

ioPAC 8600 Series

Rugged modular RTU controllers



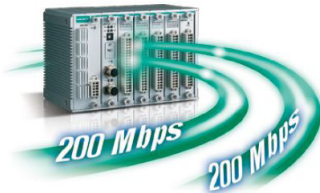
- Modular CPU/PWR/Backplane/IO design supporting ioPAC 8500/8600 series I/O modules
- Supports dual power module with dual power input
- Supports C/C++ and IEC 61131-3 programming languages, and ready-to-run services
- Supports 24 to 110 V power input range and DI/O modules
- Compliant with EN 50121-3-2 and EN 50121-4 specifications



Overview

The ioPAC 8600 modular RTU controllers are 100% modular, giving users the freedom to choose CPU, power, backplane, communication, and I/O modules. In addition, the ioPAC 8600 enhances the hardware system architecture and key features of the ioPAC 8020 and ioPAC 8500 combined. It not only preserves the dual CPU architecture to support all ioPAC 8600 I/O modules, but also adds an Ethernet bus on the backplane to support Ethernet switch modules. The ioPAC 8600 supports the C/C++ and IEC 61131-3 programming languages and ready-to-run services, including Modbus, data logging, and email alarms to fulfill different customers' requirements. With Moxa's Active OPC Server and DA-Center data integration software, the ioPAC 8600 series provides a comprehensive solution for data acquisition and control applications in harsh environments.

2-Wire Ethernet Technology



Moxa's 2-wire Ethernet technology offers system integrators an attractive option for upgrading the train's IP network to a 10/100 Mbps* Ethernet backbone with existing 2-wire cable. This innovative 2-wire Ethernet technology supports Ethernet bypass functionality, ensuring that the Ethernet backbone will continue to operate even if one ioPAC is without power. As an added plus, with two 2-wire Ethernet modules in one ioPAC, the network can reach 200 Mbps and provide a redundant architecture.

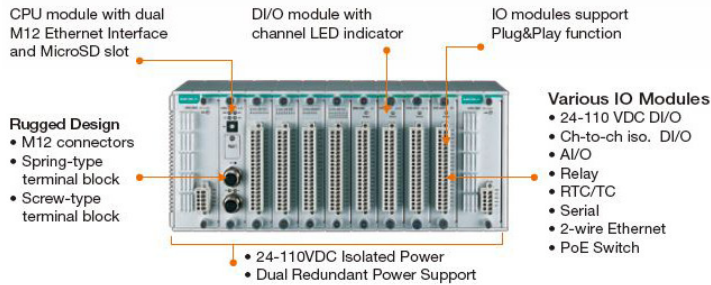
* Network performance is related to cable quality when using 2-wire technology.

Ready-to-Run Service



Moxa's ioPAC 8600 programmable controllers allow programmers to rapidly configure services (SNMP, Modbus RTU/TCP Master/Slave, E-mail/SMS alarm service, etc.) without writing any programs. The ioPAC can reduce the configuration of massively distributed deployments to a few simple mouse clicks, greatly increasing engineers' productivity.

Compact Integrated Solution



The compact ioPAC 8600 is equipped with universal dual-power inputs that support all railway power voltages, and a new channel-to-channel, high voltage DI/DO module is available for use in trains that use different power systems. The ioPAC 8600 supports a variety of communication interfaces, including Ethernet, serial, CAN*, and MVB*. System integrators can control or monitor sub-systems with the ioPAC 8600, which saves space and has powerful functions to reduce both the system integrators' budget and installation difficulties.

* CAN and MVB available by project request.

Specifications

Physical Characteristics

Housing: Aluminum

Dimensions:

- 5-slot version: 205.65 x 133.35 x 100 mm (8.1 x 5.25 x 3.94 in)
- 9-slot version: 324.8 x 133.35 x 100 mm (12.79 x 5.25 x 3.94 in)

Mounting: DIN-rail mounting, wall mounting (optional), and rack mounting (optional)

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)

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

EMI: EN 55022, EN 61000-3-2; EN 61000-3-3; FCC Part 15 Subpart B Class A

EMS: EN 55024, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11

Shock: IEC 60068-2-27

Freefall: IEC 60068-2-32

Vibration: IEC 60068-2-6

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

* Complies with a portion of EN 50155 specifications. Please contact Moxa or a Moxa distributor for details.

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

Warranty

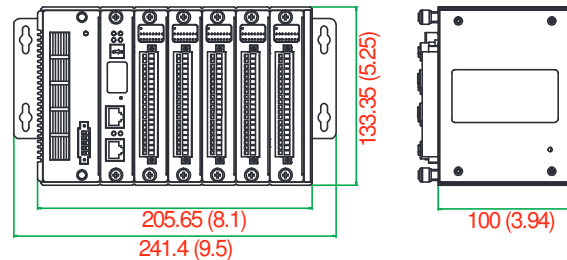
Warranty Period: 5 years

Details: See www.moxa.com/warranty

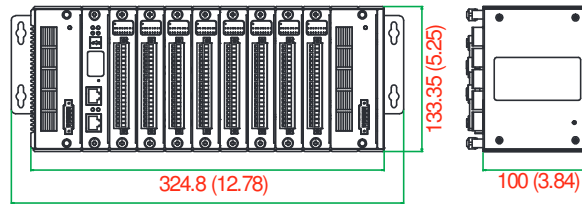
Dimensions

Unit: mm (inch)

ioPAC 8600 with 5 I/O slots



ioPAC 8600 with 9 I/O slots



: Ordering Information

Both ioPAC 8500 modules and ioPAC 8600 modules can be used with the ioPAC 8600 series. For detailed information about each module, see pages 4 to 10.

CPU Modules

ioPAC 8600-CPU10-M12-C-T: ioPAC 8600 CPU module with M12 Ethernet connectors, C/C++, -40 to 75°C operating temperature
ioPAC 8600-CPU10-RJ45-C-T: ioPAC 8600 CPU module with RJ45 Ethernet connectors, C/C++, -40 to 75°C operating temperature
ioPAC 8600-CPU10-M12-IEC-T: ioPAC 8600 CPU module with M12 Ethernet connectors, IEC 61131-3, -40 to 75°C operating temperature
ioPAC 8600-CPU10-RJ45-IEC-T: ioPAC 8600 CPU module with RJ45 Ethernet connectors, IEC 61131-3, -40 to 75°C operating temperature

Power Modules

ioPAC 8600-PW10-15W-T: ioPAC 8600 power module with 24 to 110 VDC input, 15 W, -40 to 75°C operating temperature

Backplane Modules

ioPAC 8600-BM005-T: ioPAC 8600 backplane modules with 5 I/O slots, -40 to 75°C operating temperature
ioPAC 8600-BM009-T: ioPAC 8600 backplane modules with 9 I/O slots, -40 to 75°C operating temperature

I/O Modules

86M-1832D-T: ioPAC 8600 I/O module with 8 channel to channel isolated DIs, channel LED, 24 VDC sink/source type, -40 to 75°C operating temperature
86M-2830D-T: ioPAC 8600 I/O module with 8 channel to channel isolated DOs, channel LED, 24 VDC sink type, -40 to 75°C operating temperature
86M-2604D-T: ioPAC 8600 I/O module with 6 relays, channel LED, form A (N.O.) type, -40 to 75°C operating temperature
86M-4420-T: ioPAC 8600 I/O module with 4 ACs, 0 to 10 V / -10 to 10 V / 0 to 20 mA / 4 to 20 mA, -40 to 75°C operating temperature
85M-1602-T: ioPAC 8500 I/O module with 16 DIs, 24 VDC sink/source type, -40 to 75°C operating temperature
85M-2600-T: ioPAC 8500 I/O module with 16 DOs, 24 VDC sink type, -40 to 75°C operating temperature
85M-3800-T: ioPAC 8500 I/O module with 8 AIs, 4 to 20 mA, -40 to 75°C operating temperature
85M-3810-T: ioPAC 8500 I/O module with 8 AIs, 0 to 10 V, -40 to 75°C operating temperature
85M-3801-T: ioPAC 8500 I/O module with 8 AIs, 4 to 20 mA, 40 kHz, -40 to 75°C operating temperature
85M-3811-T: ioPAC 8500 I/O module with 8 AIs, 0 to 10 V, 40 kHz, -40 to 75°C operating temperature
85M-6600-T: ioPAC 8500 I/O module with 6 RTDs, -40 to 75°C operating temperature
85M-6810-T: ioPAC 8500 I/O module with 8 TCs, -40 to 75°C operating temperature
85M-5401-T: ioPAC 8500 communication module with 4 serial ports (DB44 connectors), -40 to 75°C operating temperature

Optional Accessories (can be purchased separately)

DK-DC50131: Din-rail mounting kit
WK-75: Wall mounting kit
CBL-M12D(MM4P)/RJ45-100 IP67: M12 to RJ45 cable
85M-BKTES: Empty slot cover for ioPAC 8600/8500 modules (3 pcs per package)

Note: Conformal coating available on request

Package Checklist

- ioPAC 8600 CPU module
- Serial console cable (C/C++ version only)
- Software CD

ioPAC 8600 Series Modules

32-bit ARM9 192 MHz CPU



ioPAC 8600-CPU10 Series: 32-bit ARM9 192 MHz CPU

Computer

CPU Type: 32-bit ARM9 192 MHz CPU
 OS: Linux
 Clock: Real-time clock with super capacitor
 (retains charge for 7 days)

Memory

SDRAM: 64 MB
 Flash: 32 MB (10 MB reserved for user)
 FRAM: 128 KB
 microSD™ Slot: Up to 32 GB (SD 2.0 compatible)
Note: For units operating in extreme temperatures, industrial grade, wide-temperature microSD cards are required.

Switches & Buttons

Rotary Switch: 0 to 9
 Button: Reset to factory defaults

Ethernet Interface

LAN: 2 x 10/100 Mbps, Ethernet bypass or 2 MACs (IPs), jumper selectable, RJ45 or M12
 Protection: 1.5 kV magnetic isolation
 Automation Languages: C/C++, IEC61131-3
 Protocols: Modbus/TCP Master/Slave, Modbus/RTU Master, Active OPC

Environmental Limits

Operating Temperature: -40 to 75°C

Power Requirements

Power Consumption: 4.8 W

MTBF (mean time between failures)

Time: 1,132,561 hrs (TBD)

Database: Telcordia (Bellcore)



Dual power input, 24 to 110 VDC, 15 W



ioPAC 8600-PW10-15W-T: Dual power input, 24 to 110 VDC, 15 W

Power

Power Input: 24 to 110 VDC
Note: Compliant with EN 50155 at 24/48/60/72/110 VDC
 Wattage: 15 W

Galvanic Isolation: 3k VDC

Dual Power Input: Yes

Environmental Limits

Operating Temperature: -40 to 75°C

MTBF (mean time between failures)

Time: 1,132,561 hrs (TBD)

Database: Telcordia (Bellcore)



8 channel to channel isolated DIs, 24 VDC, channel LED, sink/source type



86M-1832D-T: 8 channel to channel isolated DIs, 24 VDC, channel LED, sink/source type

Inputs and Outputs

Digital Inputs: 8 channels

Isolation:

To system: 3k VDC or 2k Vrms

Channel to channel: 1k VDC

Digital Inputs

Sensor Type: Wet contact (NPN or PNP)

I/O Mode: DI, counter, or frequency mode

Wet Contact:

NPN:

- On: 0 to 3 VDC
- Off: 10 to 30 VDC

PNP:

- Off: 0 to 3 VDC
- On: 10 to 30 VDC

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

Power Requirements

Power Consumption: 0.3 W

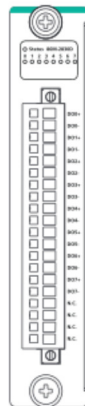
MTBF (mean time between failures)

Time: 1,132,561 hrs (TBD)

Database: Telcordia (Bellcore)



8 channel to channel isolated DOs, 24 VDC, channel LED, sink type



86M-2830D-T: 8 channel to channel isolated DOs, 24 VDC, channel LED, sink type

Inputs and Outputs

Digital Outputs: 8 channels

Isolation:

To system: 3k VDC or 2k Vrms

Channel to channel: 1k VDC

Digital Outputs

Type: Sink

I/O Mode: DO or PWM mode

Pulse Output Frequency: 1 kHz

Short Circuit Protection: 750 mA @ 25°C

Over-voltage Protection: 41 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

Power Requirements

Power Consumption: 1.8 W (with all DOs on)

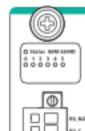
MTBF (mean time between failures)

Time: 792,571 hrs (TBD)

Database: Telcordia (Bellcore)



6 relays, channel LED, form A (N.O.) type



86M-2604D-T: 6 relays, channel LED, form A (N.O.) type

Inputs and Outputs

Relay Outputs: 6 channels

Isolation:

To System: 3k VDC or 2k Vrms

Relay Outputs

Electrical Endurance: 60,000 operations @ 5 A resistive load

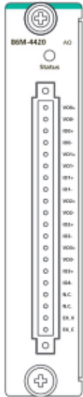
Contact Resistance: 100 m ohms (max.)

Physical Characteristics

Wiring: I/O cable, max. 16 AWG

Connector: Spring type terminal block

4 analog outputs, 0 to 10 V or -10 to 10 V or 0 to 20 mA or 4 to 20 mA



86M-4420-T: 4 analog outputs, 0 to 10 V or -10 to 10 V or 0 to 20 mA or 4 to 20 mA

Inputs and Outputs

Analog Outputs: 4 channels

Isolation:

To system: 3k VDC or 2k Vrms

Analog Outputs

Resolution: 12 bits

Output range: 0-10 V, -10-10 V, 0-20 mA, 4-20 mA

I/O mode: Static or Waveform mode

Voltage Output: 10 mA(max.)

Accuracy:

±0.1% FSR @25°C

±0.3% FSR @-40 and 75°C

Current Load Resistance:

Internal Power: 400 ohms

External 24 VDC Power: 1000 ohms

Update Rate: Software polling or waveform mode

Wavemode Frequency: 125 Hz

Physical Characteristics

Wiring: I/O cable, max. 16 AWG

Connector: Spring type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C

Power Requirements

Power Consumption:

2.26 W (Voltage)

3.45 W (Current)

MTBF (mean time between failures)

Time: 1,530,690 hrs (TBD)

Database: Telcordia (Bellcore)



EN 50155



EN 50121



ioPAC 8500 Series Modules

16 digital inputs, 24 VDC, sink/source, dry contact type



85M-1602-T: 16 digital inputs, 24 VDC, sink/source, dry contact type

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: DI or event counter

Dry Contact:

- On: short to GND
- Off: open

Wet Contact (DI to GND):

NPN (DI to GND):

- On: 0 to 3 VDC
- Off: 10 to 30 VDC

PNP (DI to GND):

- 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

Power Requirements

Power Consumption: 1.2 W @ 3.3 VDC

MTBF (mean time between failures)

Time: 1,132,561 hrs

Database: Telcordia (Bellcore)



16 digital outputs, 24 VDC, sink type



85M-2600-T: 16 digital outputs, 24 VDC, sink type

Inputs and Outputs

Digital Outputs: 16 channels
Isolation: 3k VDC or 2k Vrms

Digital Outputs

Type: Sink

I/O Mode: DO or pulse output

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

Power Requirements

Power Consumption: 0.85 W @ 3.3 VDC

MTBF (mean time between failures)

Time: 792,571 hrs

Database: Telcordia (Bellcore)



8 analog inputs, 4 to 20 mA



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

Inputs and Outputs

Analog Inputs: 8 channels

Physical Characteristics

Wiring: I/O cable, max. 16 AWG

8 analog inputs, 0 to 10 VDC



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

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

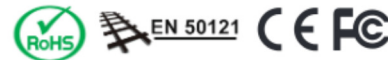
Operating Temperature: -40 to 75°C

Power Requirements

Power Consumption: 1.04 W @3.3 VDC

MTBF (mean time between failures)

Time: 1,530,690 hrs
Database: Telcordia (Bellcore)



8 analog inputs, 4 to 20 mA, 40 kHz



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

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 (□ire off)

Historical Data Buffering: 60KB per channel,
6 seconds data buffer at 5KHz

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

Power Requirements

Power Consumption: 1.25 W @3.3 VDC

MTBF (mean time between failures)

Time: 1,410,655 hrs
Database: Telcordia (Bellcore)



8 analog inputs, 0 to 10 VDC, 40 kHz



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

Inputs and Outputs

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

Analog Inputs

Physical Characteristics

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

Environmental Limits

6 RTD inputs



85M-6600-T: 6 RTD inputs

Inputs and Outputs

RTD Inputs: 6 channels
Isolation: 3KVDC or 2KVrms

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)
- NI 100, NI 200, NI 500 (-60 to 250°C)
- NI 1000 (-60 to 150°C)
- NI 120 (-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: $\pm 0.1\%$ FSR @ 25°C
 $\pm 0.3\%$ 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



8 thermocouple inputs



85M-6810-T: 8 thermocouple inputs

Inputs and Outputs

Analog Inputs: 8 channels
Isolation: 3KVDC or 2KVrms

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: $\pm 0.1\%$ FSR @ 25°C
 $\pm 0.3\%$ 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



4 serial ports



85M-5401-T: 4 serial ports

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 male

Environmental Limits

Operating Temperature: -40 to 75°C

Power Requirements

Power Consumption: 1.24 W @ 3.3 VDC

MTBF (mean time between failures)

Time: 596,611 hrs

Database: Telcordia (Bellcore)



EN 50121



