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SPECTRE Router

USER 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.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following 2 conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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1.0 Symbols Used



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



Attention – Problems that can arise in specific situations.



Information – Useful tips or information of special interest.

GPL license

Source codes under GPL license are available free of charge by sending an email to support@bb-elec.com.

Router version

The properties and settings associated with the cellular network connection are not available in non-cellular 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
ISO 9001**



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.



2.0 Safety instructions

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.

- 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.



- **Caution!** The SIM card could be swallowed by small children.
- Input voltage must not exceed 30V 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 that you create a backup copy of all the important settings stored in the router's memory.

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.

3.0 Router Description

3.1 Description

The SPECTRE Cellular industrial router is 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.

The standard configuration includes one 10/100 Ethernet port, one USB Host port, one binary Input/output (I/O) port and dual SIM card holders. Network redundancy is provided by the second SIM card holder. It also contains 2 auxiliary 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. Additional software like SmartCluster VPN Server and R-SeeNet for router monitoring are also supported.

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
- Documentation CD
- Quick Start Guide



Spectre 3G with WiFi

Fig. 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

Auxiliary Port Functions (Model Dependent):

The ports can be connected as follows.

PORT 1	RS232, RS485/422, ETHERNET, CNT, XC-SW (in combination with PORT 2)
PORT 2	RS232, RS485/422, XC-SW (together with PORT 1)

Table 1: Auxiliary port possibilities

Spectre 3G Wireless Routers		
Auxiliary Ports		
Model No.	Port 1	Port 2
RT3G-300	No connect	No connect
RT3G-302	No connect	RS-232
RT3G-304	No connect	RS-422/485
RT3G-311	Ethernet	Ethernet
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	No connect
RT3G-310-W	Ethernet	No connect
RT3G-320-W	RS-232	No connect
RT3G-330-W	12-bit I/O (AI, DI, DO)	No connect
RT3G-340-W	RS-422/485	No connect
“-W” Models Are Wi-Fi enabled		

Table 2: Model numbers

Spectre LTE Wireless Routers (Verizon)		
Auxiliary Ports		
Model No.	Port 1	Port 2
RTLTE1-300	No connect	No connect
RTLTE1-302	No connect	RS-232
RTLTE1-304	No connect	RS-422/485
RTLTE1-311	Ethernet	Ethernet
RTLTE1-322	RS-232	RS-232

RTLTE1-324	RS-232	RS-422/485
RTLTE1-330	12-bit I/O (AI, DI, DO)	No connect
RTLTE1-300-W	No connect	No connect
RTLTE1-310-W	Ethernet	No connect
RTLTE1-320-W	RS-232	No connect
RTLTE1-330-W	12-bit I/O (AI, DI, DO)	No connect
RTLTE1-340-W	RS-422/485	No connect
“-W” Models Are Wi-Fi enabled		

Table 3: LTE Model numbers for Verizon

Spectre LTE Wireless Routers (AT&T)		
Auxiliary Ports		
Model No.	Port 1	Port 2
RTLTE2-300	No connect	No connect
RTLTE2-302	No connect	RS-232
RTLTE2-304	No connect	RS-422/485
RTLTE2-311	Ethernet	Ethernet
RTLTE2-322	RS-232	RS-232
RTLTE2-324	RS-232	RS-422/485
RTLTE2-330	12-bit I/O (AI, DI, DO)	No connect
RTLTE2-300-W	No connect	No connect
RTLTE2-310-W	Ethernet	No connect
RTLTE2-320-W	RS-232	No connect
RTLTE2-330-W	12-bit I/O (AI, DI, DO)	No connect
RTLTE2-340-W	RS-422/485	No connect
“-W” Models Are Wi-Fi enabled		

Table 4: LTE Model numbers for AT&T

3.5 Dimensions

Basic dimensions, metal box

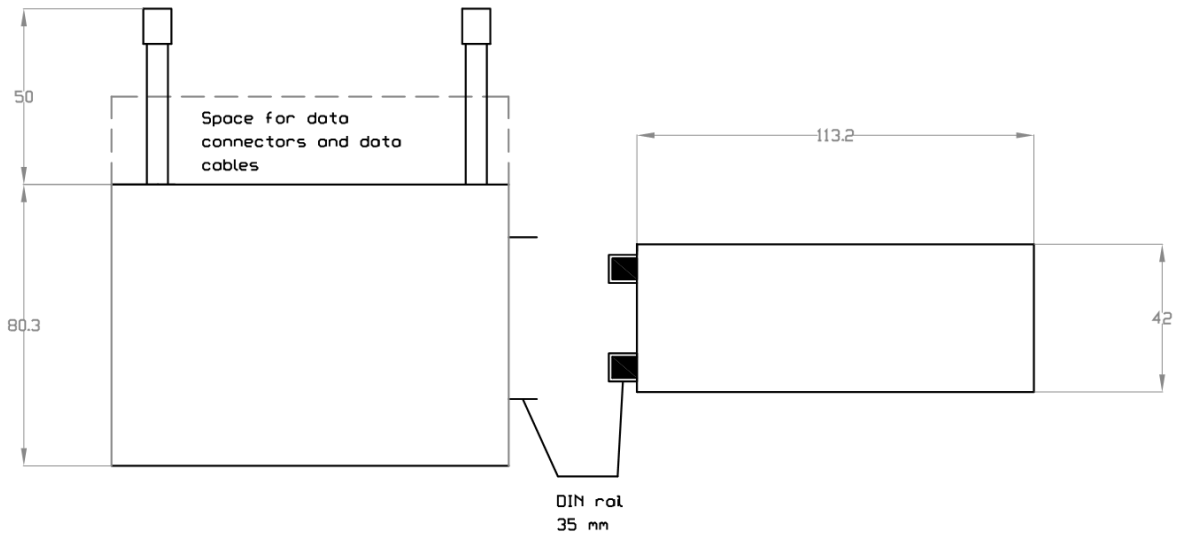


Fig. 2: Basic dimensions, metal box

4.0 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.

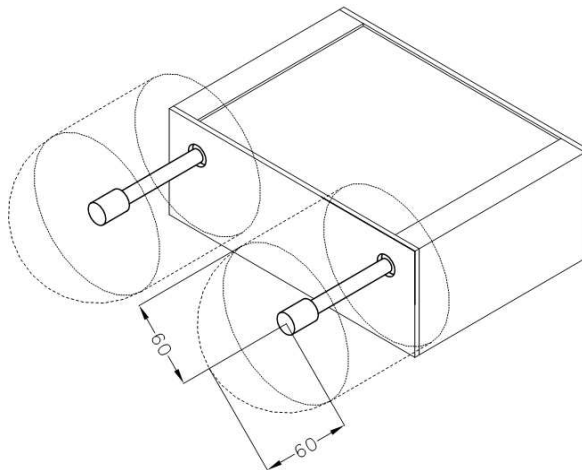


Fig. 3: Space around antenna



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.

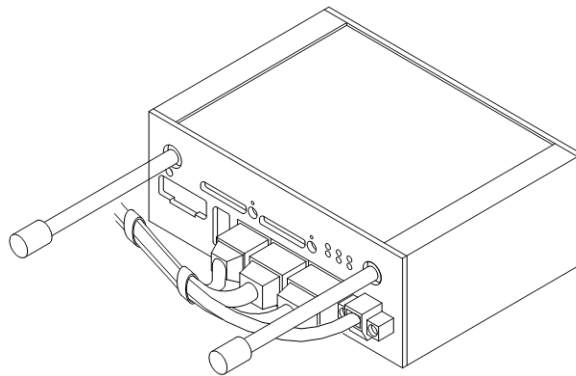


Fig. 4: Cable routing



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

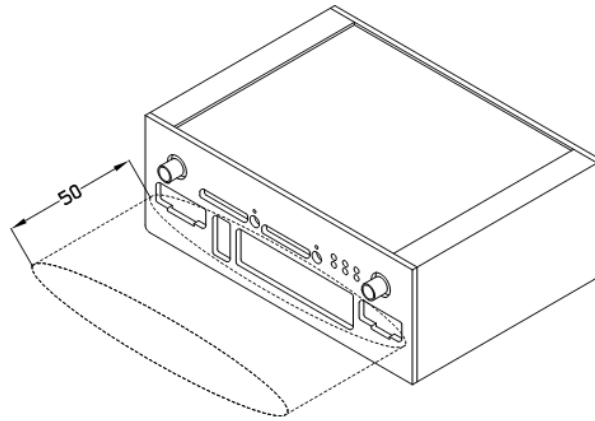


Fig. 5: Space in front connectors



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

5.0 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 I/O
PORT 2	RJ45	RS-232/422/485 or ETHERNET
ANT	SMA	Main cellular antenna.
DIV	SMA	Diversity cellular antenna.
AUX	RP-SMA	Wi-Fi antenna.
USB	USB-A Host	USB connector.
I/O	3-pin	Binary input and output.
SIM1	-	SIM card holder.
SIM2	-	SIM card holder 2

Table 5: Front panel description

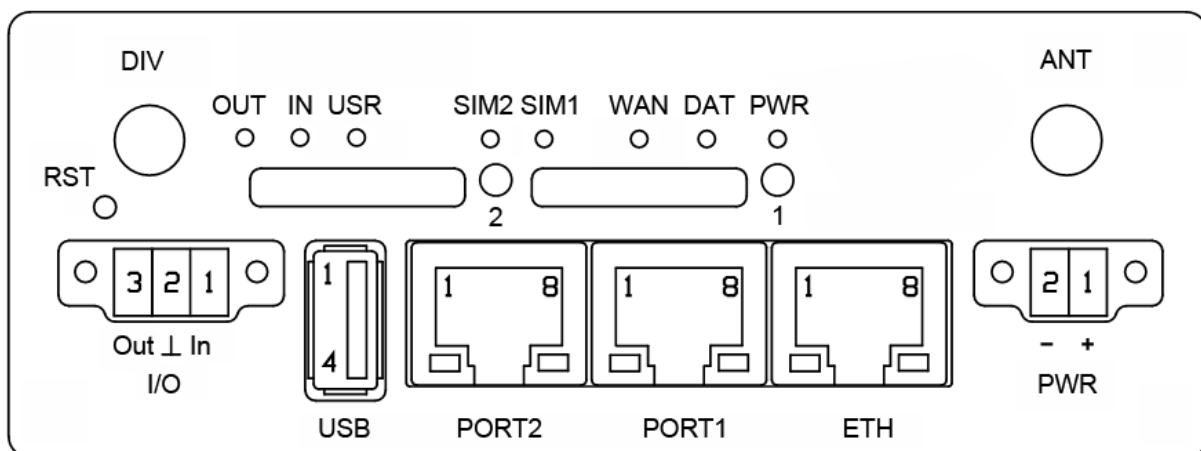


Fig. 6: Front panel SPECTRE Cellular Router

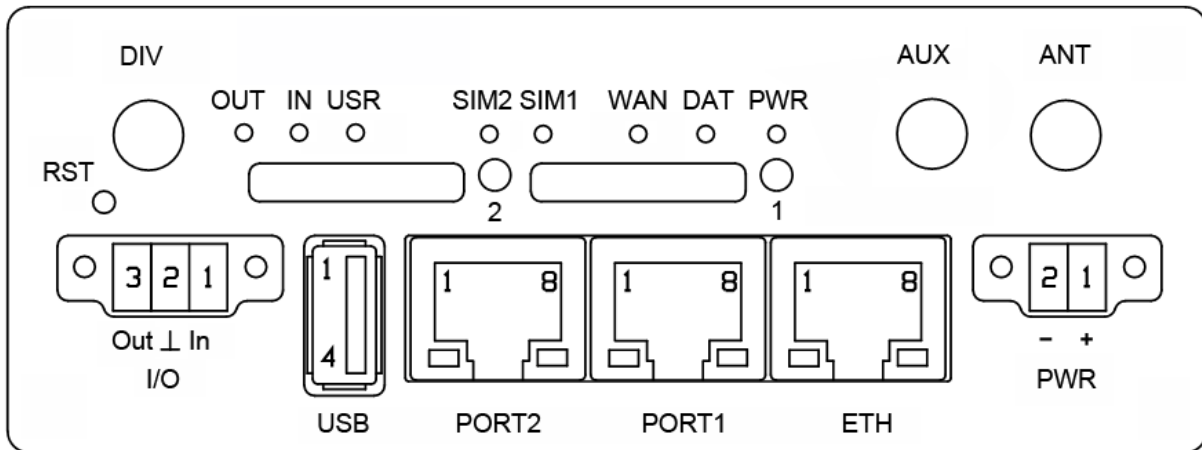


Fig. 7: Front panel SPECTRE Cellular Router with Wi-Fi

5.2 Status Indicators

Label	Color	State	Description
PWR	Green	Blinking On	Router is ready Router is initializing.
WAN	Red	Blinking	Communication in progress
DAT	Yellow	Flashing	PPP connection established
		1 x flash per second	Signal strength is from -50 dBm to -69 dBm
		2 x flash per second	Signal strength is from -70 dBm to -89 dBm or the difference between neighboring cells is exactly 3 dBm
		3x flash per second	Signal strength is from -90 dBm to -113 dBm or the difference 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.	
SIM1	Yellow	On	SIM card 1 is active
SIM2	Yellow	On	SIM card 2 is active

Table 6: Router status indication

Note: The State indication of the PPP LED is updated every 10 seconds.

5.2.1 Auxiliary Port Status Indicators

5.2.1.1 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 7: Ethernet LED status indication

5.2.1.2 RS-232 Ports

LED port indicator	
Green LED	Blinks on Receive data
Yellow LED	Blinks on Transmit data

Table 8: RS-232 LED status indication

5.2.1.3 I/O Ports

LED port indicator	
Green LED	Indicates binary input 0
Yellow LED	Indicates binary input 1

Table 9: I/O Port LED status indication

5.2.1.4 RS-485/422 Ports

LED port indicator	
Green LED	Blinks on Receive data
Yellow LED	Blinks on Transmit data

Table 10: RS-485/422 LED status indication

5.2.1.4 WiFi

LED port indicator	
Green LED	Indicates WiFi Power On
Yellow LED	Always Off

Table 11: RS-485/422 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 12: Connection of power connector

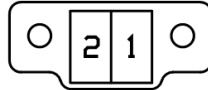


Fig. 8: Power connector

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

The power consumption during receiving is 1W. The peak power consumption during data sending is 5.5W. For correct operation, the power source must be able to supply a peak current of 600mA.

The power cable connects to the router via locking screws. (See Fig. 21)

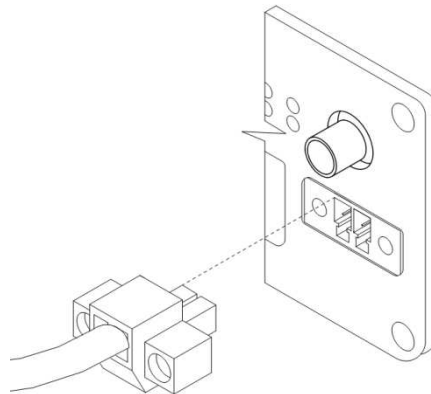


Fig. 9: Connection of power supply connector

Circuit example:

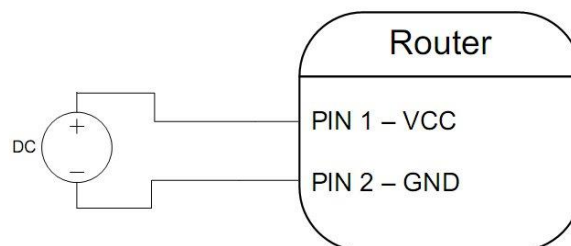


Fig. 10: Connection of power supply

The positive VCC input is marked by a red socket on the power.

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**. This antenna improves the receive sensitivity of the router and should be used in areas with weak signal strength.

On SPECTRE Cellular routers with Wi-Fi, a third antenna is connected to the **AUX** antenna connector on the front panel.



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

Example of antenna:



Fig. 11: External antenna

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

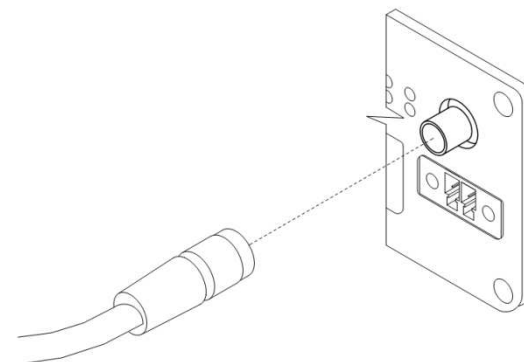


Fig. 12: Connecting the antenna

The diversity antenna improves the wireless features of the router

5.5 SIM Card Reader

The SIM card reader supports 3 V and 1.8 V SIM cards. It is located on the front panel of the router. The router will not operate on UMTS 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:

Press the small yellow 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 Fig. 25)

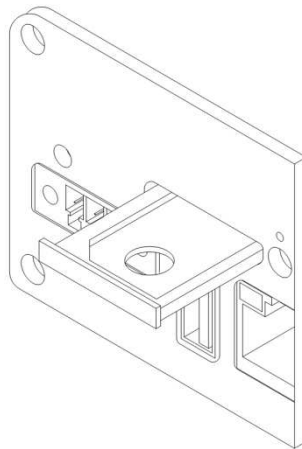


Fig. 13: Ejected SIM card holder

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 13: Ethernet connector

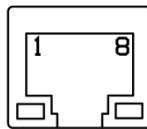


Fig. 14: Ethernet connector



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

Ethernet cable plugs into the RJ45 connector labeled as ETH. (See Fig 27)

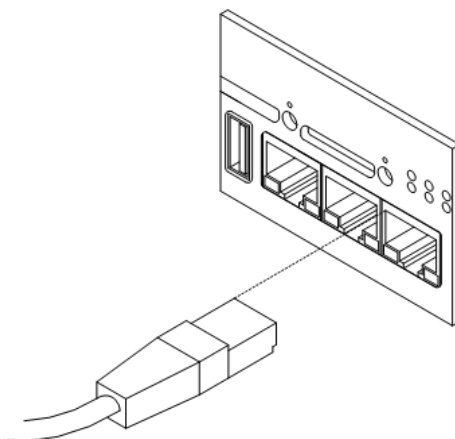


Fig. 15: Ethernet Cable Connection

The Ethernet router connection:

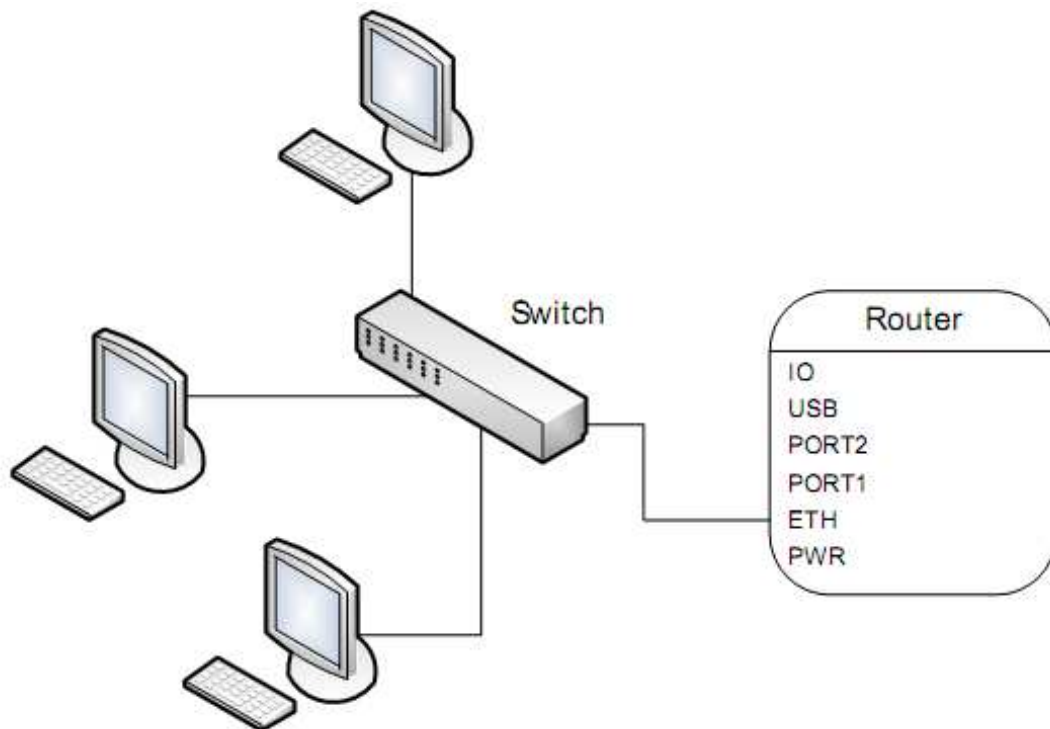


Fig. 16: Example of router connection

5.7 Ethernet Port

Port 1

Port One may be configured for Ethernet, serial communications (RS-232/485/422), or (I/O – CNT) based on the router model number. Port Two may be configured for serial communications (RS-232/485/422), or (I/O – CNT). Either port can be fitted with internal switch XC-SW.

Port 2

Port 2 may be configured for serial communications (RS-232/485/422), or (I/O – CNT). Either port can be fitted with internal switch XC-SW.

5.7.1 RS-232 Ports

The RS-232 port is configured as a Data Communication Equipment (DCE). A KD2 adapter cable can be used to convert the RJ-45 connector to a standard DB9 serial connector.

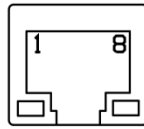


Fig. 17: RS232 port connector

Pin no.	Signal mark	Description	Direction
1	RTS	Request To Send	Input
2	CTS	Clear To Send	Output
3	DTR	Data Terminal Ready	Input
4	DSR	Data Set Ready	Output
5	GND	Signal ground	
6	RXD	Receive Data	Output
7	CD	Carrier Detect	Output
8	TXD	Transmit Data	Input

Table 14: RS232 connector Pinout

Example of connecting a meter to the router:

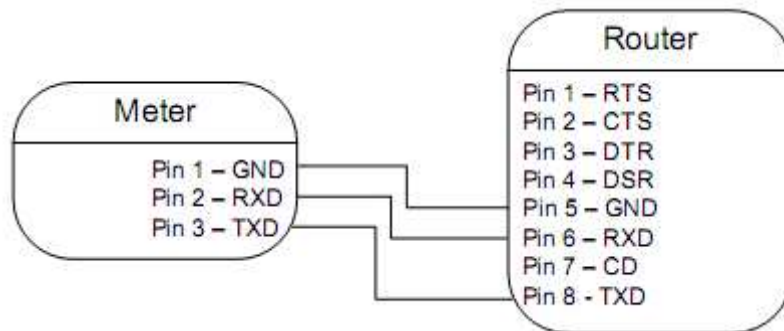


Fig. 18: Meter connection to router