www.westermo.com

Merlin 3400 Series

Industrial Cellular Router

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1. General Information

1.1. Legal Information

The contents of this document are provided “as is”. Except as required by applicable law, no warranties of any kind are made in relation to the accuracy and reliability or contents of this document, either expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Westermo reserves the right to revise this document or withdraw it at any time without prior notice.

Under no circumstances shall Westermo be responsible for any loss of data or income or any special, incidental, and consequential or indirect damages howsoever caused.

More information about Westermo can be found at www.westermo.com .

1.2. About This Guide

This guide is intended for installation engineers and users of the Westermo products.

It includes information on safety and regulations, a product description, installation instructions and technical specifications.

1.3. License and Copyright for Included FLOSS

This product includes software developed by third parties, including Free/Libre Open Source Software (FLOSS). The specific license terms and copyright associated with the software are included in each software package respectively. Please visit the product web page for more information.

Upon request, the applicable source code will be provided. A nominal fee may be charged to cover shipping and media. Please direct any source code request to your normal sales or support channel.

2. Safety and Regulations

2.1. Warning Levels

Warning signs are provided to prevent personal injuries and/or damages to the product. The following levels are used:

Level of warning	Description	Consequence personal injury	Consequence material damage
 WARNING	Indicates a potentially hazardous situation	Possible death or major injury	Major damage to the product
 CAUTION	Indicates a potentially hazardous situation	Minor or moderate injury	Moderate damage to the product
 NOTICE	Provides information in order to avoid misuse of the product, confusion or misunderstanding	No personal injury	Minor damage to the product
 NOTE	Used for highlighting general, but important information	No personal injury	Minor damage to the product

Table 1. Warning levels

2.2. Safety Information

Before installation:

Read this manual completely and gather all information available on the product. Make sure it is fully understood. Check that your application does not exceed the safe operating specifications for the product.

SAFETY DURING INSTALLATION

The product must be installed and operated by qualified service personnel and installed into an apparatus cabinet or similar, where access is restricted to service personnel only.

Before energising and connecting communication cables to the product, ensure a protective earthing conductor is first connected to the protective earthing terminal (only valid for metallic housings). Westermo recommends a cross-sectional area of at least 4 mm^2.

Upon removal of the product, disconnect the product from the power supply and all other communication ports before disconnecting the protective earthing conductor.

SAFETY USE

This equipment is not suitable for use in locations where children are likely to be present.

HAZARDOUS VOLTAGE

Do not open an energised product. Hazardous voltage may occur when connected to a power supply.

PROTECTIVE FUSE

The power supply wiring must be sufficiently fused.

This product has no internal fuse and should be connected via an external fuse for protection.

The Merlin 3400 4G models have a typical current of 400mA drawn at 12 VDC. Hence a 1A fuse is recommended

It must be possible to disconnect manually from the power supply. Ensure compliance to national installation regulations.

POWER SUPPLY CONNECTION

There are safety regulations governing the power source that can be used in conjunction with the product. Refer to the user guide for detailed information.

EARTH CONNECTION

For correct function, the earth connection needs to be properly connected to a designated protective earthing rail (only valid for metallic housings). Torque: 3.1 Nm.

INDOOR USE ONLY

The device is to be connected only to networks without routing to the outside plant. All communication ports are for indoor use only.

REDUCE THE RISK OF FIRE

To reduce the risk of fire, use only telecommunication line cords with a cable diameter of AWG 26 or larger. Regarding power cable dimensions, see chapter Interface Specifications.

RADIO PRODUCTS

Observe the usage limitations of radio products at filling stations, in chemical plants, in systems with explosives or potentially explosive locations.

The product may not be used in airplanes. Exercise particular caution near personal medical aids, such as pacemakers and hearing aids. Never perform work on the antenna system during a thunderstorm.

To fulfill human safety, a minimum separation distance of 20 cm or more should be maintained between the antenna of the product and personnel during operation.

ELECTROSTATIC DISCHARGE (ESD)

Prevent electrostatic discharge damage to internal electronic parts by discharging your body to a grounding point (e.g. use a wrist strap).

HOT SURFACE

Be aware that the surface of this product may become hot. When it is operated at high temperatures, the external surface may exceed Touch Temperature Limit according to the product's relevant electrical safety standard.

CABLE TEMPERATURE RATING FOR FIELD TERMINAL WIRES

There may be a requirement on the minimum temperature rating of the cable to be connected to the field wiring terminals, refer to the user guide for detailed information.

2.3. Care Recommendations

Follow the care recommendations below to maintain full operation of the product and to fulfill the warranty obligations:

- Do not drop, knock or shake the product. Rough handling above the specification may cause damage to internal circuit boards.
- Use a dry or slightly water-damp cloth to clean the product. Do not use harsh chemicals, cleaning solvents or strong detergents.
- Do not paint the product. Paint can clog the product and prevent proper operation.

If the product is used in a manner not according to specification, the protection provided by the equipment may be impaired.

If the product is not working properly, contact the place of purchase, the nearest Westermo distributor office or Westermo technical support.

2.4. Product Disposal

This symbol means that the product shall not be treated as unsorted municipal waste when disposing of it. It needs to be handed over to an applicable collection point for recycling electrical and electronic equipment.

Proper disposal of the product helps minimize hazardous substances and prevents potential negative impacts on both the environment and human health.

Figure 1. WEEE symbol for treatment of product disposal

2.5. Compliance Information

2.5.1. Agency Approvals and Standards Compliance

Type	Approval/Compliance
EMC	• EN/IEC 61000-6-2, Immunity industrial environments • EN/IEC 61000-6-4, Emission industrial environments
Safety	• EN 62368-1, Safety Communication Technology

Table 2. Agency approvals and standards compliance

2.5.2. Simplified Declaration of Conformity

Hereby, Westermo declares that this product is in compliance with applicable EU directives. The full declaration of conformity and other detailed information is available at www.westermo.com/support/product-support.

CE

Figure 2. The European Conformity Assessment marking

3. Product Description

3.1. Product Description

The Merlin series of versatile cellular routers provide high speed data network connectivity for demanding industrial and smart grid applications. Coupled with the Zero Touch deployment software Activator, it provides cost-effective, reliable, and consistent onboarding of routers in large-scale projects.

This compact, rugged unit is suited to tight spaces. Its high MTBF and wide temperature range support maximum service life.

To achieve best-in-class cybersecurity, the Merlin series is equipped with a TPM (Trusted Platform Module) chip that keeps cryptographic keys secure. Secure Boot ensures that the unit boots using only software that is signed and trusted by manufacturer. A set of cybersecurity tools is available as standard including VPN and stateful Firewall support for data security and user authentication.

3.2. Available Models

See datasheet for full list of models available.

3.3. Hardware Overview

The location of interfaces ports and LED indicators for Merlin-3409-T4G-S3-DIO2-AI1-WF-QFR-G-DCi1060 and subsets thereof is shown here.

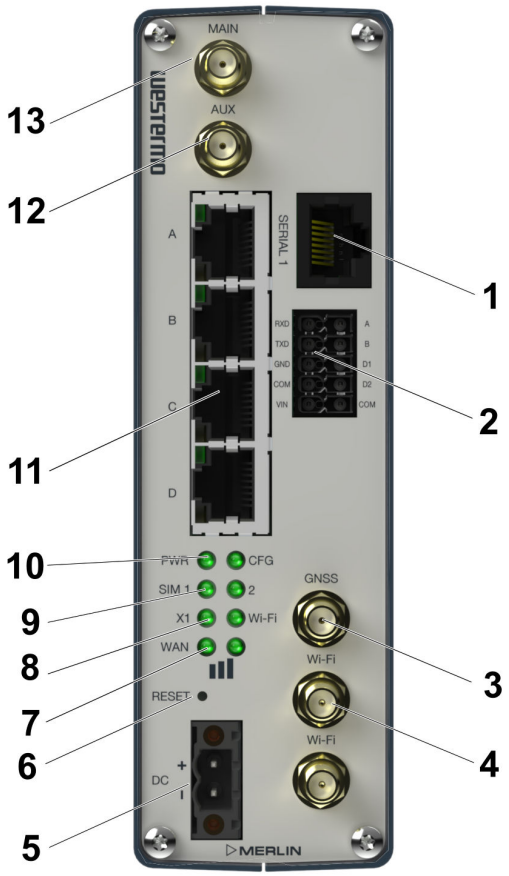


Figure 3. Location of interface ports and LED indicators, illustrated by a Merlin-3409-T4G-S3-DIO2-AI1-WF-QFR-G-DCi1060 model

No.	Description	No.	Description
1	Serial RJ45 port	2	5x2 terminal block
3	GNSS SMA connector	4	Where Wi-Fi feature is present: a pair of Reverse-Polarity Female SMA connectors
5	Power connection	6	Reset button
7	WAN signal strength	8	For future use
9	Where Wi-Fi feature is present: Wi-Fi status LED. Otherwise, for future use	10	SIM LEDs
11	Power and configuration LEDs	12	Ethernet RJ45 ports
13	WAN auxiliary SMA connector	14	WAN primary SMA connector

The location of interface ports and LED indicators for Merlin-3407-T4G-WF-QFR-PFN-G-DCi1060 is shown below.

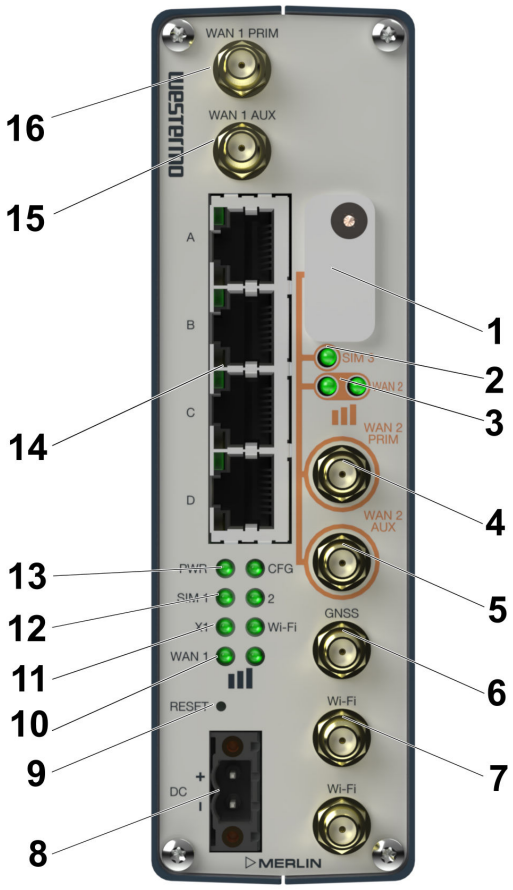


Figure 4. Location of interface ports and LED indicators, illustrated by a Merlin-3407-T4G-WF-QFR-PFN-G-DCi1060 model

No.	Description	No.	Description
1	SIM 3 slot and cover	2	SIM 3 LED
3	WAN signal strength of second cellular radio	4	Primary SMA connector of second cellular radio
5	Auxiliary SMA connector of second cellular radio	6	GNSS SMA connector
7	Pair of Reverse-Polarity Female SMA connectors for Wi-Fi	8	Power connection
9	Reset button	10	WAN signal strength of first cellular radio
11	Wi-Fi status LED	12	SIM LEDs
13	Power and configuration LEDs	14	Ethernet RJ45 ports
15	Auxiliary SMA connector of first cellular radio	16	Primary SMA connector of first cellular radio

The location of interface ports and LED indicators for Merlin-3407-F2G-T4G-PFO-DCi1060 is shown below.

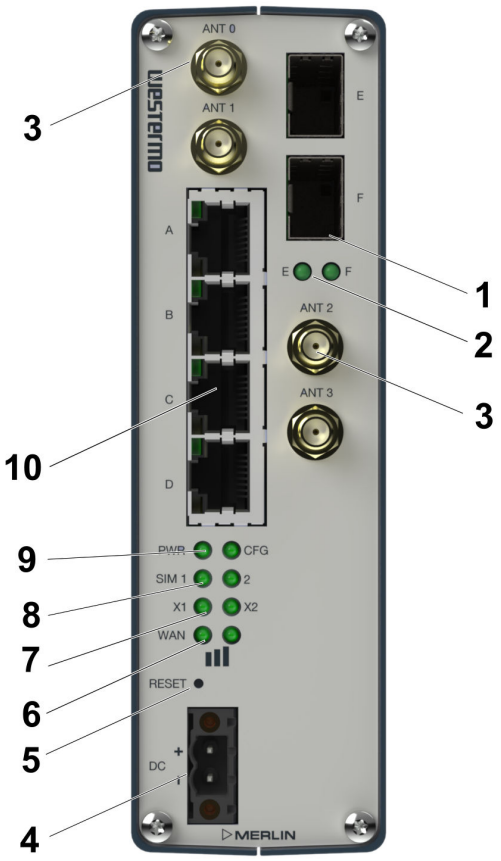


Figure 5. Location of interface ports and LED indicators, illustrated by a Merlin-3407-F2G-T4G-PFO-DCi1060 model

No.	Description	No.	Description
1	Fibre SFP ports	2	Fibre SFP status LEDs
3	Antenna SMA connectors	4	Power connection
5	Reset button	6	WAN signal strength of cellular radio
7	Reserved for future use	8	SIM LEDs
9	Power and configuration LEDs	10	Ethernet RJ45 ports

3.4. Connector Information Merlin

3.4.1. Power Input

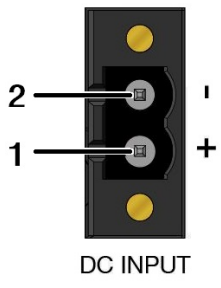
Illustration	Position	Product marking	Direction	Description
	1	DC+	Input	Supply voltage
	2	DC-	Input	Supply voltage

Table 3. Power input

The positive input is marked with a plus sign, "+". The negative input is marked with a minus sign, "-". Connect the voltage to the + pin and the return to the - pin on the power input.

NOTICE - POWER SUPPLY

Where an AC/DC-adapter has not been supplied, a power supply of no greater than 100 W should be used, with a current limit of 1 Amp.

The product can be supplied with power from a source that complies with PS2/LPS according to UL/IEC 62368-1 or with LPS according to UL/IEC 60950-1, the latest edition or equivalent. Such a power supply shall not exceed 100W after 5 seconds.

3.4.2. Antennas for model with two SMA Connectors

Where the router has two SMA connectors for mobile radio LTE antennas, one is for MAIN and the other for AUXiliary.

3.4.3. Antennas for model with four SMA Connectors

For routers with four SMA connectors marked WAN 1 PRIM, WAN 1 AUX, WAN 2 PRIM and WAN 2 AUX, they are used for dual radio 4G communication. It is recommended to use all four data antenna connectors.

3.4.4. Antennas for model with LTE, Wi-Fi and GNSS

For routers with LTE, Wi-Fi and GNSS there are five SMA connectors, they are:

- Two LTE antennas for the mobile radio - a MAIN and an AUXiliary
- Single antenna for GNSS/GPS
- A pair of Reverse-Polarity SMA Female SMA connectors for Wi-Fi

3.4.5. Serial RJ45 Port

An asynchronous RJ45 serial port may be present on the router. The serial port is named as follows, also its identifier for use within the terminal server configuration:

Label	tservd.port.serialPortName
SERIAL 1	serial1

The RJ45 serial port operates in RS-232 mode.

The pin numbering of the serial port connector is shown below.

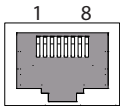


Figure 6. Pin numbering of serial port

RS-232 ports

When you configure a RJ45 serial port to operate as an RS-232 interface, it supports the following signals:

- Transmit Data
- Receive Data
- CTS
- RTS
- DSR
- DTR

The pin numbering of the RJ45 socket, when viewed from the front of the unit, is as shown below. The RS-232 interface is wired as a DCE.

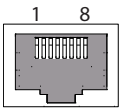
Illustration	Pin no.	Signal	Direction	Description
	1	DSR	Out	Data Set Ready
	2	DCD	Out	Data Carrier Detect
	3	DTR	In	Data Terminal Ready
	4	SG	-	Signal Ground, not chassis ground
	5	RD	Out	Receive Data
	6	TD	In	Transmit Data
	7	CTS	Out	Clear To Send
	8	RTS	In	Request To Send

Table 4. RS-232 connection

3.4.6. Terminal block

The pins of the terminal block, where present, are shown below,

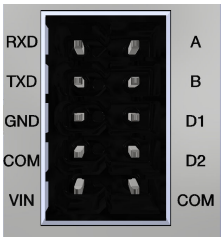
Illustration	Signal	Direction	Description
	A	-	Half-duplex RS-485
	B	-	Half-duplex RS-485
	D1	In/Out	Digital Input/Output 1
	D2	In/Out	Digital Input/Output 2
	COM	-	Signal Ground, not chassis ground
	RXD	Out	RS-232 Receive data
	TXD	In	RS-232 Transmit data
	GND	-	Signal Ground, not chassis ground. Use with RXD and TXD above
	COM	-	Signal Ground, not chassis ground
	VIN	Out	Analog input. Use with COM above. Measures voltage 1-60 VDC to common ground with a resolution of 0.1V.

Table 5. Terminal block

3.4.7. SFP Transceivers

Each SFP slot can hold one SFP transceiver. See "*Transceiver User Guide*" for transceiver handling instructions, which also can be downloaded from the product support pages at www.westermo.com/support/product-support.

In the event of contamination, the optical connectors in the SFP transceivers should only be cleaned by the use of forced nitrogen and some kind of cleaning stick. Recommended cleaning fluids are methyl-, ethyl-, isopropyl- or isobutyl alcohol, hexane or naphtha.

3.4.8. Reset Button

Use the reset button to request a system reset. When pressing the reset button, all LEDs turn on simultaneously. The length of time holding the reset button will determine its behaviour.

Press duration	PWR/CONFIG LED behaviour	Router behaviour on depress
0-3 seconds	Solid on	Normal reset to running config. No special LED activity.
3-15 seconds	Flashing fast	Releasing 3-15 seconds switches the router back to factory configuration. Note: this will wipe the configurations, both config1 and config2.
15-20 seconds	Solid on	Releasing 15-20 seconds performs a normal reset to running config.
20-30 seconds	Flashing slowly	Releasing 20-30 seconds reboots the router to recovery mode. Only to be done in case of emergency and under the guidance of Westermo support staff. Note: this may wipe the configurations, both config1 and config2.
> 30 seconds	Solid on	Releasing after 30 seconds performs a normal reset.

Table 6. Merlin series router reset behaviour

3.5. LED Indicators

The LED indicators described in this section are all single colour LEDs. When the router is powered on, the power LED is green.

The possible LED states are:

- Off
- Flashing slowly
- Flashing quickly
- On

LED	Status	Description
Booting up		The router takes less than a minute to boot up. During this time, the power LED flashes. Other LEDs display different diagnostic patterns during boot up. Booting is complete when the power LED stops flashing and stays on steady.
Power	On	Power is present
	Off	No power. Boot loader does not exist.
	Flashing	Booting
CFG	On	The router is running a valid configuration file.
	Flashing slowly	The router is running in recovery mode (2.5 flashes/second)
	Flashing quickly	The router is running in factory configuration (5 flashes/second)
SIM	On	SIM selected and registered on the 3G/4G network
	Off	Not selected or SIM not inserted
	Flashing	SIM selected and not registered on the network
Cellular signal strength LED	Both LEDs off	Data link not connected or signal strength <=-113 dBm
	Left LED on Right LED off	Data link connected and signal strength <=-89 dBm
	Left LED off Right LED on	Data link connected and signal strength is between -89 to -69 dBm
	Both LEDs on	Data link connected and signal strength >-69 dBm

Table 7. LED indicators

3.6. Ethernet Port LED Behaviour

There are four Ethernet ports and each has a pair of LEDs: a LINK LED (green) and a SPEED LED (amber).

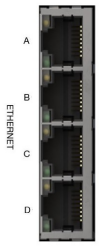


Figure 7. Merlin Ethernet ports

LINK LED (green)	On	Physical Ethernet link detected
	Off	No physical Ethernet link detected
	Flashing	Data is being transmitted or received over the link
SPEED LED (amber)	On	Link operating at 1000 Mbps
	Off	Link operating at 10 Mbps or at 100 Mbps

Table 8. Ethernet LED behaviour and descriptions

3.7. Fibre SFP LED Behaviour

Each fibre SFP port has a single green-coloured LED.

LINK LED (green)	On	Physical Ethernet link detected.
	Off	No physical Ethernet link detected.
	Flashing	Data is being transmitted or received over the link.

Table 9. Fibre LED behaviour and descriptions

3.8. Dimensions

Dimensions are stated in millimetres and are regardless of model.

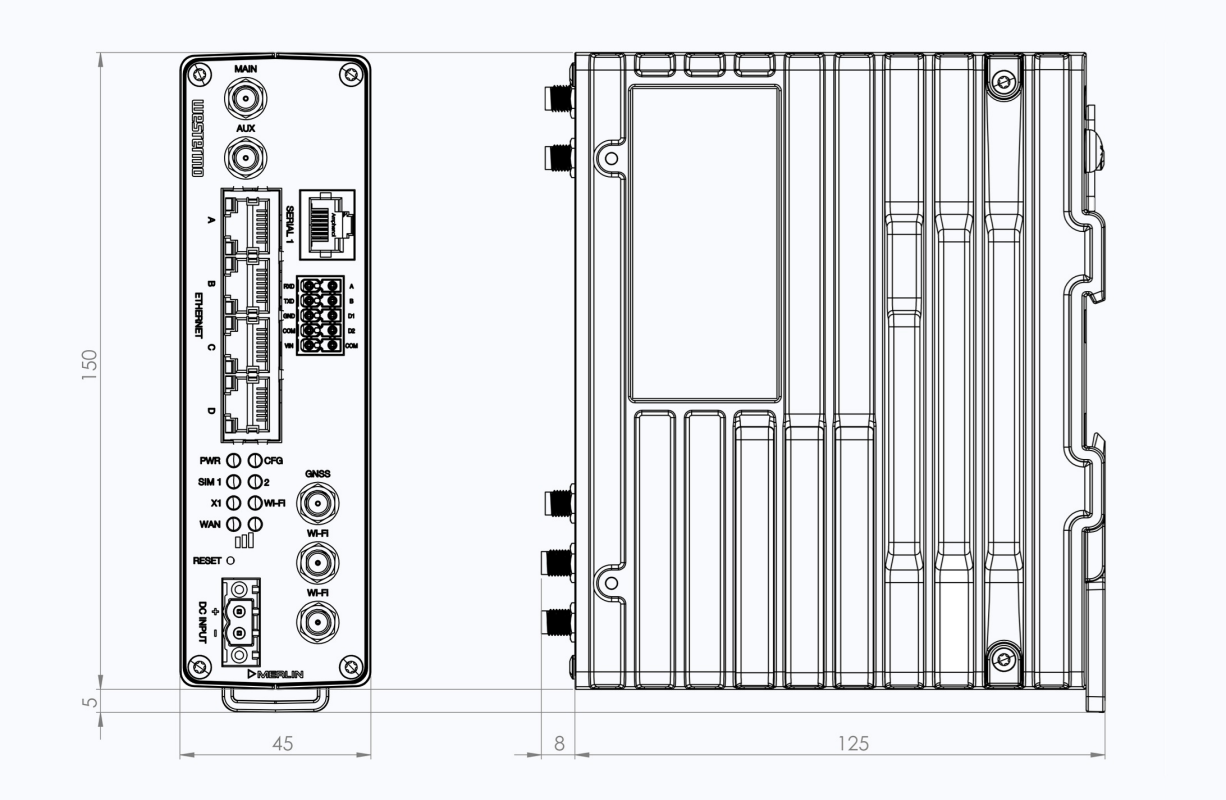


Figure 8. Dimensional drawing

4. Installation

4.1. Mounting the Router

The router has an integrated DIN-rail clip. To attach the router to a DIN-rail:

1. Pull down the plastic clasp at rear until it snaps into place in the downward position
2. Position the router so that the top hook of the DIN-clip rests on top of the DIN-rail
3. Allow the router to pivot under gravity so that it sits on the DIN-rail in the vertical position
4. Push up the plastic clasp until it snaps into place, locking the router firmly to the DIN-rail

To remove the router from the DIN-rail, simply reverse the procedure.

MOUNTING HEIGHT

To reduce the risk of personal injury and damage to the device, the unit must not be mounted at a height greater than two metres above the ground beneath it.

4.2. Cooling

This product uses convection cooling. Spacing is recommended for the use of the product in full operating temperature range and service life. To avoid obstructing the airflow around the product, use the following spacing rules.

A minimum spacing of 25 mm (1 inch) above and below, and 10 mm (0.4 inches) left and right of the product is recommended.

REDUCE THE RISK OF FIRE

To reduce the risk of fire, use only telecommunication line cords with a cable diameter of AWG 26 or larger. Regarding power cable dimensions, see chapter Interface Specifications.

4.3. Connecting Cables

Connect one end of the Ethernet cable into port A and the other end to your PC or switch.

4.4. Connecting the Antenna

If only connecting one LTE antenna to a 4G or 5G Redcap model, screw the antenna into the MAIN SMA connector. If you are using more than one LTE antenna, screw the main antenna into the MAIN SMA connector and the secondary antenna into the WAN-AUX SMA connector.

Be careful to select an antenna that ensures the equipment complies with local regulatory requirements.

In North America, Westermo has indicated to PTCRB the following set of antennas for use with this equipment:

Article Number	Model
160-00148	2J 2J7724Ma - Cellular/LTE MIMO Magnetic Mount with two 3m LL100 leads, SMA Male
160-00184	2J 2J2183K-B07H-300LL195-C91GST - Cellular/LTE wall mount antenna with a 3m LL195 lead, SMA Male

Table 10. List of antennas for use with this equipment in North America, as indicated to PTCRB

To comply with the requirements of PTCRB in North America:

1. It is recommended to select an antenna from the list above.
2. Should a user select their own antenna, Westermo strongly recommends that it be mounted with at least 20cm of cable.
3. Where a user selects a directly mounted antenna, it must comply with the OTA requirements of the PTCRB.

4.5. Inserting SIM Cards

On the rear side of the router there are two SIM slots. To access the SIM cards, first remove the SIM cover using a suitable screwdriver (not supplied). Only the proper driver can drive a specific head size without risk of damaging the driver or screw.

A Merlin 3400 dual-radio model has a third SIM slot presented on the front face. The paragraph above applies.

The product datasheet indicates the correct size of SIM card to use. A Mini-SIM card (2FF) is of size 25mm x 15mm x 0.76mm. Do not use a card larger than or smaller than that specified in the product datasheet or you may cause damage to the unit. Using the correct SIM card size helps avoid issues such as incompatibility or improper insertion that can lead to device malfunction.

4.5.1. Inserting SIM 1 Card

Ensure the router is powered off.

- Hold the SIM 1 card with the chip side facing down and the cut corner facing away from you, to the left.
- Gently push the SIM card into the upper SIM slot 1 until it clicks in.

4.5.2. Inserting SIM 2 Card

- If you are using a second SIM, hold the SIM 2 card with the chip side facing up and the cut corner front right facing away from you.
- Gently push the SIM card into the lower SIM slot 2 until it clicks in.

Screw the SIM cover back on with the screwdriver.

4.6. Powering Up

Plug the power cable first into the device and then to a suitable power source. The router takes less than a minute to boot up. During this time, the power LED flashes.

Other LEDs display different diagnostic patterns during boot up. Booting is complete when the power LED stops flashing and stays on steady.

5. Specifications

5.1. Interface Specifications

DC, Power port	
Operating voltage	9.6 to 60 VDC
Rated current	580 mA at 12 VDC 170 mA at 48 VDC
Rated frequency	DC
Inrush current	2.74×10^{-3} A^2s at 12 VDC
Polarity	Reverse polarity protected
Redundant power input	No
Connector	Push-in spring connectors
Conductor cross section	0.2-2.5 mm^2 (AWG 24-12)
Stripping length cable	7 mm
Tightening torque, screw flange	0.3 Nm
Shielded cable	Not required

Ethernet TX	
Electrical specification	IEEE std 802.3
Data rate	10 Mbit/s, 100 Mbit/s, 1000 Mbits/s manual or auto
Duplex	Full or half, manual or auto
Transmission range	Up to 150 m with CAT5e cable or better
Connection	RJ-45, auto MDI/MDI-X
Cabling	Shielded CAT5e or better is recommended
Number of ports	4

RS-232/485	
Electrical specification	Configurable for EIA RS-232 or EIA RS-422/485
Data rate	RS-232: 50 bit/s - 1 Mbit/s RS-485: 50 bit/s - 20 Mbit/s
Data format	7 or 8 data bits, odd, even or none parity, 1 or 2 stop bits (2 stop bits only when no parity is set)
Transmission range	RS-232: 15 m/49 ft RS-485: Up to 1200 m/0.74 mi, depending on data rate and cable type
Connection	RS-232: RJ-45 according to EIA-561; 3-wire RS-232 is detachable latch terminal RS-485: Detachable latch terminal
Shielded cable	Recommended
Number of ports	Up to 1 RJ45 RS-232, up to 1 3-wire RS-232, up to 1 two-wire RS-485

I/O connection, Relay output	
Maximum voltage/current	Up to 60 VDC
Connect resistance	<100mΩ
Connector	Detachable latch terminal
Conductor cross section	0.14 - 1.5 mm² (AWG 28 - 16)
Stripping length cable	7 mm
Number of ports	Up to 2

I/O connection, Digital input	
Maximum voltage	24 VDC
Voltage levels	Logic one: >9.9 VDC Logic zero: <7.4 VDC
Connector	Detachable latch terminal
Conductor cross section	0.14 - 1.5 mm² (AWG 28 - 16)
Stripping length cable	7 mm
Number of inputs	Up to 2

6. Revision Notes

Revision	Date	Change description
Rev. A	2025-07-16	First version
Rev. B	2025-07-17	Correction to dual radio product code
Rev. C	2026-07-24	Added SFP content

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EN_REV C 2026 07