BlueRS+I

DesignGuide

Content

1 Objective

This DesignGuide documents how BlueRS+I can be integrated into customer systems. It addresses developers of hardware and software environments for BlueRS+I. For detailed information about technical data refer to the manual.

Since BlueRS+I is under permanent further development, some information might alter. The following documentation is therefore meant to provide an overview. Stollmann expressly declares that this DesignGuide is no basis for a layout.

This documentation is a recommendation to the best of our knowledge. Stollmann does not assume any liability for the information in this documentation nor for any damages related to or caused by the use of this Design Guide.

2 Product Description

BlueRS+I connects an asynchronous serial interface with TTL level with the Bluetooth interface.

2.1 Product Versions

2.1.1 Power Supply

The BlueRS+I is supplied through the double row connector. It can be configured for 5V (default) and 3,3V supply.

2.2 Operation Modes

BlueRS+I runs in three modes:

2.2.1 AT-Mode

The Bluetooth connection is controlled by AT commands of the end device. You have full control over configuration and initiation of the serial link.

2.2.2 Autoconnect

For some legacy applications or cable replacement, it may be difficult to actively establish a serial connection before sending the data over the serial link. If you do not want to program the host device, the BlueRS+I automatically establishes the serial connection to a previously configured Bluetooth address.

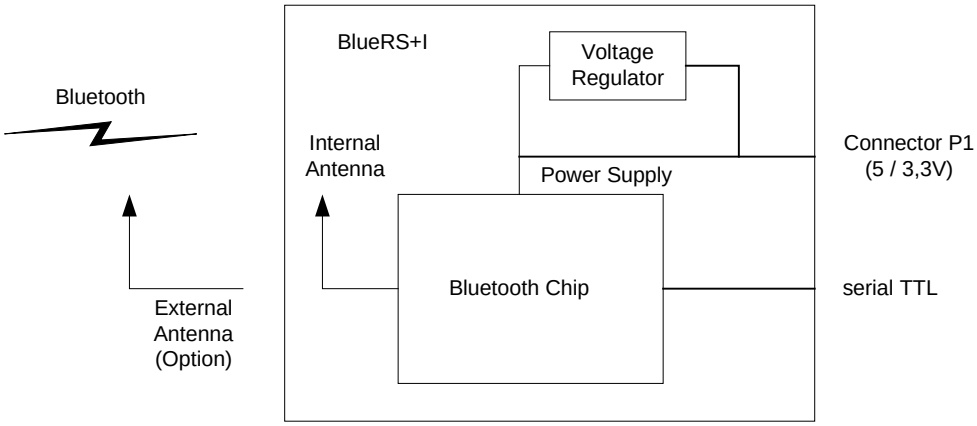
2.2.3 Autoconnect DTR

With the activation of the DTR line, the BlueRS+I Bluetooth connection is set up automatically. No adaptation of the integrating device is required since the BlueRS+I is meant to be a transparent serial cable replacement.

2.3 Security

The BlueRS+I supports various security features to restrict access via Bluetooth for unauthorized devices. These features include device bonding, restricted access via Bluetooth for bonded devices only and encryption of the transferred data via Bluetooth link.

2.4 Block Diagram

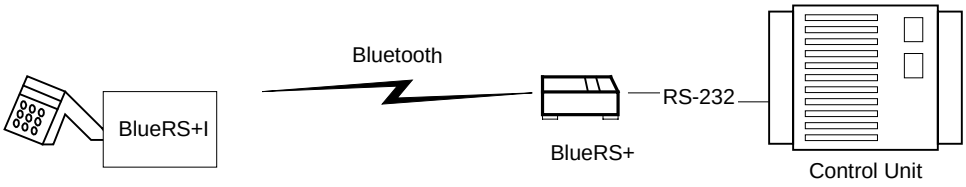


3 Applications

BlueRS+I can be used in different applications. Some typical are described in this chapter. For application requiring an external adapter please refer to other BlueRS+ versions from Stollmann.

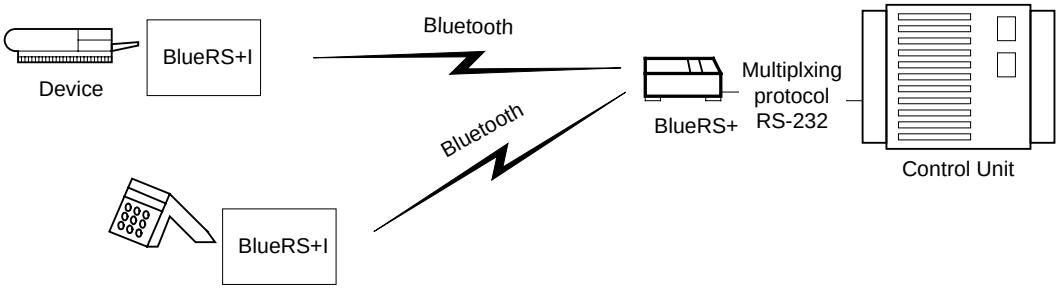
3.1 Cable Replacement Serial Point-to-point

To establish a cable replacement between two devices with a serial interface, BlueRS+I can be used.



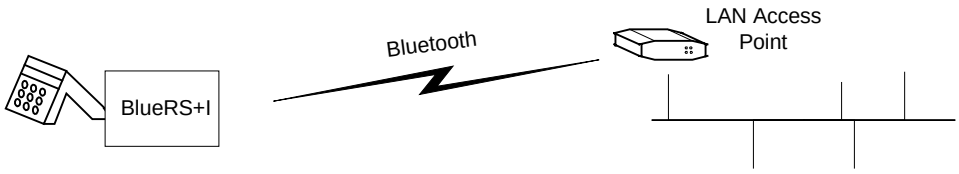
3.2 Cable Replacement Multipoint

Since several devices may be connected with a master device via Bluetooth, several end devices can also be multiplexed via Bluetooth. This adaptation is shown below for a desktop device.

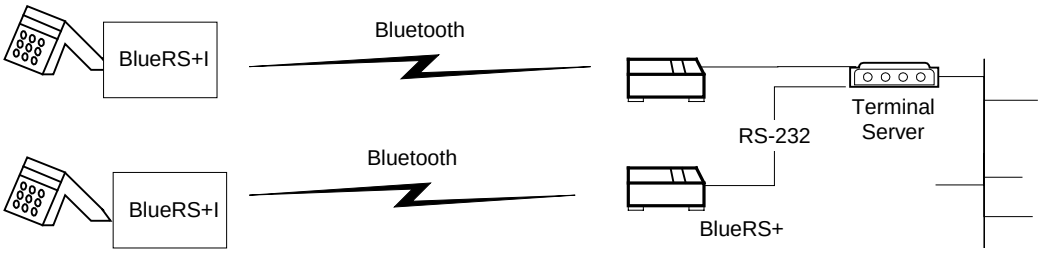


In order to handle multiple links a multiplexing protocol is required for the communication between devices, the BlueRS+ and the host. The BlueRS+ has to be adapted to the routing scheme of the protocol to transmit the data in an appropriate way. This includes Bluetooth connection control (i.e. are the Bluetooth links permanently active or only on demand) and data distribution (i.e. are all data from the host to be forwarded to all devices or only depending on the address header; are data from the devices are transmitted to the host transparently or is an address header to be added). In case you have a multipoint application please contact Stollmann for specific support.

3.3 LAN Access

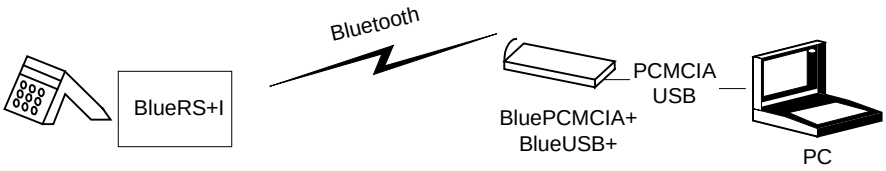


3.4 Terminal Server



3.5 PC Client

BlueRS+I as Bluetooth Client can establish connections with other Bluetooth interfaces, e.g. in PCs.



4 Software Interfaces

4.1 AT Commands

Via AT-Commands you may change not only the configuration of BlueRS+I but also control the Bluetooth connections. The end device must be adapted since a double connection setup might be required: the first for the Bluetooth connection and the second for the dial-up link itself. Additionally the Bluetooth-specific configuration commands must be supported by the end device.

4.1.1 Configuration Commands

A range of parameters can be controlled by configuration commands of BlueRS+I as listed below:

- Bluetooth Alias Name
- Bluetooth access permission (Security)
- Bluetooth Services
- Passive Scanning capability
- AT/Autoconnect operation mode
- Firmware download

4.1.2 Connection Commands

Command	Function	Response
AT**BDINQ	Scanning the environment for Bluetooth devices	OK
AT**BDLIST	Displays all found Bluetooth devices	OK
ATD	Establishes a Bluetooth connection with another device.	OK or Connect
ATH	Disconnects the Bluetooth Connection.	OK

Whenever the Bluetooth connection with a communication partner is established, a transparent channel for serial data is provided. The Bluetooth link then behaves like a serial cable.

A detailed description of the AT-Commands is found in the BlueRS+I manual.

4.2 Autoconnect

In case the end device cannot be programmed on the Bluetooth AT Commands or BlueRS+I should be in fixed operation with another Bluetooth device, the BlueRS+I Autoconnect can be configured.

Several triggers (i.e. DTR active) may be defined which introduce the scanning process of the environment and the connection setup with particular Bluetooth devices.

BlueRS+I then behaves at the interface as a serial cable which is plugged in by establishing the Bluetooth connection. In case the Bluetooth connection is not being built up, BlueRS+I is comparable to an unplugged cable.

Trigger	**Function**	**Parameter**
DTR active	Bluetooth Connect	Bluetooth Address
Power On	Bluetooth Connect	Bluetooth Address
Transmit data activity	Bluetooth Connect	Bluetooth Address
Bluetooth link request (incoming)	accept Bluetooth link	none

4.3 Security

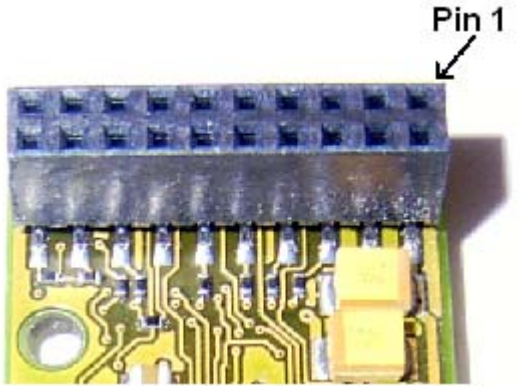
Security features are controlled via special AT-commands

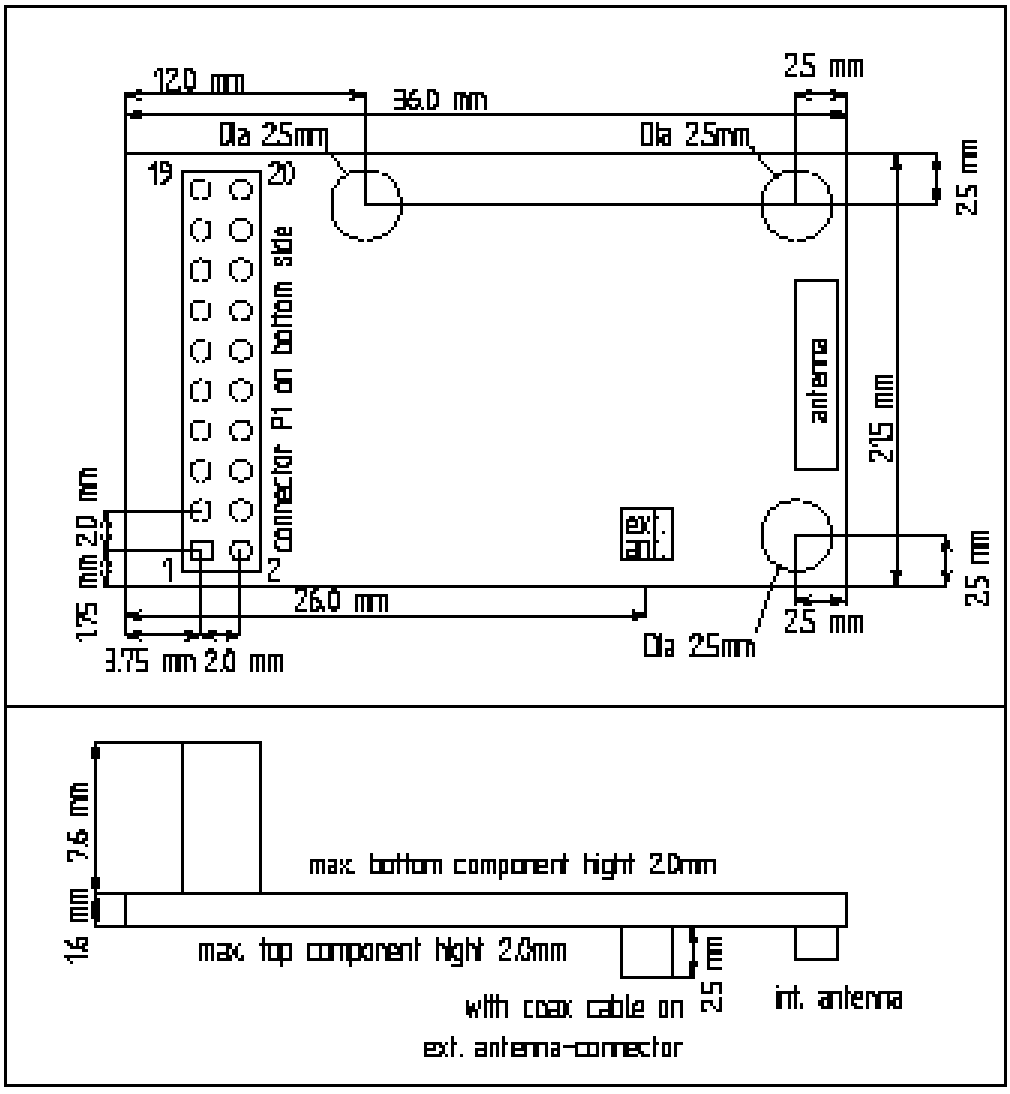
brestr	defines security level for all incomming BT-links
bcrypt	enables/disables data encyption on BT-link

Please refer to the manual for detailed information.

5 Hardware

5.1 Dimensions





BlueRS+I Dimensions	Europe	US
Width	21,5 mm	~0.85 inch
Height	8 mm	~0.3 inch
Length	36 mm	~1.42 inch
Weight	~ 10 g	~ 0.35 oz
Temperature	0...70 Degree Celsius	32...160 Fahrenheit
Humidity	95% Non-Condensing	95% Non-Condensing

5.2 Interfaces, Pin Assignment

The BlueRS+I is connected via the double pin row connector P1. This includes:

- power supply
- serial communication interface (V.24/RS-232 with TTL level)
- reserved general purpose IO pins

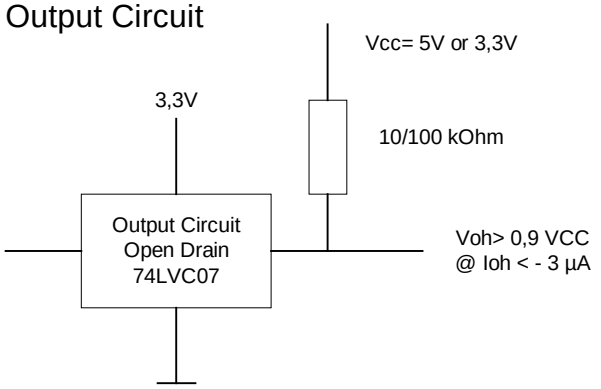
5.2.1 Serial Interface

The interface functionally corresponds to the norm V.24 / RS-232 but has TTL-level. It is compatible to the BlueRS+.

- Transmission speeds 2.400 – 230.400 bps (asynchronous)
- Character representation: 8Bit no Parity, 1 stop bit
  7Bit even/odd Parity, 1 stop bit
- half duplex or full duplex
- Flowcontrol hardware (RTS/CTS)

The signal levels are dependent on the supply voltage. The inputs are in any case 5V tolerant. The outputs are supplied as open-drain over 10 kOhm (RxD, CTS) or 100 kOhm (others) by the supply voltage such that the output level is raised to the supply level. This should be the same on the motherboard to achieve compatibility. Current sinks should be low-active. 10mA can be driven. It is not possible to drive LEDs high active directly. Drive LEDs low active or via driver circuitry.

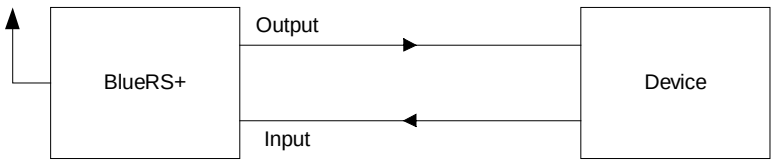
Output Circuit



	Vcc= 5 V	**Vcc = 3,3 V**
V_{IH}	2,5..5,5 V	2,5..5,5 V
V_{IL}	0..0,8 V	0..0,8 V
V_{OH} (RxD,CTS)	5 V via 10 kOhm	3,3 V via 10 kOhm
V_{OH} (all other Outputs)	5 V via 100 kOhm Imax: -10µA	3,3 V via 100 kOhm Imax -10µA
V_{OL}	0,55 V @ 10 mA Imax: +24mA	0,55 V @ 10 mA Imax: +24mA

5.2.2 Connector P1

This Connector includes the serial Interface (TTL) and power supply.



Output/Input definition of table below

P1	Signal	Dir.	active	BlueRS+I usage
1	GND	I	-	0V-Power
2	VCC	I	-	+5V / +3.3V -Power
3	GND	I	-	GND
4	TXD	I	H	Transmit Data
5	GND	I	-	GND
6	RXD	O	H	Receive Data
7				reserved
8	RTS~	I	L	RTS low active
9				reserved
10	CTS~	O	L	CTS low active
11	RESET~	I	L	RESET low active
12	DTR~	I	L	DTR low active
13				reserved
14	DCD~	O	L	DCD low active
15	RI~	O	L	RI low active
16	DSR~	O	L	DSR low active
17	UA	O	H	User Output 1
18	UE~	I	L	User Input 1
19	UA2	O	H	User Output 2
20	UE2~	I	L	User Input 2

5.2.3 Bluetooth Interface

Bluetooth Specification	V1.1
RF transmit level	4 dBm (Class 2)
Receiver sensitivity	-80 dBm
Range	~10 m
Profiles	GAP (General Access Profile)
	SDP (Service Discovery Profile)
	Serial Port Profile
	Dial-up Networking Profile (Option)
	LAN-Access Profile (Option)

5.3 Sample interfacing GPIO

It is possible to use the GPIOs on the BlueRS+I pins UEx und UAx. Their behavior has to be defined project specific in the firmware.

5.4 Layout Guidelines Basic board, Components Requirements

	Samtec	FCI (Berg)
Pin strip serial P1	MTMM-110-02-S-D-060	86451-106

5.5 Power Supply

There are two variants of supplying power to the BlueRS+I:

- 5 VDC+– 10%, the voltage is regulated on the BlueRS+I (linear regulator). The regulator is temperature and overcurrent protected.
- 3,3 V +- 2% low noise, the supply voltage is directly used (0 Ohm)

The power supply voltage can be switched as follows. The linear regulator needs to be replaced by an 0 Ohm resistor.

5.6 Power consumption and power down modes

To reduce power consumption of the BlueRS+I power down modes can be activated automatically by the BlueRS+ (controlled by parameter settings).

If no Bluetooth connection is established, the following states are implemented, the activation of these states can be controlled by the parameter *bpsm* and *pwd*.

For more details please refer to the BlueRS+I manual.

5.6.1 Deep Sleep state

The Bluetooth RF is completely deactivated, no paging requests from other Bluetooth devices will be recognized. Only rising control line DTR will activate the BlueRS+I and may initiate a Bluetooth link dependent on other parameters.

Note: In Deep Sleep state the AT command set is not active, CTS line is low.

5.6.2 Power down state

The Bluetooth RF is activated every 1.25 seconds, paging requests from other Bluetooth devices will be recognized after that intervals and accepted if allowed. Additionally rising control line DTR will activate the BlueRS+I and may initiate a Bluetooth link dependent on other parameters.

Note: In Power down state the AT command set is not active, CTS line is low.

5.6.3 Idle state

No power down mode activated.w

All functionality is available immediately including connection control using AT command set.

5.6.4 Power consumption

The following values are approximate power consumption values in the different states:

Condition	**Current Consumption (3.3V or 5V DC)**
Deep sleep	~ 0.7 mA
Power down	~ 2.5 mA
Idle, all functions available, no Bluetooth link	~ 22 mA
Bluetooth connected, no data traffic, (Master/slave)	~ 24 / 35 mA
Bluetooth connected, data traffic 115 kbit/s	~ 46 mA

5.6.5 Power-up time

The time until the BlueRS+I is able to accept link requests or serial data is about 9 seconds after power-up.

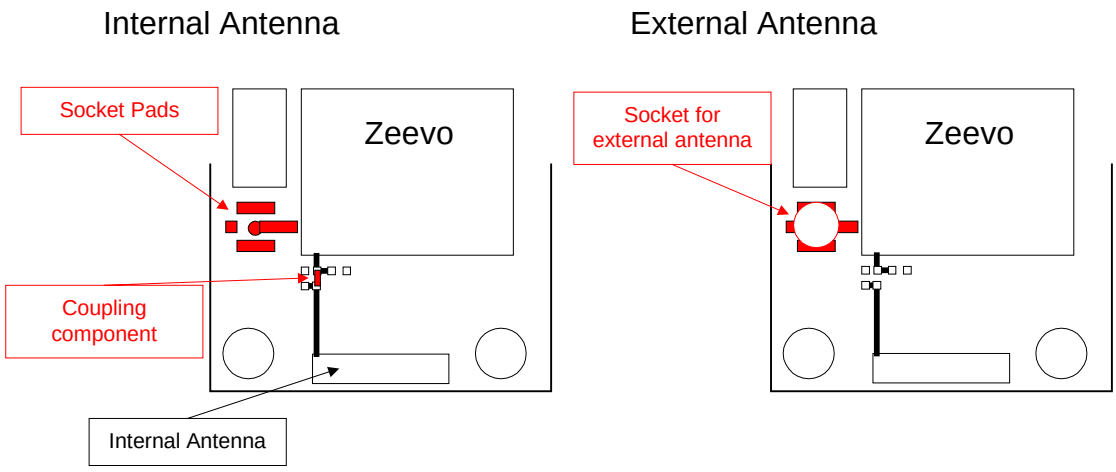
6 Mounting instructions

6.1 Antenna Issues

BlueRS+I may be delivered in two antenna designs:

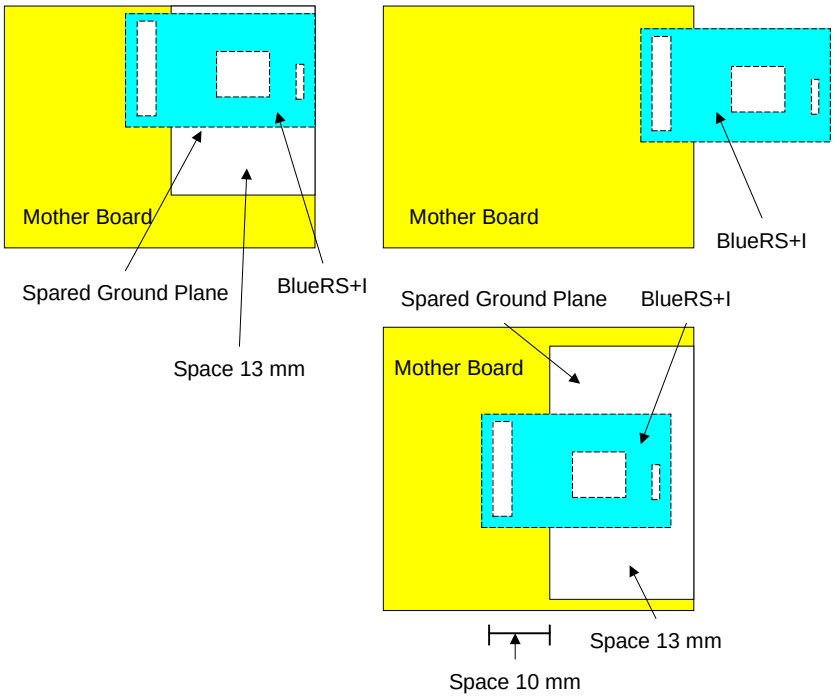
- BlueRS+I comprises an ceramic antenna which as a component is soldered to the circuit board. This is functional for a BlueRS+I integrated into a plastic housing. No additional antenna is required.
- For an external antenna to be set in, e.g. because the BlueRS+I is integrated into a metal housing, the ceramic antenna is replaced by a mini-SMA connector (50 Ohm technology) . An external antenna can either directly be connected with this SMA or indirectly by an antenna cable.

The mini Murata SMD socket for the external antenna may be soldered on the socket pads. The matching network components connecting the internal antenna has to be removed.



The influence of the internal antenna resp. the external antenna is in any case to be checked within the final integration environment. Adjacent PCBs, components, cable, housings etc. could otherwise influence the radiation pattern.

The mother board should have no ground plane under the BlueRS+I to allow best radiation.



Furthermore there must be a space of at least 15 mm in each direction from the antenna free from wire, circuits and conductive material.

It must be ensured that the antenna is not co-located or operating in conjunction with any other antenna or transmitter.

When using an external Antenna the antenna is fixed and connot be removed or replaced by the enduser.

For detailed consulting on integration please contact Stollmann.

6.2 Housing Guidelines

The individual case must be checked to decide whether a specific housing is suitable for the use of the internal antenna. A plastic housing must at least fulfill the following requirements:

- Non-conductive material, non-RF-blocking plastics
- No metallic coating
- ABS is suggested

7 Regulatory Information

7.1 FCC Statement

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

Operation is subject to the following two conditions:

(1) this device my not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

7.2 Caution

Warning: Changes or modifications made to this equipment not expressly approved by Stollmann Entwicklungs und Vertriebs may void the FCC authorization to operate this equipment.

7.3 FCC Warning

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

The radiated output power of BlueRS+E and BlueRS+I is far below the FCC radio frequency exposure limits. Nevertheless, the BlueRS+E and BlueRS+I shall be used in such a manner that the potential for human contact during normal operation is minimized

7.4 RF-exposure Statement

The BlueRS+I contains a portable modular transmitter. Thus it must have a separation of at least 2.5 cm between the antenna and the body of the user or nearby persons, excluding hands, wrists, feet, and ankles.

Any notification to the end user of installation or removal instructions about the integrated radio module is **not** allowed.

7.5 Labeling requirements for the End Product

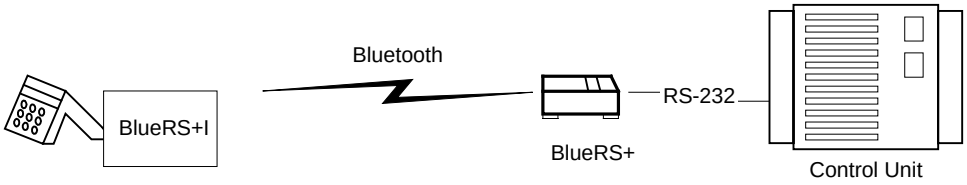
Any End Product integrating the BlueRS+I must be labeled with at least the following information:

This device contains transmitter with FCCID: RFR-BRSI / IC: 4957A-BRSI

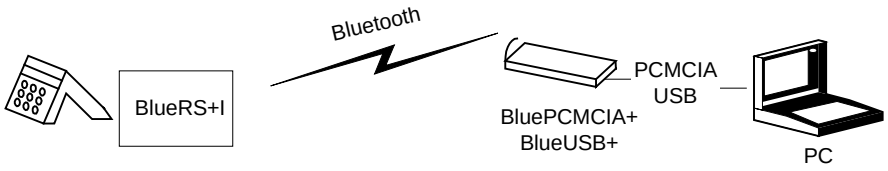
8 Test

8.1 Test Setup

Test Setup cable replacement



Test Setup PC connectivity



8.2 Compatible Remote Stations

Developer	Product	Profiles
Stollmann	BlueRS+	Serial
Stollmann	BlueRS+E	Serial
Stollmann	BluePCMCIA	Serial, Dial-up Networking
Stollmann	BlueUSB	Serial, Dial-up Networking
Stollmann	BlueTA+	Serial, Dial-up Networking

9 Variants of Delivery

Name	Class	Supply Voltage	Antenna	Art No.
BlueRS+I C2 V5 AI	2	5V	Internal	51961
BlueRS+I C2 V5 AE	2	5V	External	51963
BlueRS+I C2 V3 AI	2	3,3V	Internal	51999
BlueRS+I C2 V3 AE	2	3,3V	External	52048