Hardware Manual

Industrial Cellular Router

ICR-2431

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Used symbols

Important

Important — Indicates a risk to personal safety or potential damage to the router. Follow these instructions precisely to prevent injury or equipment damage.

Warning

Warning — Highlights conditions that may cause malfunction, loss of data, or unexpected behavior in specific situations. Read carefully before proceeding.

Info

Info — Provides helpful tips, context, or references that improve understanding but are not strictly required to complete the task.

Code Example

```
Code Example - Copy-pasteable configuration snippets or CLI commands.
```

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1. Product Overview

1.1 Product Introduction

Industrial cellular router ICR-2431 is designed for wireless communication in mobile networks that use traditional cellular technologies. The primary purpose of this router is its use in the Category 4 (**Cat.4**) services on the cellular **LTE** network. Cat.4 rated router is capable of achieving typical speeds in 4G coverage areas where the network is enabled with 20 MHz of contiguous spectrum. The peak **downlink** data rate for Category 4 is approximately **150 Mbps**. In the **uplink**, LTE Category 4 provides a peak data rate of **50 Mbps**.

The router is equipped with two independently configurable **Ethernet ports**, **RS232** and **RS485** serial ports and with one **digital input** together with one **digital output**. The router can be equipped with a **dual-band Wi-Fi module** or **GNSS module**, but this must be part of the initial configuration – it cannot be assembled to the router at some point in the future.

Router configuration is accessible through a **secure web interface**, offering detailed insights into the entire configuration, statuses, signal strength, and logs.

Basic features include **two-factor authentication**, **IPv6 Dual Stack**, **DHCP**, **NAT**, **NAT-T**, **DynDNS**, **DNS proxy**, **VLAN**, **QoS**, **NTP**, **VRRP**, **SMS control**, **port forwarding**, and **connection backup**, among others. The router supports various VPN protocols, including **IPSec**, **OpenVPN**, **GRE**, **L2TP**, and **PPTP**, ensuring secure communication.

The router allows for the insertion of **Linux scripts** for automated tasks. It supports the definition of up to **four distinct profiles**, switchable via the web interface, SMS, or digital input.

Router Apps enhance router functionality through custom software programs. For Advantech routers, a diverse array of Router Apps is offered, encompassing categories such as connectivity, routing, services, among others, freely accessible on the Advantech *Router Apps* webpage. Additionally, directly from the router web interface, you can use an **Advantech public server** for the Router App or router firmware installation/update.

Compatibility with Advantech's **remote device management** platform, *WebAccess/DMP*, offers extensive device management and monitoring, ensuring that devices remain up-to-date and secure.

1.2 Hardware Overview

In this chapter, all components of the router case are described, including links to chapters that provide more details.

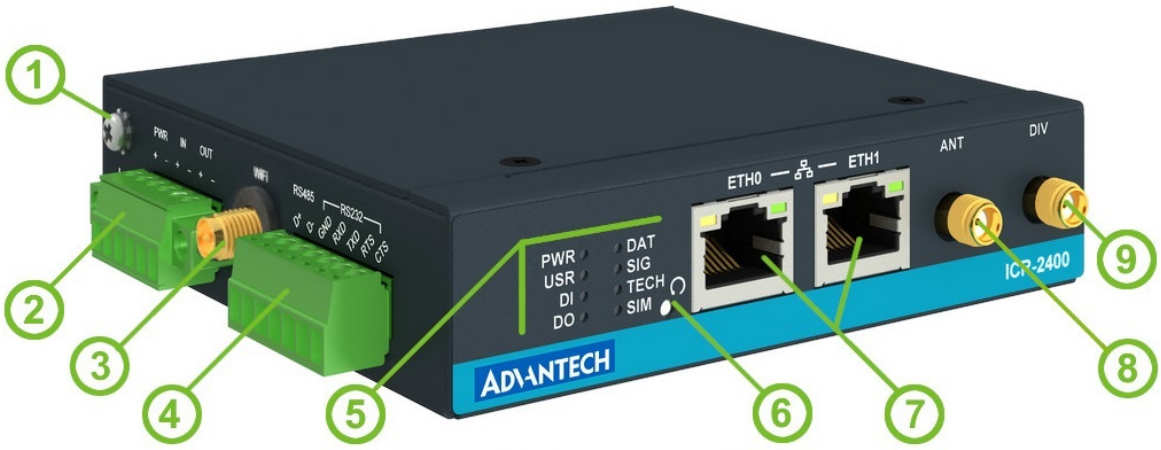

Figure 1: Router hardware overview – front view

#	Item	Type	Description
1	Grounding screw	M3	Pay attention to proper grounding; see Chapter 2.4.
2	PWR IN/OUT	6-pin terminal	Power supply, digital input, and digital output interfaces. See Chapter 2.4, Chapter 2.5, Chapter 2.6 for more information, Chapter 3.7 for I/O parameters, and Chapter 3.8 for serial interface parameters .
3	AUX	RP-SMA female / SMA female	Connector for the Wi-Fi/GNSS antenna; see Chapter 2.2, Chapter 3.6 for Wi-Fi parameters and Chapter 3.5 for GNSS parameters.
4	RS485/RS232	7-pin terminal	RS232 & RS485 serial interfaces; see Chapter 2.6.
5	LEDs	-	Status LED indication; see Chapter 2.7.
6	RST	-	Button to reboot the router or to restore the default configuration; see Chapter 2.8.
7	ETH0 ETH1	RJ45 RJ45	100 MB Ethernet connections for the first and second LAN; see Chapter 2.3.
8	ANT	SMA female	Connector for the main antenna of the cellular module; see Chapter 2.2.
9	DIV	SMA female	Connector for the second antenna of the cellular module (required for the MIMO DL); see Chapter 2.2.

Table 1: Router hardware overview – front view

Figure 2: Router hardware overview – rear view

#	Item	Type	Description
10	SIM slots	Micro SIM	Two SIM card slots; see Chapter 2.1.
11	DIN clip	-	DIN rail clip, **not included** as standard accessories; see Chapter 1.9.
12	Wall clip	-	Wall mounting clip, included as standard accessories; see Chapter 1.8.

Table 2: Router hardware overview – rear view

1.3 Order Codes

The table below provides an overview of the order codes.

Order code	Configuration
ICR-2431	LTE Cat.4 with 3G/2G fallback cellular module, 64 MB NOR Flash, 2x ETH, 1x RS232, 1x RS485, 1x Digital Input, 1x Digital Output, 2x SIM reader
ICR-2431**G**	LTE Cat.4 with 3G/2G fallback cellular module, 64 MB NOR Flash, 2x ETH, 1x RS232, 1x RS485, 1x Digital Input, 1x Digital Output, 2x SIM reader, **GNSS**
ICR-2431**W**	LTE Cat.4 with 3G/2G fallback cellular module, 64 MB NOR Flash, 2x ETH, 1x RS232, 1x RS485, 1x Digital Input, 1x Digital Output, 2x SIM reader, **dual-band Wi-Fi**

Table 3: Order code overview

1.4 Product Revisions

For the product revision history of the entire product platform, refer to the table below. Please note that some revisions may not be available for certain order codes. The revision number is printed on both the packaging and product labels.
The router GUI can also display the product revision under *Status* → *General* → *System Information* → *Product Revision*. Please note that the default revision (Rev.1.0) is unavailable here.

Rev.#	Description
1.0	Initial version (revision number not printed on the labels).
2.0	New design of the mainboard; refer to PCN-2023-05 for details.
2.1	Changed the Wi-Fi label on the chassis to "AUX"; refer to PCN-2024-05 for details.

Table 4: HW revision history

1.5 Package Contents

The standard set of router includes items listed in the following table:

Item#	Description	Figure	Q'ty
1	Router		1 pcs
2	Wall mounting clip with screws		1 set
3	6-pin terminal block for power supply, digital input and digital output (deployed on the router)		1 pcs
4	7-pin terminal block for RS485 and RS232 (deployed on the router)		1 pcs
5	Printed *Quick Start Guide Leaflet*		1 pcs

Table 5: Package contents

1.6 Product Dimensions

For the dimensions of the product see the figures below. Note that all sizes are measured in millimeters.

Variant with Wall-Mounting Clip

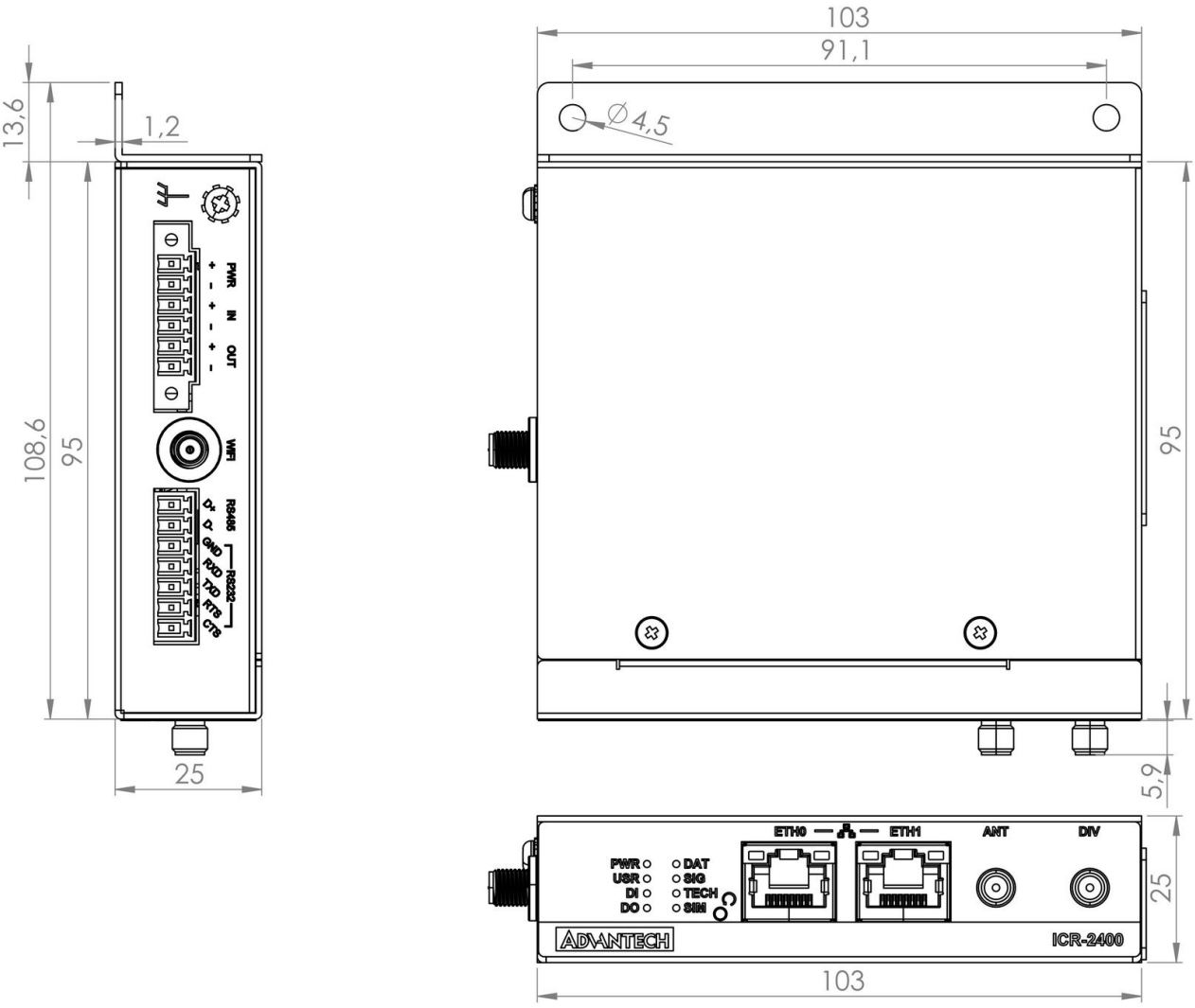

Figure 3: Router dimensions – top, side and front view with wall-mounting clip

Variant with DIN Rail Clip

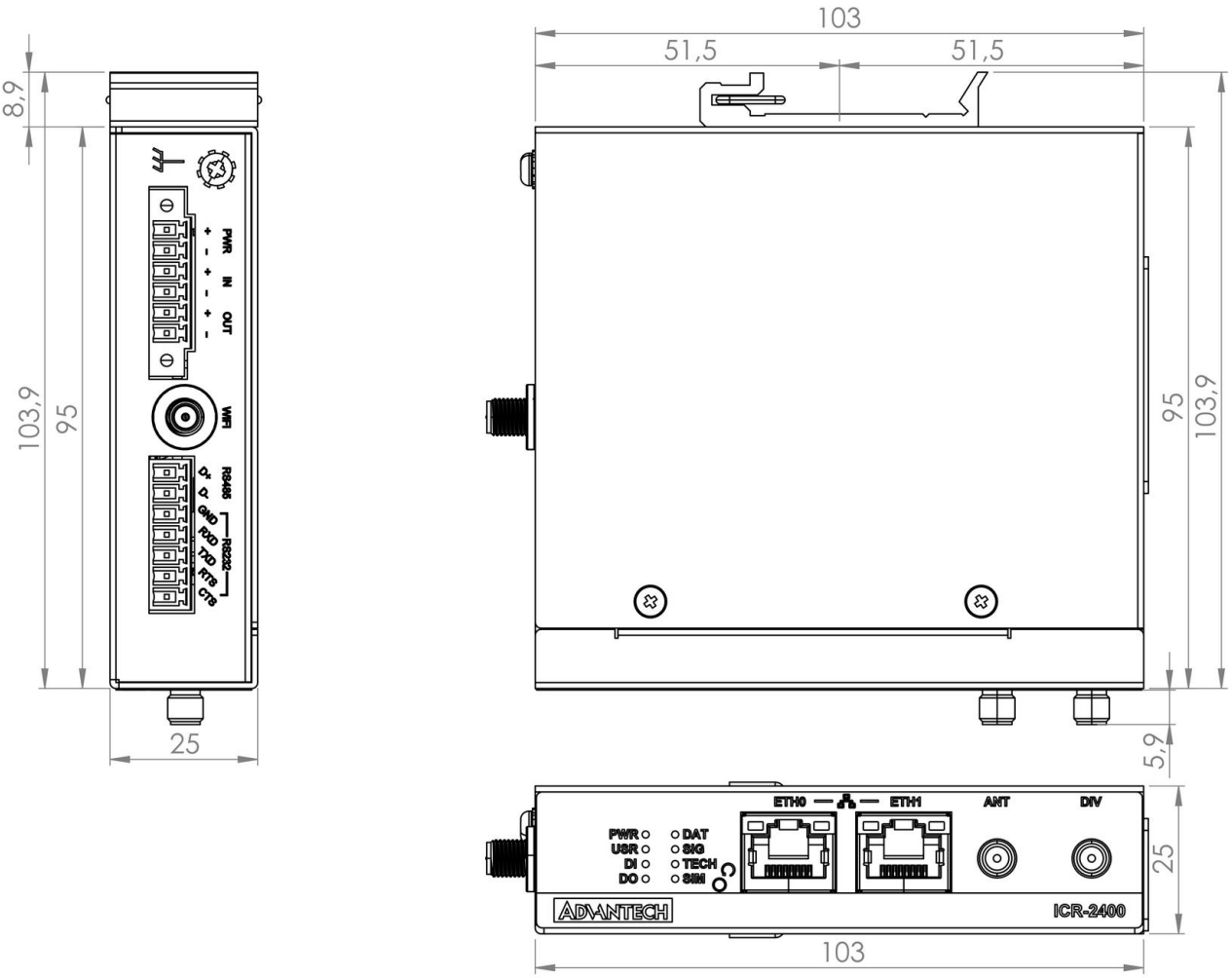

Figure 4: Router dimensions – top, side and front view with DIN rail clip

1.7 Mounting Recommendations

The router can be placed:

- on a flat surface,
- on a wall using the wall-mounting clip (see Chapter 1.8),
- on a DIN rail EN 60715 with the metal DIN rail clip (see Chapter 1.9)

For most applications with a built-in router within a switchboard, it is possible to recognize two kinds of environments:

- A non-public, industry environment of low voltage with high interference,
- a public environment of low voltage and without high interference.

For both of these environments, it is possible to mount the router to a switchboard, after which there is no need to have examination immunity or issues in connection with EMC according to EN 61439-1:2011.

Warning

In compliance with the EN 61439-1:2011 specification, it is necessary to observe the following assembly instructions for a router attached to a switchboard:

- For whip antennas it is recommended to observe a minimum distance of 6 cm from cables and metal surfaces on every side in order to avoid interference. When using an external antenna separate from the switchboard it is necessary to fit a lightning conductor.
- When mounting a router on sheet-steel we recommend using a cable antenna.
- For all cables, we recommend to bind the bunch, and for this we recommend:
  - The length of the bunch (the combination of power supply and data cables) should be a maximum 1.5 m. If the length of data cables exceeds 1.5 m or if the cable is leading towards the switchboard, we recommend installing surge protectors.
  - Data cables must not have a reticular tension of $\sim$ 230 V/50 Hz or $\sim$ 120 V/60 Hz.
- Sufficient space must be left between each connector for the handling of cables,
- To ensure the correct functioning of the router we recommend the use of an earth-bonding distribution frame for the grounding of the grounding screew, see Chapter 2.4.

1.8 Wall-Mounting

Info

The wall-mounting clip is supplied with the router as standard accessories.

The router can be screwed to a wall (or another surface) using the wall-mounting clip. There are two wholes on the clip with a diameter of 4 millimeters. For detailed information about the mounting dimensions see Figure 3 in Chapter 1.6.

Warning

When mounting the wall-mounting clip, tighten the screws with max. torque of 0.4 Nm.

Figure 5: Screwed wall-mounting clip

1.9 DIN Rail Mounting

Info

The DIN rail clip is not supplied with the router as standard accessories, but it can be ordered by the order code *BB-DIN-ICR32*.

The DIN rail clip is suitable for a DIN rail according to EN 60715 standard only. The default position of the clip is shown in Figure 6.

Warning

When mounting the DIN rail clip, tighten the screws with max. torque of 0.4 Nm.

Figure 6: Position of the DIN rail clip

To remove the router from the DIN rail it is necessary to lightly push down the router so that the bottom part of the DIN rail clip hitched to the DIN rail get out of this rail and then fold out the bottom part of the router away from the DIN rail, see Figure 7.

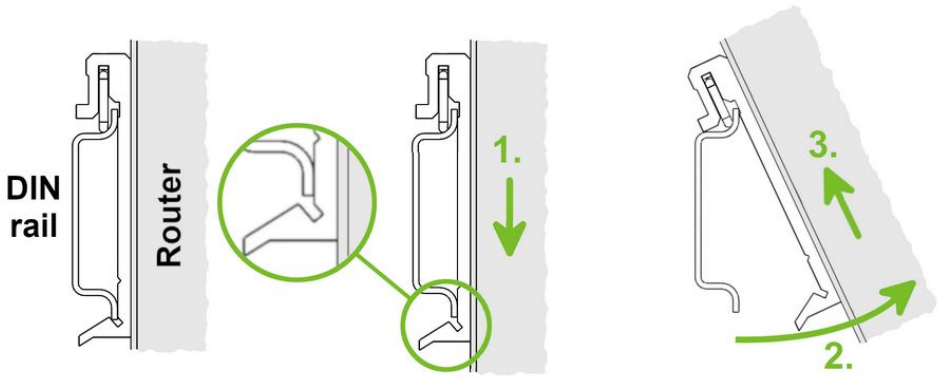

Figure 7: Removing the router from the DIN rail

1.10 Product Label

The figure below shows an example of the product labels with all the information printed on them.

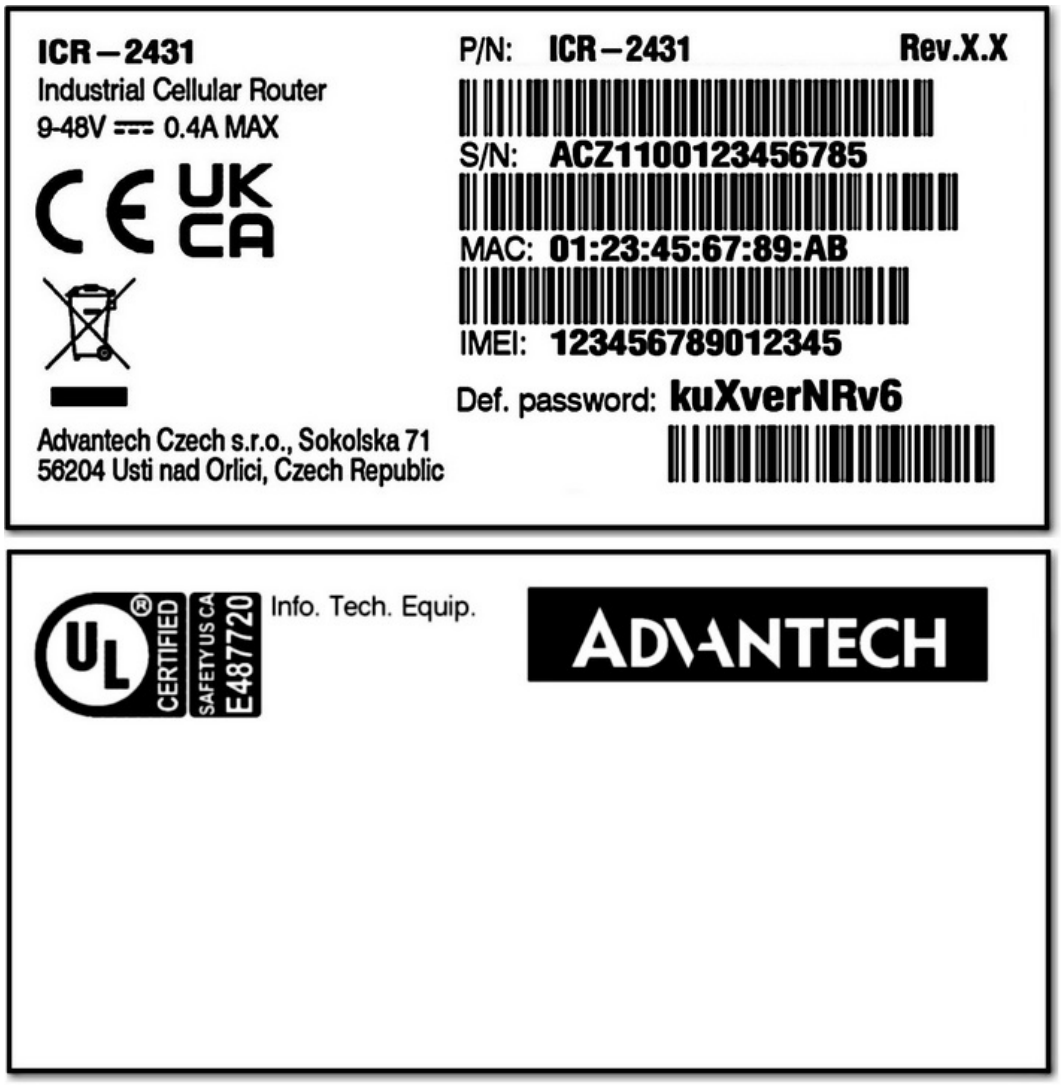

Figure 8: Product label

1.11 First Use

You can perform the initial configuration of the router using a web browser on your PC. This interface enables router monitoring, configuration, and administration.

Warning

- Before putting the router into operation, ensure that all components required for running your applications are connected. Refer to Chapter *1.2 Hardware Overview* for an overview of the hardware.
- Do not operate the router without an antenna connected to the main antenna connector. Transmitted energy will be reflected by an open connector, which could potentially damage the equipment.
- This device utilizes radio frequency bands that may be subject to specific usage restrictions in certain European Union countries (e.g., indoor use only). Please refer to Appendix C for detailed regulatory information before operation.

The procedure for connecting to a new router is described in the *Configuration Manual* [1], Chapter *Getting Started* → *Configuration Environments* → *Web Interface Initial Setup*. This manual also provides detailed descriptions and examples of router configuration using the web interface.

2. Hardware Functionality

See Chapter 1.2 for an overview of the product's hardware, along with links to chapters offering detailed explanations.

2.1 SIM Card Slots

Slots for two SIM cards are located on the router beneath a metal cover. If you plan to use this device for cellular network communication, insert an activated data-provisioned SIM card into the SIM card slot.
You have the option to install two SIM cards simultaneously for utilizing the switching feature. The SIM cards can have different Access Point Names (APNs) configured. The procedure for changing SIM cards is outlined below. If the SIM requires a PIN, input it in the router's web interface (*Administration* → *Unlock SIM Card*).

Info

Type of SIM card: Micro SIM (3FF) 15.0 × 12.0 × 0.76 mm.

Warning

Inserting the SIM card:

- Always disconnect the router from the power supply before handling the SIM card.
- Unscrew the two screws on the SIM card cover and remove the cover.
- To remove an inserted SIM card, use the flat end of a spudger or your fingernail to press the SIM card slightly into its slot until you hear a click. Upon hearing the click, release the card, and it will pop out of its slot.
- To insert a SIM card, push the card into the slot until it clicks into place.
- Put the cover back and secure it with the two screws.

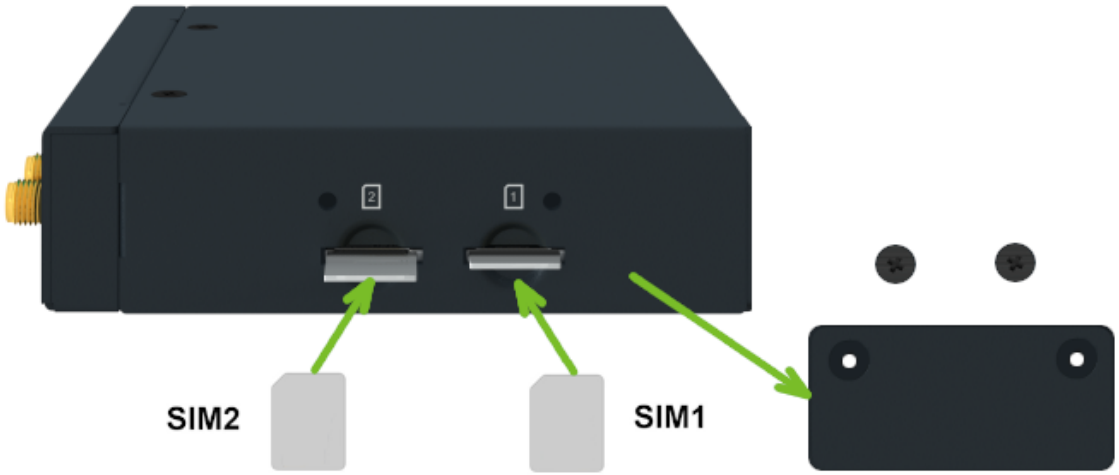

Figure 9: SIM card insertion

2.2 Antennas

Connect cellular antennas to the router to main (ANT) and secondary (DIV) SMA female connectors on the front panel. Connect Wi-Fi/GNSS antenna to the RP-SMA female/SMA female connector on the side of the router.

Warning

If a short circuit occurs on the GNSS input, the cellular module will shut down. It will restart once the short circuit is resolved.

Warning

Always operate the router with a cellular antenna securely connected to the main antenna connector. Transmitting without an antenna attached will cause RF energy to be reflected at the open connector, which can lead to permanent damage to the radio circuitry. Ensure the antenna is properly installed before powering on or transmitting to prevent equipment failure.

Info

The DIV cellular antenna is required for the MIMO DL functionality.

Info

The thread of the SMA connector for the Wi-Fi antenna is connected to the internal ground, see Figure 14.

Info

Recommended tightening moment for screwing the antenna to the SMA female connectors is 0.9 Nm.

2.3 Ethernet Interfaces

The router is equipped with one or more RJ45 Ethernet ports for wired network connections. The pinout for the standard 10/100 Ethernet connector is detailed below.

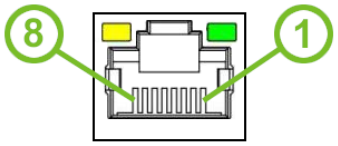

Figure 10: Ethernet RJ45 connector

Pin	Signal	Description
1	Tx+	Transmit Data+
2	Tx-	Transmit Data-
3	Rx+	Receive Data+
4	—	Not Connected
5	—	Not Connected
6	Rx-	Receive Data-
7	—	Not Connected
8	—	Not Connected

Table 6: Ethernet connector pinout

Info

The Ethernet ports provide an isolation barrier of 1500 V from the router's ground.

2.4 Power Supply

The power supply pins are physically connected to the 6-pin terminal block panel socket located on the left panel. The connection of the power supply is illustrated in Figure 11 and described in Table 7.

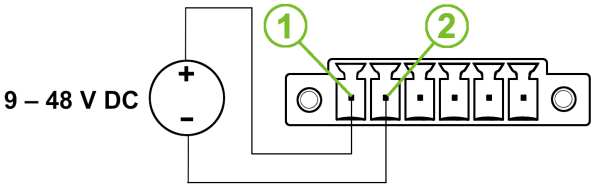

Figure 11: Power supply connection

Pin	Signal mark	Description
1	PWR(+)	Positive pole of DC supply voltage (+9 to +48 V DC)
2	PWR(-)	Negative pole of DC supply voltage

Table 7: Power connector pinout

The required power supply voltage for the router ranges between +9 V and +48 V DC. Refer to the connection scheme in Figure 11 for proper setup. The router is equipped with built-in protection against reversed polarity, functioning without signaling. To guarantee correct operation, the power source must be capable of providing a sufficient amount of energy, as detailed in the consumption section of Chapter 3.1.

Warning

Unit has to be supplied by a power supply specified as a Limited Power Source (LPS) or CEC/NEC Class 2 source of supply.

Info

The power supply (common pole) is not connected to the metal case of the router nor to the internal ground, see Figure 14.

If recommended for the installation environment, it is advised to protect the router by properly grounding it using the grounding screw, as illustrated in Figure 12.

Figure 12: Grounding screw position

2.5 I/O Port Interfaces

Warning

The maximum length of wires connected to the I/O ports is 3 meters to meet the EMC immunity conditions.

The pins of I/O interface are physically connected to the 6-pin terminal block panel socket located on the left panel. The pinout of one digital input and one digital output is shown in Figure 13 and described in Table 8.

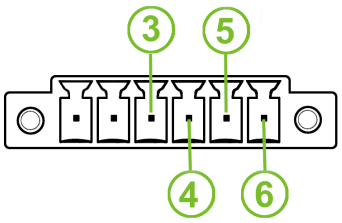

Figure 13: I/O connection

Pin	Signal mark	Description
3	IN(+)	The digital input (positive pole)
4	IN(-)	The digital input (negative pole)
5	OUT(+)	The digital output (positive pole)
6	OUT(-)	The digital output (negative pole)

Table 8: I/O connector pinout

The I/O user interface is designed for digital input processing and digital output control. For detailed electrical parameters see Chapter 3.7. The functional scheme of connection for the digital input and digital output is in Figure 14.

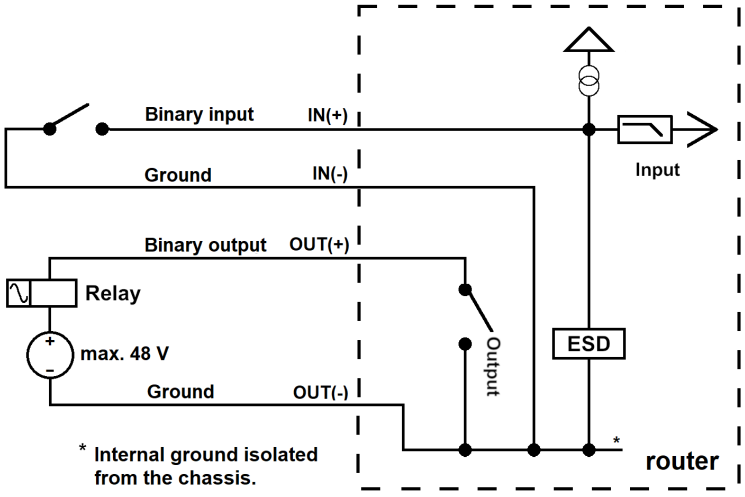

Figure 14: Functional block diagram of the digital interface

2.6 Serial Interfaces

The pins of RS232 and RS485 serial interfaces are physically connected to the 7-pin terminal block panel socket located on the left panel. The pinout of this connector is described in Figure 15 and in Table 9, resp. Table 10.

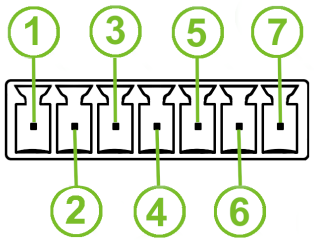

Figure 15: RS485 and RS232 connection

Pin	Signal mark	Description
1	D (+)	In/Out
2	D (-)	In/Out
3	GND	Ground (common with RS232)

Table 9: RS485 connector pinout

Pin	Signal mark	Description
3	GND	Ground (common with RS485)
4	RXD	Received Data
5	TXD	Transmit Data
6	RTS	Request to Send
7	CTS	Clear to Send

Table 10: RS232 connector pinout

The serial interfaces are not electrically isolated from the router. The ground is connected to the internal ground, see Figure 14.

2.7 LED Status Indication

There are LED indicators on the front panel of the router to provide router status information. Moreover, ETH connector, has two additional LEDs providing information about the port status.

Caption	Color	State	Description
PWR	Green Green Green	On Blinking Fast blinking	The router is booting up. The router booted up and is ready. The router firmware is being updated.
USR	Green	—	The function of this LED is user-defined.
DI	Green	On	The digital input is active.
DO	Green	On	The digital output is active.
DAT	Green	Blinking	Cellular communication is in progress.
SIG	Green	On Blinking Fast blinking	Good cellular signal. Fair cellular signal. Poor cellular signal.
TECH	Green	On Blinking Fast blinking	The active SIM uses 4G technology. The active SIM uses 3G technology. The active SIM uses 2G technology.
SIM	Green	On Blinking Fast blinking	SIM1 is active for the cellular connection. SIM2 is active for the cellular connection. A SIM issue (missing card or PIN not entered).
ETH0 ETH1	Green Green	On Off	Selected 100 Mbps bit rate. Selected 10 Mbps bit rate.
ETH0 ETH1	Orange Orange Orange	On Blinking Off	The network cable is connected. Data transmission. The network cable is not connected.

Table 11: LED status indication

2.8 Reset Functions

The *RST* button has multiple functions. For more details, refer to the configuration manual [1], Chapter *Introduction* → *Device* → *Reset*.

Info

Use a narrow screwdriver or a small tool to press the *RST* button.

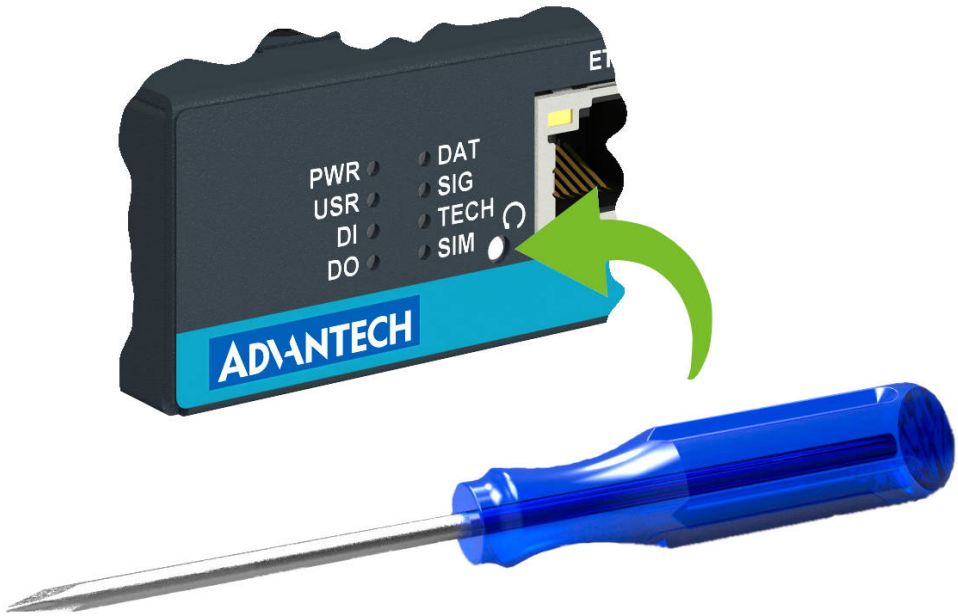

Figure 16: Resetting the router

3. Technical Specifications

3.1 Basic Technical Parameters

Parameter	Conditions	Description
Temperature range	Operating Storage	-40 °C to +75 °C (-40 °F to +167 °F) -40 °C to +85 °C (-40 °F to +185 °F)
Humidity	Operating Storage	5 to 95 % relative humidity non condensing 5 to 95 % relative humidity non condensing
Altitude	Operating	2000 m / 70 kPa
Degree of protection		IP30
Supply voltage		9 to 48 V DC
Battery for RTC		CR2032 / CR1225[1]
Consumption for non-Wi-Fi | GNSS | Wi-Fi	Idle Average Maximum	1.9 W | 2.2 W | 2.2 W 2.8 W | 3.6 W | 4.0 W 3.5 W | 4.2 W | 5.2 W
Dimensions of device w/o clip		103 × 95 × 25 mm (4.06" × 3.74" × 0.98")
DIN rail clip (optional part) specification		DIN 35 mm, EN 60715
Weight for non-Wi-Fi | Wi-Fi	Box w/o clip	345 g (0.76 lbs) | 355 g (0.78 lbs)

Table 12: Basic technical parameters

[1] For product revision 2.0 and higher.

3.2 Standards and Regulations

The router complies with the following standards and regulations:

Parameter	Description
Radio	ETSI EN 301 511, ETSI EN 301 908-1, ETSI EN 301 908-2, ETSI EN 301 908-13, ETSI EN 303 413, ETSI EN 301 893, ETSI EN 300 328
EMC	ETSI EN 301 489-1, ETSI EN 301 489-17, ETSI EN 301 489-19, ETSI EN 301 489-52, EN 55032, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-6-2, EN 61000-6-3
Safety	EN IEC / UL 62368-1 (UL E487720[1]), EN IEC 62311, IEEE 802.3
Transportation	E-Mark (E8), homologation number: 10R - 06 14028[1]
Cybersecurity	EN 18031-1
National	CE, UKCA compliant
Environmental	REACH, RoHS3 and WEEE compliant

Table 13: Standards and regulations

[1] For product revision 2.0 and higher.

3.3 Type Testing and Environmental Conditions

Phenomena	Test	Description	Test levels
ESD	EN 61000-4-2	Enclosure	CD ± 6 kV, L3
RF field AM modulated	EN 61000-4-3	Enclosure	20 V/m, 80 MHz-1 GHz, LX 10 V/m, 1 GHz-6 GHz, L3
Fast transient	EN 61000-4-4	DC port ETH - FTP Digital input Digital output RS232 RS485	± 1 kV, 5/50 Tr/Th ns, 100 kHz, L2 ± 1 kV, 5/50 Tr/Th ns, 100 kHz, L3 ± 1 kV, 5/50 Tr/Th ns, 100 kHz, L3 ± 1 kV, 5/50 Tr/Th ns, 100 kHz, L3 ± 1 kV, 5/50 Tr/Th ns, 100 kHz, L3 ± 1 kV, 5/50 Tr/Th ns, 100 kHz, L3
Surge	EN 61000-4-5	ETH RS485	± 1 kV, 1.2/50(8/20) Tr/Th us, L2 ± 1 kV, 1.2/50(8/20) Tr/Th us, L2
RF conducted	EN 61000-4-6	DC port ETH I/O ports RS232 RS485	10 V, 0.15-80 MHz, 80%AM(1kHz), L3 10 V, 0.15-80 MHz, 80%AM(1kHz), L3 10 V, 0.15-80 MHz, 80%AM(1kHz), L3 10 V, 0.15-80 MHz, 80%AM(1kHz), L3 10 V, 0.15-80 MHz, 80%AM(1kHz), L3
Radiated emission	EN 55032	Enclosure	Class B, 30 MHz-1 GHz, 1 GHz-6 GHz
Conducted emission	EN 55032	DC power port Ethernet ports Serial ports RS232 RS485	Class B, 150 kHz-30 MHz Class B, 150 kHz-30 MHz Class B, 150 kHz-30 MHz Class B, 150 kHz-30 MHz Class B, 150 kHz-30 MHz
Dry heat	EN 60068-2-2	Operating Storage	Test Bb, storage +75 °C Test Bd, operation +85 °C
Cold	EN 60068-2-1	Operating Storage	Test Ab, storage -40 °C Test Ad, operation -40 °C
Variation of temperature	EN 60068-2-14	Test Nb, -40 °C / +75 °C, 3h/3h, 2 cycles, 3 K/min	
Dry heat, cyclic	EN 60068-2-30	+55 °C / +25 °C, rel. humidity 95 %, 6 h-6 h	

Table 14: Type testing and environmental conditions

3.4 Parameters of Cellular Module

Parameter	Description
Antenna	Connector type: SMA Impedance: 50 Ω
LTE parameters	LTE: LTE Cat.4, 3GPP Rel. 11 **FDD frequencies**: B28A (700 MHz), B20 (800 MHz), B8 (900 MHz), B7 (2600 MHz), B3 (1800 MHz), B1 (2100 MHz) **TDD frequencies**: B41 (2500 MHz), B40 (2300 MHz), B38 (2600 MHz) **Bit rates**: up to 150 Mbps (DL), 50 Mbps (UL) **Maximum output power:** 23±2 dBm
HSPA+/UMTS parameters	**Supported frequencies**: B8 (900 MHz), B1 (2100 MHz) **Bit rates**: up to 42 Mbps (DL) / 5.76 Mbps (UL) **Maximum output power:** 24+1/-3 dBm
EDGE/GPRS parameters	**Supported frequencies**: B8 (900 MHz), B3 (1800 MHz) **Bit rates**: up to 296 kbps (DL) / 236.8 kbps (UL) **Maximum output power:** 33±2 dBm

Table 15: Technical parameters of cellular module

3.5 Parameters of GNSS

Parameter	Description
Antenna	Connector type: SMA 50 Ω – active
Protocols	NMEA 0183
GNSS Systems	GPS, GLONASS, BeiDou, Galileo, QZSS
Frequency	GPS/Galileo/QZSS: 1575.42 ± 1.023 MHz GLONASS: 1597.5 – 1605.8 MHz BeiDou: 1561.1 ± 2.046 MHz
Sensitivity (autonomous)	Tracking: -157 dBm Reacquisition: -157 dBm Cold start: -146 dBm
Acquisition time (autonomous)	Hot start: 2.5 s Warm start: 26 s Cold start: 35 s
Accuracy	< 1.5 m

Table 16: Technical parameters of GNSS

3.6 Parameters of Wi-Fi

Warning

The 5 GHz Wi-Fi interface operates in frequency bands (specifically 5150–5350 MHz) that are restricted to **indoor use only** in certain EU member states. Please refer to Appendix C for detailed regulatory information.

Parameter	Description
Supported Standards	IEEE 802.11a/b/g/n/ac, 2.4 GHz & 5 GHz
Antenna Connector	1x RP-SMA Input impedance: 50 Ω
Data Rate	802.11b: 1, 2, 5.5, 11 Mbps 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: Max. 72 Mbps @ 20 MHz channel 802.11n: Max. 150 Mbps @ 40 MHz channel
Frequency Ranges	2.4 GHz ISM Bands 2.412-2.472 GHz 5.15-5.25 GHz (FCC UNII-low band) for US/Canada and EU 5.25-5.35 GHz (FCC UNII-middle band) for US/Canada and EU 5.47-5.725 GHz for EU 5.725-5.825 GHz (FCC UNII-high band) for US/Canada
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM
2.4 GHz Channels	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
5 GHz Channels	36, 38, 40, 42, 44, 46, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165
Type of Device	Access point (AP) (up to 8 clients) Station (STA) Multirole (STA&AP)
Security – Standards	WPA, WPA2, WPA3, 802.1X
Security – Encryption	WEP, TKIP, AES
TX Power[1]	Max. 18 dBm @ 2.4 GHz Max. 15 dBm @ 5 GHz

Table 17: Technical parameters of Wi-Fi

[1] The maximum transmit power is determined by the *Country* setting in the router's GUI; for more details, please refer to the *Configuration Manual*.

3.7 Parameters of I/O Ports

Electrical characteristics of the digital input are in Table 18. Status of the digital input is reported in the GUI on *General Status* page or can be retrieved in the Shell via `io get bin0` command.

get command output	Voltage	Web interface status
0	$\leq$ 0.8 V (0.5 mA))	On
1	$\geq$ 2 V	Off

Table 18: Technical parameters of digital input

The maximum digital output load is **100 mA** at **9 – 48 V**.

3.8 Parameters of Serial Interfaces

Supported parameters of the RS232 and RS485 interfaces, which can be configured in *Expansion Port 1* resp. *Expansion Port 2* menu items, are in Table 19.

Parameter	Description
Baudrate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400.
Data Bits	5, 6, 7, 8.
Parity	none, even, odd.
Stop Bits	1, 2.
Flow Control	none, hardware.

Table 19: Technical parameters of serial interfaces

3.9 System Configuration

The main parametes of the system are listed in Table 20.

Parameter	Description
CPU architecture	32-bit ARM926EJ-S
CPU frequency	600 MHz
CPU power	4,72 DMIPS/MHz
Flash memory	64 MB NOR Flash • 12 MB for Router Apps • 2 MB for customer data
RAM size	128 MB
Watchdog	HW Watchdog
RTC	Battery Backup RTC

Table 20: System configuration

Appendix A: Troubleshooting

Warning

If you cannot connect to the router from your PC, your network card may be configured in a way that prevents a connection. Try one or more of the following steps to resolve the issue:

- Ensure your PC's network card is configured to obtain an IP address automatically from a DHCP server (the router's DHCP server is enabled by default).
- Connect the router to the PC via a network switch.
- Connect the PC directly to the router, but start the router first and wait for it to initialize completely before starting the PC.

Ethernet Connection Fails or Is Unstable

- On the router's *Configuration* → *LAN* page, you can disable auto-negotiation and manually set a specific link speed and duplex mode. This can resolve compatibility issues with some network devices.

Mobile WAN Connection Fails or Is Intermittent

- Check the signal strength on the *Status* → *Mobile WAN* page. If the signal is weak, a more powerful antenna is required. If neighboring cells have similar signal strength, a directional antenna may be necessary to lock onto the optimal cell tower.
- Enable the connection check feature on the *Configuration* → *Mobile WAN* page in the *Check connection* section. Select the *Enable + bind* option. This will send periodic pings to check connectivity and restart the connection if it fails. The "bind" option ensures the ping is always sent through the Mobile WAN interface.

Cannot Establish Mobile WAN Connection

- Verify all settings on the *Configuration* → *Mobile WAN* page, including the *APN*, *username*, *password*, and *IP address*. For many public networks, these fields can be left blank.
- Check if the SIM card requires a PIN. If so, enter it on the *Administration* → *Unlock SIM Card* page.
- For private APN networks, it is often not recommended to obtain DNS server addresses from the operator. Disable this option on the *Configuration* → *Mobile WAN* page.
- Check the *Status* → *System Log* for error messages that can help diagnose the issue.

Cannot Connect to a Device Behind the Router from the Internet (NAT)

- The device behind the router must be configured to use the router's IP address as its default gateway.

Cannot Access a Web Server Behind the Router via NAT

- Remote HTTP access to the router itself must be disabled. This can be done on the *Configuration* → *NAT* page.
- On the same page, enable the *Send all remaining incoming packets to default server* feature and enter the IP address of your web server.
- Ensure the web server's default gateway is set to the router's IP address.

✍ DynDNS Does Not Work

- DynDNS will not work with a private APN if the router's IP address is not publicly accessible.
- If your DynDNS hostname resolves to the same private IP address that is assigned to the router, it means your mobile operator is using NAT or a firewall, preventing direct connections.
- You can verify operator NAT by pinging a server with a static public IP and comparing the source IP (seen by the server) with the IP address shown on the router's status page.
- You can test for a firewall by trying to access the router's web interface remotely.
- The operator may not be providing DNS server addresses. Without DNS, the router cannot resolve the DynDNS service hostname. The System Log would show errors like:
  - `Error resolving hostname: no such file or directory`
  - `Connect to DynDNS server failed`

✍ L2TP or IPsec Tunnel Fails to Establish

- Check the *Status* → *System Log* for specific error messages related to the VPN tunnel negotiation.

✍ IPsec Tunnel Establishes, but No Data Is Transferred

- This is typically caused by incorrect routing rules or a misconfigured default gateway on either the client device or the remote network.

✍ Router Reverts to Online Mode After a Reboot, Despite Being Set to Offline via SMS

- State changes made via SMS commands are temporary and do not alter the saved configuration. They remain in effect only until the router is rebooted.

✍ Serial Communication Is Not Working

- Verify that your router model is equipped with a serial port. Check the serial communication settings on the *Configuration* → *Expansion Port* page.

✍ Is the Router Cisco Compatible?

- No. The router's operating system (ICR-OS) is based on Linux, not Cisco IOS. Therefore, Cisco configuration commands cannot be used.
- However, since all network connections are based on open standards, the router is fully compatible and can be connected to Cisco devices or any other standard networking equipment.

✍ FTP or SFTP Does Not Work

- **FTP** is available on v2 platform routers only. Ensure it is enabled in *Configuration* → *Services* → *FTP*. Connect using any FTP client to port `21` with the same username and password as the web interface.
- **SFTP** (SSH File Transfer Protocol) is available on all routers. Ensure SSH is enabled in *Configuration* → *Services* → *SSH*. Connect using any SFTP-capable client (like FileZilla or WinSCP) to port `22` with the same credentials as the web interface.

✍ How to Access the Router's Command Line

- You can connect to the router's command line using SSH (all routers) or Telnet (v2 routers only).
- **SSH** is enabled by default. You can verify this in *Configuration* → *Services* → *SSH*. Use any SSH client to connect to the router's IP address on port `22` .
- **Telnet** can be enabled on v2 routers in *Configuration* → *Services* → *Telnet*.
- For both methods, use the same username and password as for the web interface.

Appendix B: Customer Support

Customer Support for Europe

Advantech Czech s.r.o.
Sokolska 71
562 04, Usti nad Orlici
Czech Republic

Phone: +353 91 792444
Fax: +353 91 792445
E-mail: iiotcustomerservice@advantech.eu
Web: www.advantech.com

Customer Support for NAM

Advantech North America
707 Dayton Road
Ottawa, IL 61350 USA

Phone: +1-800-346-3119 (Monday – Friday, 7 a.m. to 5:30 p.m. CST)
Fax: +1-815-433-5109
E-mail: support.iiot.ana@advantech.com
Web: www.advantech.com

Customer Support for Asia

Phone: +886-2-2792-7818 #1299 (Monday – Friday, 9 a.m. to 5:30 p.m. UTC+8)
Fax: +886-2-2794-7327
E-mail: icg.support@advantech.com.tw
Web: www.advantech.com

Appendix C: Regulatory & Safety Information

Safety Notices

For your safety and proper operation of the device, please observe the following instructions:

- The router must comply with all applicable international, national, and local regulations, including any specific restrictions concerning its use in designated applications and environments.
- To avoid personal injury or damage to the device, use only accessories that are approved or supplied by the manufacturer. Unauthorized modifications or the use of non-approved accessories may damage the router, violate regulations, and void the warranty.
- Do not attempt to open the router enclosure under any circumstances.
- Before handling the SIM card, always switch off the router and disconnect it from the power supply. Handle the SIM card with care to avoid damage or electrostatic discharge.

Important

This equipment is not suitable for use by or near young children. Small children could accidentally swallow the SIM card.

- Always ensure that the power supply voltage does not exceed 48 V DC.
- Do not expose the router to harsh environmental conditions. Protect it from dust, moisture, and excessive temperatures.
- Use only routers with proper certifications and markings in areas containing flammable or explosive materials (such as gas stations, chemical plants, or locations with explosives). In these environments, always follow the applicable restrictions regarding the use of radio devices.
- When traveling by airplane, always switch off the router. Using the router on board may endanger flight safety, interfere with mobile networks, and violate local regulations. Non-compliance can result in suspension or cancellation of telecommunications services or legal penalties.
- Take special care when operating the router in close proximity to personal medical devices such as cardiac pacemakers or hearing aids. If in doubt, consult the manufacturer of the medical device or your physician.
- This device may cause interference if used near television sets, radio receivers, or personal computers.
- Maintain a minimum separation distance of at least 20 cm between the router and the human body during operation.
- It is strongly recommended to regularly back up all critical configuration data stored in the router's memory.
- **Specific Usage Restrictions for 5 GHz Wi-Fi:** This device operates in the 5150–5350 MHz frequency band, which is restricted to **indoor use only** within the European Union, EFTA countries, and Northern Ireland. Outdoor use in this frequency band is prohibited to prevent harmful interference with other radio services.

AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	
FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	
PT	RO	SE	SI	SK	IS	LI	NO	CH	TR	UK	

Product Disposal Instructions

The WEEE directive (Waste Electrical and Electronic Equipment: 2012/19/EU) ensures the environmentally responsible recycling and recovery of electronic products. This device contains high-quality materials and components suitable for recycling. At the end of its life, **do not dispose of this product with ordinary commercial waste**. The router also contains a battery. Remove the battery before disposing of the device, and ensure the battery is disposed of separately and in accordance with local regulations. For detailed information on product and battery disposal, consult your supplier's terms and conditions.

Appendix D: Related Documents

[1] *ICR-2[0456]00 Configuration Manual* (see *Documents to download* → *Manuals* section)

[EP] Product-related documents and applications can be obtained on **Engineering Portal** at *https://icr.advantech.com/download* address.

We, Advantech Czech s.r.o., declare that the radio equipment narrated in this user's manual complies with Directive **2014/53/EU**.

We, Advantech Czech s.r.o., declare that the radio equipment narrated in this user's manual complies with Radio Equipment Regulations 2017 (**S.I. 2017 No. 1206**).

The full text of the EU Declaration of Conformity is available at the following internet address: *icr.advantech.com/doc*