

MAR-2000 Series

Preliminary

Industrial multi-radio mobile access and applications router



- > Multiple WAN dynamic routing
- > Policy-based routing management
- > Simple web management user interface
- > IEEE 802.11a/b/g/n wireless AP/bridge/client
- > Five-band UMTS/HSPA+ and quad-band GSM/GPRS/EDGE industrial IP-modems
- > Complies with a portion of EN 50155 specifications
- > Built-in 50-channel GPS for location-based applications
- > -25 to 70°C wide temperature range (EN 50155 Class T3)



Overview

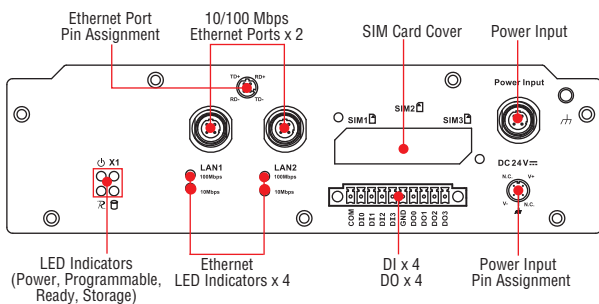
The MAR-2000 is a compact, simple, and programmable RISC-based wireless mobile router with strong wireless routing capabilities. With a built-in GPS module, HSPA+ cellular and 802.11a/b/g/n wireless capabilities, independent power switches on its cellular module connectors, and high thermal tolerance, the MAR-2000 is compliant with EN 50155 specifications. The built-in 32 MB NOR Flash ROM and 512 MB SDRAM give you enough memory for installing your own application software, the 512 MB NAND Flash can be used to provide additional data storage, and the CompactFlash socket is available for adding more memory when needed. The built-in GPS module supports geo-fencing functionality, making it ideal for managing wireless connections in the cross-WAN environments often associated with rolling stock and other vehicular applications.

When a train travels to a different region, it often encounters switches that support different wireless interfaces, such as WiFi, UMTS, and HSPA+. The MAR-2000 uses multiple-WAN support and backup functionality to ensure that your wireless connections are always available, stable, and reliable.

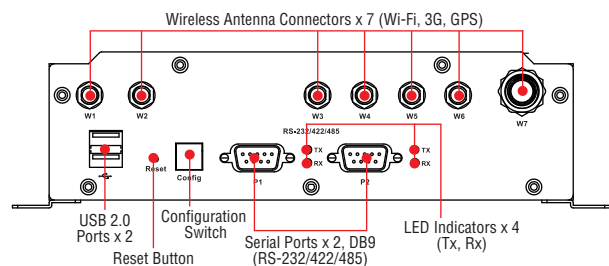
As an added bonus, the MAR-2000 series includes wide temperature models designed to operate reliably in extreme environments with temperatures ranging from -25 to 70°C.

Appearance

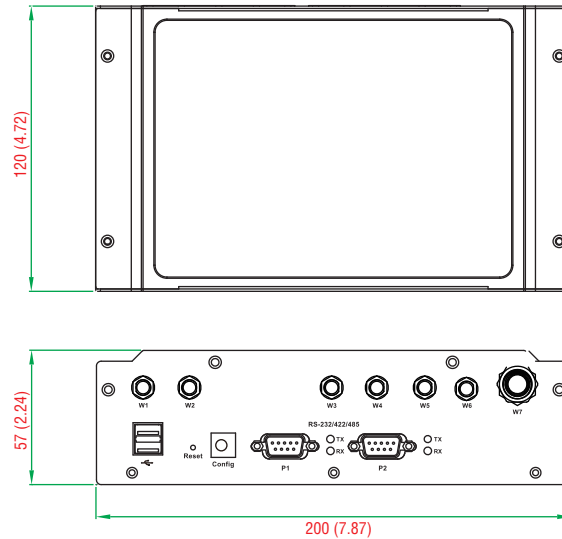
Front View



Rear View



Dimensions



Unit: mm (inch)

Hardware Specifications

Computer

CPU: Intel XScale IXP435, 533 MHz

OS (pre-installed): Linux

DRAM: 512 MB DDR2 SDRAM onboard

Flash:

- 32 MB NOR Flash onboard to store OS
- 512 MB NAND Flash, up to 1 GB for OS file system, caching storage, and data logger

USB: USB 2.0 hosts x 2

Storage

Storage Expansion: CompactFlash socket

Ethernet Interface

LAN: 2 auto-sensing 10/100 Mbps ports (M12)

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, 5 Hz max. update rate (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

WAPN001: IEEE 802.11a/b/g/n wireless LAN module with TNC antenna connector

Standard: IEEE 802.11a/b/g/n for wireless LAN

Connector Type: QMA connectors (female type) x 2

Mode: Client/AP

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)

Serial Interface

Serial Standards: 2 RS-232/422/485 ports, software-selectable (DB9)

Console Port: RS-232 (Tx, Rx, GND), 4-pin pin header output (115200, n, 8, 1)

Serial Signals

RS-232: Tx, Rx, 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

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)

Digital Input

Input Channels: 4, source type

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-type 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

Dimensions: 200 x 57 x 120 mm (7.87 x 2.24 x 4.72 in)

Mounting: DIN rail, wall

Environmental Limits

Operating Temperature: 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

Power Consumption: 20 W, 833 mA @ 24 VDC

Standards and Certifications

Safety: UL 60950-1, EN 60950-1

EMC: EN 55022 Class B, EN 55024-4-2, EN 55024-4-3, EN 55024-4-4, FCC Part 15 Subpart B Class B

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)

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

File System: JFFS2, NFS, Ext2, Ext3, YAFFS2

Internet Protocol Suite: TCP, UDP, IPv4, SNMPv2, ICMP, ARP, HTTP, CHAP, PAP, DHCP, NTP, PPP

Internet Security: OpenVPN, iptables firewall, OpenSSL

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

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).

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

MAR-2001-T: Multiple WAN programmable router with 2 LANs, 2 serial ports, 4 DIs, 4 DOs, 2 USB 2.0 hosts, CF, 2 quad-band GSM/GPRS, EDGE and five-band UMTS/HSPA+ industrial IP-modem, 2 IEEE 802.11a/b/g/n dual-RF wireless APs/bridges/clients, 1 GPS module, Linux OS, -25 to 70°C operating temperature (EN 50155 Class T3)

MAR-2001-CT-T: Multiple WAN programmable router with 2 LANs, 2 serial ports, 4 DIs, 4 DOs, 2 USB 2.0 hosts, CF, 2 quad-band GSM/GPRS, EDGE and five-band UMTS/HSPA+ industrial IP-modem, IEEE 802.11a/b/g/n dual-RF wireless AP/bridge/client, 1 GPS module, Linux OS, -25 to 70°C operating temperature (EN 50155 Class T3), conformal coating

MAR-2002-T: Multiple WAN programmable router with 2 LANs, 2 serial ports, 4 DIs, 4 DOs, 2 USB 2.0 hosts, CF, 3 quad-band GSM/GPRS, EDGE and five-band UMTS/HSPA+ industrial IP-modem, IEEE 802.11a/b/g/n wireless AP/bridge/client, 1 GPS module, Linux OS, -25 to 70°C operating temperature (EN 50155 Class T3)

Package Checklist

- MAR-2000 programmable router
- Wall mounting kit
- DIN-rail mounting kit
- CBL-4PINDB9F-100: 100 cm console port cable; 4 pin header connector to female DB9 connector
- Documentation and software CD or DVD
- Quick installation guide (printed)