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# Cellular and Wired Routers **SPECTRE LTE, 3G, RT**

USER'S MANUAL



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This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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# Contents

<b>1 About</b>	<b>1</b>
<b>2 Safety Instruction</b>	<b>2</b>
2.1 Compliance . . . . .	2
2.2 Product Disposal Instructions . . . . .	3
<b>3 Router Description</b>	<b>4</b>
3.1 Description . . . . .	4
3.2 Examples of Possible Applications . . . . .	4
3.3 Contents of Package . . . . .	5
3.4 Model Numbers . . . . .	5
3.5 Dimensions . . . . .	8
<b>4 Mounting Recommendations</b>	<b>9</b>
<b>5 User Interfaces</b>	<b>12</b>
5.1 Connectors . . . . .	12
5.2 Status Indicators . . . . .	13
5.2.1 Expansion Port Status Indicators . . . . .	14
Ethernet Ports . . . . .	14
RS-232 Ports . . . . .	15
I/O Ports . . . . .	15
RS-485/422 Ports . . . . .	15
Wi-Fi . . . . .	15
SmartMesh IP . . . . .	15
5.3 Power Connector . . . . .	16
5.4 Antenna Connector . . . . .	17
5.5 SIM Card Reader . . . . .	18
5.6 Ethernet Port . . . . .	18
5.7 Port 1 . . . . .	19
5.8 Port 2 . . . . .	19
5.9 USB Port . . . . .	20
5.10 I/O Port . . . . .	20
5.11 Expansion Ports Information . . . . .	22
5.11.1 RS-232 Ports . . . . .	22
5.11.2 RS-485/422 Ports . . . . .	23
Connector Pinout in RS-485 mode . . . . .	24
Connector Pinout in RS-422 mode . . . . .	25
5.11.3 12-bit I/O (AI, DI, DO) Port . . . . .	27

Analog Inputs . . . . .	27
Binary Input . . . . .	27
Counter Input . . . . .	27
Binary Output . . . . .	27
Selecting the Binary Input Current . . . . .	28
Input/Output Connector . . . . .	28
MODBUS ASCII Configuration and Address Space . . . . .	29
<b>6 Reset or Reboot</b>	<b>36</b>
<b>7 First Use</b>	<b>37</b>
7.1 Starting the Router . . . . .	38
7.2 Configuring the Router . . . . .	38
Configuration over Web browser . . . . .	38
Configuration over Telnet or SSH . . . . .	39
<b>8 Technical Parameters</b>	<b>40</b>
<b>9 Troubleshooting</b>	<b>45</b>
9.1 FAQ . . . . .	45
<b>10 Customer Support</b>	<b>46</b>

# List of Figures

1	Contents of Package . . . . .	5
2	Basic dimensions, metal box . . . . .	8
3	Space around antenna . . . . .	9
4	Cable routing . . . . .	10
5	Space in front of connectors . . . . .	10
6	DIN rail clip . . . . .	11
7	Removing the router from the DIN rail . . . . .	11
8	SPECTRE LTE front panel example, model RTLTE-304 . . . . .	12
9	SPECTRE 3G front panel example, model RT3G-340-W . . . . .	13
10	SPECTRE RT front panel example, model ERT311 . . . . .	13
11	Power connector . . . . .	16
12	Connection of power supply connector . . . . .	16
13	Connection of power supply . . . . .	16
14	Connecting the antenna . . . . .	17
15	Ejected SIM card holder . . . . .	18
16	Ethernet connector . . . . .	19
17	Ethernet cable connection . . . . .	19
18	USB connector . . . . .	20
19	I/O connector . . . . .	20
20	Connection of binary input and output of router . . . . .	21
21	RS-232 port connector . . . . .	22
22	Meter connection to router . . . . .	22
23	Jumper position for external power supply (left) and internal power supply (right) . . . . .	23
24	Jumper position for RS-485 (left) and for RS-422 (right) . . . . .	23
25	RS-485/422 connector . . . . .	24
26	RS-485: Connection to the router with data cable length less than 10 m . . . . .	24
27	RS-485: Connection to the router with data cable length more than 10 m . . . . .	25
28	RS-485/422 connector . . . . .	25
29	RS-422: Connection to the router with data cable length less than 10 m . . . . .	26
30	RS-422: Connection to the router with data cable length more than 10 m . . . . .	26
31	Threshold select using jumper on the board . . . . .	28
32	12-bit I/O (CNT) connector . . . . .	28
33	Typical connection of the 12-bit I/O port circuitry: . . . . .	29
34	Router reset . . . . .	36
35	Connecting the router before the first use . . . . .	37
36	Accessing the router Web interface . . . . .	38
37	Router Web interface . . . . .	39

# List of Tables

1	Expansion port possibilities . . . . .	5
2	SPECTRE LTE model numbers for Verizon . . . . .	6
3	SPECTRE LTE model numbers for AT&T . . . . .	7
4	SPECTRE 3G model numbers . . . . .	7
5	SPECTRE RT Ethernet Router . . . . .	8
6	Front panel description . . . . .	12
7	Router status indication . . . . .	14
8	Ethernet LED status indication . . . . .	14
9	RS-232 LED status indication . . . . .	15
10	I/O Port LED status indication . . . . .	15
11	RS-232 LED status indication . . . . .	15
12	Wi-Fi LED status indication . . . . .	15
13	Wi-Fi LED status indication . . . . .	15
14	Connection of power connector . . . . .	16
15	Ethernet connector . . . . .	18
16	Connection of USB connector . . . . .	20
17	I/O port connection . . . . .	20
18	Connection of RS-232 connector . . . . .	22
19	Connector pinout in RS-485 mode . . . . .	24
20	Connector pinout in RS-422 mode . . . . .	25
21	12-bit Input/Output connector pinout . . . . .	28
22	MODBUS input/output address space . . . . .	35
23	Ways to reset or restart the router . . . . .	36
24	General specifications . . . . .	40
25	SPECTRE LTE AT cellular module specifications . . . . .	41
26	SPECTRE LTE VZ cellular module specifications . . . . .	42
27	SPECTRE 3G cellular module specifications . . . . .	42
28	Processor specifications . . . . .	42
29	I/O port specifications . . . . .	42
30	Wi-Fi Specifications . . . . .	43
31	SmartMesh IP 802.15.4e Radio Specifications . . . . .	44

# 1. About

## Used Symbols



*Danger* – important notice, which may have an influence on the user's safety or the function of the device.



*Attention* – notice on possible problems, which can arise in specific cases.



*Information, notice* – information, which contains useful advice or special interest.

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[support@bbelec.com](mailto:support@bbelec.com)

## Router Version

The properties and settings associated with the cellular network connection are not available in noncellular SPECTRE RT routers.

PPPoE configuration is only available on SPECTRE RT routers. It is used to set the PPPoE connection over Ethernet.

## Declared Quality System

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.





## 2. Safety Instruction

### 2.1 Compliance



**PLEASE OBSERVE THE FOLLOWING INSTRUCTIONS:**

THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, AND D HAZARDOUS LOCATIONS, OR NON-HAZARDOUS LOCATIONS ONLY.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN REMOVED OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

WARNING – EXPLOSION HAZARD – SUBSTITUTION OF ANY COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.

CET ÉQUIPEMENT EST CONVENABLE EN CLASSE 1, DIVISION 2, GROUPES A, B, C, ET D ENDROITS DANGEREUX OU ENDROITS NON DANGEREUX SEULEMENT.

AVIS – RISQUE D'EXPLOSION – NE DÉCONNECTEZ PAS L'ÉQUIPEMENT, SAUF SI L'ALIMENTATION A ÉTÉ COUPÉE OU SI L'ENVIRONNEMENT EST CLASSÉ NON DANGEREUX.

AVIS – RISQUE D'EXPLOSION - SUBSTITUTION DE TOUTE COMPOSANTE RISQUERAIT LA QUALITÉ POUR CLASSE 1, DIVISION 2.

These devices are open-type devices that are to be installed in an enclosure suitable for the environment.

The router must be used in compliance with all applicable international and national laws and in compliance with any special restrictions regulating the use 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 a breach of applicable regulations. Unauthorized modifications or use of unapproved accessories may void the warranty.

Turn off the router and disconnect it from power supply before handling of the SIM card.



**Caution! The SIM card could be swallowed by small children.**

Input voltage must not exceed 30 V DC max.

Do not expose the router to extreme ambient conditions. Protect the router against dust, moisture and high temperature.

The router should not be used in locations where flammable and explosive materials are present, including gas stations, chemical plants, or locations in which explosives are used.

Switch off the router when travelling by plane. Use of the router in a plane may endanger the operation of the plane or interfere with the mobile telephone network, and may be unlawful.

When using the router in the close proximity of personal medical devices, such as cardiac pacemakers or hearing aids, proceed with heightened caution.

The router may cause interference when in the close proximity of tv sets, radio receivers or personal computers.

It is recommended to create an appropriate copy or backup of all the important settings that are stored in the memory of the device.

## **2.2 Product Disposal Instructions**

The WEEE (Waste Electrical and Electronic Equipment: 2002/96/EC) directive has been 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 its life, this product **MUST NOT** be mixed with other commercial waste for disposal. Check the terms and conditions of your supplier for disposal information.

## 3. Router Description

### 3.1 Description

The SPECTRE Cellular and Ethernet industrial routers are used to wirelessly connect Ethernet equipment and other devices to the Internet or intranet. Thanks to the high data transfer speed of up to 100 Mbit/s download (LTE models) and 50 Mbit/s upload (LTE models), it is an ideal wireless solution for traffic and security camera systems, individual computers, LAN networks, automatic teller machines (ATM) and other self-service terminals. Data transfer speed of 3G models is up to 14.4 Mbit/s download and up to 5.76 Mbps upload on HSPA+ network.

The standard configuration includes one 10/100 Ethernet port, one USB Host port, one binary Input/output (I/O) port and one SIM card holder (LTE models). 3G models include second SIM card holder providing network redundancy. It also contains 2 expansion ports for connecting to other types of networks such as RS-232, RS-485/422, Digital/Analog I/O, or they can be configured to provide additional switched Ethernet ports. The function of each port is dependent upon the specific router model.

Configuration of the router may be done via a password-protected Web interface. The router supports the creation of VPN tunnels using IPsec, OpenVPN and L2TP to ensure safe communication. The Web interface provides detailed statistics about the router's activities, signal strength, etc. The router supports DHCP, NAT, NAT-T, DynDNS, NTP, VRRP, control by SMS, and many other functions.

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 to control various router functions and create up to four different configurations for the same router. These configuration files can include different SMS functionality and binary input configurations. You may switch between different configurations whenever necessary. The router can automatically upgrade its configuration and firmware from your central server. This allows for mass reconfiguration of numerous routers at the same time.

### 3.2 Examples of Possible Applications

- Mobile office
- Fleet management
- Security system
- Telematics
- Telemetrics
- Remote monitoring
- Vending and dispatcher machines

### 3.3 Contents of Package



The basic router package includes:

- Router
- Power supply
- Crossover UTP cable
- External antennas
- Clips for the DIN rail
- Quick Start Guide



Figure 1: Contents of Package

### 3.4 Model Numbers

**Standard Features on SPECTRE Routers:** 10/100 Ethernet, USB Host Port, Binary I/O Port, Dual SIM Card slots

**Expansion Port Functions (Model Dependent):**

The Ports Can Be Connected As Follows:	
PORT 1	ETHERNET, SWITCH (together with PORT 2), RS-232, RS-485/422, 12-bit I/O (AI, DI, DO)
PORT 2	SWITCH (together with PORT 1), RS-232, RS-485/422, Wi-Fi, SmartMesh IP

Table 1: Expansion port possibilities

<b>SPECTRE LTE Wireless Routers (Verizon): Expansion Ports</b>		
<b>Model No.</b>	<b>Port 1</b>	<b>Port 2</b>
RTLTE-300-VZ	No connect	No connect
RTLTE-302-VZ	No connect	RS-232
RTLTE-304-VZ	No connect	RS-422/485
RTLTE-310-VZ	Ethernet	No connect
RTLTE-311-VZ	Ethernet (SWITCH)	Ethernet (SWITCH)
RTLTE-312-VZ	Ethernet	RS-232
RTLTE-314-VZ	Ethernet	RS-422/485
RTLTE-322-VZ	RS-232	RS-232
RTLTE-324-VZ	RS-232	RS-422/485
RTLTE-330-VZ	12-bit I/O (AI, DI, DO)	No connect
RTLTE-300-W-VZ	No connect	Wi-Fi
RTLTE-310-W-VZ	Ethernet	Wi-Fi
RTLTE-320-W-VZ	RS-232	Wi-Fi
RTLTE-330-W-VZ	12-bit I/O (AI, DI, DO)	Wi-Fi
RTLTE-340-W-VZ	RS-422/485	Wi-Fi
RTLTE-350-VZ	No connect	SmartMesh IP
RTLTE-351-VZ	Ethernet	SmartMesh IP
RTLTE-352-VZ	RS-232	SmartMesh IP
RTLTE-354-VZ	RS-422/485	SmartMesh IP

Table 2: SPECTRE LTE model numbers for Verizon

<b>SPECTRE LTE Wireless Routers (AT&amp;T): Expansion Ports</b>		
<b>Model No.</b>	<b>Port 1</b>	<b>Port 2</b>
RTLTE-300-AT	No connect	No connect
RTLTE-302-AT	No connect	RS-232
RTLTE-304-AT	No connect	RS-422/485
RTLTE-310-AT	Ethernet	No connect
RTLTE-311-AT	Ethernet (SWITCH)	Ethernet (SWITCH)
RTLTE-312-AT	Ethernet	RS-232
RTLTE-314-AT	Ethernet	RS-422/485
RTLTE-322-AT	RS-232	RS-232
RTLTE-324-AT	RS-232	RS-422/485
RTLTE-330-AT	12-bit I/O (AI, DI, DO)	No connect
RTLTE-300-W-AT	No connect	Wi-Fi
RTLTE-310-W-AT	Ethernet	Wi-Fi

To be continued on the next page

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<b>SPECTRE LTE Wireless Routers (AT&amp;T): Expansion Ports</b>		
<b>Model No.</b>	<b>Port 1</b>	<b>Port 2</b>
RTLTE-320-W-AT	RS-232	Wi-Fi
RTLTE-330-W-AT	12-bit I/O (AI, DI, DO)	Wi-Fi
RTLTE-340-W-AT	RS-422/485	Wi-Fi
RTLTE-350-AT	No connect	SmartMesh IP
RTLTE-351-AT	Ethernet	SmartMesh IP
RTLTE-352-AT	RS-232	SmartMesh IP
RTLTE-354-AT	RS-422/485	SmartMesh IP

Table 3: SPECTRE LTE model numbers for AT&T

<b>SPECTRE 3G Wireless Routers: Expansion Ports</b>		
<b>Model No.</b>	<b>Port 1</b>	<b>Port 2</b>
RT3G-300	No connect	No connect
RT3G-302	No connect	RS-232
RT3G-304	No connect	RS-422/485
RT3G-310	Ethernet	No connect
RT3G-311	Ethernet (SWITCH)	Ethernet (SWITCH)
RT3G-312	Ethernet	RS-232
RT3G-314	Ethernet	RS-422/485
RT3G-322	RS-232	RS-232
RT3G-324	RS-232	RS-422/485
RT3G-330	12-bit I/O (AI, DI, DO)	No connect
RT3G-300-W	No connect	Wi-Fi
RT3G-310-W	Ethernet	Wi-Fi
RT3G-320-W	RS-232	Wi-Fi
RT3G-330-W	12-bit I/O (AI, DI, DO)	Wi-Fi
RT3G-340-W	RS-422/485	Wi-Fi
RT3G-350	No connect	SmartMesh IP
RT3G-351	Ethernet	SmartMesh IP
RT3G-352	RS-232	SmartMesh IP
RT3G-354	RS-422/485	SmartMesh IP

Table 4: SPECTRE 3G model numbers

SPECTRE RT Ethernet Routers: Expansion Ports		
Model No.	Port 1	Port 2
ERT310	Ethernet	No connect
ERT311	Ethernet (SWITCH)	Ethernet (SWITCH)
ERT312	Ethernet	RS-232
ERT314	Ethernet	RS-422/485
ERT351	Etherent	SmartMeshIP

Table 5: SPECTRE RT Ethernet Router

### 3.5 Dimensions

Basic dimensions, metal box:

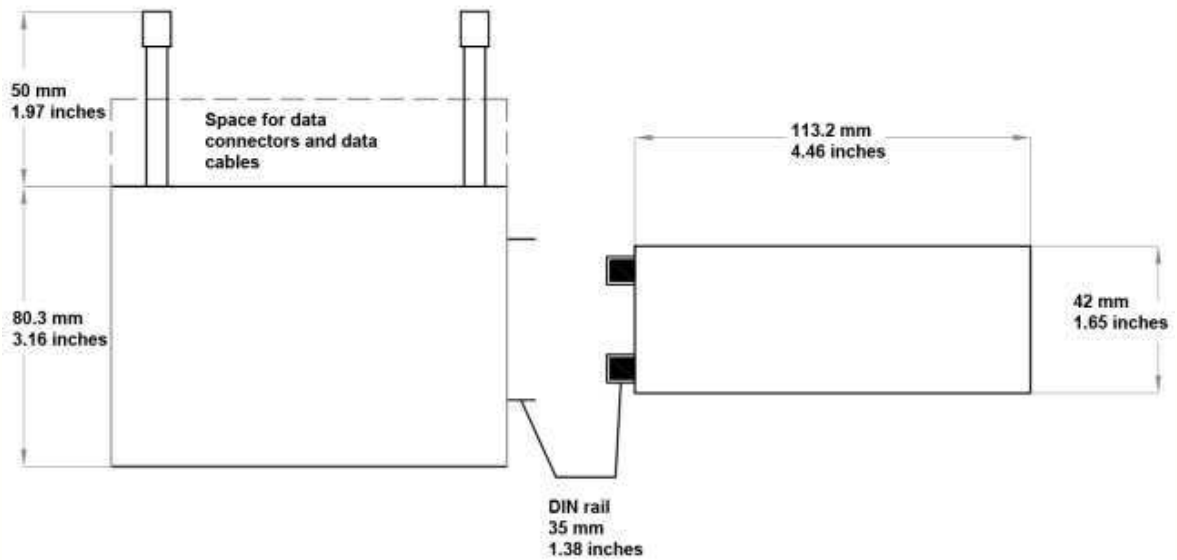


Figure 2: Basic dimensions, metal box

## 4. Mounting Recommendations



- The router may be placed on a work surface.
- Clips are included for mounting the router on a standard DIN rail.

The router may be installed in an industrial instrument panel.



For best performance, please consider the following guidelines:

- When using the supplied whip antennas, maintain a distance of 6 cm from cables and metal surfaces on every side. When using an external antenna, unless in a switch-board, it is necessary to fit a lightning conductor
- When mounting a router on sheet steel we recommend using an external antenna.
- If the router is installed in a metal instrument enclosure, an external antenna must be used and it must be mounted outside of the metal enclosure.

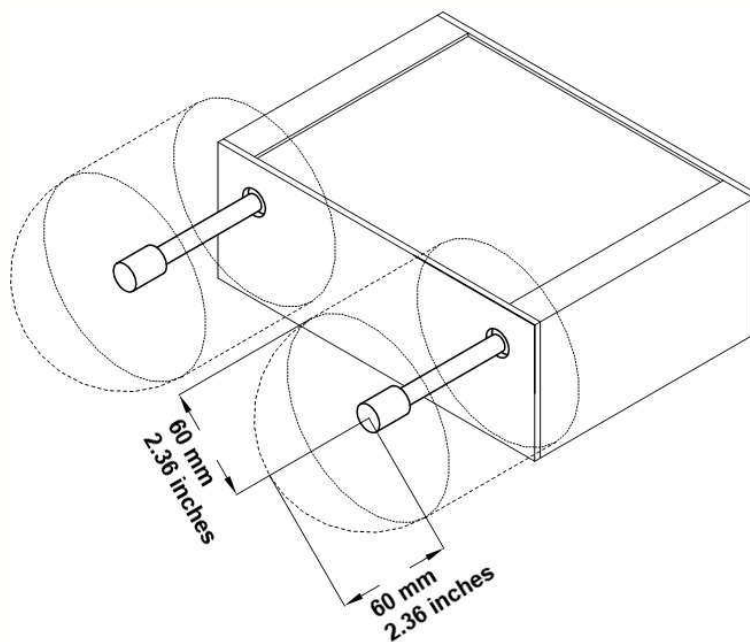


Figure 3: Space around antenna



**We recommend binding the cables together to avoid coupling noise onto the cables.**

1. Length: The combination of power supply and data cables can be a maximum of 1.5 meters.
2. If the length of the data cables exceeds 1.5 meters or if the cable leads towards the switch panel, we recommend installing overvoltage protectors (surge suppressors).
3. Do not bundle the data cables with 120/230V power cables.
4. All wiring to sensors should use shielded twisted pairs.

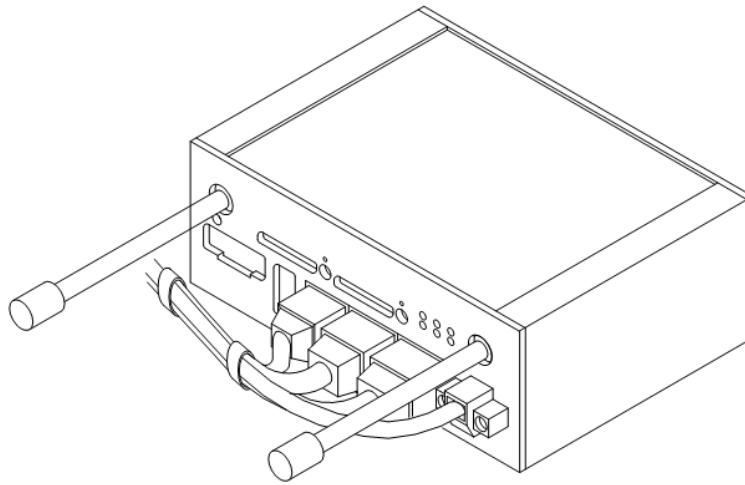


Figure 4: Cable routing

**Leave enough space around the connectors for the handling of cables.**

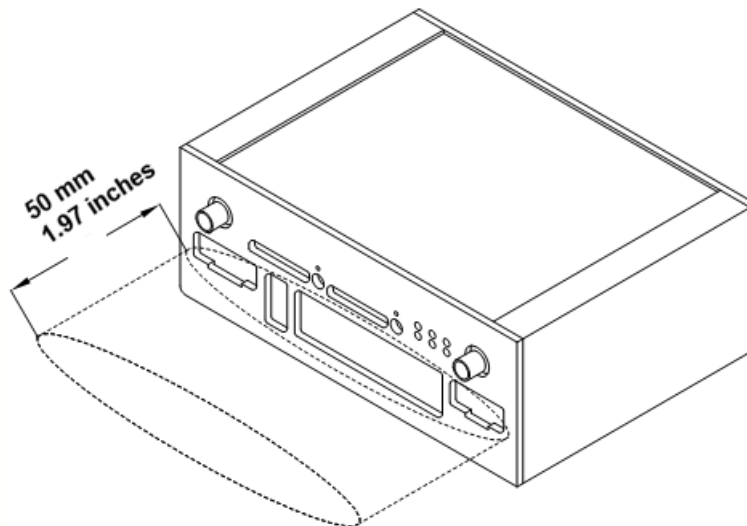


Figure 5: Space in front of connectors

We recommend using the switch panel's earth-bonding distribution frame for grounding the router's power supply, data cables and antenna.

### Removing from DIN rail



Figure 6: DIN rail clip

This is the default position of the DIN rail clip. To remove the router from the DIN rail, push the router up slightly, so that the top part of the clip disengages, and then gently slide the router off the DIN rail.

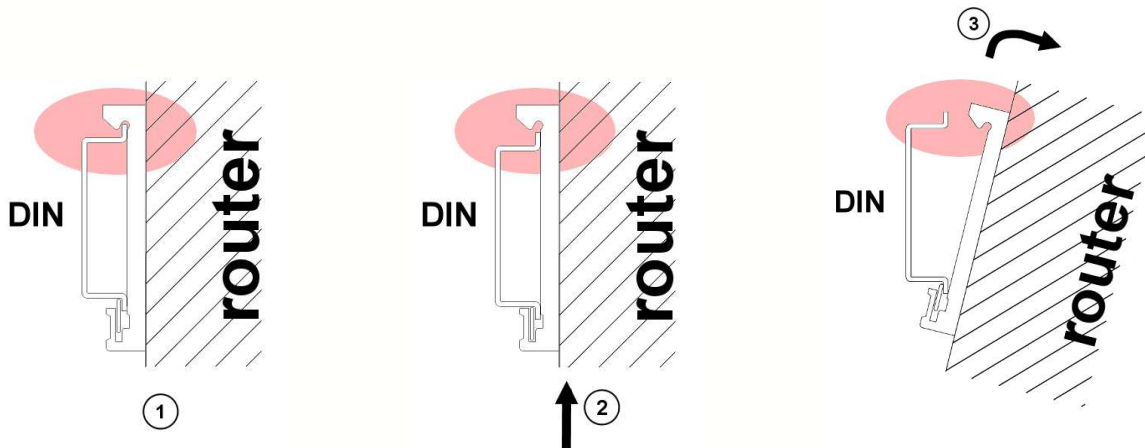


Figure 7: Removing the router from the DIN rail

# 5. User Interfaces

## 5.1 Connectors

Front Panel		
Label	Connector	Description
PWR	2-pin	Power supply
ETH	RJ45	Connection to the local computer network
PORT 1	RJ45	RS-232/422/485, ETHERNET, or 12-bit I/O
PORT 2	RJ45	RS-232/422/485 or ETHERNET
ANT	SMA	Main cellular antenna (LTE and 3G models only)
DIV	SMA	Diversity cellular antenna (LTE models only)
GPS	SMA	GPS antenna (LTE models only)
AUX	SMA RP-SMA	3G models (on the left): DIV/GPS all models (on the right): SmartMesh IP antenna
WIFI	RP-SMA	Wi-Fi antenna (LTE and 3G models only)
USB	USB-A Host	USB connector
I/O	3-pin	Binary input and output
SIM	-	SIM card holder (LTE models only)
SIM1	-	SIM card holder (3G models only)
SIM2	-	SIM card holder 2 (3G models only)

Table 6: Front panel description



Figure 8: SPECTRE LTE front panel example, model RTLTE-304

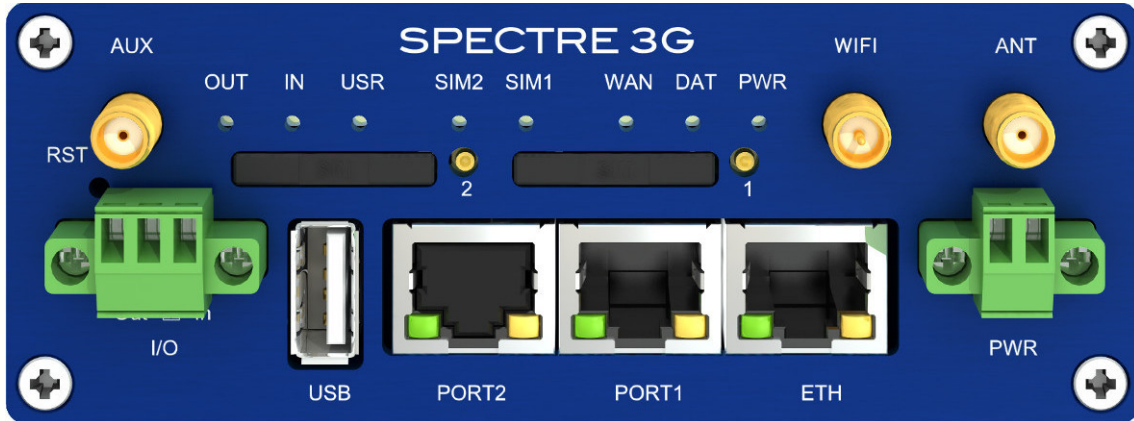


Figure 9: SPECTRE 3G front panel example, model RT3G-340-W

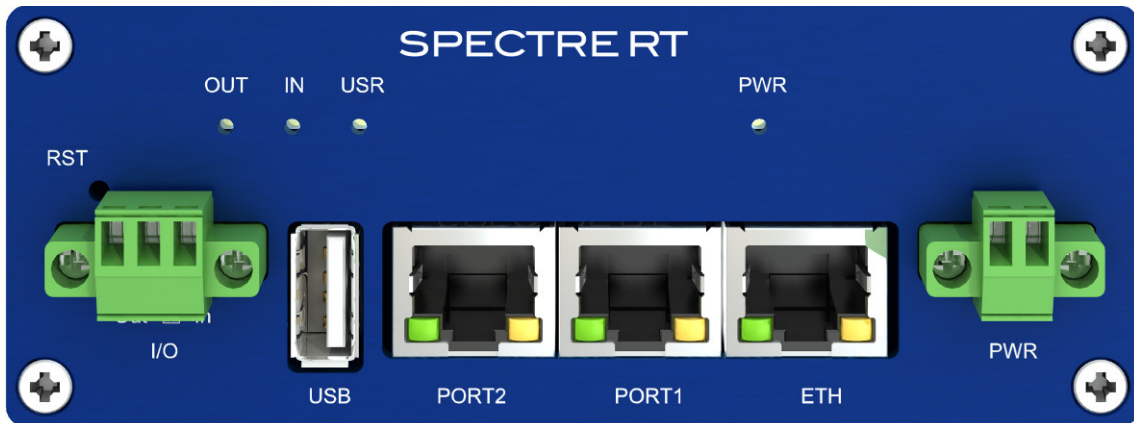


Figure 10: SPECTRE RT front panel example, model ERT311

## 5.2 Status Indicators

Caption	Color	State	Description
PWR	Green	Blinking On Fast blinking	Router is ready Starting of the router Updating firmware
DAT	Red	Blinking	Communication in progress on radio channel

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Caption	Color	State	Description
WAN	Yellow	flashing 1x flash per sec. 2x flash per sec.  3x flash per sec.	PPP connection established. Signal strength is from -50 dBm to -69 dBm. Signal strength is from -70 dBm to -89 dBm or the difference between neighboring cells is exactly 3 dBm. Signal strength is from -90 dBm to -113 dBm or difference the between neighboring cells is smaller than 3 dBm.
USR	Yellow	Function selected by user	
OUT	Green	On	Binary output active
IN	Green	On	Binary input active
ETH	Green	On Off	Selected 100 Mbit/s Selected 10 Mbit/s
ETH	Yellow	On Blinking Off	The network cable is connected Data transmission The network cable is not connected
PORT	Green	LED functions for different router configurations appear in the charts below.	
PORT	Yellow	LED functions for different router configurations appear in the charts below.	
SIM	Yellow	On	SIM card is active (LTE models only)
SIM1	Yellow	On	SIM card 1 is active (3G models only)
SIM2	Yellow	On	SIM card 2 is active (3G models only)

Table 7: Router status indication

### 5.2.1 Expansion Port Status Indicators

#### Ethernet Ports

LED Port Indicator	
Green LED	On: selected 100 Mbit/s Off: selected 10 Mbit/s
Yellow LED	On: the network cable is connected Blinking: data transmission Off: the network cable is not connected

Table 8: Ethernet LED status indication

### RS-232 Ports

LED Port Indicator	
Green LED	Blinks on Receive data
Yellow LED	Blinks on Transmit data

Table 9: RS-232 LED status indication

### I/O Ports

LED Port Indicator	
Green LED	Indicates binary input 0
Yellow LED	Indicates binary input 1

Table 10: I/O Port LED status indication

### RS-485/422 Ports

LED Port Indicator	
Green LED	Blinks on Receive data
Yellow LED	Blinks on Transmit data

Table 11: RS-232 LED status indication

### Wi-Fi

LED Port Indicator	
Green LED	Indicates Wi-Fi Power On
Yellow LED	Always Off

Table 12: Wi-Fi LED status indication

### SmartMesh IP

LED Port Indicator	
Green LED	Indicates SmartMesh IP Power On
Yellow LED	Always Off

Table 13: Wi-Fi LED status indication

### 5.3 Power Connector

2-Pin Panel Socket		
Pin number	Signal mark	Description
1	VCC (+)	Positive input of DC supply voltage (+10 to +30 VDC)
2	GND (-)	Negative input of DC supply voltage

Table 14: Connection of power connector

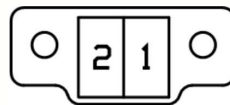


Figure 11: Power connector

The router requires a +10 V to +30 V DC supply. Protection against reversed polarity is built into the router.

The power consumption in receive mode is 2.3 W (LTE models) or 2.6 W (3G models). The peak power consumption during data sending (or communication running on RT models) is 5.5 W. For correct operation, the power source must be able to supply a peak current of 1 A.



The power cable connects to the router via locking screws. (See figure below.)

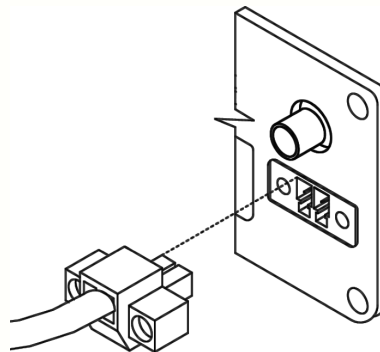


Figure 12: Connection of power supply connector



Circuit Example:

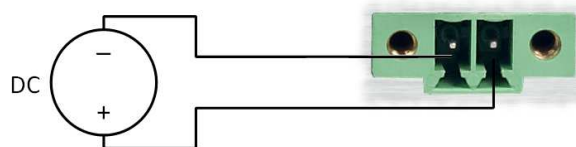


Figure 13: Connection of power supply

## 5.4 Antenna Connector

The two large cellular antennas are connected to the router using the standard SMA antenna connectors on the front panel. The main cellular antenna connection is labeled **ANT**. The router cannot operate without a main antenna. The receive diversity antenna connection is labeled **DIV** or **AUX** for 3G models). This antenna improves the receive sensitivity of the router and should be used in areas with weak signal strength.



**SPECTRE LTE:** There are always connectors ANT and DIV for main and diversity cellular antenna. The antenna connector in the middle is based on the model number: There is GPS antenna connector as a standard, WIFI antenna connector (RP-SMA) for Wi-Fi models and AUX connector (RP-SMA) for SmartMesh IP models.

**SPECTRE 3G:** There are always connectors AUX and DIV for main antenna and diversity/GPS antenna (the GPS mode is chosen internally by activating the GPS User Module in the router). There can be antenna connector in the middle based on the model number: WIFI antenna connector (RP-SMA) for Wi-Fi models and another AUX connector (RP-SMA) for SmartMesh IP models.

**SPECTRE RT:** There is not any antenna connector as a standard. Based on the model number there can be AUX connector (RP-SMA) for SmartMesh IP antenna.

**The AUX connector on the Wi-Fi and SmartMesh IP units is a reverse-polarity SMA connector and should only be used with the smaller Wi-Fi/SmartMesh IP antenna. Do not attempt to connect the cellular antennas to this connector as it can damage the connector and the antennas.**



The router can not operate without main antenna ANT connected!



Connect the antenna's SMA connector to the router's SMA connector. (See figure below).

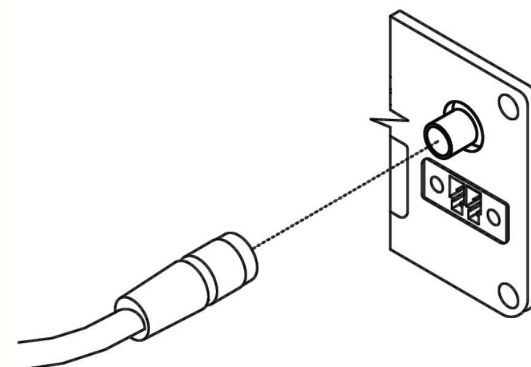


Figure 14: Connecting the antenna



## 5.5 SIM Card Reader

The SIM card reader supports 3 V and 1.8 V Mini-SIM cards. It is located on the front panel of the router. The router will not operate on UMTS or LTE networks unless an activated SIM card with an unblocked PIN is in the reader. The SIM cards may use different access point names (APN).

### Changing the SIM card:



Disconnect the router from power supply before handling the SIM card!

Press the small button on the right hand side of the SIM reader slot to eject the SIM card holder. Insert the SIM card into the holder and slide it in the reader. (See figure bellow.)

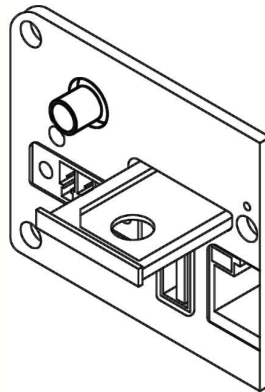


Figure 15: Ejected SIM card holder

## 5.6 Ethernet Port

Panel Socket RJ45			
Pin Number	Signal mark	Description	Data Flow Direction
1	TXD+	Transmit Data – positive pole	Input/Output
2	TXD–	Transmit Data – negative pole	Input/Output
3	RXD+	Receive Data – positive pole	Input/Output
4	—	—	
5	—	—	
6	RXD–	Receive Data – negative pole	Input/Output
7	—	—	
8	—	—	

Table 15: Ethernet connector

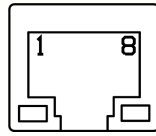


Figure 16: Ethernet connector



**ATTENTION! The Ethernet port is not POE (Power over Ethernet) compatible!**

Ethernet cable plugs into the RJ45 connector labeled as ETH. (See figure below.)

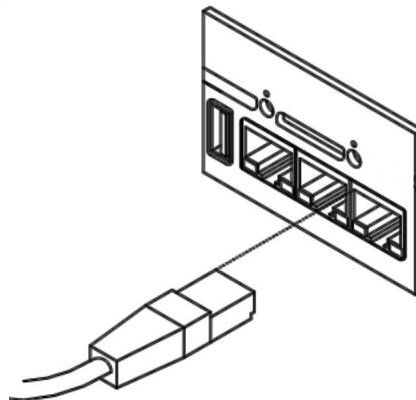


Figure 17: Ethernet cable connection

## 5.7 Port 1

Based on the model number (see chapter 3.4), the expansion PORT 1 may be configured for:

- Ethernet (same as in chapter 5.6 but plug into PORT1)
- SWITCH (together with PORT 2)
- serial communications RS-232 (see chapter 5.11.1) and RS-485/422 (see chapter 5.11.2)
- 12-bit I/O (AI, DI, DO), see chapter 5.11.3

## 5.8 Port 2

Based on the model number (see chapter 3.4), the expansion PORT 2 may be configured for:

- SWITCH (together with PORT 1)
- serial communications RS-232 (see chapter 5.11.1) and RS-485/422 (see chapter 5.11.2)
- Wi-Fi (connector PORT2 used for indication only – see chapter 5.2.1)
- SmartMeshIP (connector PORT2 used for indication only – see chapter 5.2.1)



Note: Wi-Fi and SmartMesh IP are wireless – RJ45 connector is used for indication only. (See chapter 5.2.1.)