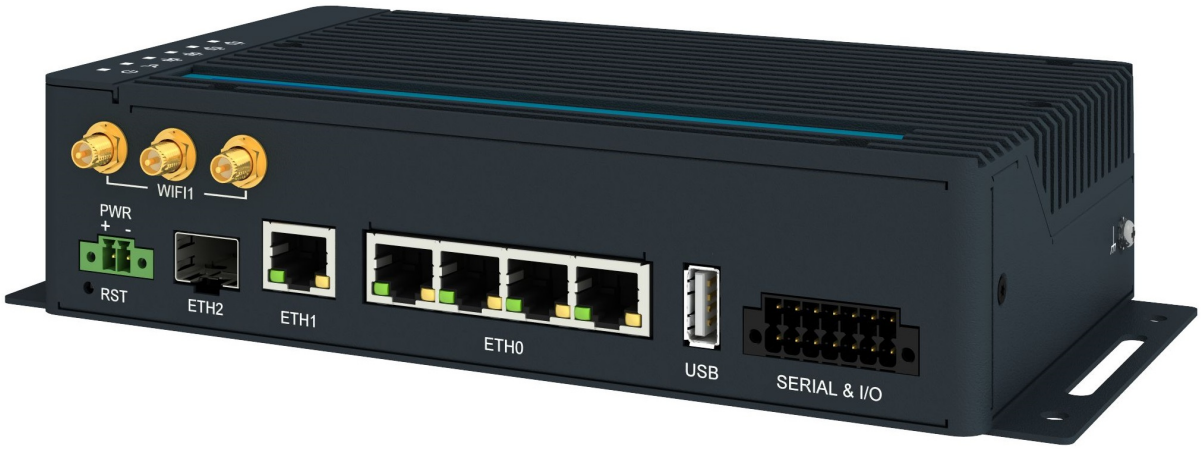
LAN Industrial Router

ICR-4401

USER MANUAL



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Used symbols

Danger – Information regarding user safety or potential damage to the router.

Attention – Problems that can arise in specific situations.

Information, notice – Useful tips or information of special interest.

GPL licence

Source codes under GPL licence are available at `https://icr.advantech.cz/source-code` address.

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Contents

1 Product Overview **2**

1.1 Product Introduction . . . 2
1.2 Product Usage Examples . . . 3
1.3 Hardware Overview . . . 5
1.4 Order Codes . . . 7
1.5 Package Contents . . . 8
1.6 Product Dimensions . . . 9
1.7 Mounting Recommendations . . . 10
1.8 Wall Mounting . . . 11
1.9 DIN Rail Mounting . . . 12
1.10 Product Label . . . 13

2 Hardware Functionality **14**

2.1 Antennas Interfaces . . . 14
2.2 Ethernet Interfaces . . . 14
2.3 SFP Cage . . . 15
2.4 Power Supply . . . 16
2.5 I/O Port Interfaces . . . 18
2.6 Serial Interfaces . . . 19
2.7 USB Port . . . 20
2.8 MicroSD Card Reader . . . 21
2.9 LED Status Indication . . . 23
2.10 Reset Functions . . . 24

3 First Use **26**

3.1 Connecting the Router . . . 26
3.2 Starting up the Router . . . 26
3.3 Router Configuration . . . 26

4 Technical Parameters **29**

4.1 Basic Parameters . . . 29
4.2 Standards and Regulations . . . 30
4.3 Type Tests and Environmental Conditions . . . 31
4.4 Parameters of WiFi . . . 32
4.5 Parameters of I/O Ports . . . 33
4.6 Parameters of PoE . . . 33
4.7 System Configuration . . . 34

Appendix A: Troubleshooting **35**

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Appendix B: Customer Support 37

Appendix C: Regulatory & Safety Information 38

Appendix D: Related Documents 40

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List of Figures

1 Access to the Internet from LAN . . . 3
2 Backed up Access to the Internet . . . 3
3 Using VPN Tunnel . . . 4
4 Serial Gateway . . . 4
5 Hardware Overview of the Router . . . 5
5 Router Dimensions – Front View . . . 9
6 Router Dimensions – Top View . . . 9
7 Rotated Wall Mounting Clips . . . 11
8 Default Position of the DIN Rail Clips . . . 12
9 Removing Router from the DIN Rail . . . 12
10 Label Example . . . 13
5 Ethernet Connector Pinout of RJ45 Socket . . . 14
6 SFP Module Installation . . . 15
7 Power Connector Pinout . . . 16
8 Position of the Grounding Screw . . . 17
9 I/O Connector Pinout . . . 18
10 Functional Scheme of the Binary Interface . . . 18
11 Serial Connector Pinout . . . 19
12 USB Connector Pinnout . . . 20
13 MicroSD Card Insertion . . . 21
14 Resetting the Router . . . 24
15 Router Connection . . . 26
16 Router's Web Interface . . . 28

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List of Tables

1 Hardware Overview of the Router 6
2 Order Codes Overview 7
1 Contents of Package 8
2 Ethernet Connector Pinout Description of RJ45 Socket 14
3 Tested SFP Cages 15
4 Power connector pinout 16
5 Connection of I/O Ports 18
6 Connection of RS232 19
7 Connection of CAN Bus 19
8 Connection of RS485 19
9 USB Connector Pinnout 20
10 Technical Specifications of MicroSD Card 21
11 LED Status Indication 23
12 Overview of Router Reboot and Reset 25
13 Basic Parameters 29
14 Standards and Regulations 30
15 Type Tests and Environmental Conditions 31
16 Technical Parameters of WiFi 32
17 Electrical Characteristics of Binary Inputs 33
18 PoE PSE Parameters 33
19 System Configuration 34

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1. Product Overview

1.1 Product Introduction

The ICR-4401 is a **LAN Router** & **Powerful Edge Computing Gateway** focused on the global market.

This router is an ideal solution for demanding IoT applications such as industrial routers and gateways, digital signage, industrial computers, and tablets, etc.

The router, assembled in a robust metal box, is equipped with five **1Gb Ethernet ports**, one **SFP cage** together with interfaces of **RS232**, **RS485**, **CAN bus**, two **binary inputs** and two **binary outputs**. A **microSD card** can be inserted under this cover as well. The designated router models can be equipped with a **WiFi module** with **3x3 MIMO** antennas.

Configuration of the router may be done via a password-protected Web interface. Web interface provides detailed statistics about the router's activities, signal strength, detailed system log etc. The router supports VPN tunnels using **IPSec** (), **OpenVPN**, **GRE**, **L2TP** or **PPTP** to make sure safe communication. **IPv6 Dual Stack**, **DHCP**, **NAT**, **NAT-T**, **DynDNS**, **DNS proxy**, **VLAN**, **QoS**, **NTP**, **VRRP**, control by **SMS**, port forwarding, primary connection backup and many other functions are supported.

The router provides **diagnostic functions** which include automatically monitoring the PPP connection, automatic restart in case of connection losses, and a hardware watchdog that monitors the router status.

The user may insert **Linux scripts** which are started on various actions. It is possible to create up to four different configurations for the same router. These configurations can be switched when necessary via Web interface, SMS or binary input status.

The router can automatically upgrade its configuration and firmware from your central server. WebAccess/DMP and WebAccess/VPN remote device management platforms are supported as well.

Examples of possible applications

- fleet management
- security system
- telematic
- telemetric
- remote monitoring
- vending and dispatcher machines

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1.2 Product Usage Examples

The router is primarily intended for these four basic situations:

I. Access to the Internet from LAN

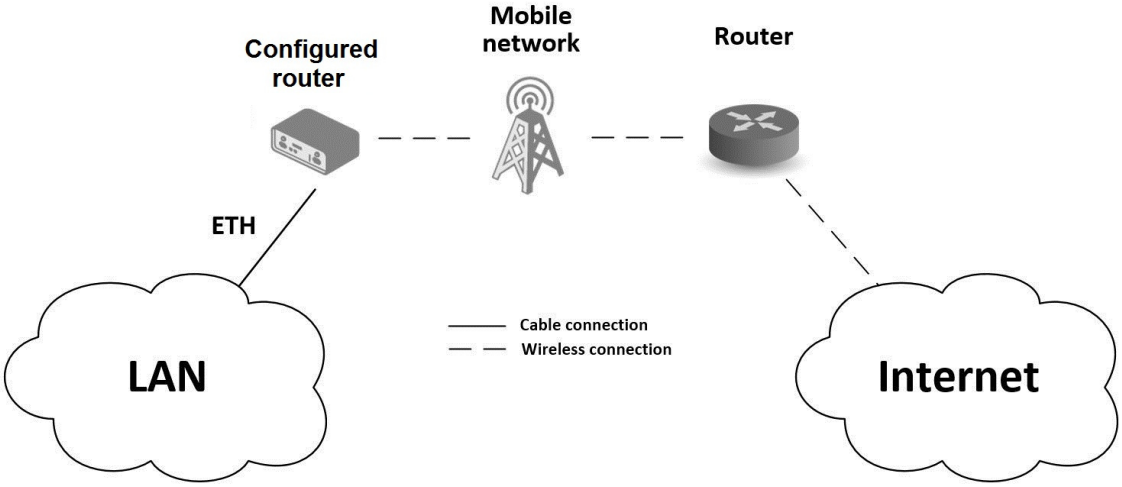

Figure 1: Access to the Internet from LAN

II. Backed up access to the Internet (from LAN)

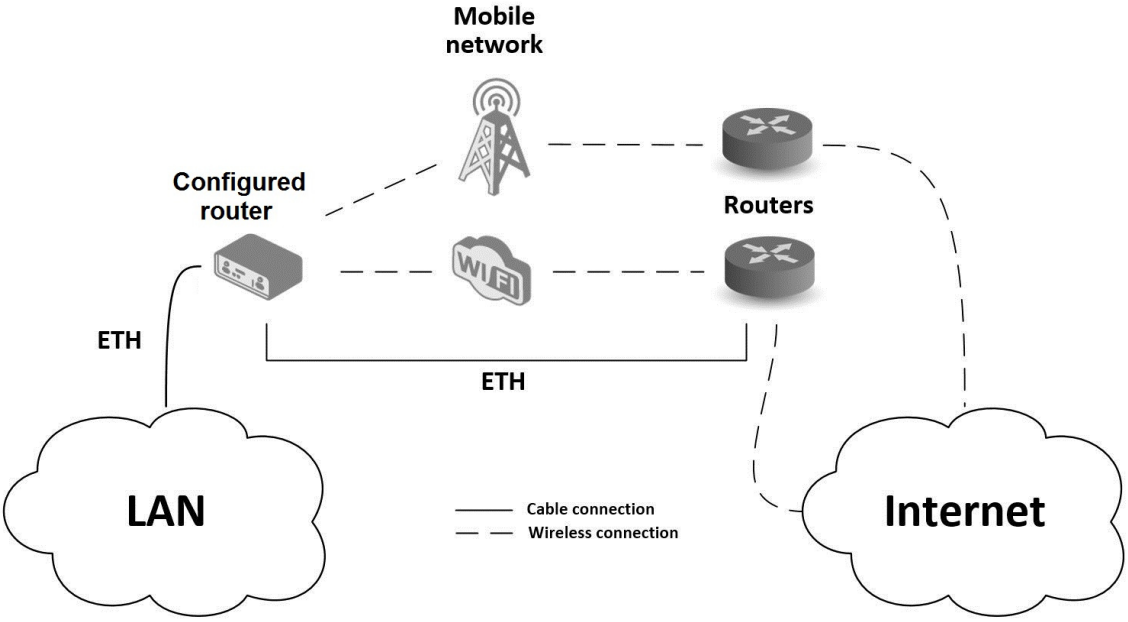

Figure 2: Backed up Access to the Internet

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III. Secure networks interconnection or using VPN

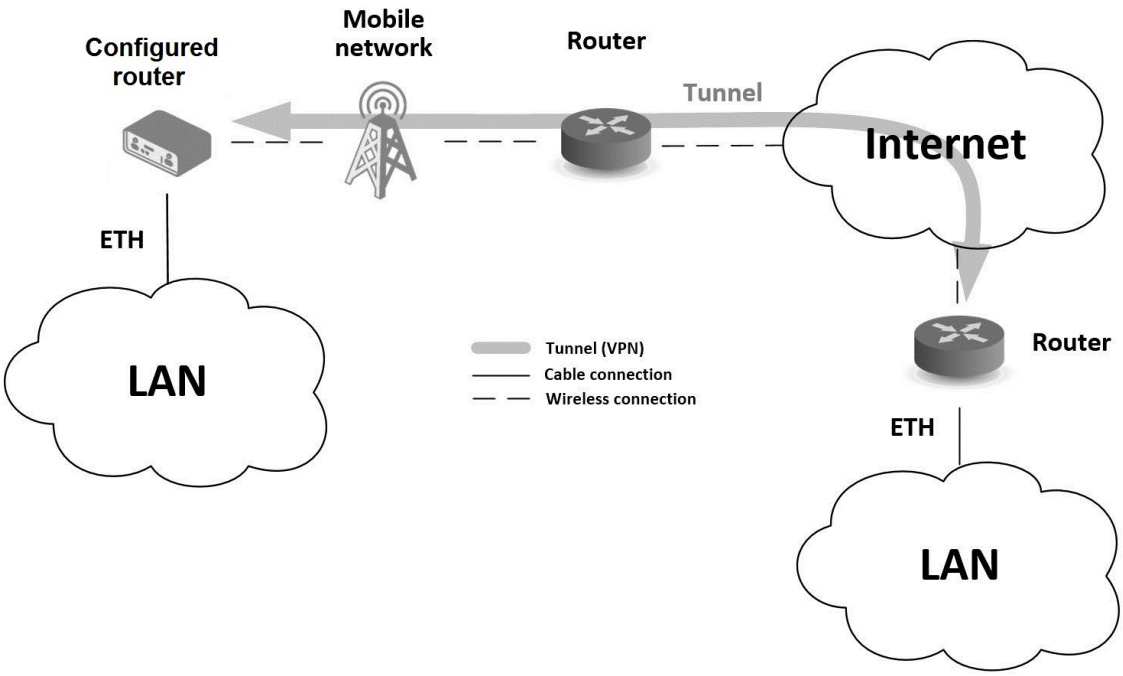

Figure 3: Using VPN Tunnel

IV. Serial Gateway

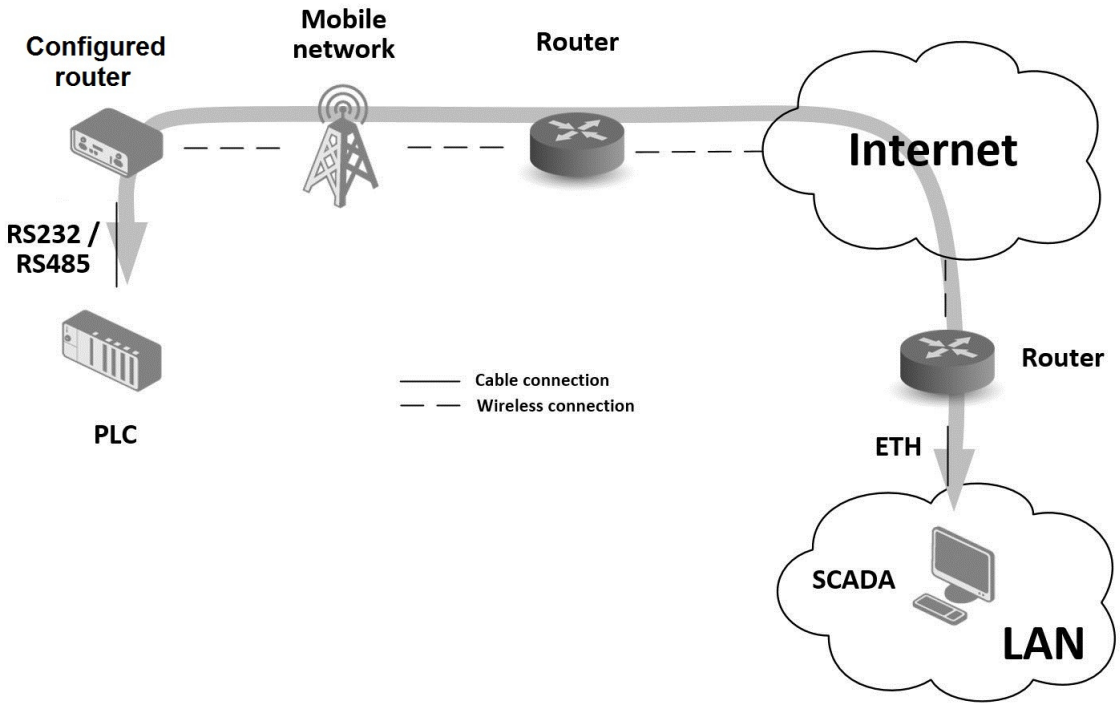

Figure 4: Serial Gateway

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1.3 Hardware Overview

The router case preview is shown in Figure 5. A short description of hardware parts of the router is listed in Table 1, including the links to the chapters with a detailed description.

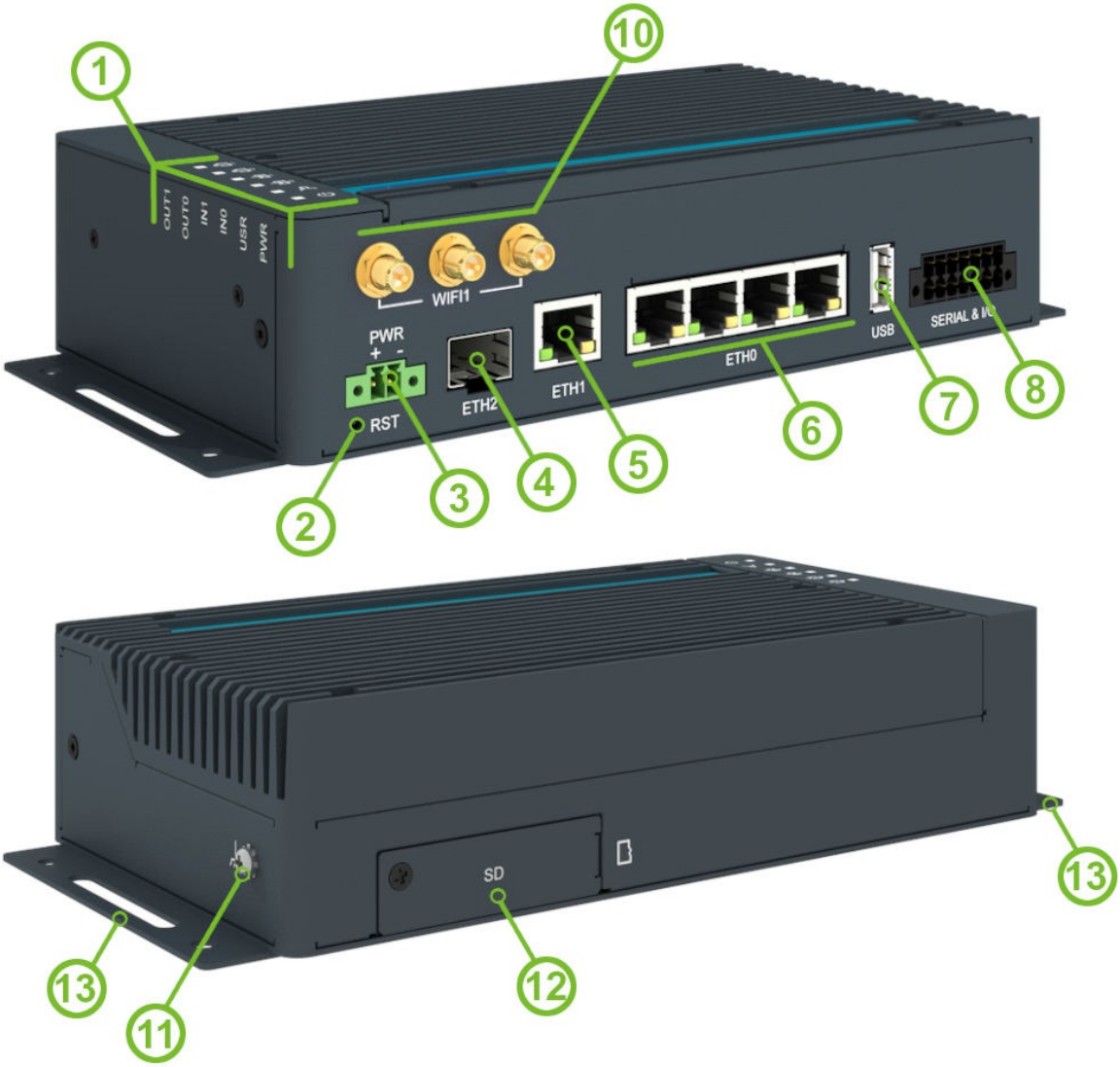

Figure 5: Hardware Overview of the Router

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#	Item/Caption	Type	Description
1	LEDs	-	Status LED indication; see Chapter 2.9.
2	RST	-	Button to reboot the router or to restore the default configuration; see Chapter 2.10.
3	PWR	2-pin terminal	Power supply socket; see Chapter 2.4.
4	ETH2	SFP cage	SFP cage socket for modules with speed up to 10 Gbps; see Chapter 2.3.
5	ETH1	RJ45	1 Gb Ethernet connection for the second LAN; see Chapter 2.2.
6	ETH0	RJ45	1 Gb Ethernet switched connection (with four ports) for the first LAN; see Chapter 2.2.
7	USB	USB-A	USB 2.0 host port; see Chapter 2.7.
8	SERIAL & I/O	14-pin terminal	RS232, RS485, CAN bus, binary input, and binary output interfaces. See Chapter 2.5 for more information and Chapter 4.5 for I/O parameters.
10	WIFI1	R-SMA	Three connectors for the WiFi antennas. See Chapter 2.1 for more information and Chapter 4.4 for WiFi parameters.
11	Grounding screw	M3	Pay attention to proper grounding; see Chapter 2.4.
12	microSD slot	microSD	MicroSD card slot; see Chapter 2.8.
13	Wall clips	-	Wall mounting clips, included as standard accessories; see Chapter 1.8.

Table 1: Hardware Overview of the Router

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1.4 Order Codes

Order codes overview is shown in the table below.

Order code	Configuration
ICR-4401	Gb ETH SWITCH, GNSS, SFP cage, USB, microSD card slot, RS232, RS485, CAN bus, two binary inputs, two binary outputs
ICR-4401**S**	Gb ETH SWITCH, GNSS, SFP cage, **PoE PSE**, USB, microSD card slot, RS232, RS485, CAN bus, two binary inputs, two binary outputs
ICR-4401**W**	Gb ETH SWITCH, GNSS, SFP cage, **Dual-Band WiFi**, USB, microSD card slot, RS232, RS485, CAN bus, two binary inputs, two binary outputs
ICR-4401**WS**	Gb ETH SWITCH, GNSS, SFP cage, **PoE PSE**, **Dual-Band WiFi**, USB, microSD card slot, RS232, RS485, CAN bus, two binary inputs, two binary outputs
ICR-4401**W1**[1]	Gb ETH SWITCH, GNSS, SFP cage, **Dual-Band WiFi**, USB, microSD card slot, RS232, RS485, CAN bus, two binary inputs, two binary outputs
ICR-4401**W1S**[1]	Gb ETH SWITCH, GNSS, SFP cage, **PoE PSE**, **Dual-Band WiFi**, USB, microSD card slot, RS232, RS485, CAN bus, two binary inputs, two binary outputs

Table 2: Order Codes Overview

[1] This product has no E8 certification and has a limited operating temperature range of -40 °C to +60 °C.

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1.5 Package Contents

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

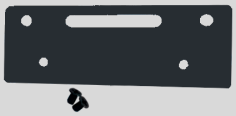
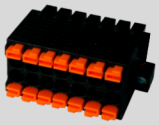
Item#	Description	Figure	Q'ty
1	Router		1 pcs
2	Wing for wall mounting (screwed on the router)		2 pcs
3	2-pin terminal block for power supply (deployed on the router)		1 pcs
4	14-pin terminal block for RS232, RS485, CAN BUS, and I/O (deployed on the router)		1 pcs
5	Printed Quick Start Guide		1 pcs

Table 1: Contents of Package

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1.6 Product Dimensions

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

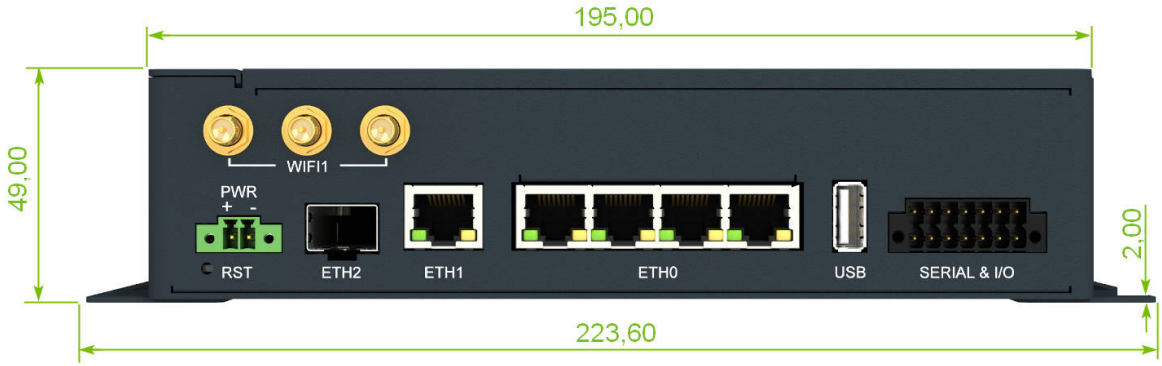

Figure 5: Router Dimensions – Front View

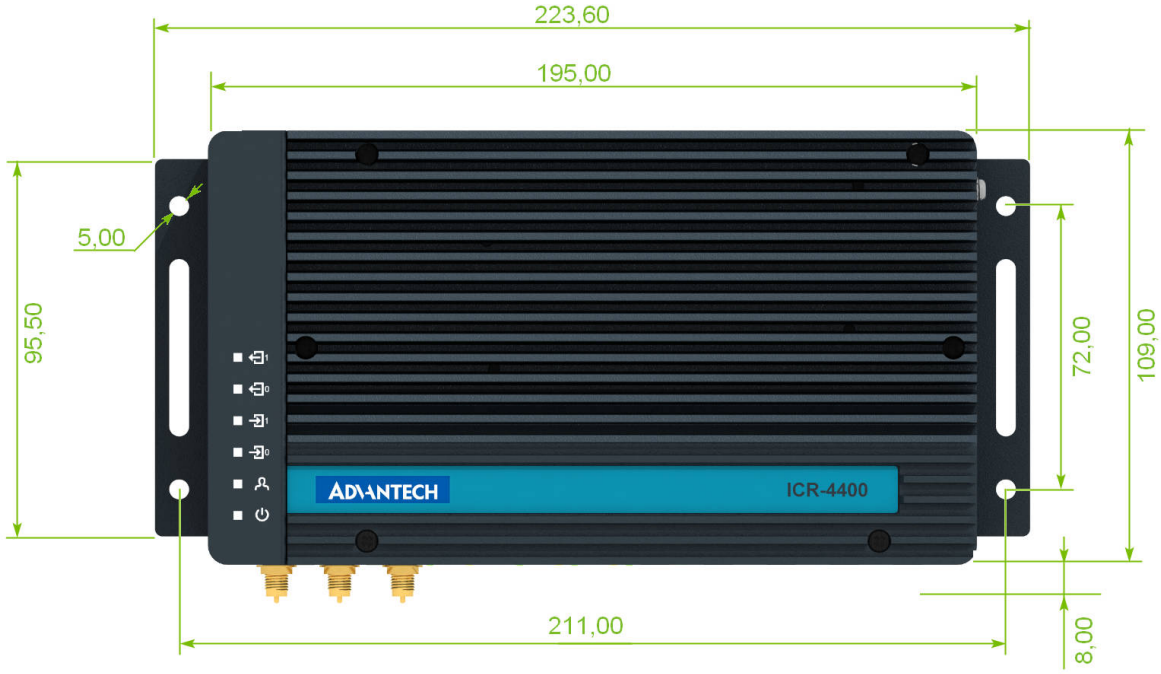

Figure 6: Router Dimensions – Top View

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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.

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.

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1.8 Wall Mounting

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 clips. Two wall mounting clips are assembled to the router during the production and need to be roteted as shown of Figure 7.

There are two wholes on the clip with a diameter of 5 millimeters. For detailed information about the mounting dimensions see Figure 6 in Chapter 1.6.

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

Figure 7: Rotated Wall Mounting Clips

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1.9 DIN Rail Mounting

The DIN rail clips are not supplied with the router as standard accessories, but they can be ordered by the order code *BB-DIN-ICR32* (two pieces for one router).

Two DIN rail clips can be assembled to the router and used to mount it to the DIN rail which meets the 60715 standards. The default position of the clips is shown in Figure 8. If needed, the clips can be rotated vertically as well.

When mounting the clips, tighten the screws with max. torque of 0.4 Nm.

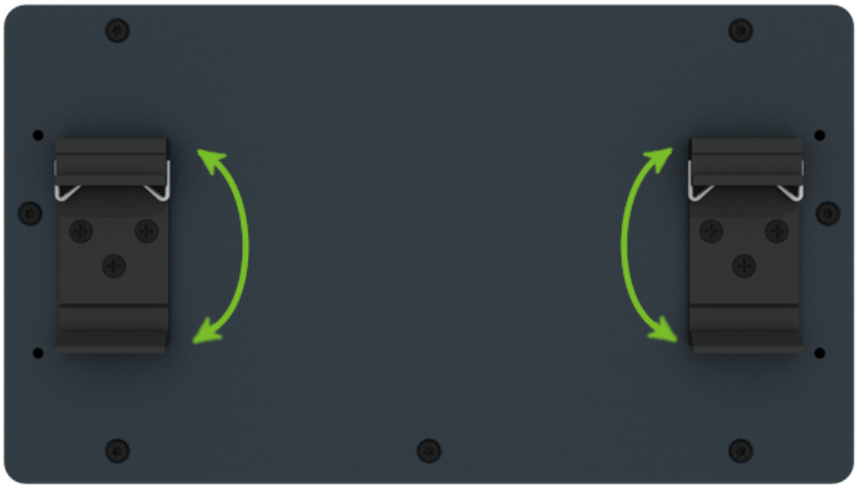

Figure 8: Default Position of the DIN Rail Clips

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 as shown in Figure 9.

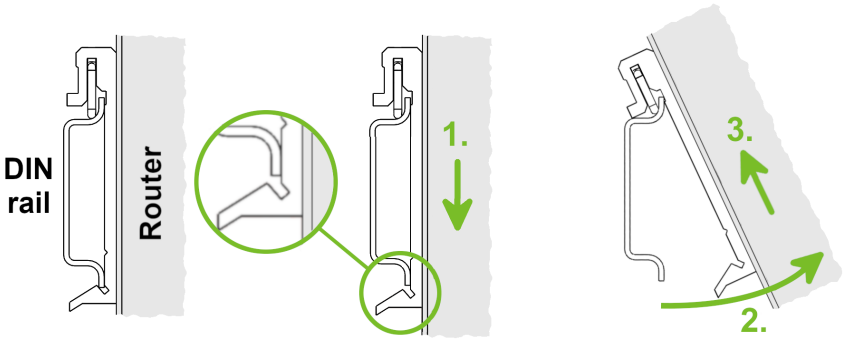

Figure 9: Removing Router from the DIN Rail

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1.10 Product Label

An example of the product label, with all the information printed on it, is in the figure below.

Figure 10: Label Example

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2. Hardware Functionality

See Chapter 1.3 for the product hardware overwiew. Table 1 lists a short description of the hardware, including the links to the chapters with a detailed description.

2.1 Antennas Interfaces

Three R-SMA connectors *WIFI1* are designed for the connection of the WiFi antennas.

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

2.2 Ethernet Interfaces

The RJ45 panel socket is used for four ETH0 (switched) and one ETH1 Ethernet interfaces. The pinout of the socket is shown in Figure 6 and described in Table 2.

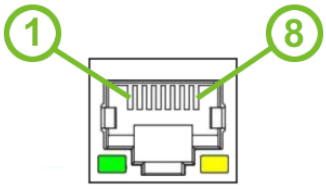

Figure 5: Ethernet Connector Pinout of RJ45 Socket

Pin	Signal mark	Description
1	BI_DA+	Bi-directional pair A +
2	BI_DA-	Bi-directional pair A -
3	BI_DB+	Bi-directional pair B +
4	BI_DC+	Bi-directional pair C +
5	BI_DC-	Bi-directional pair C -
6	BI_DB-	Bi-directional pair B -
7	BI_DD+	Bi-directional pair D +
8	BI_DD-	Bi-directional pair D -

Table 2: Ethernet Connector Pinout Description of RJ45 Socket

All four ETH0 ports can be used for PoE PSE, if the router is equipped with this feature. For technical parameters of PoE see Chapter 4.6.

The isolation barrier of the Ethernet ports against the ground is 1500 V.

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2.3 SFP Cage

A hot-pluggable (SFP) network interface module with a speed of up to 10 Gbps can be settled into the ETH2 SFP cage.

Installing an SFP Module

To install a SFP module, see Figure 6 and follow these steps:

- You should use the bale clasp if the SFP module is equipped with it. If so, close the clasp before inserting the SFP module.
- Hold the SFP module with the hardware label facing up.
- Insert the SFP module into the ETH2 slot and gently push on it until it snaps into the slot tightly.

Figure 6: SFP Module Installation

See Table 3 for a list of successfully tested SFP modules on the product.

Model	Manufacturer
IE-SFP-1250-ED	IMC Networks
ML-S+31Dout-10	MaxLink
S-3553LC20D	MikroTik
SFP-PLUS-LR10-HPE	Hewlett Packard
SFP-TXCIS	OEM
TXM431-LR(UN)	TP-Link
UF-RJ45-1G	Ubiquiti

Table 3: Tested SFP Cages

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2.4 Power Supply

Two pin terminal connector with 3.5 mm pitch is used to power the router. Corresponding connector is supplied with the router as a standard accessories.

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

Table 4: Power connector pinout

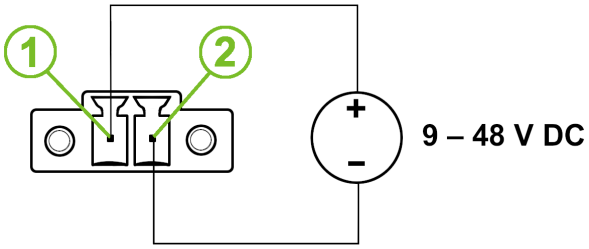

Figure 7: Power Connector Pinout

Required power supply voltage for the router is between +9 V and +48 V DC, see the connection scheme on Figure 7. Protection against reversed polarity without signaling is built into the router. For correct operation it is necessary that the power source is able to supply power of 18 W (non-PoE version).

If the router is grounded, using the grounding screw, there is no protection against the reversed polarity. The negative pole of the DC power supply must be at the same voltage reference as the grounding screw. If not, a voltage difference between these two points might damage the router, and only an authorized service center can fix it.

The power voltage for the PoE router version must be 48 V DC to work as the PoE PSE device.

In applications requiring low power consumption (such as solar power - not 7/24 mode) is strictly recommended to use the Low Power Mode (LPM) mode prior to powering down the entire router.

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All metal parts, including the box, are connected together with the negative pole of the power supply (common pole). If recommended for the installation environment, protect the router by grounding it properly by the grounding screw on the right panel, see Figure 8.

Figure 8: Position of the Grounding Screw

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2.5 I/O Port Interfaces

The I/O user interface is designed for binary input processing and binary output control. The pinout of the I/O interface is described in Figure 9 and Table 5. For detailed electrical parameters see Chapter 4.5. The functional scheme of connection for the binary input and binary output is in Figure 10.

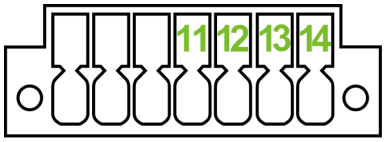

Figure 9: I/O Connector Pinout

Pin	Signal mark	Description
11	BIN0	The first binary input
12	BOUT0	The first binary output
13	BIN1	The second binary input
14	BOUT1	The second binary output

Table 5: Connection of I/O Ports

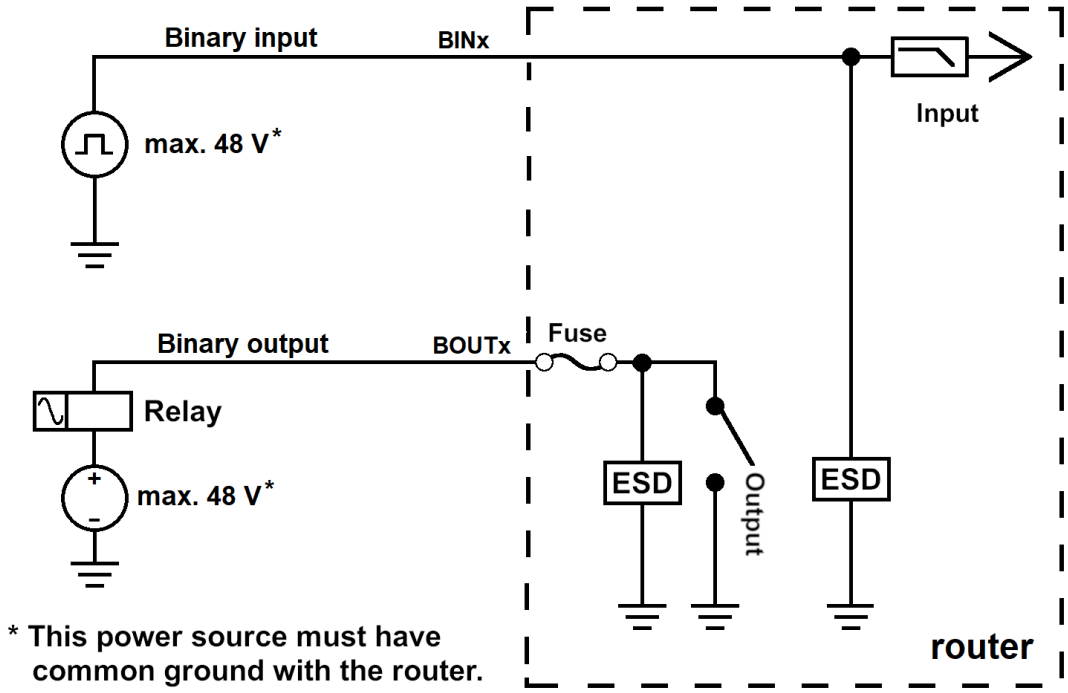

Figure 10: Functional Scheme of the Binary Interface

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2.6 Serial Interfaces

The RS232, RS485 CAN serial interfaces together with the two I/O interfaces are physically connected to the 14-pin terminal block panel socket. All these interfaces are not isolated from the router. The pinout of this connector is described in Figure 11 and the tables below.

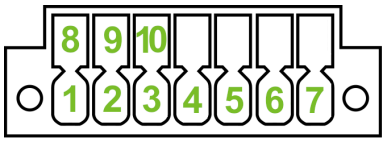

Figure 11: Serial Connector Pinout

Pin	Signal mark	Description
1	RXD	Received Data
2	CTS	Clear to Send
3	GND	Ground
4	RTS	Request to Send
5	TXD	Transmit Data

Table 6: Connection of RS232

Pin	Signal mark	Description
6	CAN_H	CAN low
7	CAN_L	CAN high

Table 7: Connection of CAN Bus

Pin	Signal mark	Description
8	B (+)	In/Out
9	A (-)	In/Out
10	GND	Ground

Table 8: Connection of RS485

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2.7 USB Port

There is one USB 2.0 host port with socket of USB-A type. USB Mass Storages and FTDI serial converters are supported. For a piece of advice, how to fix an unsupported FTDI chip, see the Commands and Scripts application note, chapter *How to Use Unsupported FTDI Chip*.

The USB port is disabled on overload to prevent its damage (connected device is trying to get too high current). The port is enabled again after the reboot of the router.

Mounting USB Flash Drive to the System

It is necessary to mount the USB flash drive to be able to access it in the system of the router. Follow these steps to mount the drive:

- Use the *dmesg* command to see the list of recently connected devices.
- In the output of the command find out the entry for the microSD card, for example:
  `sda: sda1`
- To mount the card to to *mnt* directory, use the *mount* command:
  `mount /dev/sda1 /mnt`

For more information about the commands for creating, mounting, checking and unmounting a file system on a USB Flash Drive, see the application note for Ext4_tools router app.

USB Socket Pinouts

USB socket pinouts is described in Figure 12 and Table 9.

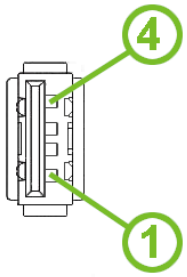

Figure 12: USB Connector Pinout

Pin	Signal mark	Description	Data flow direction
1	+5 V	Positive pole of 5 V DC supply voltage, 0.5 A	
2	USB data -	USB data signal – negative pole	Input/Output
3	USB data +	USB data signal – positive pole	Input/Output
4	GND	Negative pole of DC supply voltage	

Table 9: USB Connector Pinout

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2.8 MicroSD Card Reader

The microSD card reader is located on the router's rear panel under a metal cover. This card reader allows the router to operate with microSD memory cards. The technical specifications are stated in the table below. The microSD card changing procedure is described below.

Technical specifications of microSD card		
Supported technologies		SD, SDHC, SDXC
Supported capacity	SDHC SDXC	up to 32 GB from 32 GB to 512 GB
Supported microSD card filesystems		vfat, ext2, ext3, ext4

Table 10: Technical Specifications of MicroSD Card

Inserting the microSD card:

- To remove an inserted microSD card, use the flat end of a spudger, or your fingernail, press the card slightly into its slot until you hear a click, release the card and it will pop out of its slot.
- To insert a microSD card push card into the slot with correct orientation as shown on the picture until it clicks into place.

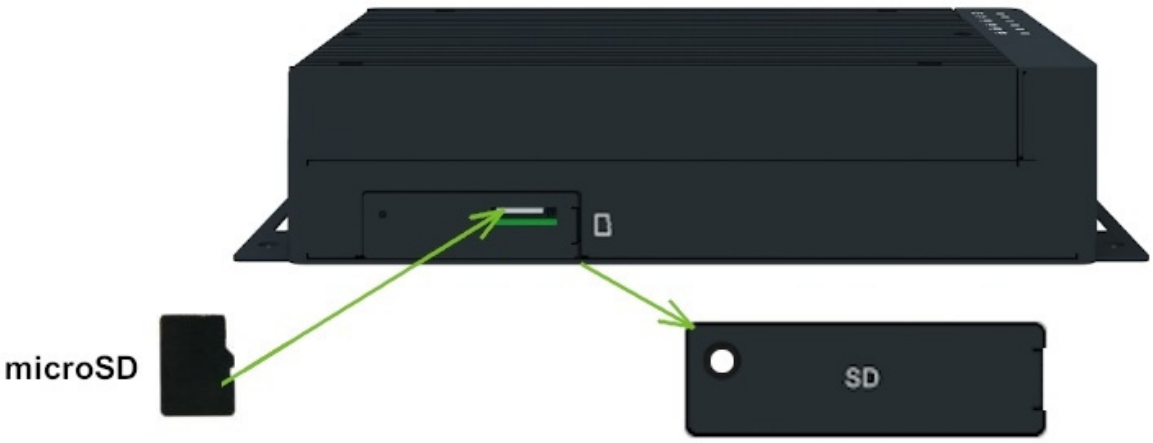

Figure 13: MicroSD Card Insertion

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Mounting microSD Card to the System

It is necessary to mount the microSD card to be able to access it in the system of the router. Follow these steps to mount the card:

- Use the *dmesg* command to see the list of recently connected devices.
- In the output of the command find out the entry for the microSD card, for example:
  `mmcblk0: p1`
- To mount the card to to *mnt* directory, use the *mount* command:
  `mount /dev/mmcblk0p1 /mnt`

For more information about the commands for creating, mounting, checking and unmounting a file system on a microSD card, see the application note for Ext4_tools router app.

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2.9 LED Status Indication

There are six LED indicators on the top side of the router to provide router status information. Moreover, ETH0 and ETH1 connectors, located on the front panel, have two additional LEDs providing information about the port status.

	Caption	Color	State	Description
⏻	PWR	Green Green Green	On Blinking Fast blinking	Starting of the router Router is ready Updating firmware
	USR	Green	On / Blinking / Fast blinking	Function of this LED diode can be selected by user
0	IN0	Green	On	The first binary input is active.
1	IN1	Green	On	The second binary input is active.
0	OUT0	Green	On	The first binary output is active.
1	OUT1	Green	On	The second binary output is active.
	ETH0 ETH1	Green Green	On Off	Selected 1 Gbps bit rate Selected 100/10 Mbps bit rate
	ETH0 ETH1	Yellow Yellow Yellow	On Blinking Off	The network cable is connected Data transmission The network cable is not connected

Table 11: LED Status Indication

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2.10 Reset Functions

The *RST* button on the front panel can be used in three different situations:

- **Reboot the router**: Hold the *RST* button for less than 4 seconds, the router will be restarted.
- **Factory reset** – restore the default configuration: Hold the *RST* button for more than 4 seconds. The *PWR* LED turns off and on again. We recommend holding down the *RST* button for 1 second after turning on the PWR LED on the front panel.
- **Emergency factory reset** – If the router is unable to boot up due to the bad configuration, turn off the router (disconnect the power supply). Push and hold the *RST* button, turn on the router and hold the *RST* button for at least 10 seconds. This will return the configuration of the router to the default one.

It is recommended to back up the settings of the router configuration, prior to performing the factory reset of the router. Note that resetting of the router reset the whole configuration to the default state.

It is necessary to use a narrow screwdriver or any other small tool to press the *RST* button.

Figure 14: Resetting the Router

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Action	Router behavior	Trigger events – options
Reboot	Turns off and then turns on the router	• Disconnect and reconnect the power. • Press the *Reboot* menu item in the web interface. • Press the *RST* button and hold il less than 4 seconds.
Factory Reset	Restores the default configuration and reboots the router	• Hold the *RST* button for more than 4 seconds. • If it does not help (router does not start at all), turn off the router (power supply). Push and hold the *RST* button, then turn on the router and hold the *RST* button for more than 10 seconds.

Table 12: Overview of Router Reboot and Reset

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3. First Use

3.1 Connecting the Router

Before putting the router into an operation, it is necessary to connect all the components that are required to run your applications, see Figure 15.

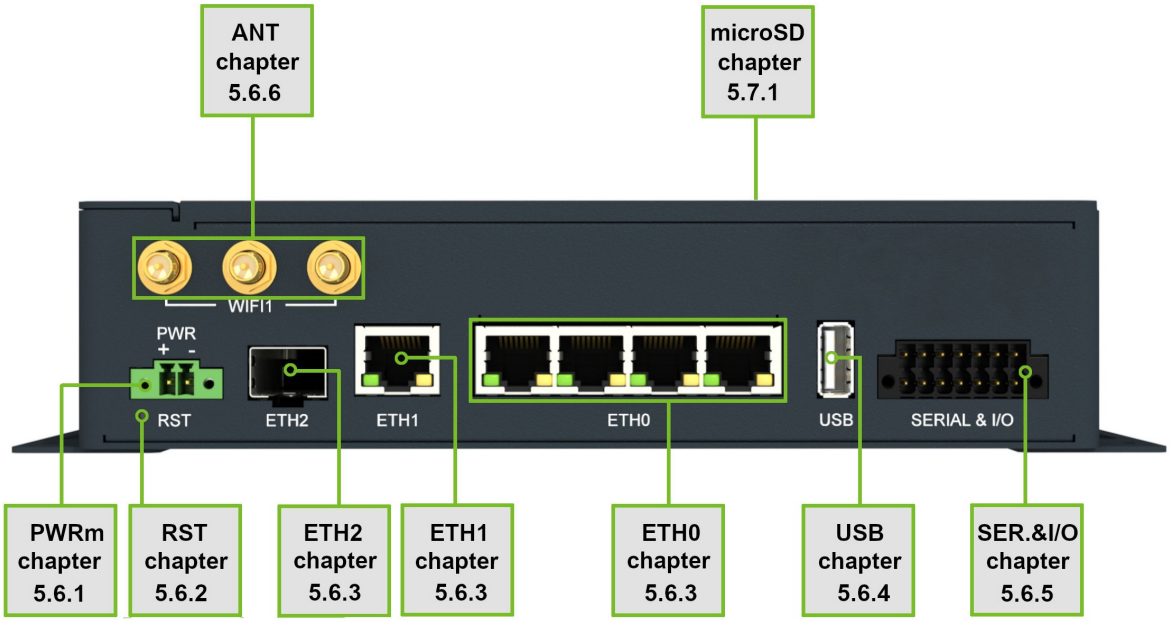

Figure 15: Router Connection

3.2 Starting up the Router

The router will start up when a power supply is connected to it. The DHCP server will assign an addresses to the devices connected through the Ethernet port ETH0.

3.3 Router Configuration

Initial router configuration can be made via a web browser running on your PC. Here you can perform router monitoring, configuration, and administration. First, connect the PC to the default LAN interface described in the *Start Guide* application note [1]. To get the router interface, enter the `https://192.168.1.1` address in a web browser. Please note that usage of the HTTPS protocol for secure communication over the network is required.

There is just the extbf*root* user account created on the router by default. See the **product label** on the router for its **default password**. Log in to the web interface by the *root* user and

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his password. If logged in successfully, the user will have access to the router web interface, see Figure 16. See the configuration manual [2] of the router for a detailed description and examples of the router configuration.

After logging on to the device for the first time, we strongly recommend changing the default password due to security reasons.

For security reasons, we highly recommend updating the router's firmware to the latest version regularly. Downgrading the firmware to an older version than the production version or uploading firmware intended for a different device may cause the device's malfunction.

All routers have the *WebAccess/DMP* client pre-installed by default. The activated client periodically uploads router identifiers and configuration to the *WebAccess/DMP* server. See the configuration manual [2], chapter *Basic Information -> WebAccess/DMP Configuration*, for more information.

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Figure 16: Router's Web Interface

A detailed description of the router settings in the web interface can be found in the configuration manual of the router.

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4. Technical Parameters

4.1 Basic Parameters

Router parameters		
Temperature range	Operating Storage	-40 °C to +75 °C[1] -40 °C to +85 °C
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 – 48 V DC
Battery for RTC		CR1225
Consumption w/ WiFi	Idle Average Maximum Sleep mode	5.4 W 5.5 W 14.5 W / 129 W[2] 24 mW / 310 mW[3]
Dimensions of device (w/o wings)		195 x 109 x 47 mm
DIN rail clip specification		2 pcs of DIN 35 mm, EN 60715
Total weight		1275 g
Antenna connectors	WIFI1	R-SMA connectors for WiFi – 50 Ω
Interfaces	ETH0 ETH1 ETH2 USB SERIAL & I/O	RJ-45 socket for 1Gb Ethernet SWITCH RJ-45 socket for 1Gb Ethernet SFP cage for up to 10 Gbps SFP modules USB-A 14-pin panel socket terminal block for RS232, RS485, CAN bus and I/O interfaces

Table 13: Basic Parameters

[1] Models having ICR-4401**W1**x order codes have an operating temperature range of -40 °C to +60 °C.
[2] Maximal power consumption for model with the PoE PSE (for maximal power load on all ETH0 ports).
[3] For device equipped with the PoE PSE.

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4.2 Standards and Regulations

Standards and regulations	
Radio	EN 301 893, EN 300 328
EMC	EN 301 489-1, EN 301 489-17, 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 55032
Safety	EN 62368-1, IEEE 802.3
Mechanical	EN 60068-2-27, EN 60068-2-64, EN 60529
Climatic	EN 60068-2-2, EN 60068-2-1, EN 60068-2-14, EN 60068-2-30
Transportation	E-Mark (E8), homologation number: 10R - 06 11459[1]
National	CE, UKCA compliant
Environmental	REACH, RoHS3 and WEEE compliant

Table 14: Standards and Regulations

[1] Models having ICR-4401**W1**x order codes have no E8 certification.

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4.3 Type Tests and Environmental Conditions

Phenomena	Test	Description	Test levels
ESD	EN 61000-4-2	Enclosure contact	± 6 kV (crit. A)
RF field AM modulated	EN 61000-4-3	Enclosure	20 V/m (crit. A) (80 – 1000 MHz) 10 V/m (crit. A) (1 – 6 GHz)
Fast transient	EN 61000-4-4	Signal ports Power ports Ethernet ports	± 1 kV (crit. A) ± 2 kV (crit. A) ± 1 kV (crit. A)
Surge	EN 61000-4-5	Ethernet ports Power ports	± 1 kV (crit. A), shielded cab. ± 1 kV (crit. A)
RF conducted	EN 61000-4-6	All ports	10 V/m (crit. A) (0.15 – 80 MHz)
Radiated emission	EN 55032	Enclosure	Class B
Conducted emission	EN 55032	Signal ports Power ports Ethernet ports	Class B Class B Class B
Dry heat	EN 60068-2-2	Test Bb, storage +85 °C, operation +75 °C	
Cold	EN 60068-2-1	Test Ab, storage -40 °C, operation -40 °C	
Damp heat	EN 60068-2-78	95 % rel. humidity (+40 °C)	
Dry heat, cyclic	EN 60068-2-30	+55 °C / +25 °C, rel. humidity 95 %, 6 h - 6 h	
Dry heat	EN 60068-2-2	Test Bb, storage +85 °C, operation +75 °C	
Thermal shock/ temp. variation	EN 60068-2-14	Test Nb, -40 °C/+75 °C, 3h/3h, 2 cycles, 3 K/min	
Degrees of protection provided by enclosures	EN 60529	IP30	
Vibration, broadband random	EN 60068-2-64	Spectrum A.3 cat 1, breakpoints A.6 cat 1	
Shock	EN 60068-2-27	50 m/s^2, 11 ms, half sine, 10 in each dir.	

Table 15: Type Tests and Environmental Conditions

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4.4 Parameters of WiFi

WiFi	
Short Module Description	Dual Band 2.4/5GHz 3x3 WiFi 5 (802.11ac Wave 1)
Supported Standards	IEEE: 802.11ac compliant & compatible with 802.11a/b/g/n
Data Rate (3x3 MIMO OFDM)	Up to 600 Mbps @ 2.4 GHz Up to 1300 Mbps @ 5 GHz
Frequency Ranges	2.412 – 2.472 GHz, 4.920 – 5.825 GHz
Spectrum Widths	20/40MHz @ 2.4GHz, 20/40/80MHz @ 5GHz
Modulation Techniques	OFDM: BPSK, QPSK, DBPSK, DQPSK, 16-QAM, 64-QAM, 256-QAM
Antenna Connectors	3x3 MIMO R-SMA – 50 Ω
2.4 GHz supported channels	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
5 GHz supported 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)), Station (STA), multi-role (AP & STA)
Key Features	Spatial Multiplexing, Cyclic-Delay Diversity (CDD), Low-Density Parity Check (LDPC) Codes, Maximal Ratio Combining (MRC), Space Time Block Code (STBC), Dynamic Frequency Selection (DFS), IEEE 802.11d, e, h, i, j, k, r, v time stamp, and w standards
Security – Standards	WEP, WPA, WPA2, WPA3, 802.1X
Security – Encryption	WEP, TKIP, AES
Security – EAP Types	EAP–FAST, EAP–TLS, EAP–TTLS, PEAP–GTC, PEAP–MSCHAPv2, PEAP–TLS, LEAP
TX Power (per chain)	max 21 dBm @ 2.4 GHz max 18 dBm @ 5 GHz

Table 16: Technical Parameters of WiFi

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4.5 Parameters of I/O Ports

Electrical characteristics of the binary inputs are in Table 17. Status of the binary input can be retrieved in the router's web interface (on the *General Status* page) or by the `status ports` and `io get` commands, see Commands and Scripts application note.

Logical[1]	Voltage	Current	Status[2]
1	3 V	0.5 mA	Off
0	5 V	0.8 mA	On
0	12 V	1.6 mA	On
0	48 V	3.4 mA	On

Table 17: Electrical Characteristics of Binary Inputs

The maximum binary output load is **500 mA** at **48 V**.

4.6 Parameters of PoE

Dedicated models support the PoE PSE funcionality, see Chapter 1.4. All four ETH0 ports can be used for this purpose.

Standards IEEE 802.3at-2009 (PoE+) and IEEE 802.3af-2003 (PoE) are supported. Cabling needed is Category 5, up to 12.5 Ω.

PoE PSE parameters	
Required power supply	48 V / 150 W
Power available per port	25.5 W
Total power available (all 4 ETH0 ports)	102 W

Table 18: PoE PSE Parameters

[1]The binary status returned by the `io get` shell command.
[2]The binary status returned by the `status ports` shell command and displayed on the *General Status* page.

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4.7 System Configuration

The main parametes of the system are listed in Table 19.

Other technical parameters	
CPU architecture	Quad-Core ARMv8-A (core Cortex-A72)
CPU frequency	1200 MHz
CPU power	4.72 DMIPS/MHz
Flash memory	4 MB of NOR 4 096 MB of eMMC • 838 MB for Router Apps • 512 MB for customer data
RAM size	1 024 MB
Watchdog	HW watchdog
RTC	Battery backup RTC
TPM	Trusted Platform Module (TPM) 2.0

Table 19: System Configuration

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Appendix A: Troubleshooting

If you cannot connect to the router from your PC, your network card may be configured in such a way that it is not possible to connect to the router. Take one or more of the following steps in order to solve the problem:

- Make sure your PC's network card is configured to obtain the IP address form the DHCP server (by default the DHCP server is running in the router).
- Connect the router to the PC via Switch.
- Connect the router to the PC, start the router first and then start the PC after the router's initialization.

Ethernet connection fails or is not establishing.

- *It is possible to turn auto negotiation off and set a rate and duplex manually on the Ethernet interface of the router. Available on "LAN Configuration" page in the router.*

I cannot connect from the Internet to the device behind the router. I have NAT enabled.

- *The device's gateway has to be configured so it points to the router.*

I can't access my Web server placed behind the router over NAT.

- *The remote HTTP access to the router has to be disabled on "NAT Configuration" page in the router. Also enable "Send all remaining incoming packets to default server" feature and fill in the IP address of your Web server. On the Web server, the default gateway has to be the IP address of the router.*

DynDNS doesn't work.

- *If the same IP address is recorded in your canonic name as a dynamically assigned address, it means that the provider is using NAT or a firewall.*
- *You can verify NAT using ping to your server with static address and then compare with router's IP address.*
- *You can verify a Firewall by accessing remotely to the router's Web interface.*
- *The operator may not provide the address of DNS server and without DNS server's address it is impossible to connect to the dyndns.org server. The following messages will be shown in the System Log:*
  - *DynDNS daemon started*
  - *Error resolving hostname: no such file or directory*
  - *Connect to DynDNS server failed*

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✍ **L2TP or IPSec isn't establishing.**

- *Check the "System Log" page for error messages.*

✍ **IPSec tunnel establishes but the communication does not run.**

- *Probably there are bad routing rules defined in the connected devices, or the default gateway.*

✍ **Serial communication is not working.**

- *Verify that the router model supports serial communications. Also verify the serial communication settings. To do so, open the router's configuration menu via the web browser, select the appropriate "Expansion Port" from "Configuration" part of the menu and verify the settings.*

✍ **Is the router Cisco compatible? Can I use the Cisco configuration?**

- *No, the Firmware in the router (Conel OS) is based on Linux with BusyBox. Thus the Cisco configuration cannot be used. But network connections are defined by standards so connecting the router to the Cisco or other networking devices is possible and will be compatible.*

✍ **FTP or SFTP does not work**

- *FTP will work on v2 routers only. You can use SFTP on all routers to transfer files to/from the router. If having troubles with FTP on v2 routers, make sure you have FTP enabled: "Configuration" section, "Services", "FTP". Then you can connect with any client on port 21 with name and password same as for the Web interface. If having troubles with SFTP, make sure you have SSH enabled: "Configuration" section, "Services", "SSH". Then you can connect with any client on port 22 with name and password same as for the Web interface.*

✍ **How can I connect to the router's command line? (SSH, Telnet)**

- *You can use SSH on all routers or Telnet on v2 routers only. SSH is enabled by default, but you can verify in Web interface in "Configuration" section, "Services", "SSH". Then connect with any SSH client on port 22 of the router. User and password is the same as for the Web interface. Telnet on v2 routers can be enabled here: "Configuration" section, "Services", "Telnet".*

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Appendix B: Customer Support

Customer Support for Europe

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Appendix C: Regulatory & Safety Information

Safety Notices

Please, observe the following instructions:

- The router must be used in compliance with all applicable international and national laws and in compliance with any special restrictions regulating the utilization of the router in prescribed applications and environments.
- To prevent possible injury and damage to appliances and to ensure compliance with all relevant provisions, use only the original accessories. Unauthorized modifications or the use of unapproved accessories may result in damage to the router and / or a breach of applicable regulations. Unauthorized modifications or use of unapproved accessories may void the warranty.
- The router can not be opened.
- **Caution!** This equipment is not suitable for use in locations where children are likely to be present.
- Power supply must not exceed 48 V DC max.
- Do not expose the router to extreme ambient conditions. Protect the router against dust, moisture and high temperature.
- Only routers with appropriate certification and labelling should be used in locations where flammable and explosive materials are present, including gas stations, chemical plants, or locations in which explosives are used. We remind users of the duty to observe the restrictions concerning the utilization of radio devices at such places.
- Switch off the router when travelling by plane. Utilization of the router on a plane may endanger the operation of the plane or interfere with the mobile telephone network, and may be unlawful. Failure to observe these instructions may result in the suspension or cancellation of telephone services for the respective client and / or may result in legal sanctions.
- When using the router in close proximity to personal medical devices, such as cardiac pacemakers or hearing aids, you must proceed with heightened caution.
- The router may cause interference when used in close proximity to TV sets, radio receivers or personal computers.
- It is recommended that you create an appropriate copy or backup of all important settings that are stored in the memory of the device.

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Product Disposal Instructions

The WEEE (Waste Electrical and Electronic Equipment: 2012/19/EU) directive was introduced to ensure that electrical/electronic products are recycled using the best available recovery techniques to minimize the impact on the environment. This product contains high quality materials and components which can be recycled. At the end of it's life this pro- duct MUST NOT be mixed with other commercial waste for disposal. The device contains a battery. Remove the battery from the device before disposal. The battery in the device needs to be disposed of apart accordingly. Check the terms and conditions of your supplier for disposal information.

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Appendix D: Related Documents

[1] Quick Start Guide for v4 Platform
[2] Configuration Manual for v4 Platform

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

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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**) (WiFi version) and with the Electromagnetic Compatibility Regulations 2016 (**S.I. 2016 No. 1091** and **S.I. 2016 No. 1101**) (non-WiFi version).

We, Advantech Czech s.r.o., declare that the radio equipment narrated in this user's manual complies with Directive **2014/53/EU** (WiFi version) and with the essential requirements and other relevant provisions of Directives **2014/30/EU** and **2014/35/EU** (non-WiFi version).

The full text of the EU Declaration of Conformity is available at the following internet address: icr.advantech.cz/eudoc

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