

# BlueRS+

Bluetooth Serial Adapter

User manual

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**Table of contents**

1	Introduction .....	1
1.1	Product description .....	1
1.2	Safety .....	2
2	Installation .....	3
2.1	Contents .....	3
2.2	Installation procedure .....	3
2.3	Displays and control elements BlueRS+MF5 desktop model.....	4
3	Using the BlueRS+ .....	5
3.1	Automatic connection establishment.....	6
3.2	AT command set for BlueRS+.....	8
3.2.1	Bluetooth specific AT commands .....	15
3.2.2	AT command S register set .....	20
3.2.3	AT result codes.....	20
3.3	Cable replacement .....	21
3.4	Table of coding of Bluetooth services .....	22
4	BlueRS+Configurator command set.....	23
4.1	Configuring the BlueRS+ after power on.....	23
4.2	Configuring the BlueRS+ with AT commands .....	24
4.3	Remote Configuration using the TA+Configurator commands.....	24
4.4	List of BlueRS+Configurator commands .....	26
4.5	Software update .....	34
5	Diagnostic and error messages.....	35
5.1	Error messages from AT command set.....	35
5.2	Bluetooth error codes.....	35

5.3	Diagnostic using the internal Trace .....	38
6	Appendix .....	40
A1:	Technical data BlueRS+.....	40
A2:	LED displays BlueRS+ desktop models .....	41
A3:	Mechanical dimensions of the BlueRS+ module .....	42
A4:	BlueRS+ Serial Interface Connector P1 .....	43
A5:	BlueRS+ Interface Connector P2 .....	44
A6:	Pinout of the V.24/V.28 interface BlueRS+ desktop models (DSUB 9).....	44

## 1 Introduction

We are very pleased to see that you have bought a Stollmann product and would like to express our appreciation.

This documentation is valid for the following models of the BlueRS+ product family

- **BlueRS+MF5** (plug on module, antenna internal, 5V DC)
- BlueRS+MF3 (plug on module, antenna internal, 3.3V DC) on request
- BlueRS+MS5 (plug on module, antenna external, 5V DC) on request
- BlueRS+MS3 (plug on module, antenna external, 3.3V DC) on request
- **BlueRS+DF** (desktop model, antenna internal)
- BlueRS+DS (desktop model, antenna external) on request
  
- **BlueRS+MF5/C1** (class1 plug on module, antenna internal, 5V DC)
- **BlueRS+DF/C1** (class1 desktop model, antenna internal)
  
- Software versions V1.124.003 or later

### 1.1 Product description

The RS+ is an Bluetooth adapter with the following functions.

- The BlueRS+ connects devices with a **serial port** to any Bluetooth link. It gives access to other devices situated in the same Bluetooth area (piconet).
- Data can be transmitted with the following rates:
  - limited by the baudrate of the serial link from 1200 up to 230400 baud.
- The connected serial device can drive the BlueRS+ by using
  - asynchronous AT commands
  - automatic connection setup

The following profiles are supported:

- One serial profile for transparent data communication through the Bluetooth link.
- A second serial profile for management access from another Bluetooth device using a Bluetooth link.

BlueRS+ may be used in two product versions:

- The BlueRS+ **module** may be integrated into different devices and connects them with the Bluetooth interface via a serial TTL/CMOS compatible interface. These modules are referenced as **BlueRS+Mxx** in this document and represents the product types BlueRS+MF5, BlueRS+MF3, BlueRS+MS5, BlueRS+MS3.
- The BlueRS+ **Desktop** device is an external device that connects the terminal equipment with the Bluetooth interface via a serial V.24 / RS-232 interface.

These devices are referenced as **BlueRS+Dx** in this document and represents the product types BlueRS+DF, BlueRS+DS.

Please refer Appendix A1: for information about the differences.

## **1.2 Safety**

The BlueRS+ is conform to the European safety requirements IEC 60 950. Please use only the delivered power supply or an original replacement from Stollmann.

The homologation for the Bluetooth compatibility tests according the Bluetooth standard V1.1 has been started.

## 2 Installation

### 2.1 Contents

This packet contains the following items:

- Bluetooth Serial adapter BlueRS+
- Mains plug power supply adapter (only BlueRS+Dx)
- DTE interface serial cable (only BlueRS+Dx)
- This user manual

### 2.2 Installation procedure

The following installation procedure is typical for the desktop model BlueRS+Dx. For all plug in modules the installation is dependent on the overall system and has to be referred there.

Desktop model only:

To start using the BlueRS+Dx, please follow these steps:

- Connect the serial port (DTE) of the BlueRS+ to the serial port (COM-port) of a PC or other serial terminal equipment by using the supported DTE interface serial cable.  
Please make sure that the COM-port of the PC is not used for other purposes or by other communication programs.
- Connect the power supply to a standard AC outlet. Please reference to page 4 for selecting the correct plug for interfacing.
- The green LED on the BlueRS+Dx front panel will come on to indicate that the device has been power up. After some seconds the green LED will start blinking to indicate power save mode.
- Optionally: Configure the BlueRS+Dx Bluetooth interface if needed.  
Configuration is required especially if you want to automatically connect to another Bluetooth device (set up the remote Bluetooth address).

The BlueRS+ is now ready for use with Bluetooth links, please refer to the next chapter for the configuration to use the terminal equipment together with the BlueRS+.



### 3 Using the BlueRS+

Before using the BlueRS+ the address of another Bluetooth device has to be selected - if not predefined by factory – that shall be the communication partner in the Bluetooth link.

The compatible devices can be scanned using the configuration command "bdinq". From that list one Bluetooth device has to be selected.

If you are using an automatic connecting mode that Bluetooth address has to be entered and stored using the configuration command "brad" (see BlueRS+Configurator activation on page 23).

You can select different operation modes for the BlueRS+. These operating modes are used to control Bluetooth links and to configure the BlueRS+.

Supported operating modes:

- Automatic connecting deriving from DTR or always connected.
- Automatic accepting of incoming connections.
- Asynchronous mode for devices that need the AT command set.

You can configure the BlueRS+ in the following ways:

- by using BlueRS+Configuration commands entered by the locally connected PC.
- by using the AT command set entered by the locally connected PC.
- by using BlueRS+Configuration commands entered via the Bluetooth link (remote configuration).

### 3.1 Automatic connection establishment

Automatic connection establishment is available in the following modes:

- An automatic connection will be initiated when control line DTR is on.
- An automatic connection will be initiated when transmit data is received from the DTE device. All data received before the Bluetooth connection is established will be buffered inside the BlueRS+ and automatically sent via the Bluetooth link.
- An Automatic connection will be initiated independent of any status line – automatically after power up and initialization.
- No connection establishment initiated by this module. Bluetooth connection requests from other Bluetooth devices will be automatically accepted (if compatible).

To enable automatic call you have to set BlueRS+Configuration parameter "*cmds*" to 6, 7, 8 or 13 (see below).

An established connection will be indicated by a status line (default: DCD). See also configuration commands "*cdcd*" and "*cdtr*".

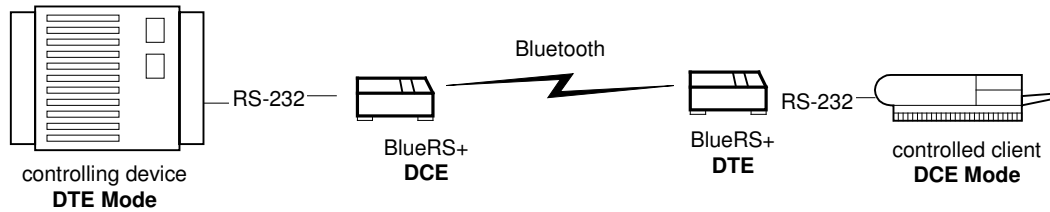
If a connection cannot be established successfully an automatic retry will be started. The duration of trying to establish the connection and the pause for next retry can be configured.

The Bluetooth device to be accessed is taken from the parameter "*brad*", it has to be set up to the Bluetooth device address of the remote Bluetooth device. Additionally the server channel has to be set up if not fitting to the default (1), see parameter *brsch*.

<i>cmds</i> 6	Automatic connection establishment when DTR is ON.
<i>cmds</i> 7	Automatic connection establishment when transmit data are received by the BlueRS+.
<i>cmds</i> 8	Automatic connection establishment independent of any status line.
<i>cmds</i> 12	No connection establishment initiated by this module.
<i>cato</i> <i>n</i>	call abort of a not successful call after <i>n</i> seconds. <i>n</i> ={3..255}, default: <b>15</b> seconds.
<i>capa</i> <i>n</i>	call pause for <i>n</i> seconds before next call attempt. <i>n</i> = 0 : no call retry. <i>n</i> ={0..255}, default: <b>3</b> seconds.

Hint: The configuration command "*idle*" can be used, to automatically disconnect after a predefined time without data transmission.

Example:



Setting of BlueRS+ **DCE**:

cmds=8

brad= boad of BlueRS+**DTE**

Setting of BlueRS+ **DTE**:

cmds=12

Don't forget to set the baudrate to the correct setting.

### 3.2 AT command set for BlueRS+

All parameter can be changed by using an extended AT command set described in this chapter.

Please check if the factory setting will fit with your environment. The factory setting is described (highlighted) in the parameter list below.

If you want another configuration as set in the factory default setting, please do the following steps:

- Connect the PC's com-port to the DTE interface of the BlueRS+.
- Connect the power supply to the mains socket.
- Start a terminal emulation on your PC, please verify that the baudrate setting of the terminal emulation fits those of the BlueRS+.
- Set up the parameter of the BlueRS+ from the terminal emulation and save the parameter using the AT command set.

Example:

To change the access mode to restricted please enter the following commands:

**AT\*\*BRESTR=1**<↵> (set restricted mode to ON)

**AT&W**<↵> (store the new configuration)

- Leave your terminal emulation and start your application program.

With the exception of the command **A/** (Repeat command) all commands begin with the prefix **AT** and are terminated with <↵>. Corrections in a command line are done with <BACKSPACE>. A command line has a maximum of 80 characters. The command line is automatically cancelled by longer input. Blanks are ignored, capital/small letters are not significant.

The parameter settings of the BlueRS+ obtained when using the AT commands can be permanently stored (AT&W) and are not lost by resetting or by leaving the AT command mode.

To enter the AT command mode during an active data connection you must use the following sequence ("Escape sequence"):

at least 1 sec pause <+><+><+> 1 sec pause

The time gap between all three plus signs may not exceed 1 sec.

The escape sequence is transmitted transparent to the remote device.

By using initialization strings to configure the TA which includes more than one parameter to be configured please follow the examples below:

- Initialization string includes standard AT commands:  
AT&F&D2&C1E0&W

By using a special configuration command (at\*\*<cmd>) in the initialization string you have to set a semicolon <;> in case that additional commands will follow.

- Initialization string includes special AT commands:  
AT&F\*\***BR=8**;&D2&C1E0&W

### Supported commands:

---

**A/** Repeat last command line

---

This command repeats the commands of the last entered command line.

Note: No prefix **AT** is required.

A/

---

**A** Accept incoming call

---

Using this command you can accept an incoming call, if automatic call acceptance is not set (Register S0 = 0). An incoming call is always displayed by the message "RING" or the code "2", also if automatic call acceptance is selected.

Must be the last command in an AT command line.

---

**CONF** Enter BlueRS+Configurator

---

Enters directly into the BlueRS+Configurator, the configuration prompt "#" will be displayed. Leave the BlueRS+Configurator with the command "quit" (or "exit" or "go").

ATCONF

---

**&C** DCD control

---

Selects the behavior of the DCD control line from the BlueRS+.

AT&C	BlueRS+ control line DCD is always ON
<b>AT&amp;C1</b>	DCD ON indicates Bluetooth connection is established (default)
AT&C2	DCD line follows DTR
AT&C4	DCD follows remote DCD

---

**D** Initiate Bluetooth link

---



---

Selects the local echo in command mode.

ATE	No local echo
<b>ATE1</b>	Local echo on in command phase (default)

---



---

## **&F** Load factory defaults

---

Factory default will be loaded. (for storing in non volatile memory please use the command AT&W).

AT&F	setup all parameter concerning data port.
AT&F1	setup all parameter including Bluetooth specifics and passwords.

---



---

## **H** Disconnect

---

Disconnects existing Bluetooth connection, after issuing the escape sequence (see page 8).

ATH
-----

---



---

## **I** Display version information

---

Displays different information about version number and settings:

ATI	Returns the "Modem"-type; name of the terminal adapter ("BlueRS+")
ATI1	Returns "0"
ATI2	Returns "OK"
ATI3	Returns version string: "V1.xyz"
ATI4	Returns manufacturers name: "Stollmann E+V GmbH"
ATI5	Returns "OK"
ATI6	Returns copyright string: "(c) Copyright Stollmann GmbH"
ATI7	Returns "OK"
ATI8	Returns "ERROR"
ATI9	Returns "OK" (Plug&Play ID-Request not supported)
ATI77	Returns Bootloader version string
ATI99	Returns software creation date

---



---

## **&K** Flow control

---

Selects the flow control behavior of the BlueRS+ while in data communication phase.

AT&K	No local flow control between the DTE and BlueRS+ is used
<b>AT&amp;K3</b>	Local flow control is set to hardware handshake RTS/CTS (default)

---

---

**AT&K5** Local flow control is set to hardware handshake RTS/CTS additionally in AT command phase

---

**O** Return to online state

---

If the BlueRS+ is in command mode after issuing an escape sequence out of an existing connection, ATO brings the BlueRS+ back to data phase.

Must be the last command in AT command line.

ATO

---

**Q** Suppress results

---

With this command result codes or messages can be suppressed.

**ATQ** Returns status - codes after command input (default)

ATQ1 No result codes are returned

---

**&R** CTS control

---

Selects the behavior of the CTS control line from the BlueRS+.

**AT&R** BlueRS+ control line CTS is following all changes of RTS

**AT&R1** CTS is always ON (default)

**AT&R2** BlueRS+ control line CTS is following all changes of DTR

**AT&R3** BlueRS+ control line CTS is following all changes of remote CTS (set for cable replacement)

---

**S** Display and set internal S register

---

**ATSnn?** Show actual values (decimal) of selected register *nn*

**ATSnn=xxx** Set selected register *nn* to the decimal value *xxx*.

See S register definitions on page 20.

---

**&S** DSR control

---

Selects the behavior of the DSR control line from the BlueRS+.

**AT&S** BlueRS+ control line DSR is always ON (default)

**AT&S1** DSR ON indicates Bluetooth link is established

**AT&S2** BlueRS+ control line DSR is following all changes of DTR

**AT&S3** BlueRS+ control line DSR is following all changes of DCD

**AT&S4** BlueRS+ control line DSR is following all changes of remote DSR (set for cable replacement)

**AT&S5** reserved

---

---

<b>V</b>	Result format
<b>ATV</b>	Result is presented as numbers (followed by <↵>)
<b>ATV1</b>	Result is presented as text (default)

---

<b>&amp;V</b>	Display configuration
<b>AT&amp;V</b>	Displays the actual configuration of AT command setting
<b>AT&amp;V1</b>	Displays the actual configuration of extended AT command setting

---

<b>W</b>	Extended result codes
<b>ATW</b>	Result is presented without extended result codes.
<b>ATW1</b>	Result is presented with extended result codes, Result messages include error causes.

---

<b>&amp;W</b>	Store active configuration
<b>AT&amp;W</b>	The active configuration will be stored in non volatile memory.

---

<b>Z</b>	Load stored settings
<b>ATZ</b>	The active configuration will be reset to the stored configuration. Must be the last command in an AT command line.

---

<b>**DBITS</b>	Number of data bits x asynchronous chars (7,8)
<b>AT**DBITS=x</b>	Number of data bits x for asynchronous character (7,default: 8).
	Note: only valid for br <> 0.

---

<b>**PRTY</b>	Set parity of asynchronous characters
	Selects the parity for asynchronous characters.

**0**: no parity; **1**: even parity; **2**: odd parity

**AT\*\*PRTY=0** No parity (default)

**AT\*\*PRTY=1** Odd parity

**AT\*\*PRTY=2** Even parity

**AT\*\*PRTY=3** Space parity

**AT\*\*PRTY=4** Mark parity

Notes: To use other data formats than 10 bit (= (N1, 7E1, 7O1) you have to set br to fixed speed.

- only valid for br <> 0.

### 3.2.1 Bluetooth specific AT commands

#### Setting up special Bluetooth parameter:

---

**\*\*BACCTAB**                      Show pairing information

---

To show the pairing information (setup due to a successful restricted connection) within the BlueRS+ you have to issue the command "AT\*\*BACCTAB".

Example:   at\*\*bacctab

Response:  1: used: YES BD: 00803714ECA4 name:  
            OK

---

**\*\*BDEL**                              Delete pairing information

---

To delete the pairing information (setup due to a successful restricted connection) within the BlueRS+ you have to issue the command "AT\*\*BDEL 1". The paired Bluetooth device can be read out by the command "AT\*\*BACCTAB".

Example:   at\*\*bdel 1

Response: OK

---

**\*\*BDINQ**                            Inquire Bluetooth devices

---

With this request the automatic scan of all discoverable Bluetooth devices will be initiated.

As a result the creation of the list *bdlist* will be initiated. The list can be read out using the command at\*\*bdlist. If the Inquiry-scan has not been terminated while issuing the command at\*\*bdlist, the BlueRS+ will return "inquiry active". The entries contain the Bluetooth device address, the Bluetooth device names and available services (profiles).

The creation of this list may take up to 20 seconds due to the reaction time of the accessible Bluetooth devices, a maximum of 9 Bluetooth devices can be listed.

When issuing the command "at\*\*bdinq 1" the inquiry scan will only request the Bluetooth addresses, name and service inquiry will not be performed. The maximum waiting time for responses of the Bluetooth devices is limited by a time defined with the command "at\*\*binqtim".

Example:   at\*\*bdinq                      request Bluetooth devices with name and service.

Response: OK

at\*\*bdinq 1                      request Bluetooth device addresses only

Response: OK

---

---

**\*\*BDLIST** Show inquired Bluetooth devices

---

With this request the list of found Bluetooth devices will be returned, the entries show the Bluetooth device address and the Bluetooth device name requested by the command *at\*\*bdinq*. For every Bluetooth device in addition the available services (profiles) will be shown.

These entries can be accessed by the selectors *d1 .. dn* to address the Bluetooth device and the selectors *s1 .. sn* to address the Bluetooth devices service channel.

Example: *at\*\*bdlst*

Responses: *d1*: <bradr1>, <bname1>  
*s1*: <service1>, <server channel>, <bsname1>  
*s2*: <service2>, <server channel>, <bsname2>  
*d2*: <badr2>, <bname2>  
*s1*: <service1>, <server channel>, <bsname3>  
OK

or

*inquire active* ; if the search initiated by *at\*\*bdinq*  
OK ; is still active

or

*list empty* ; no Bluetooth device found  
OK

***brad*** found Bluetooth remote device address (12 digits)  
***bname*** found Bluetooth remote device name  
***service*** coding of service type  
***server channel*** used channel number for service type

---

**\*\*BINQTIM** Timeout for Inquiry Scan

---

With this command the Inquiry Scan time will be limited to the configured value (default: 8 = 10 seconds). See also command *at\*\*bdinq*.

Allowed values: 1 to 48 (1,25 sec to 60 sec).

Example: *at\*\*binqtim=n* set maximum wait time to *n* \* 1.25 seconds  
*at\*\*binqtim=2* set maximum wait time to 2.5 seconds

---

**\*\*BNAME** BlueRS+ own device name

---

Defines the device name. *bname* is shown on a remote Bluetooth terminal device during a Service Discovery sequence It is a string constant according

to V.250.

Example:    at\*\*bname                    show own device name  
              at\*\*bname=<rs+name>    set own device name to *rs+name*

---

**\*\*BRAD**                                    Bluetooth Device Remote Address

---

With this command you can setup the Bluetooth address of the other Bluetooth device, that should be connected using an automatic link setup.

Example:  
          AT\*\*BRAD=0080371443AB

---

**\*\*BRNAME**                                Displays connected device name

---

Displays the device name of the connected Bluetooth device.  
This value is can not be changed.

Example:    at\*\*brname                    show connected device name

---

**\*\*BRSCH**                                Set remote Bluetooth server channel

---

Set up server channel of the remote Bluetooth module, to that the Bluetooth link shall be established.

The own server channel number is fixed to 1, only used for accepting Bluetooth links.

Remote management between BlueRS+ is achieved using the server channel 30.

default:    **1**

Example:    at\*\*brsch=1

---

**\*\*BSNAME**                                BlueRS+ service name

---

Defines the service name of the BlueRS+. bsname is shown on a remote Bluetooth terminal device during a Service Discovery sequence.

Example:    at\*\*bsname  
              at\*\*bsname=<rs+srvname>    set own device name to *rs+srvname*  
  default: "BlueRS+ serial port"

Note:

To activate a new name for discoveries you have to make a power off/on cycle.

---

**\*\*BRESTR**                      Set restricted mode

---

Control the restricted mode for exchanging the Pin (Passkey). When set to 1 the setting of parameter bpin will be used to verify a pin with the requesting Bluetooth device.

The pins of two bluetooth devices have to set to the same value, if one of these devices allows only restricted connections. If a restricted connection has been established one time between two Bluetooth devices these devices know each other and are called as "paired" (see command "AT\*\*BACCTAB" for information about the paired Bluetooth device).

After a pairing has taken place Bluetooth links can be established between these paired devices independent of the setting of the restricted mode!

To delete the pairing information within the BlueRS+ you have to issue the command "AT\*\*BDEL 1" .

---

**\*\*BPIN**                              Bluetooth device Pin (Passkey)

---

Set the Pin for establishing a connection in the restricted mode by the command "AT\*\*BPIN=<old\_pin>,<newpin>".

This Pin is always checked if

- the BlueRS+ is set to restricted mode
- the BlueRS+ is not set to restricted mode and the other Bluetooth device is set to restricted mode.

The Pin has a fixed length of 4 digits, factory default: **0000**.

To reset the Pin to factory default please use the command AT&F1 (all parameter will be set to factory default).

Example:    at\*\*bpin=0000,1234              set Pin to 1234 (old Pin was 0000)

Note: After a pairing has taken place (Pin successful exchanged) Bluetooth links can be established between these paired devices independent of the setting of the restricted mode and the Pin!

---

**\*\*BOAD**                              Bluetooth Device Own Address

---

With this command you can read out the own Bluetooth device address. This value is can not be changed.

Example:  
AT\*\*BOAD

---

**\*\*<cmd>**                      Execute configuration command

---

Executes one configuration command, for definition of commands see page 26.

AT\*\*<cmd>

More than one configuration command have to be separated by a ";".

AT\*\*cmd1;\*\*cmd2

### 3.2.2 AT command S register set

- S0** 0: No automatic call acceptance, acceptance of an incoming call is controlled by the data terminal (command ATA after RING)  
1: Immediate call acceptance by the terminal adapter (default)  
2..n: Call acceptance through the terminal adapter after *n* "RING" messages.
- S2** Escape Character (default = 43h)
- S3** Carriage Return Character (default = 13)
- S4** Line Feed Character (default = 10)
- S5** Backspace Character (default = 08)
- S7** Wait time for Carrier (sec) (default = 30 sec)
- S9** Enable PNP functionality for Windows95 (default=1, enabled)
- S91** 0: default  
1: all unknown AT commands will be answered with OK.  
2: Windows 2000 compatibility: some AT commands will be answered with OK, unknown AT commands will be answered with OK.

### 3.2.3 AT result codes

#### Result codes (numerical and verbose):

Code	Text	Meaning
0	OK	Command completed
1	CONNECT <radr>	Connection established
2	RING <radr >	Indicates an incoming call (Link request received)
3	NO CARRIER <berr>	No synchronization ( <i>berr</i> = BT error cause)
4	ERROR	Illegal command or error that can not be indicated otherwise
6	NO DIALTONE <berr >	No access to Bluetooth? network ( <i>berr</i> = BT error)
7	BUSY < berr >	Number engaged ( <i>berr</i> = BT error cause)
8	NO ANSWER < berr >	No connection; addressed Bluetooth device can not be reached ( <i>berr</i> = BT error cause)

#### Error cause display:

< *berr* > = BT release (error) cause, hexadecimal

Example: NO CARRIER <0104>

In AT command mode, error cause display (does not belong to the AT command standard) can be turned on by issuing the command ATW1 (default). The shown error causes use the coding defined by the Bluetooth definition (see page 35).

### 3.3 Cable replacement

A pair of BlueRS+ devices can be used to operate as a RS232 cable replacement. Typically one BlueRS+ has to operate as a DCE interface ("BlueRS+DCE", DSU9 female) and the other one as a DTE interface ("BlueRS+DTE", DSUB9 male). These devices have to be ordered with the correct interfaces.

When ordering a pair of BlueRS+ both devices will have the correct setting to operate without changing any parameter. The default behavior is as follows:

- The Bluetooth link is established directly and automatically after powering on from the BlueRS+ operating in DCE mode
- the restricted mode is disabled
- data transfer is transparent set to baudrate 115200 bit/s
- all status lines are transparently transferred to the other device (local flowcontrol is disabled).
- LED2 shows the Bluetooth connection status (ON = link established)

In detail the following settings differ from the factory default setting:

#### BlueRS+DCE:

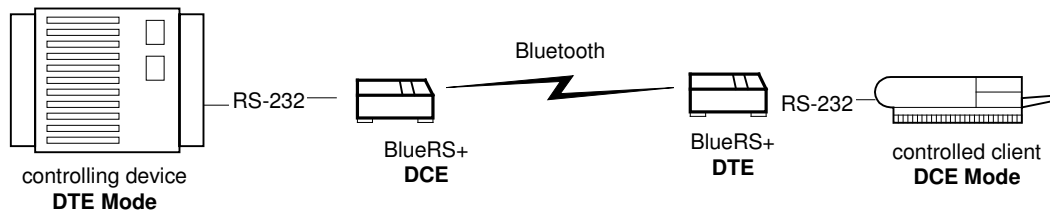
cmds 8	Automatic connection establishment independent of any status line.
cdtr 0	DTR line is not controlling the Bluetooth link
cdsr 4	DSR Output line of BlueRS+DCE follows DSR input line of BlueRS+DTE
ccts 3	CTS Output line of BlueRS+DCE follows CTS input line of BlueRS+DTE
cdcd 4	DCD Output line of BlueRS+DCE follows DCD input line of BlueRS+DTE
cri 1	RI Output line of BlueRS+DCE follows RI input line of BlueRS+DTE
flc 0	no hardware flowcontrol

#### BlueRS+DTE:

cmds 12	Only acceptance of incoming Bluetooth link requests.
cdtr 0	DSR line is not controlling the Bluetooth link (DTR is mapped internally to DSR)
cdsr 4	DTR Output line of BlueRS+DTE follows DTR input line of BlueRS+DCE (DTR is mapped internally to DSR)
ccts 3	RTS Output line of BlueRS+DTE follows RTS input line of BlueRS+DCE (RTS is mapped internally to CTS)
flc 0	no hardware flowcontrol

Note: to readout the mode of operation of the BlueRS+ please use the command "devmode".  
 Don't forget to set the baudrate to the correct setting.

Example:



### 3.4 Table of coding of Bluetooth services

List of Bluetooth services (profiles):

Code	Text	Meaning
1101	SerialPort	Serial port, serial data link without any restriction
1102	LANAccessUsingPPP	Lan Access with PPP protocol
1103	DialupNetworking	Dial Up Networking to establish switched connections to the ISDN or PSTN
1104	IrMCSync	
1105	OBEXObjectPush	OBEX Object Push
1106	OBEXFileTransfer	OBEX Filetransfer
1107	IrMCSyncCommand	
1108	Headset	Headset access via Bluetooth
1109	Cordless Telephony	
1100	Intercom	
1111	Fax	Fax
1112	HeadsetAudioGateway	Headset Gateway for audio signals
1113	WAP	
1114	WAP_CLIENT	

## 4 BlueRS+Configurator command set

The settings of the BlueRS+ for the serial interface and the Bluetooth interface are called configuration. The BlueRS+ is delivered with a set of pre-set values. In the following section it will be shown how, by using the configuration commands, you can examine the configuration of the BlueRS+ and if necessary change it. The values can be stored in non volatile memory; this means they'll remain unchanged even if the power supply is disconnected.

You can configure the BlueRS+ in the following ways:

- by using BlueRS+Configurator commands entered by a locally connected PC.
- by using the AT command set entered by a locally connected PC.
- Seite: 23  
by using BlueRS+Configurator commands entered via the Bluetooth link (remote configuration).

The BlueRS+Configurator can be entered in the following ways:

- by entering a special escape sequence (default: "!!!") after initialization independent whether a Bluetooth link is established or not.
- by using a special command from the asynchronous dialup command interface (AT: "ATCONF").
- Seite: 23  
remote via a Bluetooth connection from another Bluetooth device.
- or escape sequence in power up phase if enabled (rsttim>10, rstmsg=1).

### 4.1 Configuring the BlueRS+ after power on

- Connect the PC's com-port to the DTE interface of the BlueRS+.
- Start a terminal emulation program (i.e. Hyper-Terminal) with the following settings: 9600 Baud, 8 databits, No Parity (**8N1**)
- Connect the BlueRS+ to the mains by the mains plug adaptor
- Wait until LED 2 starts blinking (after about 5 sec, see config cmd "rsttim") and the message to enter the config-sequence is displayed:  
**"+++ Press <CR>,<CR>,<ESC>,<ESC> to enter BlueRS+Configurator  
 +++"**
- Type in quickly within 2 seconds after the message appears: <RET> <RET> <ESC> <ESC>, to call up the BlueRS+Configurator.
- The BlueRS+Configurator acknowledges by giving a welcome string and a "#" as the prompt character. Now you can work with the BlueRS+Configurator by using the configuration commands (see page 26).
- Setup the parameter for the BlueRS+ from your terminal program and store them.

Example:

#### 4. BlueRS+Configurator command set

---

To **set** the baudrate to 9600 baud please enter the following commands:

**br=4**<↵> (set baudrate to 9600 baud)  
**save**<↵> (store the new configuration)  
**quit**<↵> (leave the BlueRS+Configurator and activate the new value settings)

Hint: The active set of parameters can be displayed on screen by the BlueRS+Configurator with the command "**show**<↵>".

- Leave the terminal program and start your application.

Now you can use the BlueRS+ with the new set of parameters by running the needed PC program.

### 4.2 Configuring the BlueRS+ with AT commands

To execute one BlueRS+Configuration command *cmd* out of the AT command mode you have to issue the command: "at\*\**cmd*".

To call up the BlueRS+Configurator please use the command "atconf".

You can leave the BlueRS+Configurator by the command "quit" (or „exit“ or „go“).

### 4.3 Remote Configuration using the TA+Configurator commands

The BlueRS+ to be configured is referred here as "*remote* BlueRS+".

The BlueRS+ to configure is referred as "*local* BlueRS+".

Please make sure that the *remote* BlueRS+ to be configured at the other end is powered up.

- Connect the PC's com-port to the DTE interface of the *local* BlueRS+.
- Connect the power supply to the mains socket.
- Start a terminal emulation program (i.e. Windows-Terminal)
- Configure the *local* BlueRS+ with the special service channel 30 (brsch=30).
- Set up a Bluetooth-Link to the *remote* BlueRS+ to be configured by using the command: ATD<*brad*><↵>.

The called BlueRS+Configurator acknowledges by requesting the remote password. Please enter the correct password (default: no password, just return). Now you can work with the BlueRS+Configurator by using the BlueRS+Configurator commands (see page 23).

- Configure the parameter for the *remote* BlueRS+ from your terminal program and store them (if wanted). (see page 26).

Hint: The active set of parameters can be displayed on screen by the BlueRS+Configurator with the command "**show**<↵>".

If necessary the *remote* BlueRS+ can be reset using the command  
**"reset<↵>"**.

- Hang up the Bluetooth connection by leaving the BlueRS+Configurator using the command **quit**.  
Leave your terminal program. After the next reset the changes will be active.
- Restore the server channel to the desired value, default to 1 (brsch=1).

Now the configured *remote* BlueRS+ with the new set of parameters can be used by running the needed PC program.

## 4.4 List of BlueRS+Configurator commands

The BlueRS+Configurator commands typed in must have the correct syntax and be complete, including all blanks. Capital/small letter use is not important. The entry is not case sensitive.

The bolded values are factory defaults. The usage is:

**[?]<command>[=parameter]**

Example to **set** the baudrate to 9600 baud:

**br=4**

Example to **show** the selected baudrate:

**br**

Example to **show all** selectable baudrates:

**?br**

To get an overview about the commands of your BlueRS+ some major commands here as a preview:

<b>show</b>	show the usually used parameter
<b>showall</b>	show all changeable parameter
<b>quit</b>	leave BlueRS+Configurator
<b>help</b>	show all available commands
<b>defa 1</b>	setup factory default parameter set
<b>save</b>	store parameter non volatile

---

### **at.sx** **AT command parameter set**

---

AT command set only:

Handle AT specific settings.

Show and change AT S registers by entering the new value.

**at.s0** show setting of S0-Register

**at.s0=1** set Register S0 to 1

---

### **boad** Bluetooth Device Own Address

---

With this command you can read out the own Bluetooth device address.  
(read only)

Example:

**boad**

---

### **bpin** Bluetooth device Pin (Passkey)

---



---

**cato** **call timeout to abort**

---

Time to abort a call if not successful connected after *n* seconds.  
*n* = {3..255}, default: **15** seconds.

---

**capa** **call pause**

---

Automatic call: set a call pause for *n* seconds before next call attempt.  
*n* = 0 : no call retry, default: **3** seconds.

---

**ccts** **CTS control**

---

CTS control  
0 : CTS follows RTS  
1 : CTS always ON (default)  
2 : CTS follows DTR  
3 : CTS follows remote CTS line status

---

**cdcd** **DCD control**

---

DCD control  
0 : DCD always ON  
1 : DCD indicates a Bluetooth connection (default)  
2 : follows DTR  
4 : follows remote DCD

---

**cdsr** **DSR control**

---

DSR control  
0 : DSR always ON (default)  
1 : DSR indicates a Bluetooth connection  
2 : DSR follows DTR line status  
3 : DSR follows DCD line status  
4 : DSR follows remote DSR line status

---

**cdtr** **DTR control**

---

Usage of DTR to control a Bluetooth connection  
0 : No control:  
Incoming calls will be accepted independent of DTR status;

- DTR drop does not disconnect an active connection.
- 2 : DTR off disconnects  
Incoming calls will be accepted only when DTR is ON;  
DTR drop disconnects an active connection.
- 4 : DTR ignore and DTR drop disconnects (default)  
Incoming calls will be accepted independent of DTR status;  
DTR drop disconnects an active connection.

---

<b>cmds</b>	<b>command set</b>	<b>(note 1)</b>
	Command set for connection control	
0:	AT command set (default)	
6:	Automatic connection establishment when DTR is ON.	
7:	Automatic connection establishment when transmit data are available.	
8:	Automatic connection establishment independent of any status line.	
12:	No connection establishment initiated by this module.	

Note: For details see the appropriate chapters.

---

<b>cpua, cpua2, cpl3</b>	<b>Output pin behavior (BlueRS+ module only)</b>
	(under development)
	Definition of the behavior of the output pins UA UA2 and L3 of BlueRS+.
	The behavior can be configured by using one of the following setting to the value of the list below.
	The output level can be inverted by adding 128 to the desired value (defines the output pin to low active).
0:	always OFF. <b>Default UA, UA2, L3</b>
1:	always ON
29:	Bluetooth link established, same as DCD on V.24.

---

<b>cri</b>	<b>RI control</b>
	RI control
0 :	RI is set with an incoming Bluetooth link request (default)
1 :	RI follows remote RI line status

---

<b>defa</b>	<b>default settings</b>
-------------	-------------------------

Sets up factory default parameter setting.  
defa 0:        setup all parameter concerning data port  
defa 1:        setup all parameter to factory defaults including Bluetooth  
                  parameter.

---

**devmode**                               **device mode strapping**

---

Shows the mode of operation of the BlueRS+: DTE or DCE mode.  
When selecting DTE mode two additional inputs are evaluated and mapped  
to the behavior of DCD (Pin 18) and RI (Pin 11).  
    0 : DTE mode  
    1 : DCE mode

Note: If you are working in DCE mode using the plug-on module, please make sure,  
that PIN20 of connector P1 is connected to GND.

---

**dbits**                                       **asynchronous databits**

---

Number of data bits asynchronous chars        (default: 8)   7,8

Note: To use other data formats than 10 bit (8N1, 7E1, 7O1) you have to set br to  
fixed speed.

---

**flc**   **flowcontrol**

---

Flowcontrol to DTE  
0 : No flowcontrol  
3 : Hardware flowcontrol RTS/CTS (default)  
5 : Hardware flowcontrol RTS/CTS additionally in AT command phase

---

**flash**   **load new firmware**

---

This commands loads new firmware into the BlueRS+. The actual firmware  
will be overwritten.  
The firmware will be stored into the used part of the flash memory. While  
uploading the following checks will be performed:  
- File transfer protocol is XMODEM1K  
- An overall firmware checksum is used.  
- The firmware type written in the module header of the firmware must be  
compatible to the hardware- and allowed firmware type (stored inside the  
Bootloader).

---

This command is available only via the local serial port.

---



---

**idle** **Idle data timeout**

---

Timer to disconnect the Bluetooth link after inactivity on the serial line (sec).  
**0**: inactive (default)  
**1..n**: delay time to disconnect in seconds (1..255).

---



---

**load** **Load stored parameter setting**

---

All parameters stored in non volatile ram will be loaded.

---



---

**opt** **option register for AT register**

---

option register representing the setting of some AT commands:  
bit 0: 1 = echo on, equals ATE1  
bit 1: 1 = quiet, equals ATQ1  
bit 2: 1 = numeric response, equals ATV0

---



---

**prty** **asynchronous parity**

---

Parity of asynchronous character (default: no parity)  
**0** : No parity; **1** : Odd parity; **2** : Even parity, **3** : space parity, **4** : mark parity

Note: To use other data formats than 10 bit (8N1, 7E1, 7O1) you have to set br to fixed speed.

---



---

**quit, exit, go** **activate parameter changes**

---

Activates the actual parameter settings and leave the BlueRS+Configurator (without storing the parameter in non volatile memory ).

---



---

**reset** **reset BlueRS+**

---

Resets the whole functionality of the BlueRS+ by a forced hardware reset (like Power off / on).  
Refer also to parameter rsttim.

---



---

**rsttim** **startup timer**

---

---

Startup delay timer after reset. Within this period the configuration can be entered after reset.

1 .. 255 : reset phase in 100 milliseconds, default: **40** (4 seconds)

---

**save** **store parameter changes**

---

Stores the actual set of parameters in non volatile memory

---

**sbits** **number of stopbits**

---

Number of stopbits of asynchronous character

**1** : One stopbit (default); **2** : two stopbit

Note: To use other data formats than 10 bit (8N1, 7E1, 7O1) you have to set br to fixed speed.

---

**show** **show parameters**

---

Displays the actual set of parameters

---

**showall** **show all parameters**

---

Displays the all accessible parameters

---

**trcnnn** **commands for internal trace**

---

The usage of the commands for internal trace are described in chapter 5.3.

---

**ver** **show version string**

---

Displays detailed information about the software version and BlueRS+ type.

---

**verb** **show version string of Bootloader**

---

Displays detailed information about the software version of the Bootloader.

---

**<cmd>?**

**more information for one command**

---

Displays the allowed values for one selected command *<cmd>*

---

**??**

**help**

---

Displays help texts for all commands

**Notes:**

## 4.5 Software update

The BlueRS+ uses a Flash-EPROM for software updates to store the operational software. This software can be updated from a local connected PC via the COM port or via an remote configuration connection. Please fulfill the following steps to update the BlueRS+:

- Get a new software release for the BlueRS+ from your supplier or <http://www.stollmann.de/> or <ftp://ftp.stollmann.de/> and copy it to your PC.
- Start a terminal emulation on your PC with the capability to run an X-MODEM-1K file transfer (i.e. HyperTerminal).
- Local update: enter the BlueRS+Configurator.
- Enter the BlueRS+Configuration command "flash".
- Wait for end of erasing the Flash-EPROM and the prompt to start your X-MODEM transfer.
- Start the 1k-X-MODEM file transfer (send file or upload) by selecting the Transfer / Send File menu point in your terminal emulation and select the new software.
- After completion you will get the information whether the software update ended successfully or erroneous.
- The loaded new firmware will be activated automatically.
- Due to new functionality the last stored configuration setting may be lost, please check before using.

For more details refer to the description of the commands flash in the chapter "List of BlueRS+Configurator commands" on page 26.

### Note:

Due to an error it may be that no firmware is active within the BlueRS+. This will be indicated by continuous flashing of the LEDs L1, L2 (Bootloader active). To store a new firmware correctly you have to enter the command `at**flash` and load a firmware using the XMODEM protocol as described above. This Bootloader supports only `AT**cmd` with fixed baudrate of 115.200 Baud.

## 5 Diagnostic and error messages

For the diagnostic of erroneous situations the following functionality is supported. Please check first the behavior of LED displays, if an Bluetooth link can not be established. Refer to list of LED displays on page 41.

### 5.1 Error messages from AT command set

When the extended result messages are selected using the command ATW1 Bluetooth error codes are displayed in addition to the standard AT result messages. Bluetooth error codes are always coded as <xxxx>. The meaning can be taken from the following tables Bluetooth error codes (see page 35).

### 5.2 Bluetooth error codes

Note: error codes marked with (i) are internal errors.

Error cause hexadecimal	Meaning	Translation to AT result codes
0x0000	no error, no explanation	3
0x0001	driver and application version mismatch	3
0x0002	application id provided is not correct	3
0x0003	unknown message code in message	3
0x0004	not enough resources to complete request (out of descriptor etc)	3
0x0005	at least one parameter of the message is wrong	3
0x0006	no adapter plugged in	3
0x0007	too much outstanding messages in downstream direction	6
0x0008	driver is busy, repeat request later	6
0x0009	error in message transport system (driver not correct installed?)	3
0x0101	(i) HCI_ERR_UNKNOWN_COMMAND	3
0x0102	(i) HCI_ERR_NOCONNECTION	3
0x0103	bluetooth adapter crashed	3
0x0104/260	remote bluetooth device not found (wrong address?, out of range?)	8
0x0105	authentication error(wrong pin code supplied?)	3
0x0106	(i) HCI_ERR_KEY_MISSING	3
0x0107	(i) HCI_ERR_MEMORY_FULL	3
0x0108/264	lost connection to remote bluetooth device (out of	3

	range)	
0x0109	max no of connections exceeded	6
0x010a	max no of voice connections exceeded	6
0x010b	(i) HCI_ERR_ACL_CONN_ALREADY_EXISTS	3
0x010c	(i) HCI_ERR_COMMAND_DISALLOWED	3
0x010d	connection attempt by remote side rejected	3
0x010e	connection attempt by remote side rejected	3
0x010f	connection attempt by remote side rejected	3
0x0110	connection attempt by remote side timed out	8
0x0111	(i) HCI_ERR_UNSUPPORTED_PARAM_VALUE	3
0x0112	(i) HCI_ERR_INVALID_HCI_PARAMETER_VALUE	3
0x0113	connection terminated by remote side	3
0x0114	connection terminated by remote side	3
0x0115	connection terminated by remote side	3
0x0116	connection terminated by local side	3
0x0117	(i) HCI_ERR_REPEATED_ATTEMPTS	3
0x0118	authentication rejected by remote side	3
0x0119	incompatible remote bluetooth adapter	3
0x011a	unspecified error	3
0x011b	(i) HCI_ERR_UNSUPPORTED_LMP_PARAMETER_VAL	3
0x011c	master slave role switch not allowed	3
0x011d	connect lost to remote Bluetooth adapter (link manager)	3
0x011e	(i) (HCI_ERR_LMP_ERROR_TRANSACTION_COLLISION	3
0x011f	(i) HCI_ERR_LMP_PDU_NOT_ALLOWED	3
0x0120	attempt to enable encryption failed	3
0x0121	information: unit key used	3
0x0122	(i) quality of service not supported.	3
0x0123	(i) HCI_ERR_INSTANT_PASSED	3
0x0124	(i) unit key not supported	3
0x0164	(i) HCI_ERR_ILLEGAL_HANDLE	3
0x0165	initialization of adapter failed (timeout)	6
0x0166	initialization of adapter failed (synchronization)	6
0x0201	(i) connection went to state pending	3
0x0202	protocol not supported by remote side	3
0x0203	connection refused due to security conditions	3
0x0204	out of resources	3
0x02ee	remote side timed out	3
0x0301	version of remote SDP entity not compatible	3
0x0302	invalid service record handle	3
0x0303	invalid request syntax	3
0x0304	invalid size of pdu	3
0x0305	continuation state is invalid	3

---

0x0306	not enough resources to complete operation	3
0x0364	client received unhandled SDP opcode	3
0x0365	No answer from server(timeout)	3
0x0366	specified service not found	3
0x0367	Syntax Error in Response from server	3
0x0464	Connection setup was rejected by remote side (DM), i.e. the Pin exchange has failed in restricted mode	3
0x0465	Connection timed out (no response)	8
0x0466	Non Supported Command received (incompatible remote side)	3
0x0467	Illegal parameter	3

Note: error codes marked with (i) are internal errors.

### 5.3 Diagnostic using the internal Trace

For more sophisticated debugging an internal trace functionality is implemented. This logging mechanism allows to write activities of the Bluetooth interfaces and the serial interface into a wrap around buffer. The type of entries can be selected by a trace mask.

---

#### trcmsk                    set trace mask

---

trcmsk *par*    Setup the mask to select the type of data to be written into the trace buffer.  
Default: Bluetooth HCI and Blueface messages, DTE interface lines, DTE-Data in connection-setup and clearing-phase.  
The parameter *par* has to be setup in the following way, all bytes have to be entered (default 00 00 00 00 00 00 00 00 04):  
par := bl1 bl2 bl3 dl1 dl2 dl3 sl1 app bt1

- bl1    reserved (00)
- bl2    reserved (00)
- bl3    reserved (00)
- dl1    reserved (00)
- dl2    reserved (00)
- dl3    reserved (00)
- sl1    Serial line 1; i.e. first V.24 port; default: **00**
  - bit0: control lines after change
  - bit2: data bytes while connection control (call phase)
- app    reserved (00)
- bt1    Bluetooth; default: **04**
  - bit0: hci interface, commands and events
  - bit1: hci interface, acl data
  - bit2: Blueface interface: signaling
  - bit3: Blueface interface: traffic while DCD off
  - bit4: Blueface interface: traffic

examples:  
trcmsk 000000000000000004    Trace Bluetooth messages and V.24 commands.

---

#### trcon                    start trace write

---

trcon                    set trace to active regarding to trace mask

---

**trcoff**                      **stop trace write**

---

trcoff                      set trace to OFF independent of trace mask

---

**trcclr**                      **clear trace buffer**

---

trcclr                      clear actual trace buffer contents

---

**trcread**                      **read trace buffer**

---

trcread                      Output of the complete trace buffer in hexadecimal chars (ASCII, max. line length 72 chars).

Every entry of the trace buffer is output using the following format:

*Entry number – Timestamp – Type – Length – Databytes*

<i>Entry number</i>	Sequence number of entry
<i>Timestamp</i>	in units of 10 ms
<i>TypeAndSource</i>	Source of traceentry: bit0-7: type from trace mask bit8-14: source of trace entry:  bit15: 0xxx : incoming event (from Bluetooth link) 8xxx : outgoing event (to Bluetooth link) "FFFF" : Reset for firmware
<i>Length</i>	Length of following data bytes
<i>Databytes</i>	Data bytes; continued lines are indicated by an ">".

Coding of trace data bytes dependent of *TypeAndSource*:

0901/8901: Serial line control line change:  
bit0 : 1 = DSR is ON  
bit1 : 1 = DCD is ON  
bit2 : 1 = CTS is ON  
bit3 : 1 = RING is ON  
bit4 : 1 = RTS is ON  
bit5 : 1 = DTR is ON

## 6 Appendix

### A1: Technical data BlueRS+

BlueRS+ desktop model serial interface:

functional:	V.24
electrical:	V.28
mechanical:	9 pin DSUB connector (female)

BlueRS+ module serial interface:

functional:	V.24
electrical:	TTL
mechanical:	double pin rows P1

Transmission speeds:

DTE:	1200 – 230400 bit/s (asynchronous)
------	------------------------------------

Character representation:

8Bit no Parity, 1 stop bit
7Bit even/odd Parity, 1 stop bit

Character synchronization:

asynchronous

Operating mode:

half duplex or full duplex

Flowcontrol

Hardware (RTS/CTS)

Bluetooth link:

RF part: +4 dBm Radio,  
20 m (Bluetooth Power Class 2)  
Bluetooth Spec: 1.0 B (1.12.1999)  
Flowcontrol credit based

Class 1 module:

RF part: +20 dBm Radio,  
100 m (Bluetooth Power Class 1)

Bluetooth antenna:

internal or external via coax SMC connector

Physical dimensions:

BlueRS+Dx:	desktop casing: 71 x 22 x 123 mm (WxHxD)
BlueRS+Mx:	plug on module: 56 x 56 x 12s mm (WxHxD)

Power supply:

BlueRS+Dx:	external power supply 5V DC. idle: ca. 75 mA, active: ca. 115 mA.
BlueRS+Mx5:	5V DC, +-5%, via double pin row P2 idle: ca. 30 mA, active: ca. 70 mA.

**A2: LED displays BlueRS+ desktop models**Active states:

L1	L2	Status
⊕	⊕ (2sec)	Power-On-Phase ; Bootloader, Init active, wait
⊗	○	Ready, idle ; Initializing ok, no Bluetooth link established
∅	○	Ready, power down; Init ok, no Bluetooth link established
⊗	∅	Connecting ; Bluetooth link will be established
⊗	⊗	Connected ; Bluetooth link established

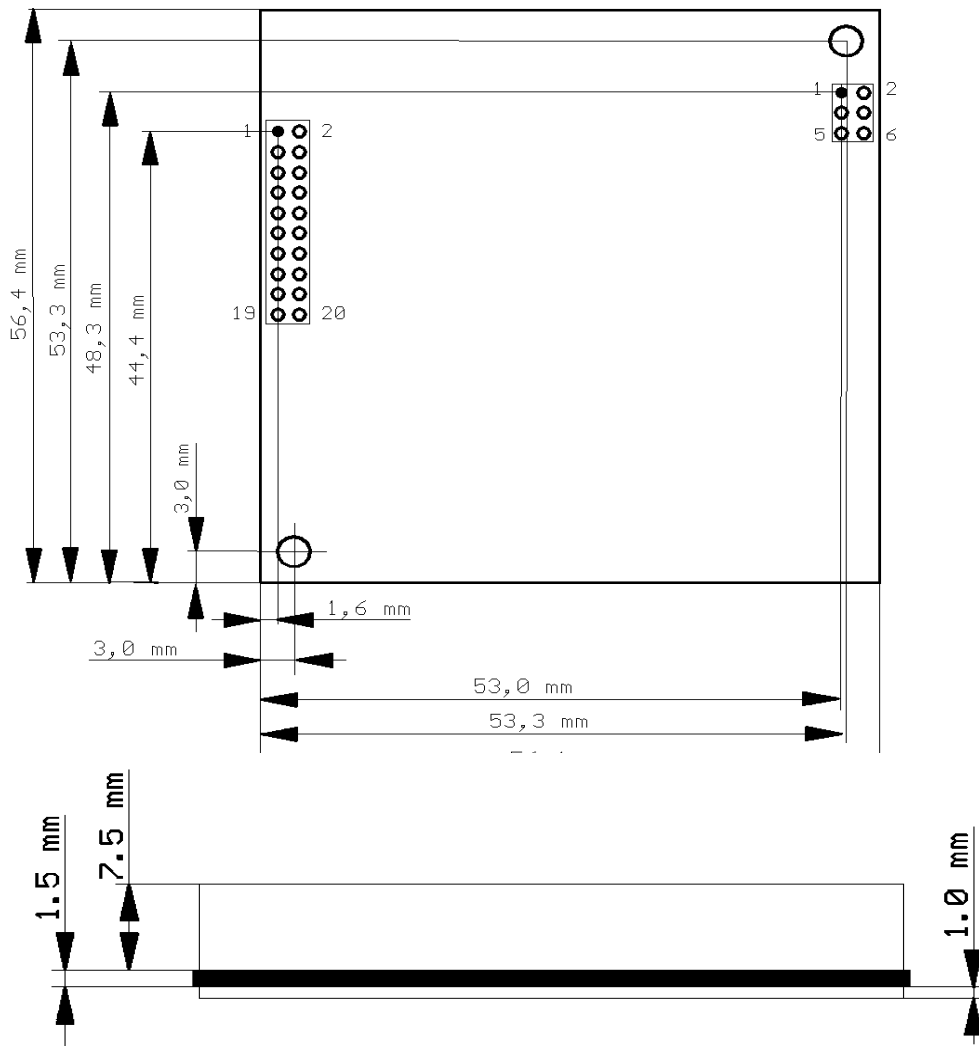
Error states:

L1	L2	Status
○	○	BlueRS+ not ok ; Hardware error, BlueRS+ repair necessary
○	⊕ (nx1s)	BlueRS+ not ok ; Hardware error, BlueRS+ repair necessary
⊕	⊕	L1, L2 flashing: Bootloader active, no operational firmware programmed. Use command at**flash to download firmware with 115200 Bd ,N81 (see page 34).

LED Legend:

⊗	On	
∅	occ	short on, long off Cycle 1 to 2 sec
⊕	fl	long on, short off Cycle 1 sec
⊕	( <i>n</i> x <i>m</i> s)	continuous blinking: <i>n</i> times every <i>m</i> seconds
○	Off	

**A3: Mechanical dimensions of the BlueRS+ module**



**A4: BlueRS+ Serial Interface Connector P1**

P1-Pin	Signal	Direction from BlueRS+	BlueRS+ usage	External interfacing
1	GND	I	0V-Power	0V Power supply
2	VCC	I	+5V-Power	+5V Power supply
3	GND		GND	GND
4	TXD~	I		
5	GND		GND	GND
6	RXD~	O		
7	ID2	O	GND	NC or READ
8	RTS~	I		
9	ID1	O	GND	NC or READ
10	CTS~	O		
11	RESET	I	RESET active low (OC)	NC
12	DTR~	I		
13	L3~ (UA0)	O	(internal 10k Pull up)	NC or status info
14	DCD~	O		
15	RI~	O		
16	DSR~	O		
17	UA~	O	User Output 1	NC or status info
18	UE~	I	User Input 1	10k Pull up
19	UA2	O	User Output 2	NC or status info
20	UE2	I	User Input 2	GND

**Outputs:**

UA: default: similar to L1 of BlueRS+Dx  
L3: Bluetooth link established  
UA2: reserved

**Inputs:**

UE: reserved  
UE2: select DCE/DTE mode. GND=DCE mode.

Inputs and output lines with '~' are low active (i.e. ON has the TTL level 0VDC)

**A5: BlueRS+ Interface Connector P2**

If mounted:

P2-Pin	Signal	Direction
1	NC	-
2	NC	-
3	NC	-
4	NC	-
5	NC	-
6	NC	-

**A6: Pinout of the V.24/V.28 interface BlueRS+ desktop models (DSUB 9)**

Pin	V.24/V.28			I/O	TEXT
	ITU	DIN	EIA		
1	109	M5	DCD	O	Data carrier detect
2	104	D2	R D	O	Receive data
3	103	D1	T D	I	Transmit data
4	108/1 108/2	S1.1 S1.2	DTR	I	Data terminal ready
5	102	E2	GND	---	Signal ground
6	107	M1	DSR	O	Data set ready
7	105	S2	RTS	I	Request to send
8	106	M2	CTS	O	Clear to send
9	125	M3	RI	O	Ring indicator