

LTE Industrial Router

SmartStart SL302

USER MANUAL



ADVANTECH

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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 license

Source codes under GPL license are available at <https://icr.advantech.cz/source-code> address.



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1. Safety Instructions



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.
- Turn off the router and disconnect it from power supply before handling the SIM card.
- **Caution!** This equipment is not suitable for use in locations where children are likely to be present. The SIM card could be swallowed by small children.
- Input voltage must not exceed 36 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 traveling 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.



2. Directives and Statements

2.1 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 environmental impact. 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. 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.

2.2 FCC Compliance Statement

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.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Industry Canada license-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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Important: Changes or modifications to this product not authorized by Advantech Czech could void the electromagnetic compatibility (EMC) and wireless compliance and negate your authority to operate the product. This product has demonstrated EMC compliance under conditions that included the use of compliant peripheral devices and shielded cables between system components. It is important that you use compliant peripheral devices and shielded cables between system components to reduce the possibility of causing interference to radios, televisions, and other electronic devices.

3. Router Description

Cellular router SmartStart SL302 is designed for wireless communication in mobile networks that use traditional cellular technologies. The primary purpose of this router is its use in the newest Category 1 (Cat.1) services on the cellular LTE network of the **AT&T** and **Verizon** carriers.

3.1 LTE Category 1 (Cat.1)

Given the uncertain future of 2G technologies (they are gradually sunseting), it needs to find a suitable (natural) replacement. LTE Category 1 (Cat.1) in general is the only real alternative to 2G. It is specifically designed to bring 4G LTE capabilities to the Internet of Things (IoT) and machine-to-machine (M2M) applications. Like all LTE services, Cat.1 provides a low-latency broadband connection but capped at 10 Mbps download (and 5 Mbps upload). It is an ideal solution for smart meters for utilities, telematics for vehicle tracking and fleet management and security use cases, such as in alarm systems.

3.2 Basic HW Information

As a standard, the SmartStart router is equipped with one Ethernet 10/100 Mbps, one serial interface RS232, one binary input and one output. SL302 also contains two readers for 3 V and 1.8 V SIM cards, which are placed on the rear panel of the device. The router can be equipped with a WiFi module, but this must be part of the initial configuration – it cannot be assembled to the router at some point in the future. The router is supplied in a plastic casing.

3.3 Configuration and Diagnostics

The router can be configured using a password-protected Web interface. The web interface provides (after logging in) detailed statistics about the router activities, signal strength, detailed system logs etc. This device supports the creation of VPN tunnels using technologies IPSec, OpenVPN and L2TP for secure communications. There are also supported functions such as IPv6 (the latest revision of the Internet Protocol), DHCP, NAT, NAT-T, DynDNS, NTP, VRRP, control by SMS, primary connection backups and many other functions are also supported.

Other diagnostic functions ensuring continuous communication include automatic inspection of PPP connection offering an automatic restart feature in case of connection is lost, or hardware watchdog which monitors the status of the router. Using a special window (start up script window) you may insert Linux scripts for various actions. For some applications is the key possibility to create several different configurations for one router which can be switched as needed (e.g. using SMS or status of the binary input). Cellular routers may automatically update configuration and firmware from server. This allows mass reconfiguration of many routers in one time.

The router also supports additional software such as R-SeeNet for permanent traffic monitoring of routers.



Examples of possible applications

- mobile office
- smart meters for utilities
- fleet management
- security systems
- telematic
- telemetric
- remote monitoring
- vending and dispatcher machines

3.4 Usage of the Router

The router is primarily intended for these four basic situations:

I. Access to the Internet from LAN

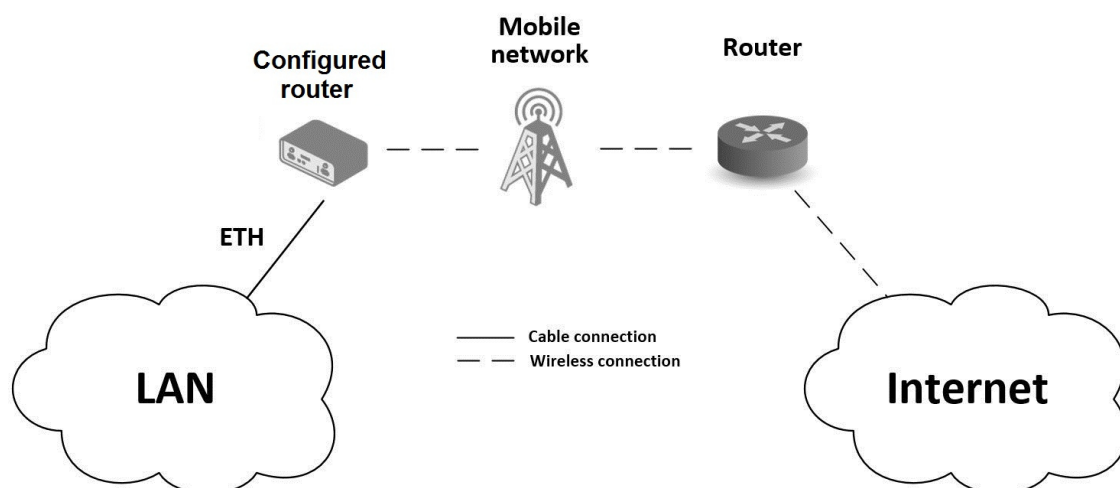


Figure 1: Access to the Internet from LAN

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

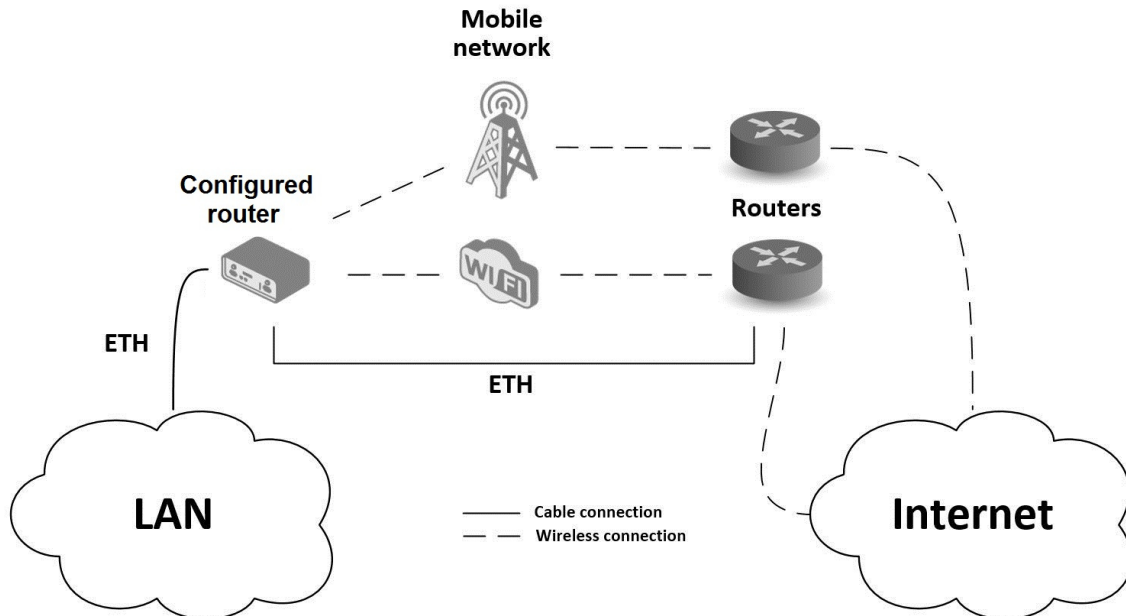


Figure 2: Backed up access to the Internet

III. Secure networks interconnection or using VPN

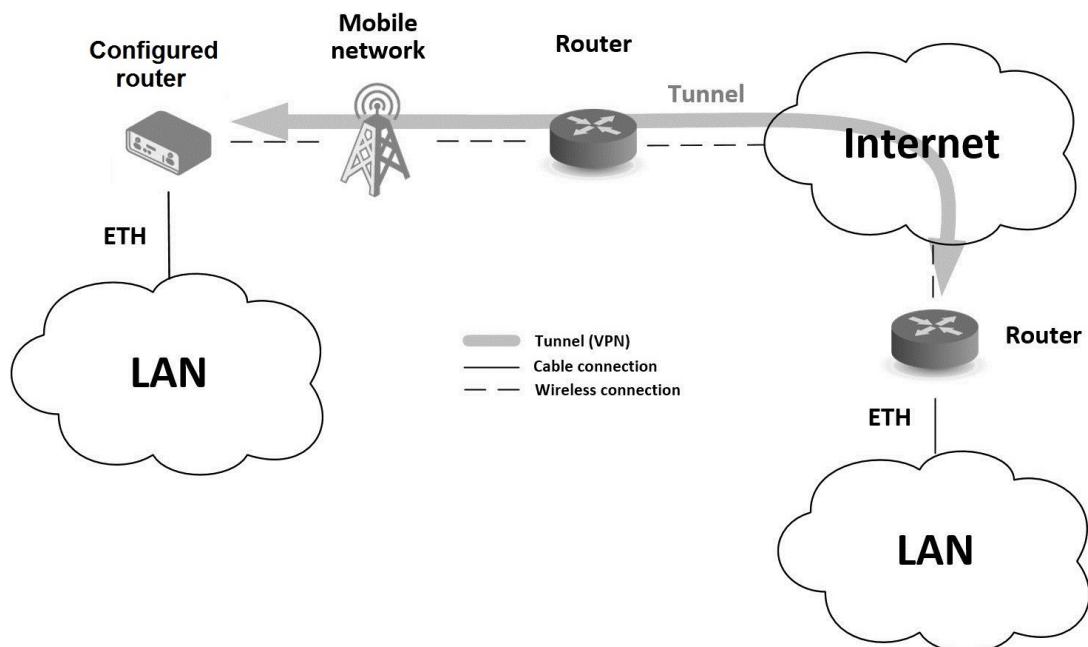


Figure 3: Using a VPN tunnel

IV. Serial Gateway

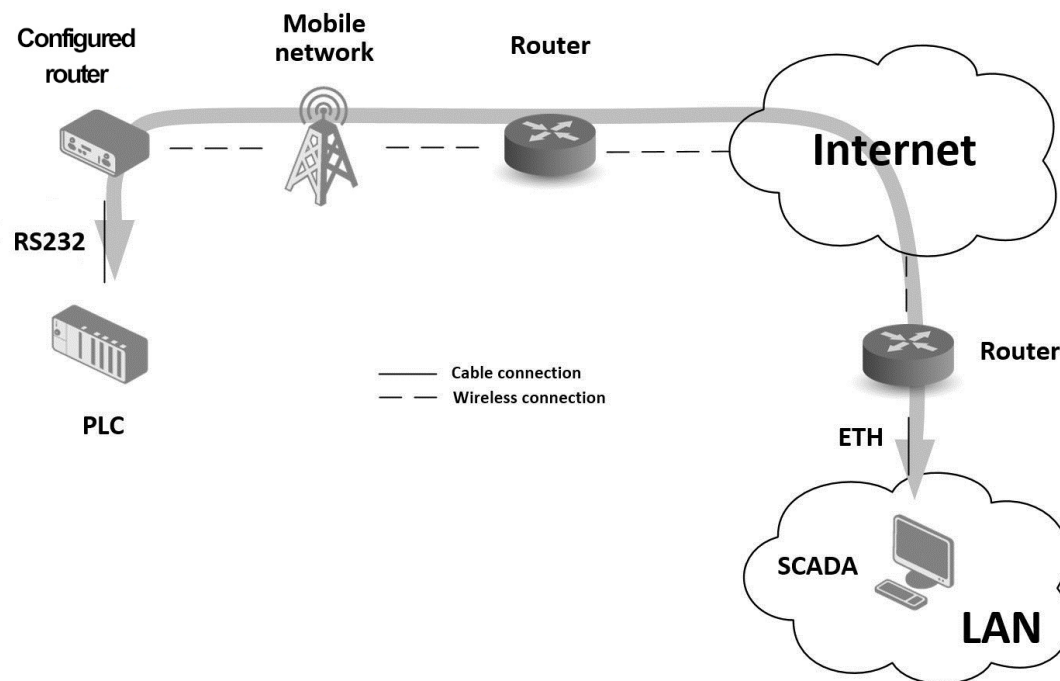


Figure 4: Serial Gateway

4. Contents of Package

The basic router set available for delivery includes the following items:

- router,
- power and IO cable (1.5 m long),
- clip for the DIN rail (two screws are included),
- printed *Quick Start Guide Leaflet*.

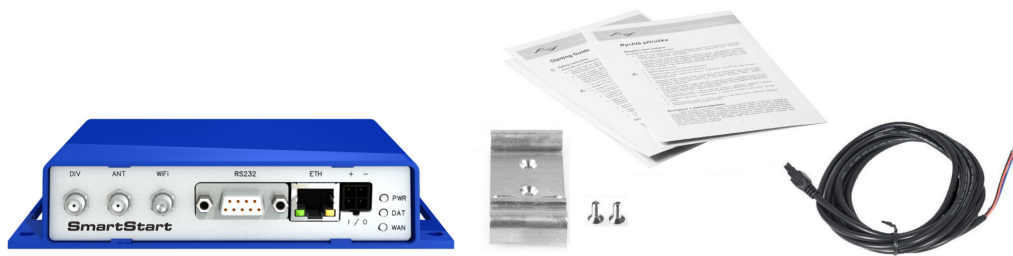


Figure 5: Contents of package

5. Router Design

5.1 Router Versions

The SmartStart SL302 router is supplied in the following versions (see table below). All versions are available only in plastic casing.

Router versions	SIM	BIN	BOUT	ETH	RS232	WiFi
SL302 with RS232	2 x	1 x	1 x	1 x	1 x	
SL302 with RS232 & WiFi	2 x	1 x	1 x	1 x	1 x	1 x

Table 1: Router versions

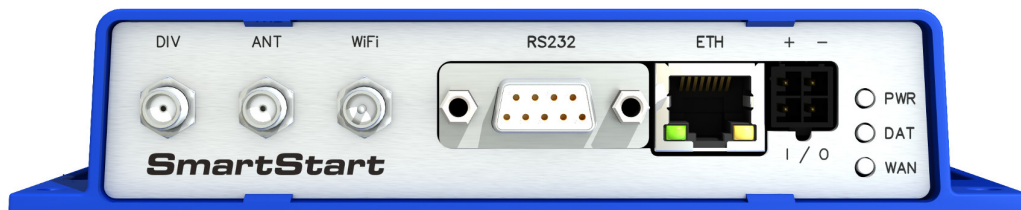


Figure 6: Front panel

5.2 Delivery Identification

Trade name	Product name	Description
SL302	SmartStart	LTE router (Cat.1) for NAM (AT&T and/or Verizon carrier - see order codes below)

Table 2: Delivery identification

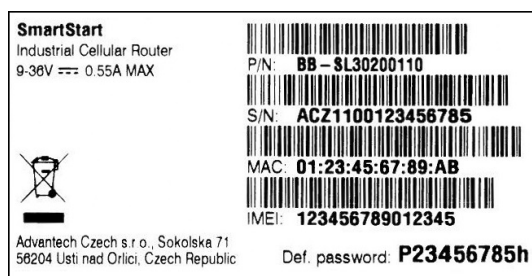


Figure 7: Product label

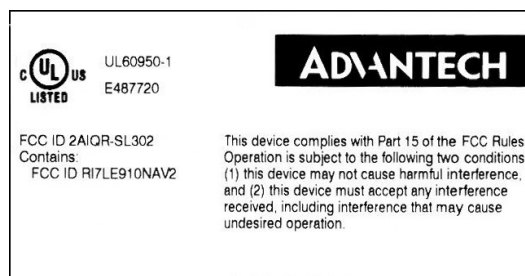


Figure 8: Certification label

5.3 Order Codes

The table below shows an overview of order codes.

Name	Order code	Features – interfaces
SmartStart SL302	BB-SL30200010	LTE module Cat.1 AT&T , 1x ETH, 1x RS232, 1x BIN, 1x BOUT, 2x SIM reader
SmartStart SL302	BB-SL30210110	LTE module Cat.1 AT&T , 1x ETH, 1x RS232, 1x BIN, 1x BOUT, 2x SIM reader, WiFi
SmartStart SL302	BB-SL30200010-X	LTE module Cat.1 AT&T + Verizon , 1x ETH, 1x RS232, 1x BIN, 1x BOUT, 2x SIM reader
SmartStart SL302	BB-SL30210110-X	LTE module Cat.1 AT&T + Verizon , 1x ETH, 1x RS232, 1x BIN, 1x BOUT, 2x SIM reader, WiFi

Table 3: Order codes overview

5.4 Basic Dimensions of the Router

5.4.1 Front view

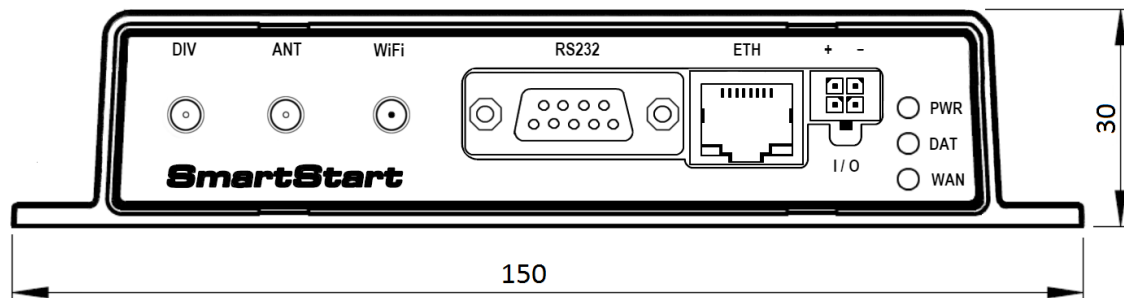


Figure 9: Front view

5.4.2 Top view

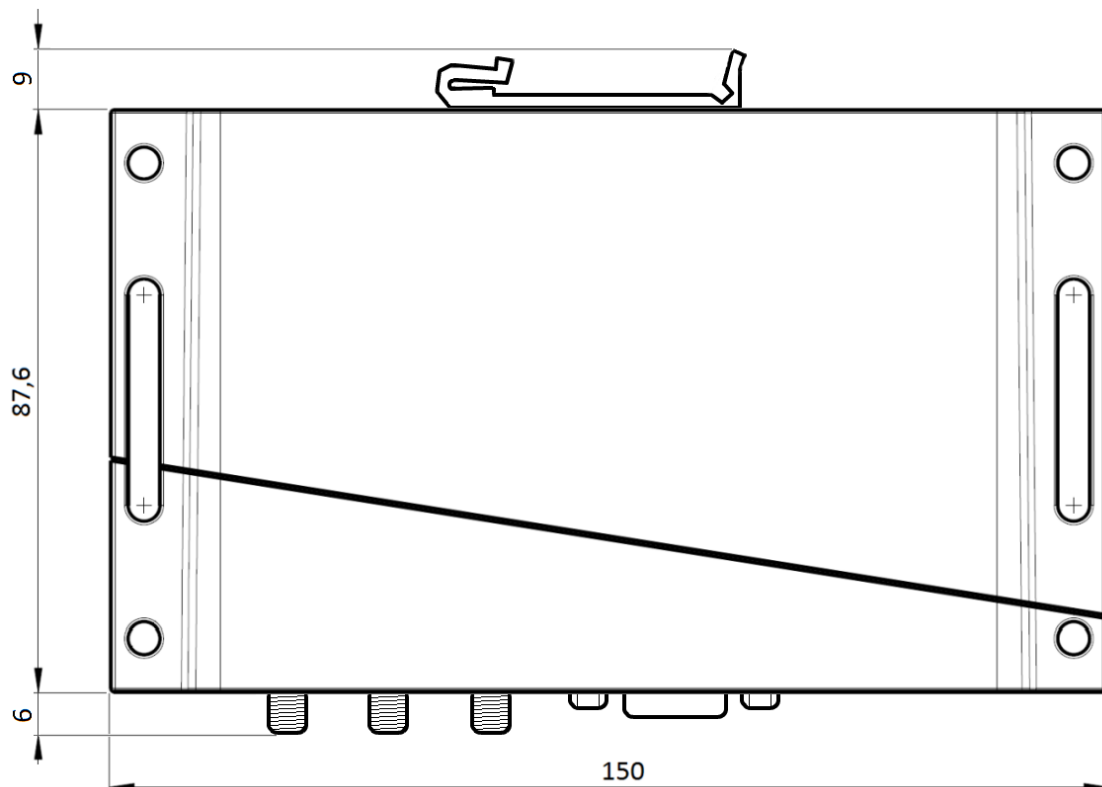


Figure 10: Top view

5.4.3 Bottom view

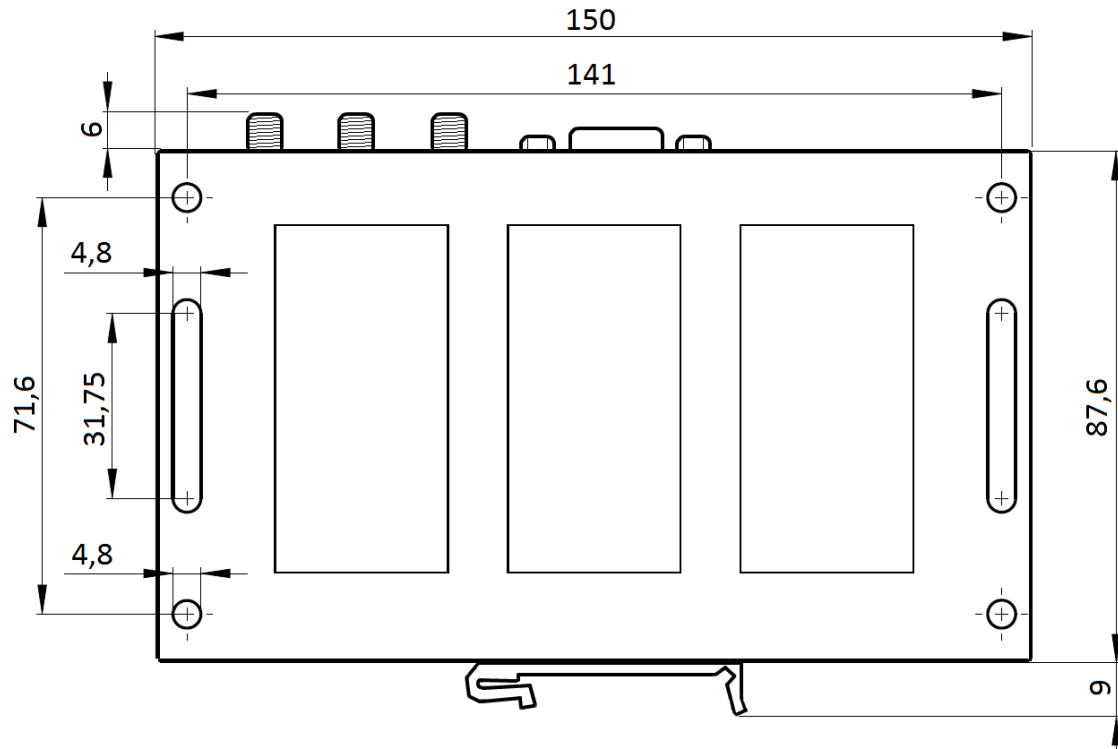


Figure 11: Bottom view

5.4.4 Rear view

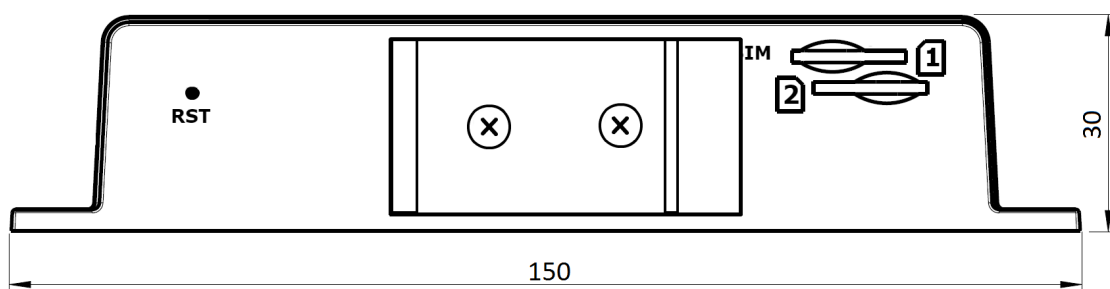


Figure 12: Rear view

5.5 Mounting recommendations

- It is possible to place the router on a flat surface,
- mount the router on a wall using four holes in corners (Figure 11) and screws with diameter 4 mm,
- attach the router on DIN rail EN 60715 with the included clip BB-SBD25.

The router meets EN 61439-1:2011 requirements/certifications for low-voltage switchgear and control gear assemblies. These environments are described as:

- 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.



To comply with the EN 61439-1:2011 specification, follow these instructions:

- 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 ~ 230 V/50 Hz or ~ 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 power supply of the router, data cables and antenna within the switchboard.

5.6 Removal from the DIN rail



The DIN rail clip is suitable for a DIN rail according to EN 60715 standard only. The default position of metal rail clip, which is used for mounting the router on a DIN rail, is shown in the following figure. When mounting the DIN rail clip, tighten the screws with max. 0.4 Nm torque.



Figure 13: Default position of metal DIN rail clip

To remove the router from the DIN rail, push the router down lightly, so the bottom part of the DIN rail clip (hitched to the DIN rail) gets out of the rail and then pull out the bottom part of the router away from the DIN rail.

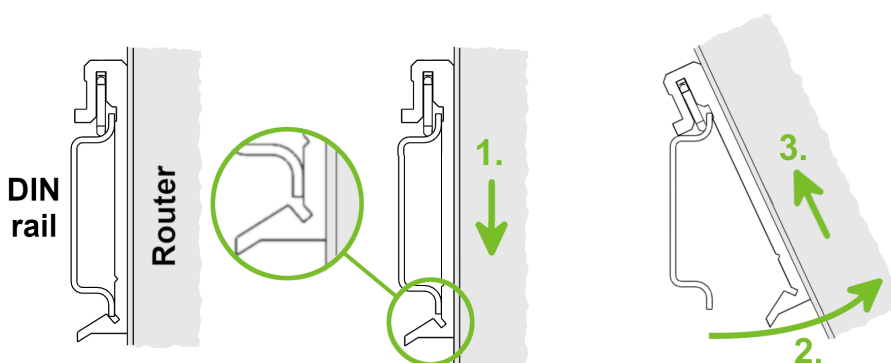


Figure 14: Removal from the DIN rail

5.7 Description of the Rear Panel

The rear panel contains two holders for SIM cards (*SIM1*, *SIM2*) and *RST* button used to restore the default configuration followed by rebooting of the router. Picture with the rear view of the router is on figure 12. Description of resetting procedure is described in chapter 5.8.7.

5.8 Description of the Front Panel

On the front panel is the following:

Caption	Connector	Description
PWR/IO	4-pin	Connector for the power supply and connection of the binary input and output.
ETH	RJ45	Connector for connection into the computer network.
RS232	DB9 female	Connector for serial interface RS232.
ANT	SMA	Connector for main antenna.
DIV	SMA	Connector for diversity antenna.
WiFi	R-SMA	Connector for WiFi antenna (only for versions with WiFi module!).

Table 4: Front panel description



Figure 15: SmartStart front panel

5.8.1 Status indication

There are three LED indicators on the front panel to provide router status information. The ETH port has two additional LEDs that provide information about the port status.

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 the radio channel.
WAN	Yellow	Fades out 1x/5 s Fades out 1x/2 s Fades out 1x/1 s	Signal strength is good. Signal strength is fair ¹ . Signal strength is poor ² . For value ranges of signal strength see <i>Configuration manual</i> , chapter <i>Mobile WAN Status</i> .
ETH	Green	On Off	Selected 100 Mbps. Selected 10 Mbps.
ETH	Yellow	On Blinking Off	The network cable is connected. Data transmission. The network cable is not connected.

Table 5: Status indication



The status indication of the WAN LED is updated every 10 seconds.

¹Or the difference between neighbouring cells is exactly 3 dBm.

²Or the difference between neighbouring cells is smaller than 3 dBm.

5.8.2 Power PWR/IO Connector

Panel socket 4-pin.

Pin number	Signal mark	Description
1	GND(-)	Negative pole of DC supply voltage
2	VCC(+)	Positive pole of DC supply voltage (+9 to +36 V DC, 1 A)
3	IN0	Binary input
4	OUT0	Binary output

Table 6: Connection of PWR / IO connector

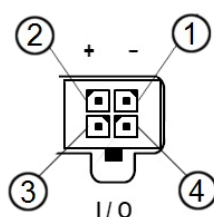


Figure 16: PWR / IO connector



Unit has to be supplied by a power supply specified as a Limited Power Source (LPS) according to Annex Q of IEC 62368-1:2014. If the power supply/cable provided with device is not used, always use the cables with minimum wire size (nominal cross section) 0.5 square mm for power supply.

The power supply for the router must be between +9 V to +36 V DC, with current output 1 A. Protection against reversed polarity without signaling is built into the router. **Note:** The protection against reversed polarity is lost if the negative pole is grounded!



The router is awakened after the power supply outage and subsequent renewal.

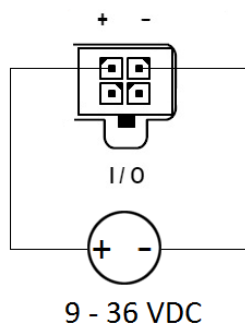


Figure 17: Circuit example – connection of power supply

The PWR/IO interface is also designed for the processing of binary input and control (setting) of binary output.

Binary Input

Logical 0/1*	Voltage	Web interface status
logic 0	0 – 0.7 V	On
logic 1	1.6 – 36 V	Off

Table 7: Characteristics of binary input

* The binary input status in the Shell is returned via `io get bin0`.

Binary Output

The binary output is open in the default configuration. The current of the binary output is limited by a resettable fuse (200 mA).

Binary inputs and output connections

Binary inputs and output connections example:

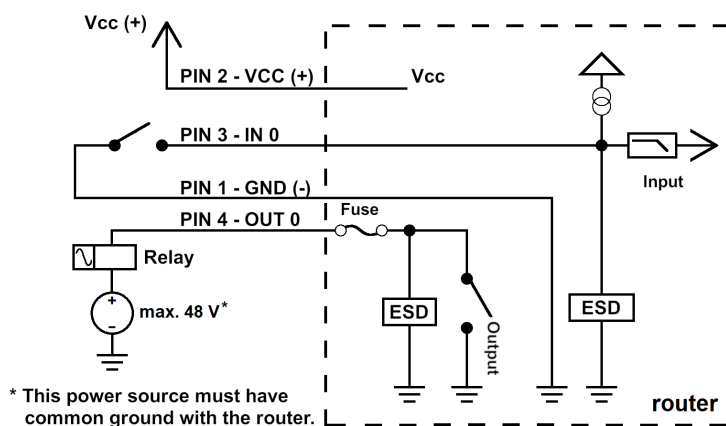


Figure 18: Binary connection



All metal parts are connected together with the negative pole of power supply (common pole). However, the router box may not be connected to the negative pole properly.

Low Power Mode



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

LPM (Low Power Mode) is a router mode where the router is in sleep mode with minimal power consumption. The router can be woken up from this mode by a signal applied to the BIN0 input or after a predetermined period of time. Putting the router into LPM mode can be done using the `lpm` command, see [Commands and Scripts](#) application note for more details. Consumption in LPM mode may vary depending on the configuration of the router.

5.8.3 Antenna Connector ANT, DIV and WiFi

The main and diversity antennas are connected to the router using the SMA connector on the front panel. There is also an R-SMA antenna connector available, through which an additional antenna can be connected, if the router is equipped with a WiFi module.

The *ANT* connector is used to First, connect the main antenna to the router. To connect the diversity antenna, the second antenna connector *DIV* is used. An R-SMA connector named *WiFi* is designed for the connection of a WiFi antenna (available only for versions with a WiFi module).



The router can not operate without a main antenna connected through the port marked as *ANT*!



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



An SMA connector is used for the connection of the antenna. The antenna is connected by screwing this antenna to the SMA connector on the router's front panel (see the figure below). Recommended tightening moment is 0.9 Nm.

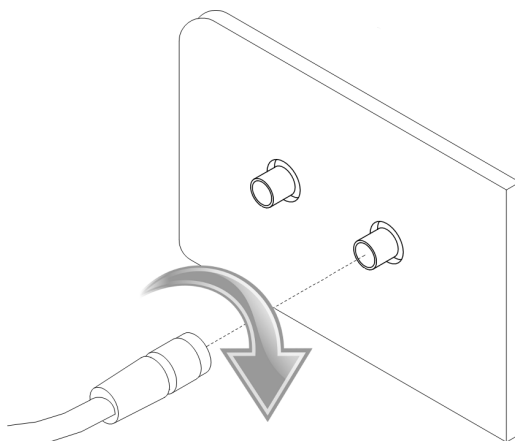


Figure 19: Connecting the antenna



A diversity antenna improves the radio capability of the router at low signal strength.

5.8.4 SIM Card Reader

The SmartStart SL302 contains two readers for 3 V and 1.8 V SIM cards, which are located on the rear panel of the device. In order for the router to function, it is necessary to insert an activated SIM card with an unblocked PIN code. The SIM cards may have different APNs (Access Point Names) adjusted.



Supported type of SIM cards: **Mini SIM** (2FF), dimensions 25.0 x 15.0 x 0.76 mm.

Changing the SIM card:

- Always disconnect the router from the power supply before handling the SIM card.
- To remove the SIM card, use the flat end of a spudger, or your fingernail, press the SIM card slightly into its slot until you hear a click.
- After hearing this click, release the card, and it will pop out of its slot.
- Remove the SIM card and push any other SIM card into the slot until it clicks into place.

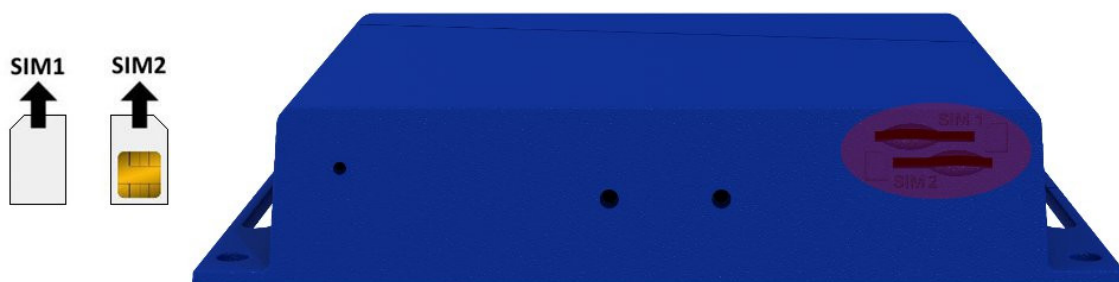


Figure 20: SIM cards

5.8.5 Ethernet Port ETH

The panel socket RJ45 is used for this interface. The isolation barrier of the Ethernet signal ports against the ground is 1500 V.

Pin	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 8: Connection of Ethernet connector

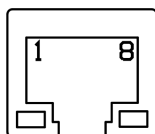


Figure 21: Ethernet connector

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

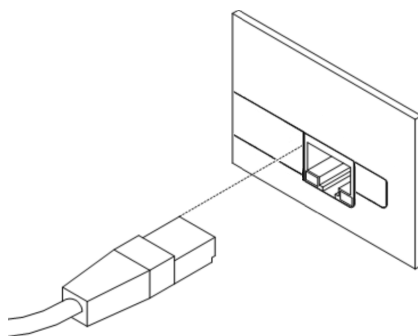


Figure 22: Connection of Ethernet cable

5.8.6 Serial Port RS232

This interface is physically connected through the DB9 Female connector.

Pin	Signal mark	Description	Data flow direction
1	DCD	Data Carrier Detect	Output
2	RXD	Receive Data	Output
3	TXD	Transmit Data	Input
4	DTR	Data Terminal Ready	Input
5	GND	System Ground	—
6	DSR	Data Set Ready	Output
7	RTS	Request to Send	Input
8	CTS	Clear to Send	Output
9	RI	Ring Indicator	NC

Table 9: Connection of RS232 connector

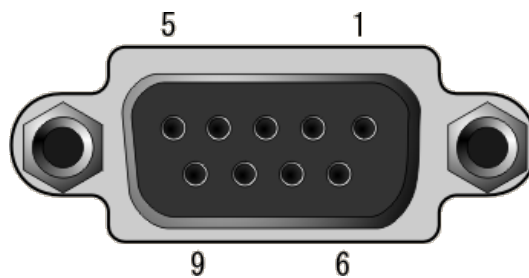


Figure 23: RS232 connector

5.8.7 Reset

When the *PWR* LED starts flashing on the front panel, it is possible to restore the default configuration of the router by pressing the *RST* button on the rear panel. After pressing this button, the default configuration will be restored and the router will reboot (after which the green LED will be on).

In order to press the *RST* button it is necessary to use a narrow screwdriver or other small tool.

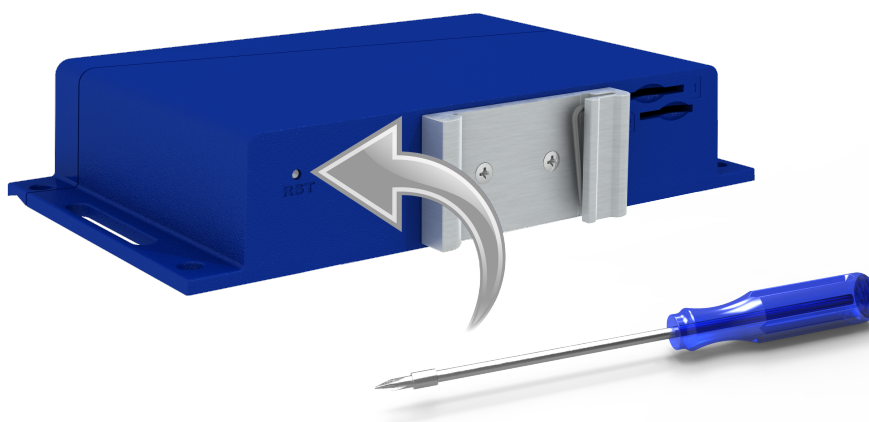


Figure 24: Router reset



Before resetting the router, it is recommended to back up the router configuration settings (see *Configuration manual*) because resetting the router will return all configuration settings to their default states.

It is important to distinguish between a router reset and reboot.

Action	Router behavior	Invoking events
Reboot	Turns off and then turns on the router	Disconnect and reconnect the power, press the <i>Reboot</i> button in the web configuration
Reset	Restores the default configuration and reboots the router	Press the <i>RST</i> button

Table 10: Description of router reset and restart

6. First Use

6.1 Connecting the Router Before the First Use

Before putting the router into operation it is necessary to connect all of the components that are required to run your applications. Don't forget to insert a SIM card.



The router can not operate without a connected antenna, SIM card and power supply. If the antenna is not connected, the router may be damaged.

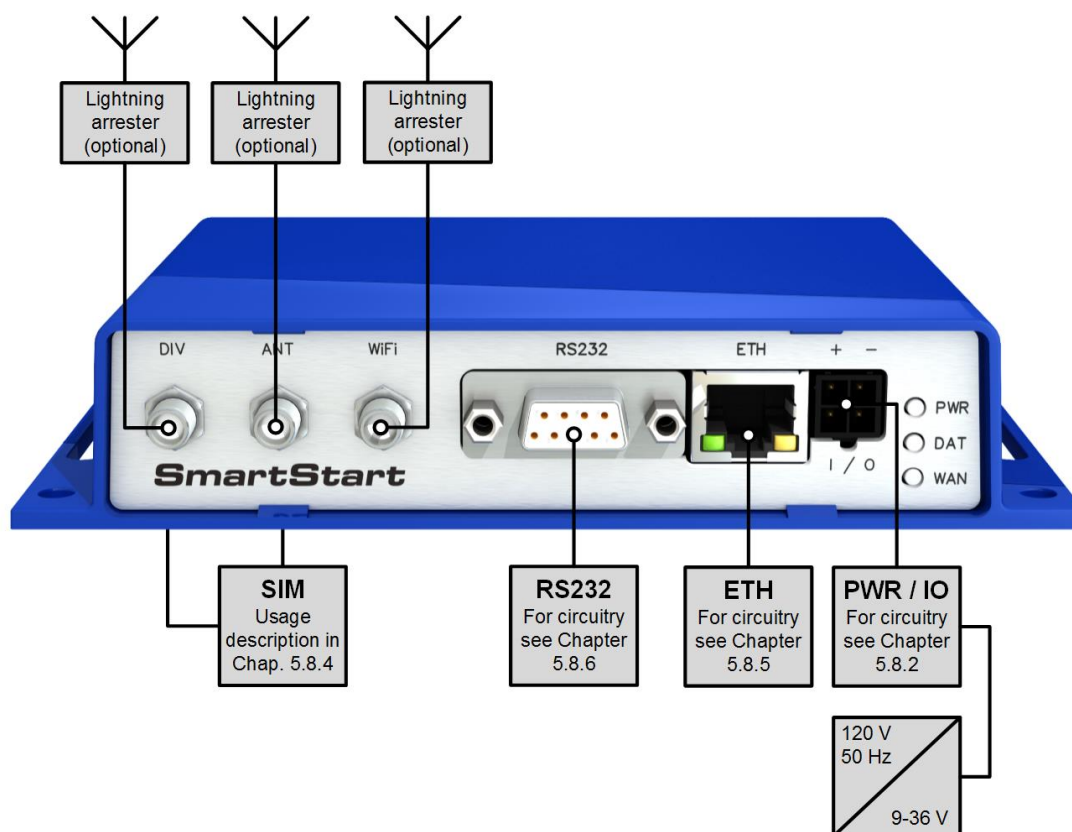


Figure 25: Router connection

6.2 Start

The router will start when a power supply is connected to the router. By default, the router will automatically start to log on to the default APN. The DHCP server will start to assign addresses for devices connected through the Ethernet port ETH. Router's behavior can be changed via the web interface. This is described in detail in the *Configuration manual for SmartStart* [1].

6.3 Configuration



If no SIM card is inserted in the router, it is not possible for the router to operate. Any inserted SIM card must have active data transmission.

6.3.1 Configuration by web browser

For status monitoring, configuration and administration of the router, a web interface is available, which can be accessed by entering the IP address of the router into the web browser. The default IP address of the router is 192.168.1.1. **Attention, it is necessary to use HTTPS protocol for secure communication over a network!**

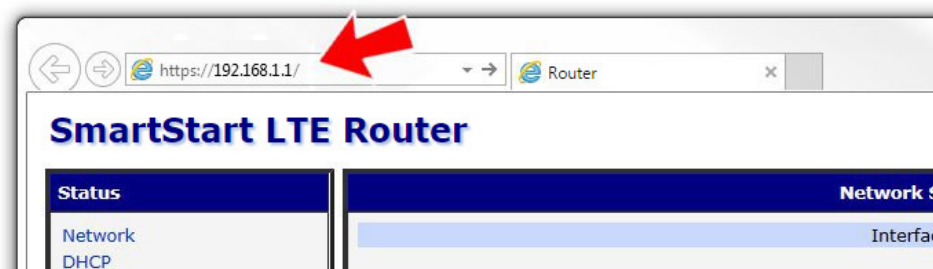


Figure 26: Entering the IP address of the router

By default, configuration may be performed only by the user "root". The default password is printed on the router's label.¹ Change the default password as soon as possible!



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 [1], chapter *Basic Information* -> *WebAccess/DMP Configuration*, for more information.

¹ If the router's label does not contain a unique password, use the password "root".

Once the login information are entered successfully, the user will have access to the router's web interface via the web browser.

Status	General Status
<ul style="list-style-type: none"> General Mobile WAN WiFi WiFi Scan Network DHCP IPsec DynDNS System Log 	<p>Mobile Connection</p> <p>SIM Card : Primary IP Address : Unassigned State : Offline</p> <p>» More Information «</p> <p>Primary LAN</p> <p>IP Address : 10.40.28.66 / 255.255.252.0 MAC Address : 7C:66:9D:38:30:F0 Rx Data : 4.2 MB Tx Data : 140.8 KB Bridged : Yes</p> <p>» More Information «</p> <p>WiFi</p> <p>IP Address : Unassigned MAC Address : 78:A5:04:22:2A:67</p> <p>» More Information «</p> <p>Peripheral Ports</p> <p>Expansion Port 1 : RS-232 Expansion Port 2 : None Binary Input 0 : Off Binary Input 1 : Off Binary Output : Off</p> <p>System Information</p> <p>Firmware Version : 6.0.1 Serial Number : N/A Profile : Standard Supply Voltage : 12.0 V Temperature : 38 °C Time : 2000-05-16 00:57:08 Uptime : 0 days, 0 hours, 39 minutes</p>
<p>Configuration</p> <ul style="list-style-type: none"> LAN VRRP Mobile WAN PPPoE WiFi WLAN Backup Routes Firewall NAT OpenVPN IPsec GRE L2TP PPTP DynDNS NTP SNMP SMTP SMS Expansion Port 1 Expansion Port 2 USB Port Startup Script Up/Down Script Automatic Update 	
<p>Customization</p> <ul style="list-style-type: none"> User Modules 	
<p>Administration</p> <ul style="list-style-type: none"> Users Change Profile Change Password Set Real Time Clock Set SMS Service Center Unlock SIM Card Send SMS Backup Configuration Restore Configuration Update Firmware Reboot Logout 	

Figure 27: Router web interface



A detailed description of the router settings in the Web interface can be found in the *Configuration manual for SmartStart* [1].

7. Technical Parameters

7.1 Basic Parameters

SmartStart		
Temperature range	Operating Storage	-40 °C to +75 °C (-40 °F to +167 °F) -40 °C to +85 °C (-40 °F to +185 °F)
Humidity	Operating Storage	0 to 95 % relative humidity non condensing 0 to 95 % relative humidity non condensing
Altitude	Operating	2000 m / 70 kPa
Degree of protection		IP30
Supply voltage		9 to 36 V DC
Battery for RTC		CR1225
Consumption without WiFi	Average	2.1 W
	Maximum	4.8 W
Consumption with WiFi	Average	2.7 W
	Maximum	5.5 W
Sleep mode consumption		40 mW
Dimensions		30 x 87 x 150 mm (1.18" x 3.43" x 5.91") (DIN 35 mm, EN 60715)
Weight		approximately 190 g (0.41 lbs) (depends on interface)
Antenna connectors		2x SMA – 50 Ohm 1x R-SMA – 50 Ohm (only for WiFi)

Table 11: Basic parameters



* Temperature range for routers equipped with WiFi module is reduced to -25 °C to +55 °C (-40 °F to +131 °F)!

7.2 Technical specification of user interfaces

	ETH	RS232
Connector	RJ45	DB9 Female
Standard	IEEE 802.3	
Min. data rate	10 Mbps	300 bps
Max. data rate	100 Mbps	230400 bps
Max. total cable length (300 Bd, 200 nF/km)	100 m	20 m

Table 12: Technical specification of user interfaces

7.3 Standards and Regulations

The router complies with the following standards and regulations.

Parameter	Description
Industrial	FCC 15.107 Class B, FCC 15.109 Class B, FCC ID 2AIQR-SL302, Contains: FCC ID RI7LE910NAV2. WiFi version contains: FCC ID VRA-SG9011059B. PTCRB IEC 61000-6-2
Safety	IEC 62368-1, EN 62311, EN 45545-2 United States and Canada, UL File No.: E487720 For Mexico UL File No: CoC-Mex-02085-UL
Carrier approvals	AT&T, Verizon
Environmental	REACH, RoHS and WEEE compliant

Table 13: Standards and Regulations

7.4 Type Tests and Environmental Conditions

Phenomena	Test	Description	Test levels
ESD	EN 61000-4-2	Enclosure contact Enclosure air	± 6 kV (crit. A) ± 8 kV (crit. A)
RF field AM modulated	EN 61000-4-3	Enclosure	10 V/m (crit. A) (80 – 2700 MHz) 3 V/m (crit. A) (2700 – 6000 MHz)
Fast transient	EN 61000-4-4	Power port Ethernet port RS232 port I/O port	± 2 kV (crit. A) ± 1 kV (crit. A) ± 1 kV (crit. A) ± 1 kV (crit. A)
Surge	EN 61000-4-5	Ethernet port Power port	± 1 kV (crit. A), shielded cab. $\pm 0,5$ kV (crit. A)
RF conducted	EN 61000-4-6	All ports	10 V/m (crit. A) (0,15 – 80 MHz)
Radiated emission	EN 55022	Enclosure	Class B
Conducted emission	EN 55022	DC power ports Ethernet ports	Class B Class B
Dry heat	EN 60068-2-2	Operation Storage	+75 °C, 40 % rel. humidity, 16 hours +85 °C, 40 % rel. humidity, 16 hours
Cold	EN 60068-2-1	Operation Storage	-40 °C, 16 hours -40 °C, 16 hours
Damp heat	EN 60068-2-30, test Db	+55 °C / +25 °C, 12 h – 12 h, 2 cycles	
Temperature variation	EN 60068-2-14 Nb	-40 °C / +75 °C, 3 h / 3 h, 2 cycles, 3 K/min	
Vibration	EN 60068-2-64 ed. 2	Transport. box DIN rail direct mounting	3 axis, 1 hour per axis 3 axis, 0.5 hour per axis 3 axis, 8 hours per axis
Shock	EN 60068-2-27 ed. 2	half-sine, 15 g peak, 11 ms, 6 pulses per axis	
Isolation	–	Ethernet port	1.5 kV

Table 14: Type tests and environmental conditions

7.5 Technical Parameters of Cellular Module

Cellular module for NAM	
LTE parameters	Bit rates: 10 Mbps (DL) / 5 Mbps (UL) LTE FDD Cat.1, 3GPP release 9 compliant Supported bandwidths: 5 MHz, 10 MHz, 20 MHz Supported frequencies: B12/B13 (700 MHz), B5 (850 MHz), AWS B4 (1700 MHz), B2 (1900 MHz)
UMTS parameters	Bit rates: 42.2 Mbps (DL) / 5.74 Mbps (UL) Supported frequencies: B5 (850 MHz), B2 (1900 MHz)
Other parameters	Rx Diversity and MIMO DL 2x2

Table 15: Technical parameters of cellular module

Antenna Requirements

- VSWR – <2:1 (Antenna input impedance response as function of frequency. This shows the antenna resonances and its bandwidth).
- SMA – 50 Ω
- For good diversity performance, the primary and secondary antennas should have different polarizations.

7.6 Technical Parameters of WiFi

WiFi	
Antenna connector	R-SMA – 50 Ω
Supported WiFi bands	2.4 GHz
Standards	802.11b, 802.11g, 802.11n
2.4 GHz supported channels	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
RX Sensitivity	11b, 11 Mbps: typ. -85 dBm 11g, 54 Mbps: typ. -70 dBm (HT20) 11n, MSC7: typ. -66 dBm (HT40) 11n, MSC7: typ. -62 dBm
TX Output Power	11b, 11 Mbps: min. 18, typ. 19, max. 20 dBm 11g, 54 Mbps: min. 14.5, typ. 16, max. 17.5 dBm 802.11n (HT20): min. 13.5, typ. 15, max. 16.5 dBm 802.11n (HT40): min. 13.5, typ. 15, max. 16.5 dBm
Type of device	Access point, station
AP maximum users	Unlimited (WiFi module does not support multi-role operation).

Table 16: Technical parameters of WiFi

7.7 Other Technical Parameters

Parameter	Description
CPU power	2 DMIPS per MHz
Flash memory	256 MB
RAM	512 MB
M-RAM	128 kB

Table 17: Other technical parameters

8. Related Documents

- [1] Advantech Czech: **Start Guide for SmartStart,**
- [2] Advantech Czech: **SmartStart Configuration Manual,**
- [3] Advantech Czech: **Commands and Scripts.**

9. 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 from 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.

9.1 FAQ



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.*




Mobile WAN connection fails.

- *Check the signal power ("Mobile WAN status" page). If the signal power is weak, you will have to use a better antenna. If the neighbouring cells have a similar signal strength, you will need to use a directional antenna. For proper operation, the signal levels have to be good.*
- *Try to enable automatic ping from the router, which will check the connection when there are no data running and in the case of a failed ping, restart the connection. This can be done on the "Mobile WAN Configuration" page in the router in the "Check connection" section. "Enable + bind" option is to ensure the ping goes always through Mobile WAN network interface.*



Mobile WAN connection cannot be established.

- *Check the "Mobile WAN Configuration" – APN, name, password and IP address (all can be blank).*
- *Try to enter the SIM card PIN – verify that the SIM card has the PIN code entered. Available on "Unlock SIM Card" page in the "Administration" section.*
- *In a private APN it is not recommended to get the DNS settings from operator (on "Mobile WAN" page)*
- *Go to "System Log" page in "Status" section and observe where the error occurs.*

 **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.**

- *With private APN this will not work.*
- *If the same IP address is recorded in your canonic name as a dynamically assigned address, it means that the operator 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*

 **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.*

 **I switched the router to offline mode by SMS message, but the router is in online mode after reboot.**

- *SMS messages do not change the router configuration. They remain in effect only until the router is rebooted.*

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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