non-condensing)
Shock: IEC 60068-2-27
Vibration: IEC 60068-2-6

Standards and Certifications
Safety: UL 508
EMC: EN 55032/24
EMI: FCC Part 15 Subpart B Class A, CISPR 22
EMS:
IEC 61000-4-2 ESD: Contact: 6 kV; Air: 8 kV
IEC 61000-4-3 RS:
    80 MHz to 1000 MHz: 3 V/m
    1400 MHz to 2100 MHz: 3 V/m
    2100 MHz to 2700 MHz: 1 V/m
IEC 61000-4-4 EFT: Power: 1 kV; Signal 0.5 kV
IEC 61000-4-5 Surge: Power: 2 kV (L-PE), 1 kV (L-L); Signal: 1 kV (L-L), 2 kV (L-PE)
IEC 61000-4-6 CS: 3V
IEC 61000-4-8 PFMF: 3 A/m
Rail Traffic: EN 50155*, EN 50121-3-2, EN 50121-4
*Complies with a portion of EN 50155 specifications
Note: Please check Moxa's website for the most up-to-date certification status.
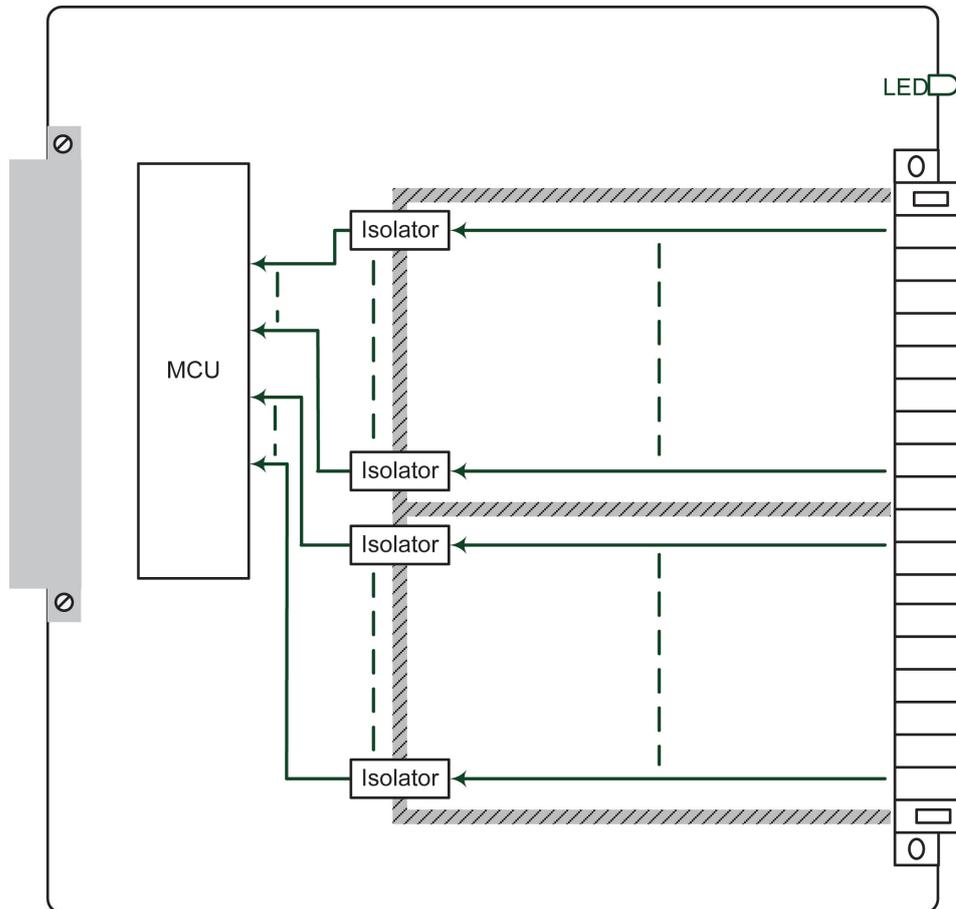
Warranty
Warranty Period: 5 years
Details: See www.moxa.com/warranty

Module Specifications

85M-1602-T: 16 DIs, sink/source, 24 VDC, dry contact

The 85M-1602-T modules is a 16-channel, sink/source, or dry contact type digital input module that support wide temperature and high isolation protection.

Block Diagram

Specifications

The following are the 85M-1602-T module's product specifications.

Inputs and Outputs
Digital Inputs: 16 channels
Isolation: 3K VDC or 2K Vrms

Digital Inputs
Sensor Type: Wet contact (NPN or PNP), dry contact
I/O Mode: Counter or Frequency
Dry Contact:
• On: short to GND
• Off: open
Wet Contact (DI to COM):
• Off: 0 to 3 VDC
• On: 10 to 30 VDC
Common Type: 8 points per COM

Counter Frequency: 5 kHz
Digital Filtering Time Interval: Software selectable (by 0.1 ms)

Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements
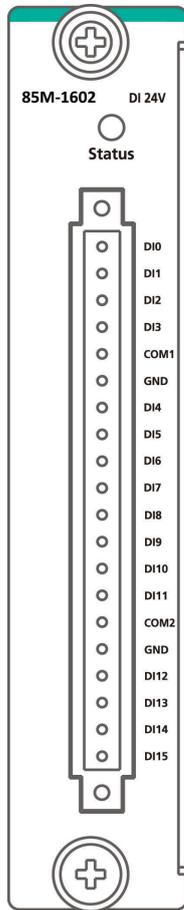**Input Current:** 363.6 mA @ 3.3 VDC

MTBF (mean time between failure)
Time: 1,132,561 hrs.
Standard: Telcordia SR332

Pin Assignment and Wiring Guide
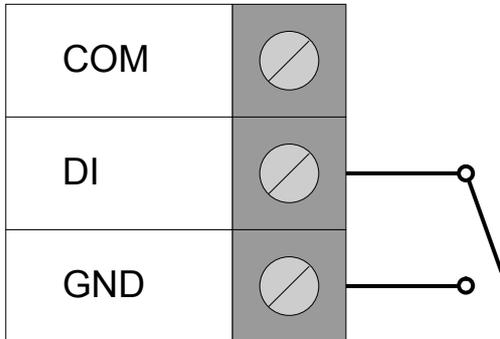
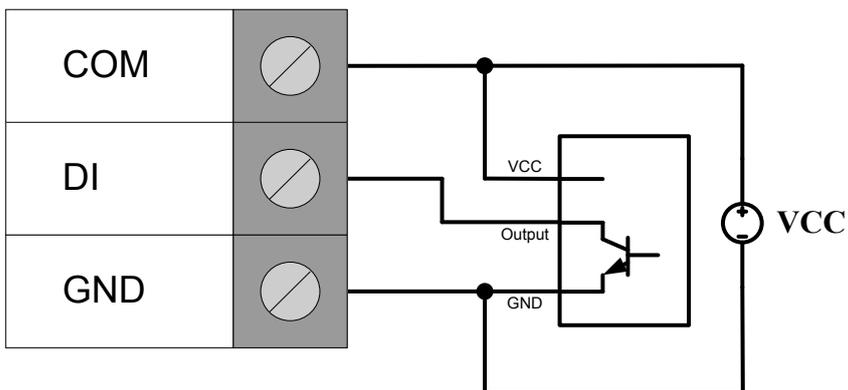The following is 85M-1602-T module's pin assignment and wiring guide.

Wiring Guide

The following wiring guide is for the 85M-1602-T module.
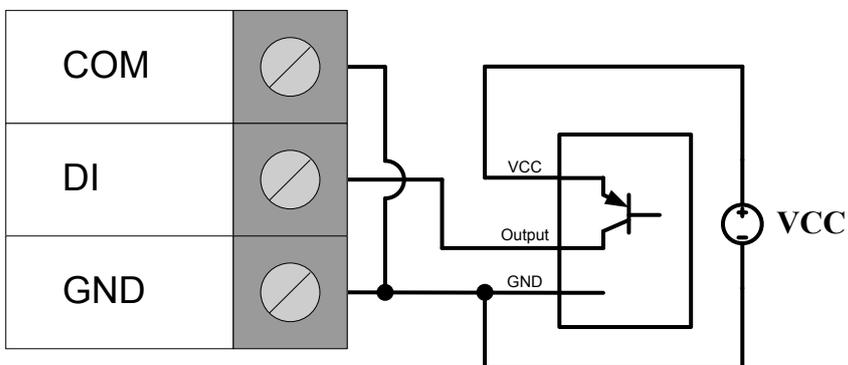
Dry Contact

Wet Contact

Source Type

Sink Type

85M-2600-T: 16 DOs, sink, 24 VDC

The 85M-2600-T features sink type sixteen digital output channels. The 85M-2600-T can use the module's digital outputs to determine the state of limit or safety switches, or to receive remote digital signals.

Block Diagram
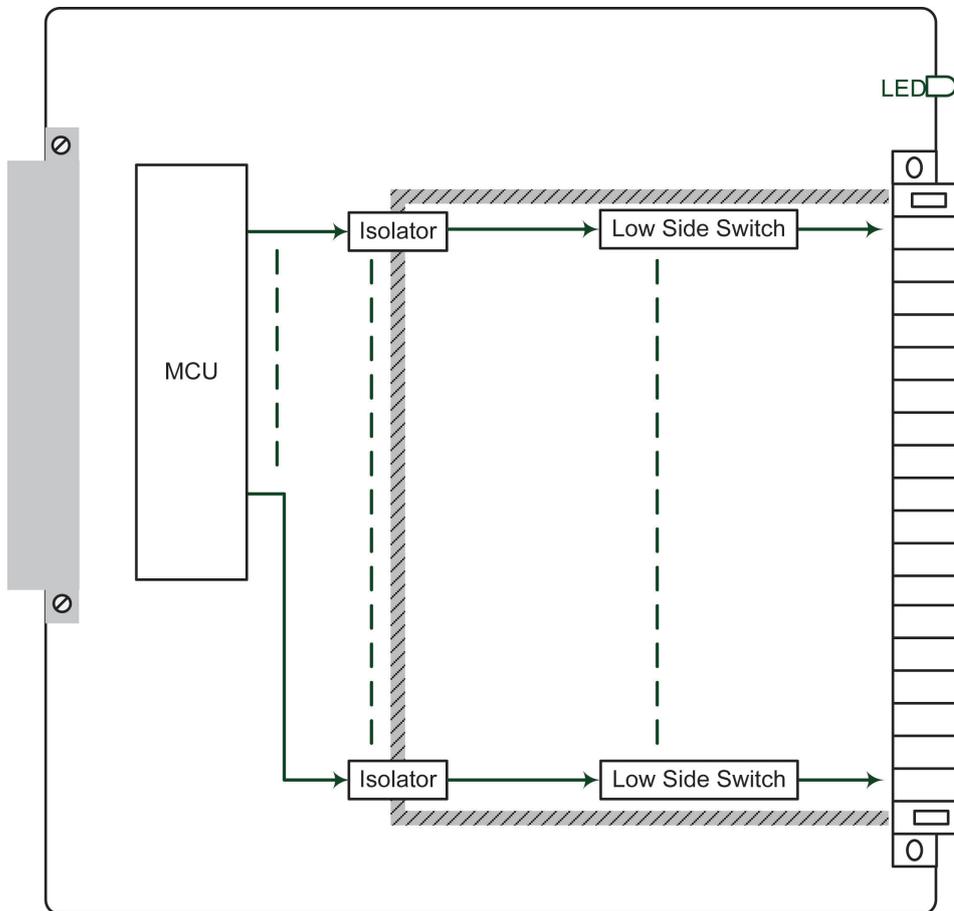
Specifications

The following are the 85M-2600-T module's product specifications.

Inputs and Outputs
Digital Outputs: 16 channels
Isolation: 3K VDC or 2K Vrms

Digital Outputs
Type: Sink
I/O Mode: DO or PWM
Pulse Output Frequency: 5 kHz
Over-voltage Protection: 45 VDC
Over-current Protection: 2.6 A (4 channels @ 650 mA)
Over-temperature Shutdown: 175°C (typical), 150°C (min.)
Current Rating: 200 mA per channel

Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements
Input Current: 257.6 mA @ 3.3 VDC

MTBF (mean time between failure)
Time: 792,571 hrs.
Standard: Telcordia SR332

Pin Assignment and Wiring Guide

Wiring Guide

The following wiring guide is for the 85M-2600-T module.

<u>**Resistive Load**</u>

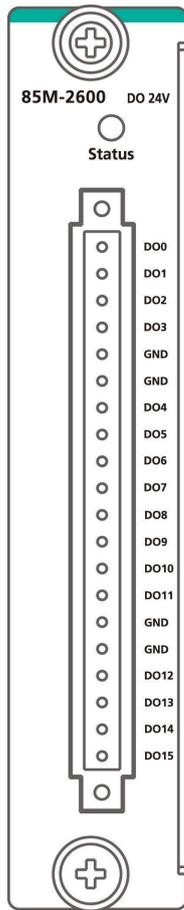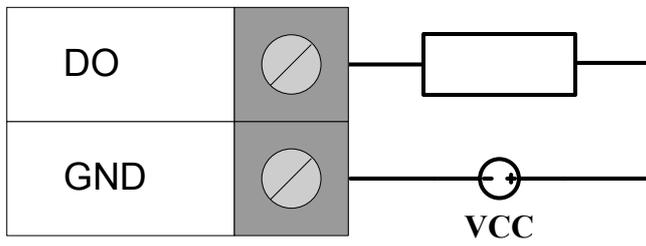<u>**Inductive Load**</u>
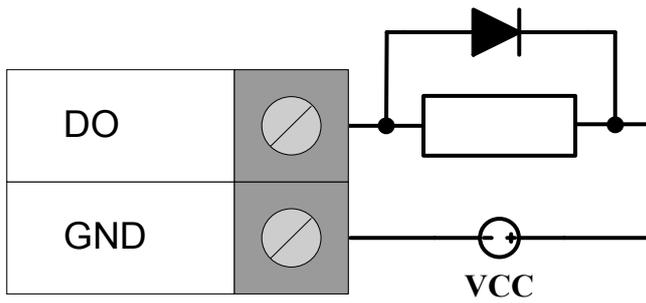
85M-38XX-T: 8 AIs

The 85M-38XX-T series provides eight 16-bit analog input modules. It accepts voltage inputs (0–10 V) and current input (4–20 mA). This high performance analog input module features high density I/O with a flexible topology and hot-swappable functionality. This module is cost-effective solution for most industrial application.

Block Diagram

The following is the 85M-38XX-T module's block diagram. The 85M-38XX-T uses an MCU processor that has three communication interfaces: SPI, RS232, and USB. The MCU processor accesses the ADC and SRAM by SPI, whereas the 85M-38XX-T module communicates with the modular head through RS-232 and USB interfaces. The 85M-38XX-T has isolation protection up to 3K VDC or 2K Vrms.
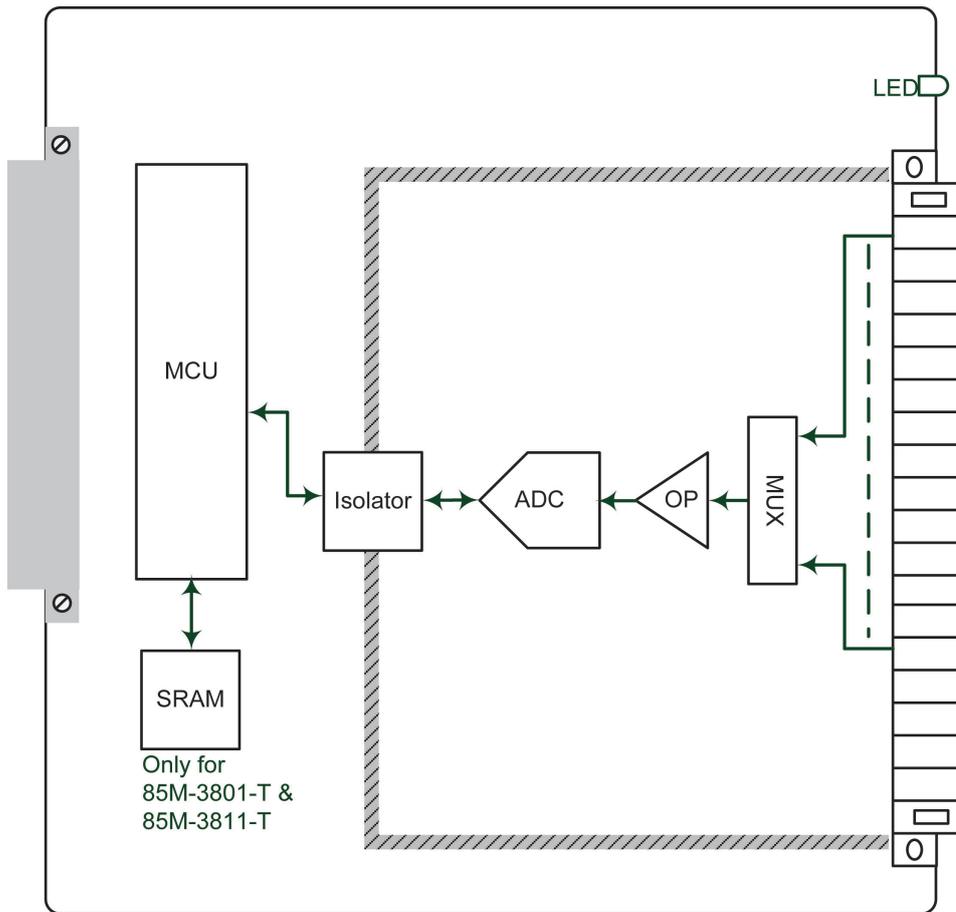
Specifications

The following are the 85M-38XX-T module's product specifications.

85M-3800-T: 8 analog inputs, 4 to 20 mA Specifications

Inputs and Outputs
Analog Inputs: 8 channels
Isolation: 3K VDC or 2K Vrms

Analog Inputs
Type: Differential
Resolution: 16 bits
I/O Mode: 4 to 20 mA (wire off)
Accuracy:
±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Sampling Rate:
• All channels: 100 samples/sec
• Per channel: 12.5 samples/sec
Input Impedance: 125 ohms (min.)

Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements
Input Current: 318.2 mA @ 3.3 VDC

MTBF (mean time between failure)
Time: 1,512,906 hrs.
Standard: Telcordia SR332

85M-3801-T: 8 analog inputs, 4 to 20 mA, 40 kHz Specifications

Inputs and Outputs
Analog Inputs: 8 channels
Isolation: 3K VDC or 2K Vrms

Analog Inputs
Type: Differential
Resolution: 16 bits
I/O Mode: 4 to 20 mA (wire off)
Historical Data Buffering: Up to 6 sec per channel
Accuracy:
±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Sampling Rate:
• All channels: 40k samples/sec
• Per channel: 5k samples/sec
Input Impedance: 125 ohms (min.)

Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements
Input Current: 378.8 mA @ 3.3 VDC

MTBF (mean time between failure)

Time: 1,410,655 hrs

Standard: Telcordia SR332

85M-3810-T: 8 analog inputs, 0 to 10 VDC Specifications

Inputs and Outputs

Analog Inputs: 8 channels

Isolation: 3K VDC or 2K Vrms

Analog Inputs

Type: Differential

Resolution: 16 bits

I/O Mode: 0 to 10 VDC

Accuracy:

±0.1% FSR @ 25°C

±0.3% FSR @ -40 and 75°C

Sampling Rate:

• All channels: 100 samples/sec

• Per channel: 12.5 samples/sec

Input Impedance: 200 k-ohms (min.)

Physical Characteristics

Wiring: I/O cable, max. 16 AWG

Connector: Spring type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements

Input Current: 315.2 mA @ 3.3 VDC

MTBF (mean time between failure)

Time: 1,530,690 hrs.

Standard: Telcordia SR332

85M-3811-T: 8 analog inputs, 0 to 10 VDC, 40 kHz Specifications

Inputs and Outputs

Analog Inputs: 8 channels

Isolation: 3K VDC or 2K Vrms

Analog Inputs

Type: Differential

Resolution: 16 bits

I/O Mode: 0 to 10 VDC

Historical Data Buffering: Up to 6 sec per channel

Accuracy:

±0.1% FSR @ 25°C

±0.3% FSR @ -40 and 75°C

Sampling Rate:

• All channels: 40k samples/sec

• Per channel: 5k samples/sec

Input Impedance: 20 M-ohms (min.)

Physical Characteristics

Wiring: I/O cable, max. 16 AWG

Connector: Spring type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements

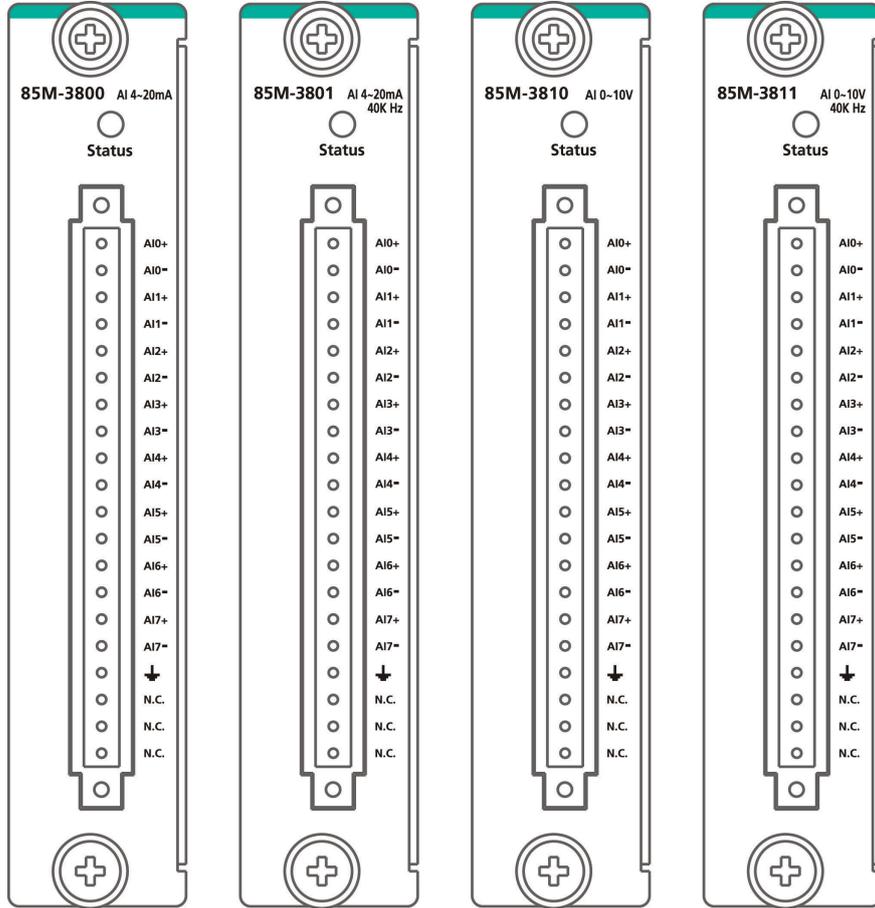**Input Current:** 378.8 mA @ 3.3 VDC

MTBF (mean time between failure)
Time: 1,426,112 hrs.
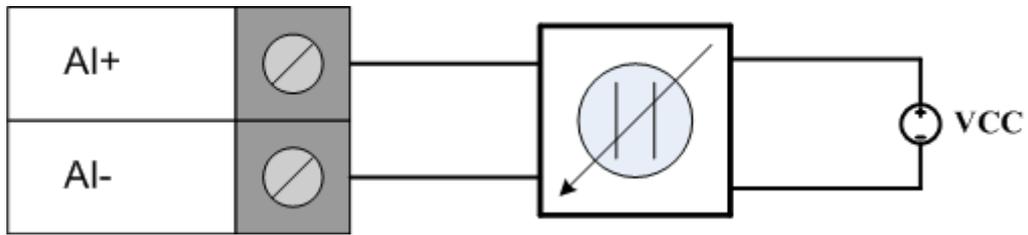**Standard:** Telcordia SR332

Pin Assignment

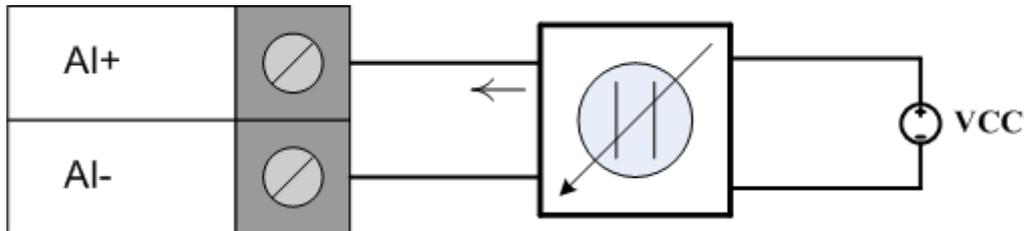The following is the 85M-38XX-T module's pin assignment.

Wiring Guide

The following wiring guide for the 85M-38xx-T module.
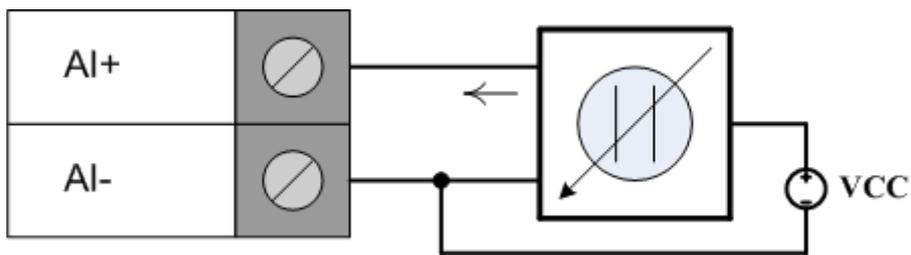
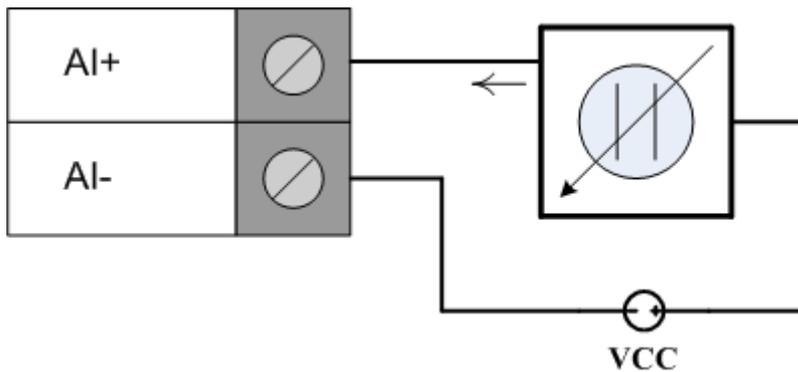### Voltage:

Current:

4-wire

3-wire

2-wire

Analog Input Data Format

The I/O analog inputs have a 16-bit, unipolar, and analog to digital (A/D) converter that measures input voltages from 0–10 V and current from 4–20 mA (with Burnout). The following chart is the raw data conversion table for current and voltage.

The voltage ranges from 0 to 10 V. The lowest voltage of 0 V represents raw data of 0, and the highest voltage of 10 V represents raw data of 65535. When the raw voltage data is at 1, it represents 0.15 mV. The current ranges from 0 to 20 mA. The lowest current of 0 mA represents a raw data value of 0. Users can manually adjust the burnout value from 0 to 4 mA. All raw data below the burnout value will be 0. The highest current of 20 mA represents raw data of 65535. Raw current data of 1 represents 0.3125 µA.

Burnout mode can indicate if the current analog input has burned out.

NOTE	Refer to the **ioPAC Programmable Controller Software User's Manual** for the burnout mode settings.

NOTE	Grounding the device through the earth/ground pin (⏚) gives 6kV ESD protection.

The 4–20 mA burnout mode values are defined in the following diagram:
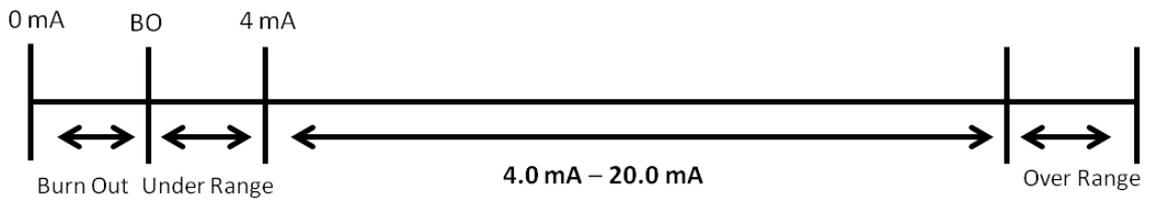
Users can define burnout values for selected ranges. When input values are in the burnout range, raw data will register as 0000h to indicate analog input burnout. The definition of raw data is as follows:

Burnout Value (BO)	0.0 < BO < 4.0	User-defined (default: 2 mA)
Burnout State	0 ≤ AI < BO mA	S/W output 0000h
Under Range	BO ≤ AI < 4 mA	S/W output raw data
Normal Range	4 ≤AI ≤ 20.00 mA	S/W output raw data until FFFEh
Over Range	XX > 20.00 mA	S/W output FFFFh
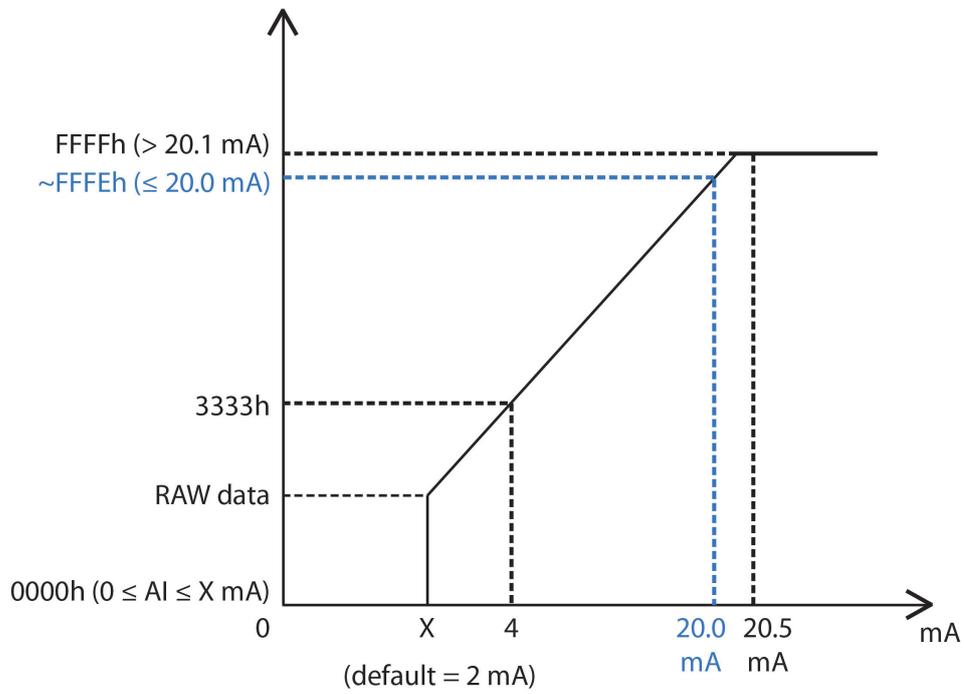
Current

Data	Current
0	0 mA
1	0.3125 µA
13107	4 mA
49152	15 mA
65534	20 mA
65535	> 20 mA

Voltage

| Data	Voltage
0	0 V
1	0.16 mV
16384	2.5 V
32768	5 V
65535	10 V

85M-5401-T: 4 serial ports (RS-232/422/485 3-in-1)

The 85M-5401-T module is a 3-in-1 DB-44 serial communication port module, which supports RS-232, RS-422, and RS485 communications. The following table shows the serial and protocol communication parameters supported by the 85M-5401-T.

View of the 85M-5401 front panel.

| Parameter	Supported Values
Baudrate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 921600 bps (Default: 9600 bps)
Mode	RS-232/422/485 (Default: RS-232)
Duplex	Full or Half duplex (Default: Full duplex)
Parity	Odd, None or Even (Default: None)
Data Bits	7 or 8 Bits (Default: 8 Bits)
Stop Bits	1 Bit
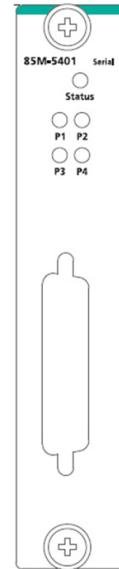
ATTENTION

The ioPAC Programmable controller only supports up to 2 85M-5401-T modules.

Block Diagram
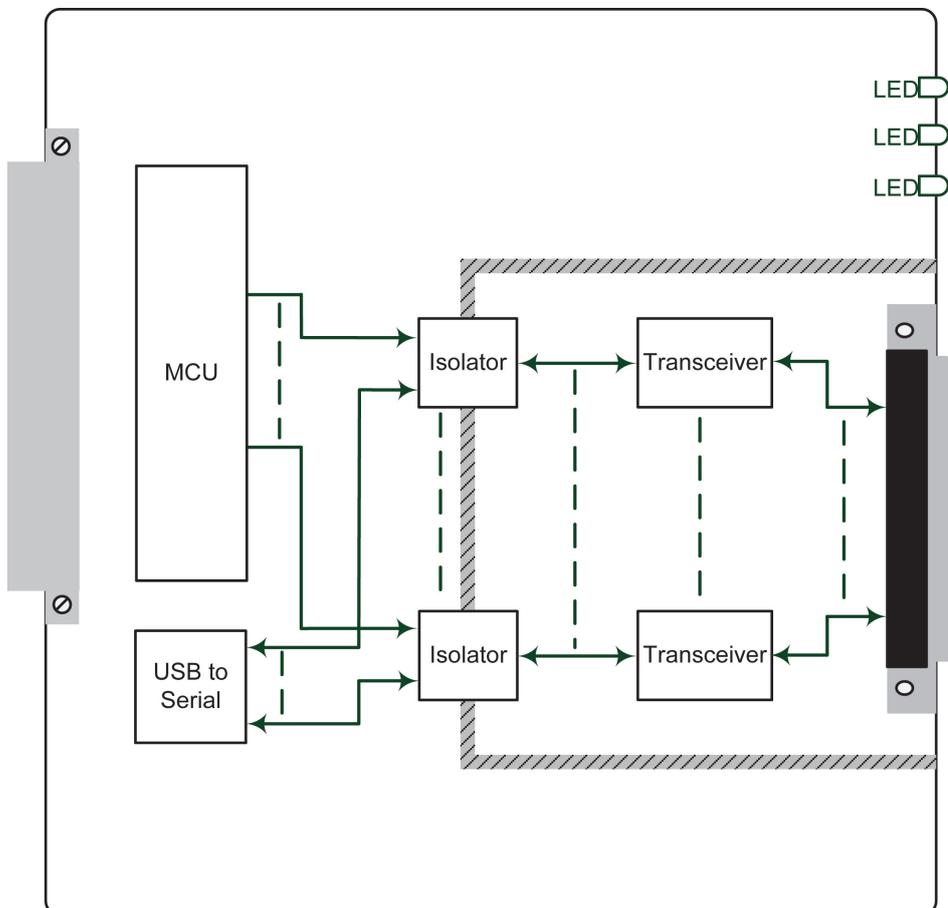
Specifications

The following are the 85M-5401-T module's product specifications.

Serial Communication

Interface: 4 RS-232/422/485 ports, software selectable (DB44 male)

Isolation: 3K VDC or 2K Vrms

Note: DB44 to 4-port DB9 cable included in the package.

Serial Communication Parameters

Parity: None, Even, Odd

Data Bits: 7, 8

Stop Bits: 1, 2

Flow Control: RTS/CTS, XON/XOFF

Baudrate: 300 bps to 921.6 Kbps

Serial Signals

RS-232: TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND

RS-422: Tx+, Tx-, Rx+, Rx-, GND

RS-485-4w: Tx+, Tx-, Rx+, Rx-, GND

RS-485-2w: Data+, Data-, GND

Physical Characteristics

Connector: DB44 female

Environmental Limits

Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements

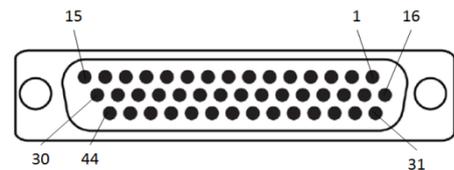**Input Current:** 375.8 mA @ 3.3 VDC

MTBF (mean time between failure)

Time: 596,611 hrs.

Standard: Telcordia SR332

Pin Assignment

The 85M-5401-T module's pin assignment follows. The DB44 to 4-port DB9 cable should be included in the package.

DB44 Pin Assignments

DB44 (Female): RS-232

Pin	Signal	Pin	Signal	Pin	Signal
1	TxD3	16	CTS3	31	DCD3
2	RxD3	17	DTR3	32	–
3	RTS3	18	DSR3	33	GND
4	–	19	–	34	–
5	TxD2	20	CTS2	35	DCD2
6	RxD2	21	DTR2	36	–
7	RTS2	22	DSR2	37	GND
8	–	23	–	38	–
9	TxD1	24	CTS1	39	DCD1
10	RxD1	25	DTR1	40	–
11	RTS1	26	DSR1	41	GND
12	–	27	–	42	DCD0
13	TxD0	28	CTS0	43	–
14	RxD0	29	DTR0	44	GND
15	RTS0	30	DSR0		

DB44 (Female): RS-422/RS-485 (4-wire)

Pin	Signal	Pin	Signal	Pin	Signal
1	RxD3+(B)	16	–	31	TxD3-(A)
2	TxD3+(B)	17	RxD3-(A)	32	–
3	–	18	–	33	GND
4	–	19	–	34	–
5	RxD2+(B)	20	–	35	TxD2-(A)
6	TxD2+(B)	21	RxD2-(A)	36	–
7	–	22	–	37	GND
8	–	23	–	38	–
9	RxD1+(B)	24	–	39	TxD1-(A)
10	TxD1+(B)	25	RxD1-(A)	40	–
11	–	26	–	41	GND
12	–	27	–	42	TxD0-(A)
13	RxD0+(B)	28	–	43	–
14	TxD0+(B)	29	RxD0-(A)	44	GND
15	–	30	–		

DB44 (Female): RS-485 (2-wire)

Pin	Signal	Pin	Signal	Pin	Signal
1	Data3+(B)	16	–	31	–
2	–	17	Data3-(A)	32	–
3	–	18	–	33	GND
4	–	19	–	34	–
5	Data2+(B)	20	–	35	–
6	–	21	Data2-(A)	36	–
7	–	22	–	37	GND
8	–	23	–	38	–
9	Data1+(B)	24	–	39	–
10	–	25	Data1-(A)	40	–
11	–	26	–	41	GND
12	–	27	–	42	–
13	Data0+(B)	28	–	43	–
14	–	29	Data0-(A)	44	GND
15	–	30	–		

DB9 Pin Assignment
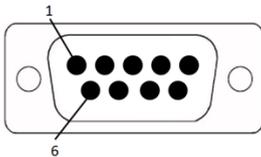
DB9 (Female): RS-232/RS-422/RS-485

Pin	RS-232	RS-422/RS-485(4-wire)	RS-485 (2-wire)
1	DCD	TxD-(A)	–
2	RxD	TxD+(B)	–
3	TxD	RxD+(A)	Data+(B)
4	DTR	RxD-(B)	Data-(A)
5	GND	GND	GND
6	DSR	–	–
7	RTS	–	–
8	CTS	–	–
9	–	–	–

DIP Switch
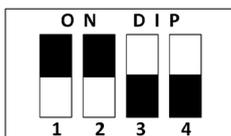
| DIP Switch	ON	OFF
1	1K Ohm Pull High Resistor	150K Ohm Pull High Resistor (default)
2	1K Ohm Pull Low Resistor	150K Ohm Pull High Resistor (default)
3	120 Ohm Terminal Resistor	None (default)
4	Reserved	Reserved (default)

85M-6600-T: RTDs

The 85M-6600-T module provides 6-channel RTD which features high density I/O with a flexible topology and hot-swappable functionality. This module is cost-effective solution for most industrial application.

Block Diagram

The following is the 85M-6600-T module's block diagram. The 85M-6600-T uses an MCU processor that has three communication interfaces: SPI, RS232, and USB. Whereas the 85M-6600-T module communicates with the modular head through RS-232 and USB interfaces. The 85M-6600-T has isolation protection up to 3K VDC or 2K Vrms.
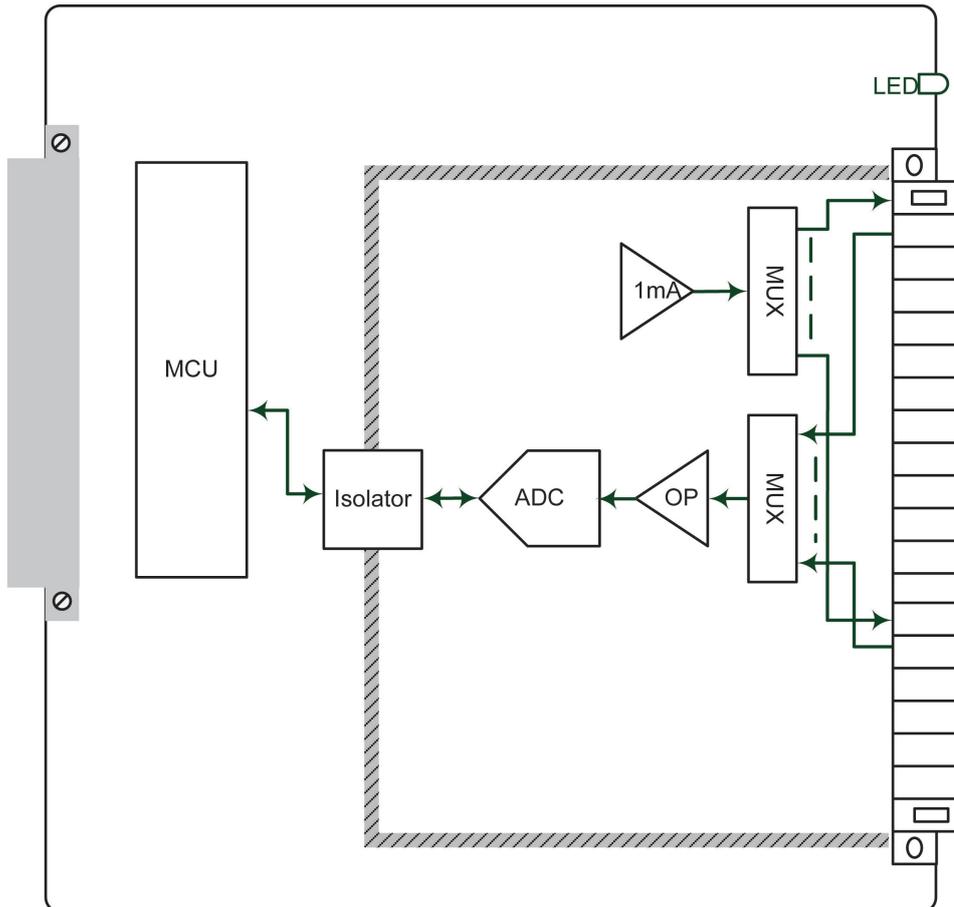
Specifications

Inputs and Outputs
RTD Inputs: 6 channels
Isolation: 3K VDC or 2K Vrms

RTD Inputs
Input Type:
- PT50, PT100, PT200, PT500 (-200 to 850°C)
- PT1000 (-200 to 350°C)
- JPT100, JPT200, JPT500 (-200 to 640°C)
- JPT1000 (-200 to 350°C)
- NI100, NI200, NI500 (-60 to 250°C)
- NI1000 (-60 to 150°C)
- NI120 (-80 to 260°C)
- Resistance of 310, 620, 1250, and 2200

Sampling Rate (single channel):

• All channels: 12 samples/sec

• Per channel: 2 samples/sec

Resolution: 0.1°C or 0.1 ohm

Accuracy: ±0.1% FSR @ 25°C ±0.3% FSR @ -40 and 75°C

Input Impedance: 625 kohms (min.)

Physical Characteristics

Wiring: I/O cable, max. 16 AWG

Connector: Spring type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C (-40 to 176°F)
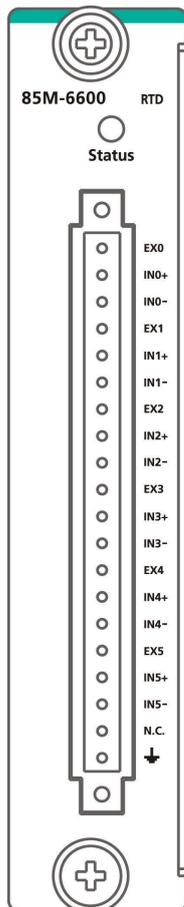
Power Requirements

Input Current: 201.5 mA @ 3.3 VDC

MTBF (mean time between failure)

Time: 571,446 hrs.
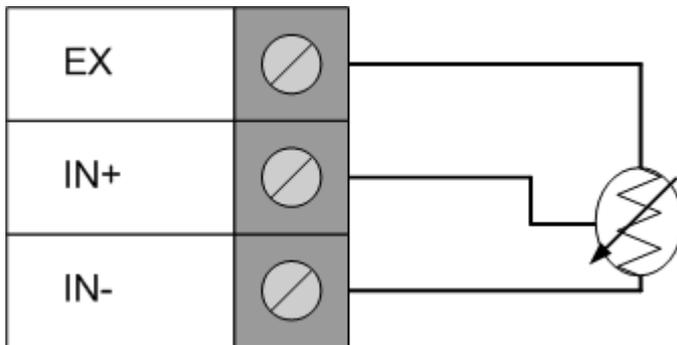
Standard: Telcordia SR332

Pin Assignment

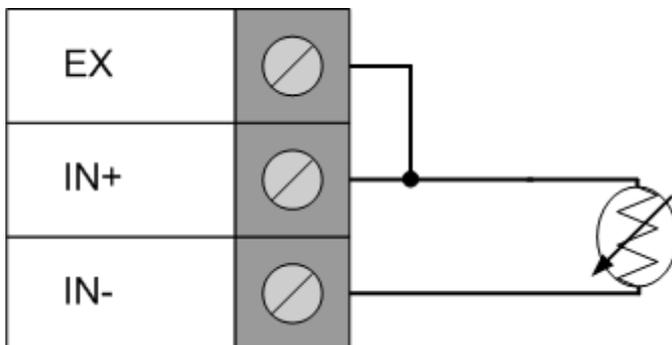The following is the 85M-6600-T module's pin assignment.

Wiring Guide

The following wiring guide is for the 85M-6600-T module.

3-wire

2 wire

85M-6810-T: 8 TCs

The 85M-6810-T module provides 8-channel TC which features high density I/O with a flexible topology and hot-swappable functionality. This module is cost-effective solution for most industrial application.

Block Diagram

The following is the 85M-6810-T module's block diagram. The 85M-6810-T uses an MCU processor that has three communication interfaces: SPI, RS-232, and USB. Whereas the 85M-6810-T module communicates with the modular head through RS-232 and USB interfaces. The 85M-6810-T has isolation protection up to 3K VDC or 2K Vrms.
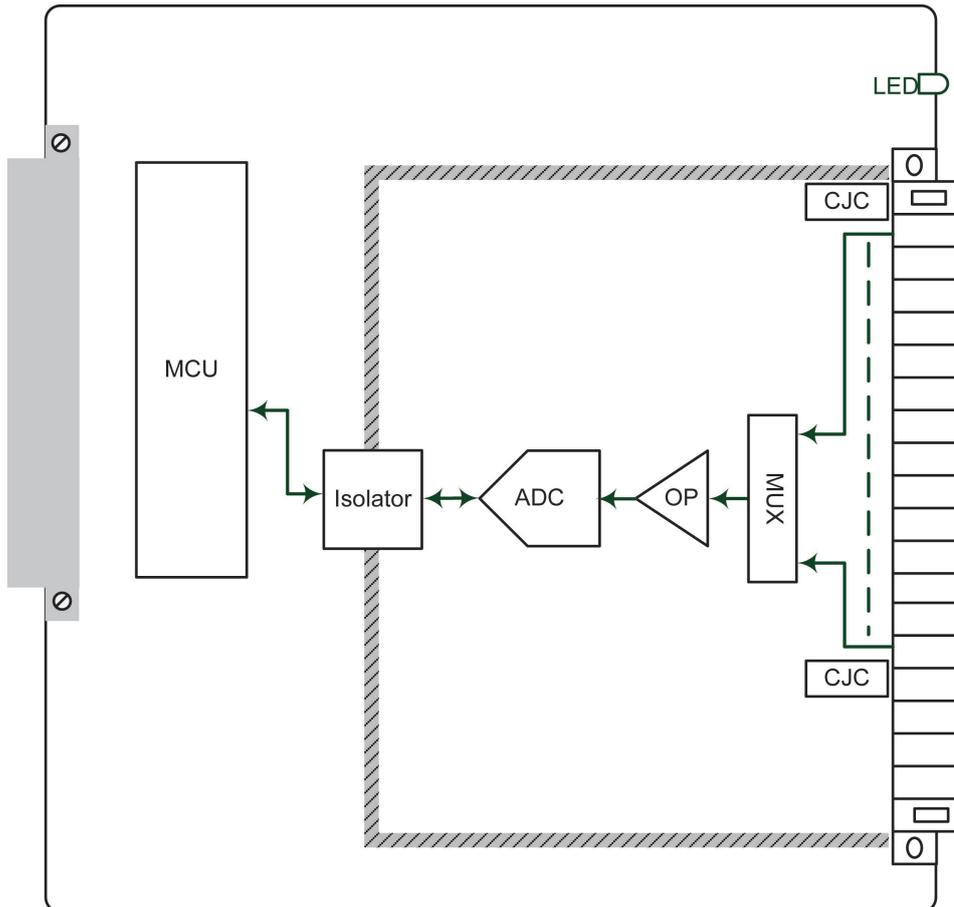
Specifications

Inputs and Outputs

Analog Inputs: 8 channels
Isolation: 3K VDC or 2K Vrms

Thermocouple Inputs

Sensor Type: J (0 to 750°C), K (-200 to 1250°C), T (-200 to 350°C), E (-200 to 900°C), R (-50 to 1600°C), S (-50 to 1760°C), B (600 to 1700°C), N (-200 to 1300°C)
Millivolt Type:
• Mode: ±78.126 mV, ±39.062 mV, ±19.532 mV
• Fault and over-voltage protection: -35 to +35 VDC (power off); -25 to +30 VDC (power on)
Sampling Rate (single channel):
• All channels: 12 samples/sec
• Per channel: 1.5 samples/sec
Resolution: 16 bits

Accuracy: ±0.1% FSR @ 25°C ±0.3% FSR @ -40 and 75°C

Input Impedance: 1 Mohms (min.)

Physical Characteristics

Wiring: I/O cable, max. 16 AWG

Connector: Spring type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C (-40 to 176°F)

Power Requirements

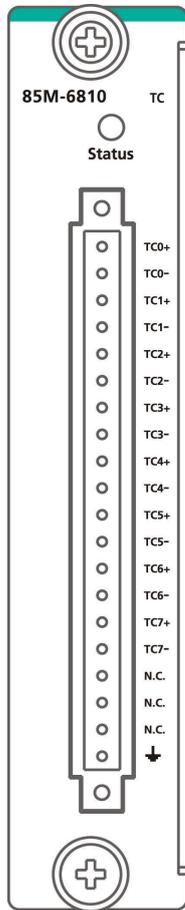**Input Current:** 175.5 mA @ 3.3 VDC

MTBF (mean time between failure)

Time: 2,324,891 hrs.

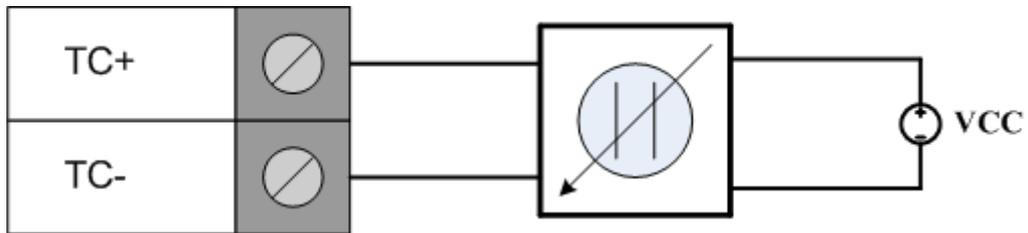**Standard:** Telcordia SR332

Pin Assignment

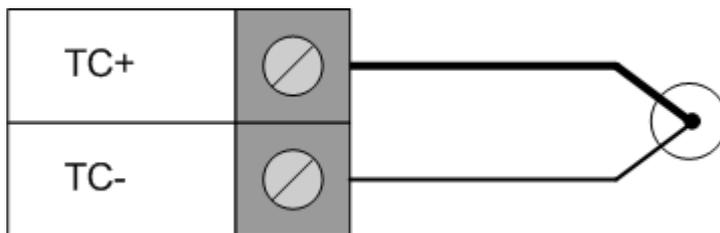The following is the 85M-6810-T module's pin assignment.

Wiring Guide

The following wiring guide is for the 85M-6810-T module.

Voltage

Thermocouple

NOTE   Grounding the device through the earth/ground pin (⏚) gives 6 kV ESD protection.