UC-8481 Series

Award-winning Product

TAIWAN EXCELLENCE 2013

Industrial RISC-based mobile Linux computers with cellular, Wi-Fi, and GPS modules, 2 Ethernet, 2 serial, 2 USB 2.0 ports, and 2 mini PCIe sockets

- 512 MB NAND Flash for data storage
- Fanless and rugged design for rolling stock applications
- Complies with a portion of EN 50155 specifications
- Extra Wi-Fi and cellular slots for cross-operator expansions
- Wi-Fi, cellular, and GPS modules for full communications mobility
- Independent, software-based power control of cellular modules
- Ready-to-run embedded Linux operating system
- -25 to 70°C wide temperature models available

Overview

The UC-8481 embedded computer comes with 2 RS-232/422/485 serial ports, 2 Ethernet ports, 4 digital input channels, 4 digital output channels, a CompactFlash socket, and 2 USB 2.0 ports.

The computer uses the Intel XScale IXP435 533 MHz RISC CPU. This powerful computing engine supports several useful communication functions, but will not generate too much heat. The built-in 32 MB NOR Flash ROM and 512 MB SDRAM give you enough memory to run your application software directly on the UC-8481, and the 512 MB NAND Flash can be used to provide additional data storage.

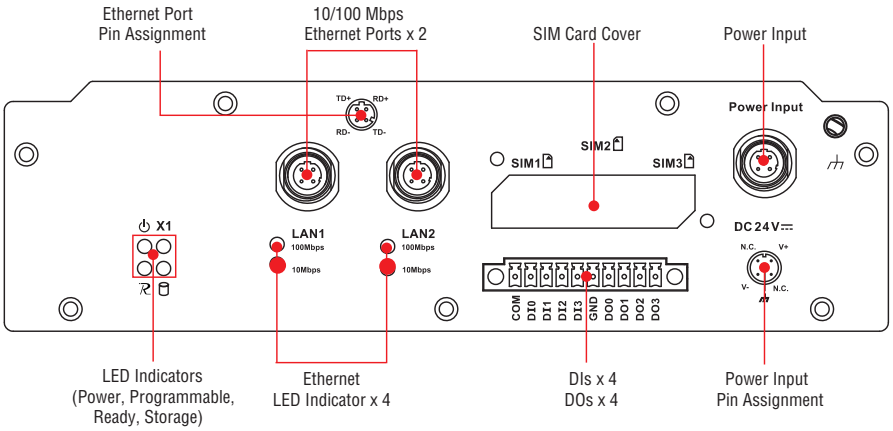
Mostly importantly, the UC-8481 series comes with seven connectors that allow users to connect various wireless and GPS modules, making it particularly well-suited for rolling stock and moving vehicles. The UC-8481 is a convenient cornerstone for customizing intelligent, cost-effective wireless communication platforms.

With an embedded Linux operating system pre-installed, the UC-8481 series provides an open software platform perfect for custom-authored software. Software written on desktop PCs can be easily ported to the UC-8481 via a common compiler, without any modification of code. This makes the UC-8481 an optimal solution for industrial applications, allowing ample customization with minimal cost and effort.

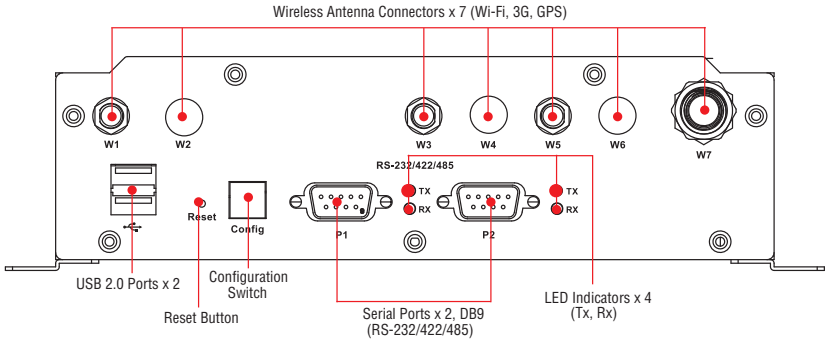
The UC-8481 also comes in a wide-temperature model designed to operate reliably in extreme temperatures ranging from -25 to 70°C.

Appearance

Front View

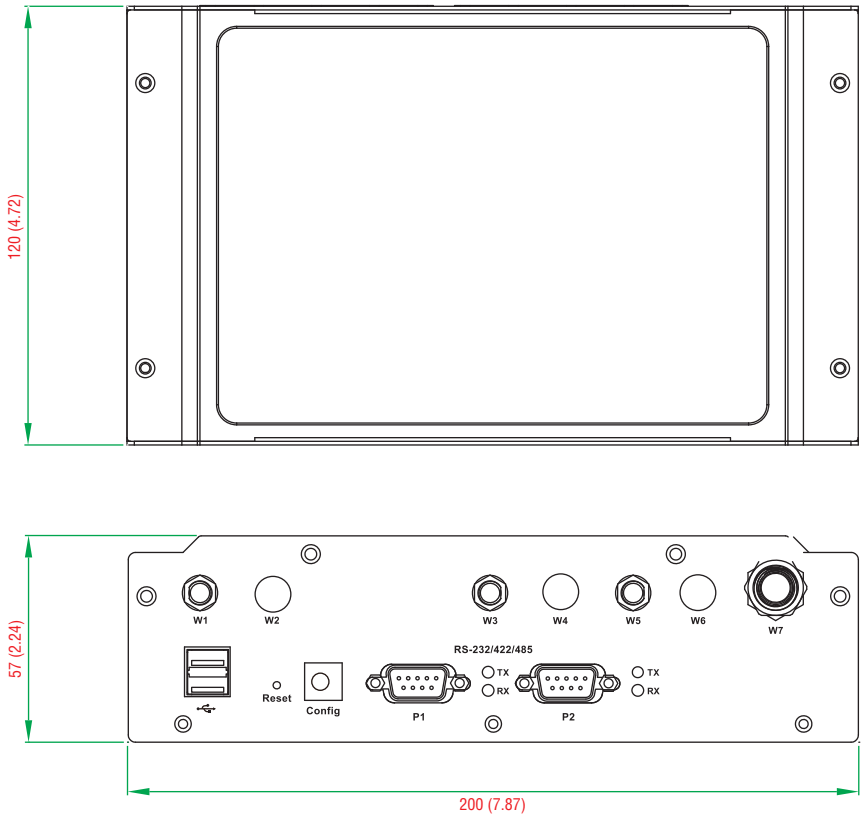


Rear View



Dimensions

Unit: mm (inch)



Hardware Specifications

Computer
CPU: Intel XScale IXP435, 533 MHz
OS: Linux (pre-installed)
USB: USB 2.0 hosts x 2
DRAM: 512 MB DDR2 SDRAM onboard
Flash:
• NOR Flash, 32 MB (max. 32 MB) onboard to store OS
• NAND Flash, 512 MB (max. 1 GB) for OS file system, caching storage, and data logger

Storage
Storage Expansion: CompactFlash socket

Ethernet Interface
LAN: Auto-sensing 10/100 Mbps ports (M12) x 2
Magnetic Isolation Protection: 1.5 kV built in

GPS Module (U-Blox LEA-6S)
Receiver Types:
• 50-channel U-blox 6 engine
• GPS L1 C/A code
• SBAS: WAAS, EGNOS, MSAS, GAGAN
Acquisition:
• Cold starts: 28 s
• Warm starts: 28 s
• Aided starts: 1 s
• Hot starts: 1 s
Sensitivity:
• Tracking: -160 dBm
• Reacquisition: -160 dBm
• Cold starts: -147 dBm
Timing Accuracy:
• RMS: 30 ns
• 99%: <60 ns
• Granularity: 21 ns
Accuracy:
• Position: 2.5 m CEP
• SBAS: 2.0 m CEP
Protocols: NMEA, UBX binary, max. update rate: 5 Hz (ROM version)
Time Pulse: 0.25 Hz to 1 kHz
Velocity Accuracy: 0.1 m/s
Heading Accuracy: 0.5 degrees
A-GPS: Supports AssistNow Online and AssistNow Offline, OMA SUPL compliant
Operational Limits: Velocity: 500 m/s (972 knots)
Connector Type: TNC

WLAN Module (Atheros AR9220)
WAPN001: IEEE 802.11a/b/g/n wireless LAN module with U.FL antenna connector
Standards: IEEE 802.11a/b/g/n for wireless LAN
Connector Type: QMA connector (female type) x 2
Mode: Client

Cellular Module (Cinterion PH8)
Frequency Bands: GSM/GPRS/EDGE/UMTS/HSPA+
Band Options:
• Five band UMTS(WCDMA/FDD)
• 800/850/1900 AWS and 2100 MHz
• Quad-band GSM: 850/900/1800/1900 MHz
HSDPA/HSUPA Data Rates:
DL: 3.6/7.2/14.4 Mbps; UL: 2.0/5.76 Mbps
UMTS Data Rates:
DL: max 384 kbps; UL: max 384 kbps
EDGE Class 12:
DL: max 237 kbps; UL: max 237 kbps
GPRS Class 12:
DL: max 85.6 kbps; UL: max 85.6 kbps
Connector Type: QMA connector (female type) x 1

Serial Interface
Serial Standards: 2 RS-232/422/485 ports, software-selectable (DB9)
Console Port: RS-232 (TxD, RxD, GND), 4-pin pin header output (115200, n, 8, 1)

Serial Communication Parameters
Data Bits: 5, 6, 7, 8
Stop Bits: 1, 1.5, 2
Parity: None, Even, Odd, Space, Mark
Flow Control: RTS/CTS, XON/XOFF, ADDC® (automatic data direction control) for RS-485
Baudrate: 50 bps to 921.6 kbps (supports non-standard baudrates; see user's manual for details)

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

Digital Input
Input Channels: 4
Input Voltage: 0 to 30 VDC
Digital Input Levels for Dry Contacts:
• Logic level 0: Close to GND
• Logic level 1: Open
Digital Input Levels for Wet Contacts:
• Logic level 0: +3 V max.
• Logic level 1: +10 V to +30 V (COM to DI)
Connector Type: 10-pin screw terminal block (4 points, COM, GND)
Isolation: 2 kV optical isolation

Digital Output
Output Channels: 4, sink type
Output Current: Max. 200 mA per channel
On-State Voltage: 24 VDC nominal, open collector to 30 V
Connector Type: 10-pin screw terminal block (4 points, GND)

LEDs
System: Power, Ready, Storage, Programmable
LAN: 10M/Link x 2, 100M/Link x 2 (on connector)
Serial: TxD x 2, RxD x 2
Reset Button: Supports "Reset to Factory Default"

Physical Characteristics
Housing: SECC sheet metal (1 mm)
Weight: 1 kg (2.22 lb)
Dimensions: 200 x 57 x 120 mm (7.87 x 2.24 x 4.72 in)
Mounting: Wall, DIN rail

Environmental Limits
Operating Temperature:
Standard Models: -25 to 55°C (-13 to 131°F)
Wide Temp. Models: -25 to 70°C (-13 to 158°F)
Storage Temperature:
Standard Models: -25 to 75°C (-13 to 167°F)
Wide Temp. Models: -40 to 80°C (-40 to 176°F)
Ambient Relative Humidity: 5 to 95% (non-condensing)
Anti-Vibration: IEC 61373 standard
Anti-Shock: IEC 61373 standard

Power Requirements
Input Voltage: 24 VDC (9 to 48 V), M12 connector
Input Current: 833 mA @ 24 VDC
Power Consumption: 20 W

Standards and Certifications
Safety: UL 60950-1, EN 60950-1
EMC: EN 55022/24
EMI: CISPR 22, FCC Part 15B Class A

EMS:
IEC 61000-4-2 ESD: Contact: 6 kV; Air: 8 kV
IEC 61000-4-3 RS: 80 MHz to 1 GHz: 20 V/m
IEC 61000-4-4 EFT: Power: 2 kV; Signal: 2 kV
IEC 61000-4-5 Surge: Power: 2 kV; Signal: 2 kV
IEC 61000-4-6 CS: 10 V
IEC 61000-4-8
Rail Traffic: EN 50155*, EN 50121-2-3, EN 50121-4, IEC 61373
*Complies with a portion of EN 50155 specifications. Please contact Moxa or a Moxa distributor for details.

Reliability
Alert Tools: Built-in buzzer and RTC (real-time clock)
Automatic Reboot Trigger: Built-in WDT (watchdog timer)

MTBF (mean time between failures)
Time: 195,415 hrs
Standard: Telcordia (Bellcore) Standard TR/SR

Warranty
Warranty Period: 5 years (does not apply to cellular module)
Details: See www.moxa.com/warranty
Note: These hardware specifications describe the embedded computer unit itself, but not its official accessories. In particular, the wide temperature specification does not apply to accessories such as power adapters and cables.

Software Specifications

Linux
OS: Linux 2.6.38
Web Server (Apache): Allows you to create and manage web sites; supports PHP and XML
Terminal Server (SSH): Provides secure encrypted communications between two un-trusted hosts over an insecure network
File System: JFFS2, NFS, Ext2, Ext3, YAFFS2
Internet Protocol Suite: TCP, UDP, IPv4, IPv6, SNMPv1, ICMP, ARP, HTTP, CHAP, PAP, DHCP, NTP, NFS, SMTP, Telnet, FTP, TFTP, PPP, PPPoE
Internet Security: OpenVPN, iptables firewall, OpenSSL
Dial-up Networking: PPP Daemon for Linux that allows Unix machines to connect to the Internet through dialup lines, using the PPP protocol, as a PPP server or client. Works with 'chat', 'dip', and 'diald', among (many) others. Supports IP, TCP, UDP, and (for Linux) IPX (Novell).
Watchdog: Features a hardware function to trigger system reset in a user specified time interval (Moxa API provided)
Wireless: wpa_supplicant is configured using a text file that lists all accepted networks and security policies, including pre-shared keys.
GPS: gpsd is a daemon that receives data from a GPS receiver, and provides the data back to multiple applications such as Kismet or GPS navigation software.
Application Development Software:
• Moxa API Library (Watchdog timer, Moxa serial I/O control, Moxa DI/DO API)
• GNU C/C++ cross-compiler, supports EABI
• GNU C library
• GDB source-level debugging server
Software Protection: Encryption tool for user executable files (based on patented Moxa technology)

Ordering Information

Available Models
UC-8481-LX: RISC-based industrial wireless mobile computer with 2 LANs, 2 serial ports, 4 DIs, 4 DOs, 2 USB 2.0 hosts, CF, 1 cellular module, 1 Wi-Fi module, 1 GPS module, 2 mini PCIe sockets (USB interface), Linux OS, -25 to 55°C operating temperature (EN 50155 Class T1)
UC-8481-T-LX: RISC-based industrial wireless mobile computer with 2 LANs, 2 serial ports, 4 DIs, 4 DOs, 2 USB 2.0 hosts, CF, 1 cellular module, 1 Wi-Fi module, 1 GPS module, 2 mini PCIe sockets (USB interface), Linux OS, -25 to 70°C operating temperature (EN 50155 Class T3)

Optional Accessories (can be purchased separately)
PWR-24250-DT-S1: Power adapter
PWC-C7US-2B-183: Power cord with 2-pin connector, USA plug
PWC-C7EU-2B-183: Power cord with 2-pin connector, Euro plug
PWC-C7UK-2B-183: Power cord with 2-pin connector, British plug
PWC-C7AU-2B-183: Power cord with 2-pin connector, Australia plug
PWC-C7CN-2B-183: Power cord with 2-pin connector, China plug

M12 Connectors (can be purchased separately)
M12A-5P-IP68: 5-pin female circular threaded A-coded M12 power connector, IP68-rated (for field installation)
M12D-4P-IP68: 4-pin male circular threaded D-coded M12 Ethernet connector, IP68-rated (for field installation)

M12 Cables (can be purchased separately)
CBL-M12(FF5P)/Open-100 IP67: 1-meter A-coded M12-to-5-pin power cable, 5-pin female M12 connector, IP67-rated
CBL-M12D(MM4P)/RJ45-100 IP67: 1-meter D-coded M12-to-RJ45 Cat-5C UTP Ethernet cable, 4-pin male M12 connector, IP67-rated

UC-8481 Wi-Fi Accessory Package
WAPN001: Wireless LAN module, supporting IEEE 802.11 a/b/g/n
Wireless Antenna Connector and Cable: QMA (female) antenna connector with 140 mm cable to Wi-Fi module
Installation Kit: Bronze screws x 3, M2.5 screws x 3, thermal pad x 1

UC-8481 PH8 Cellular Accessory Package
EPM-PH8: Cellular Module
Wireless Antenna Connector and Cable: QMA (female) antenna connector with 140 mm cable to cellular module
Installation Kit: Bronze screw x 1, M2.5 screw x 1, thermal pad x 1

WLAN Cable and Antenna
Cable: QMA (male) to SMA (male) adapter with 50 cm cable
Antenna: 2 dual-band omni-directional antenna (2 dBi, RP-SMA, 2.4/5 GHz)

Cellular Cable and Antenna
Cable: QMA (male) to SMA (female) adapter with 50 cm cable
Antenna: Omni 1 dBi rubber SMA antenna

GPS Cable and Antenna
Cable: TNC to SMA (female) adapter with 50 cm cable
Antenna: 26 dBi, 1572 MHz, L1 band antenna

Package Checklist
- UC-8481 embedded computer
- Wall-mounting kit
- DIN-rail mounting kit
- CBL-4PINDB9F-100: 100 cm console port cable; 4 pin header connector to DB9 female connector
- Documentation and software CD or DVD
- Quick installation guide (printed)

Optional Accessories

Ethernet	Item	Type	Model Name	Description
	1	Cable	CBL-M12D(MM4P)/RJ45-100 IP67	1-meter D-coded M12-to-RJ45 Cat-5C UTP Ethernet cable, 4-pin male M12 connector, IP67-rated
	2	Connector	M12D-4P-IP68	Field-installation D-coded screw-in Ethernet connector, 4-pin male M12 connector, IP68-rated
Power	1	Cable	CBL-M12(FF5P)/OPEN-100 IP67	1-meter A-coded M12-to-5-pin power cable, 5-pin female M12 connector, IP67-rated
	2	Power adapter kit	PWR-24250-DT-S1 adapter w/USA plug	Power adpater, power jack, M12 connector, power cord
	3		PWR-24250-DT-S1 adapter w/Euro plug	Power adpater, power jack, M12 connector, power cord
	4		PWR-24250-DT-S1 adapter w/Australia plug	Power adpater, power jack, M12 connector, power cord
	5		PWR-24250-DT-S1 adapter w/British plug	Power adpater, power jack, M12 connector, power cord
	6		PWR-24250-DT-S1 adapter w/China plug	Power adpater, power jack, M12 connector, power cord
Wi-Fi	1	Cable	A-CRF-RFQMAM-R2-50	QMA (male) to SMA (male) adapter with 50 cm cable
	2	Antenna	ANT-WDB-ARM-02	Omni 1 dBi rubber SMA antenna
	3	Module	UC-8481 Wi-Fi accessory package	WAPN001, wireless module
Cellular	1	Cable	A-CRF-RFQMSF-R2-50	QMA (male) to SMA (female) adapter with 50 cm cable
	2	Antenna	ANT-WDCMA-ASM-1.5	Omni 1 dBi rubber SMA antenna
	3	Module	UC-8481 HSPA cellular accessory package	PH8, cellular module
GPS	1	Cable	A-CRF-CTPSF-R2-50	TNC to SMA (female) adapter with 50 cm cable
	2	Antenna	ANT-GPS-OSM-05-3M	26 dBi, 1572 MHz, L1 band SMA antenna