



BlueMod+B20/BT2.1

AT Command Reference

Release r01

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1 Introduction

This document describes the command interface for the BlueMod+B20/BT2.1 featuring software version V2.000 SPP or later. The BlueMod+B20/BT2.1 supports Bluetooth 2.1 with Secure Simple Pairing (SSP).

The BlueMod+B20/BT2.1 has three different operating states. The command state, the online command state and the online data state. In the command state and in the online command state, the BlueMod+B20/BT2.1 can be controlled using the AT-commands described below. In the online data state (data transfer mode) the BlueMod+B20/BT2.1 transmits each character to the remote device via an existing Bluetooth link.

To enter the online command state during an active data connection the following sequence (escape sequence) can be used:

<+><+><+><A><T>

The time interval for the full escape sequence must not exceed 1 second. The escape sequence remains transparent to the remote device.

To activate the detection of the escape sequence the corresponding bit has to be set in the firmware compatibility register (**S402**). The data throughput is decreased significant when using this feature.

2 Commands

Each command line sent from the DTE to the DCE consists of a prefix, a body, and a terminator.

All command lines begin with the prefix **AT** (ASCII 065, 084) or **at** (ASCII 097, 116).

The body is a string of characters in the ASCII range 032-255. Control characters other than <CR> (carriage return; ASCII 013) and <BS> (back space; ASCII 008) in a command line are ignored.

The terminator is <CR>.

There is no distinction between upper-case and lower-case characters. A command line can have a maximum length of 40 characters. It is automatically discarded if the input is longer. Corrections are made using <BS>. Multiple commands on the same command line are not allowed.

If a command line is not terminated with <CR> (carriage return; ASCII 013) within 30 seconds, the command line is discarded.

Commands have the following syntax:

Syntax	Description
AT<S register>?<CR>	Read the current value of the S register
AT<command>=<value><CR>	Write the value of the command

Responses are sent back to the host and can be any of the following:

Responses	Description
<CR><LF>OK<CR><LF>	Successful final message
<CR><LF>ERROR<CR><LF>	Error message, command not supported

Each parameter value is stored in the non-volatile memory immediately after executing the command.

The factory-default values of the parameters are marked using the bold letter format.

? [Get Help](#)

AT?<parameter>

This command shows a help text for the parameter.

A [Accept Incoming Call](#)

ATA

This command accepts an incoming call if automatic call acceptance is not set (register S0=0). An incoming call is always signaled with the unsolicited response "RING" or result code "2", even if automatic call acceptance is selected.

&C [DCD Behavior](#)

AT&C<n>

This command determines the behavior of the DCD control line.

n	Description
0	DCD always ON
1	DCD ON indicates a Bluetooth connection
2	DCD follows local DTR
4	DCD follows remote DCD

D [Initiate Bluetooth Link](#)

ATD<Bluetooth address> | <bx> [,<UUID> | <service channel>]

This command addresses a Bluetooth device directly via its address or by reference the index bx of the bonded device list entry (b01...bx). If a connection to a Bluetooth 2.0 device is initiated, the PIN must have been set up using **S318** command. When connecting to a Bluetooth 2.1 device a SSP procedure is initiated.

The default UUID from **S329** register or the optional UUID (4-digit hex value) from the command line is used to select the remote service profile.

The optional service channel (1 or 2-digit decimal value 1...31) from the command line is used to select the channel of the remote side to connect to. This will only succeed if the service on this channel is supported by the local device.

In case the remote device is not reachable, the authentication fails, the service or the service channel is not available on the remote device the **ATD** command will respond with a "NO CARRIER" message.

The characters W P T R w p t r > ; / ^ ! @ () – and space are ignored within a dial string.

Example:

ATD 0080371443AB,1106	Connect to Bluetooth device 0080371443AB using the remote service profile UUID 1106
ATD 0080371443AB,1	Connect to Bluetooth device 0080371443AB to rfcmm channel 1
ATD b01	Connect to first entry of the bonded device list

DL Initiate Bluetooth Link to Last Dialed Bluetooth Address

ATDL<Bluetooth address>

This command initiates a Bluetooth link to the last Bluetooth address used with the **ATD** command.

If the **ATD** command was not used prior to the **ATDL** command (e.g. after reset), the command is answered with an ERROR message.

&D DTR Behavior

AT&D<n>

This command determines the behavior of the RTC-IN (DTR in DCE mode) line controlling the Bluetooth connection.

n	Description
0	Ignore: Incoming calls will be accepted independently of the DTR status; DTR drop does not disconnect an active connection
1	On DTR drop go to online command state. Afterwards you can use ATH for hang-up. Leave online command state with ATO command.
2	Control: Incoming calls will be accepted only when DTR is ON; DTR drop disconnects an active connection
4	Hang-up: Incoming calls will be accepted independently of the DTR status; DTR drop disconnects an active connection

E Local Echo

ATE / ATE1

This command sets the local echo in command states on or off.

Param.	Description
ATE	No local echo
ATE1	Local echo on in command states

&F Factory Defaults

AT&F

The factory-default values will be loaded.

H Disconnect

ATH

This command disconnects an existing Bluetooth connection or disconnects an incoming connection.

The disconnection of an existing Bluetooth connection is only possible in online command state (see setting for AT&D1). After executing the command the firmware automatically performs a transition to command state.

It is possible to disconnect an incoming Bluetooth connection in the state RING. If the incoming Bluetooth connection is disconnected with **ATH**, the firmware automatically performs a transition to command state.

I Display Information

ATI<n>

Read out information from the module. These values cannot be changed.

Param.	Description
ATI	Show own device name
ATI3	Read out the firmware version
ATI4	Read out the own Bluetooth device address
ATI99	Read out the firmware version

O	Return to Online State
---	------------------------

ATO

If the device is in online command state while a connection is active, **ATO** returns the device to data mode. All received data from remote side is lost in command state. See AT&D1 for entering command state during connection.

Q	Result Messages
---	-----------------

ATQ / ATQ1

This command allows/suppresses result codes and messages.

Param.	Description
ATQ	Enable result messages after command input
ATQ1	Suppress result messages after command input

&S	DSR Control
----	-------------

AT&S<n>

This command determines the behavior of the RTC-OUT (DSR in DCE mode) control line of the BlueMod+B20/BT2.1.

n	Description
0	DSR always ON
1	DSR ON indicates a Bluetooth connection
2	DSR follows DTR
3	DSR follows DCD
4	DSR follows remote DSR

S0	Call Acceptance
----	-----------------

ATS0=<value>

This command configures the call acceptance.

Value	Description
0	No automatic call acceptance; acceptance of an incoming call is controlled by the data terminal (ATA command after RING)
1	Immediate call acceptance
2...15	Call acceptance after n RING messages

S3	Command Line Termination Character
----	------------------------------------

ATS3=<value>

This command sets the default command line termination character.

To reset the command line termination character to the factory-default, use the **AT&F** command (all parameters will be set to the factory-default). The factory-default setting is 13.

Example:

ATS3=13	Set command line termination character <CR>
---------	---

Note: The command line termination character is set in decimal format.

S4	Response Formatting Character
----	-------------------------------

ATS4=<value>

This command sets the default response formatting character.

To reset the response formatting character to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default). The factory-default setting is 10.

Example:

ATS4=10	Set response formatting character <LF>
---------	--

Note: The response formatting character is set in decimal format.

S5	Command Line Editing Character
----	--------------------------------

ATS5=<value>

This command sets the default command line editing character .

To reset the BS character to the factory-default, use the **AT&F** command (all parameters will be set to the factory-default). The factory-default setting is 8.

Example:

ATS5=8	Set command line editing character to <BS>
--------	--

Note: The command line editing character is set in decimal format.

S301	Local Device Name
-------------	--------------------------

ATS301=<name>

This command allows the modification of the local device name. The device name is shown on a remote Bluetooth device during device/service discovery. It is limited to 31 characters, the output of the string has to match this length.

The device name can contain a format string to include the device's own address or parts of it in the name.

Format: "%[<s>][<d>]a"

"%"	Identifier start format string
<s>	Character separator on byte order (optional)
<d>	Number (1-12) of digits included in device name (optional, default is 4)
"a"	Identifier end format string

Examples: Device address = "0123456789AB"

ATS301=BlueMod+B20 %:4a	Display on remote end: BlueMod+B20 89:AB
ATS301=BlueMod+B20 %4a	Display on remote end: BlueMod+B20 89AB
ATS301=BlueMod+B20 %:3a	Display on remote end: BlueMod+B20 9:AB
ATS301=BlueMod+B20 %3a	Display on remote end: BlueMod+B20 9AB
ATS301=BlueMod+B20 %:12a	Display on remote end: BlueMod+B20 01:23:45:67:89:AB

*Note: This command has to be executed with a "=" sign, if a blank is used between **ATS301** and name an **ERROR** is the feedback. This is because blanks are allowed for a device name, e.g. "B20 device".*

S302	Class of Device
-------------	------------------------

ATS302=<value (hex)>

This command allows the manipulation of the Bluetooth class of device (CoD).

Note: Changing the class of device affects profile-specific requirements and may influence interoperability. Change this only if you are certain of all side effects.

The CoD consists of 3 octets (24 bits). Bits 23 through 13 define the service class, bits 12 through 8 define the major device class, and bits 7 through 2 define the minor device class. Bits 1 and 0 are reserved and must always be set to 0.

The **service class** field is a bit field; no bit, one bit or several bits can be set, depending on the profile requirements.

Service classes:

Bit	Description
13	Limited discoverable mode
14	Reserved
15	Reserved
16	Positioning (location identification)
17	Networking (LAN, ad-hoc, ...)
18	Rendering (printing, speaker, ...)
19	Capturing (scanner, microphone, ...)
20	Object transfer (v-inbox, v-folder, ...)
21	Audio (speaker, microphone, headset service, ...)
22	Telephony (cordless telephony, modem, headset service, ...)
23	Information (Web server, WAP server, ...)

The **major device** class field represents the highest level of granularity for defining a Bluetooth device. The main function of a device is used to determine the major device class setting (bits 12 through 8 in the CoD).

Major device class:

Bit	12	11	10	9	8	Description
	0	0	0	0	1	Computer (desktop, notebook, PDA, organizer, ...)
	0	0	0	1	0	Phone (cellular, cordless, payphone, modem, ...)
	0	0	0	1	1	LAN/network access point
	0	0	1	0	0	Audio/video (headset, speaker, stereo, video display, VCR, ...)
	0	0	1	0	1	Peripheral (mouse, joystick, keyboards, ...)
	0	0	1	1	0	Imaging (printing, scanner, camera, display, ...)
	0	0	1	1	1	Wearable
	0	1	0	0	0	Toy
	0	1	0	0	1	Health
	1	1	1	1	1	Uncategorized, specific device code not specified

The **minor device** class field (bits 7 through 2 in the CoD) can be interpreted only in the context of the major device class (but independently of the service class field). The meaning of the bits may therefore change depending on the major device class.

Minor device class values for the "Computer" major device class:

Bit	7	6	5	4	3	2	Description
	0	0	0	0	0	0	Uncategorized, specific device code not assigned
	0	0	0	0	0	1	Desktop workstation
	0	0	0	0	1	0	Server-class computer
	0	0	0	0	1	1	Laptop
	0	0	0	1	0	0	Handheld PC/PDA (clam shell)
	0	0	0	1	0	1	Palm-sized PC/PDA
	0	0	0	1	1	0	Wearable computer (watch-sized)

Minor device class values for the “Phone” major device class:

Bit	7	6	5	4	3	2	Description
	0	0	0	0	0	0	Uncategorized, specific device code not assigned
	0	0	0	0	0	1	Cellular
	0	0	0	0	1	0	Cordless
	0	0	0	0	1	1	Smart phone
	0	0	0	1	0	0	Wired modem or voice gateway
	0	0	0	1	0	1	Common ISDN access

Minor device class values for the “Health” major device class:

Bit	7	6	5	4	3	2	Description
	0	0	0	0	0	0	Undefined
	0	0	0	0	0	1	Blood pressure monitor
	0	0	0	0	1	0	Thermometer
	0	0	0	0	1	1	Weighing scale
	0	0	0	1	0	0	Glucose meter
	0	0	0	1	0	1	Pulse oximeter
	0	0	0	1	1	0	Heart/pulse rate monitor
	0	0	0	1	1	1	Health data display

For the description of other minor device classes, refer to the Bluetooth specification.

Examples:

ATS302=0x00001F00	Uncategorized, specific device code not specified
ATS302=0x00000210	Wired modem
bclass=0x090C	Weighing scale

S305 Device Role

ATS305=<value>

This command sets the device role for all connections.

Value	Description
0	Master preferred
1	Slave preferred
2	Don't care

To reset the device role to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Example:

ATS305=2	Set device role to “don't care”
----------	---------------------------------

S307	Link Supervision Timeout
-------------	---------------------------------

ATS307=<value>

This command sets the link supervision timeout in seconds. The factory-default setting is 20. The valid range is 1 - 40.

The link supervision timeout parameter is used by the master or slave Bluetooth device to monitor link loss. If, for any reason, no base band packets are received on an active connection for a duration longer than the link supervision timeout, the connection is disconnected. This value is used on all connections. However only the master device of a Bluetooth connection can set this timeout value for a connection.

To reset the link supervision timeout to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Example:

ATS307=20	Set link supervision timeout to 20 sec.
-----------	---

S308	Page Scan Interval
-------------	---------------------------

ATS308=<value>

This command sets the page scan interval. The factory-default setting is 2048. Valid range is from 18 to 4096, only even values are allowed.

Value	Description
n=18...4096	Page scan interval for n*0.625 ms (n is a decimal value)
2048	Page scan interval set to 1.28 s

To reset the page scan interval to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Example:

ATS308=20	Set current value of the page scan interval to 12.5 ms
-----------	--

Note: Setting the page scan interval to values below the default significantly increases the power consumption.

S309	Page Scan Window
-------------	-------------------------

ATS309=<value>

This command sets the page scan window value. The factory default setting is 18. Valid range is from 17 to 4096.

To reset the page scan window to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Value	Description
n=17...4096	Page scan window for n*0.625 ms (n is a decimal value)
18	Page scan window set to 11.25 ms

Example:

ATS309=20	Set current value of the page scan window to 12.5 ms
-----------	--

Note: The page scan window has to be less or equal the page scan interval.

S310 Inquiry Scan Interval

ATS310=<value>

This command sets the inquiry scan interval. The factory default setting is 2048.

Valid range is from 18 to 4096, only even values are allowed.

To reset the inquiry scan interval to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Value	Description
n=18...4096	Inquiry scan interval for n*0.625 ms (n is a decimal value)
2048	Inquiry scan interval set to 1.28 s

Example:

ATS310=20	Set current value of the inquiry scan interval to 12.5 ms
-----------	---

Note: Setting the inquiry scan interval to values below the default significantly increases the power consumption.

S311 Inquiry Scan Window

ATS311=<value>

This command sets the page scan window. The factory default setting is 18.

Valid range is from 17 to 4096.

To reset the inquiry scan window to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Value	Description
n=17...4096	Inquiry scan window for n*0.625 ms (n is a decimal value)
18	Inquiry scan window set to 11.25 ms

Example:

ATS311=20	Set current value of the inquiry scan window to 12.5 ms
-----------	---

S312 Name Discovery during Inquiry

ATS312=<value>

This parameter controls the name discovery during an inquiry using **AT+BINQ** command. The name discovery works for a maximum of 40 different Bluetooth devices.

Value	Description
0	Name discovery during inquiry off
1	Name discovery during inquiry on

S314 Own Service Profiles (Bit field)

ATS314=<value>

This command defines the services the BlueMod+B20/BT2.1 reports to a remote Bluetooth device during a service discovery sequence. 2 multiple profiles at the same time are supported and can be selected by combining the profile values (AND operation).

If the own service profiles are changed by the **ATS314** command the class of device is automatically set in the **S302** register.

Value	Description
0x01	SPP (UUID 1101)
0x02	DUN (UUID 1103)
0x08	Headset (UUID 1108)
0x80	Obex Push (UUID 1105)
0x100	Obex FTP (UUID 1106)

Example:

ATS314=0x100	Set Obex FTP profile
--------------	----------------------

Note: The profile specific higher protocols (DUN AT, PPP, Obex), must be implemented on the device host.

S316 **Scanning Capability**

ATS316=<value>

This command controls the visibility (inquiry) of the device and its ability to accept connections (paging). If set to "0" all paging/inquiry requests from other Bluetooth devices will be ignored, and the RF receiver of the BlueMod+B20/BT2.1 is disabled.

Value	Description
0	Page scan and inquiry scan are disabled; the BlueMod+B20/BT2.1 is not connectable and not discoverable
1	Inquiry scan is enabled; the BlueMod+B20/BT2.1 is discoverable, but not connectable
2	Page scan is enabled; the BlueMod+B20/BT2.1 is connectable, but not discoverable
3	Page scan and inquiry scan are enabled; the BlueMod+B20/BT2.1 is connectable and discoverable

S317 **Page-Scan Repetition Mode**

ATS317=<value>

This parameter gives the interval between successive page scans starting at the paged/remote device, and hence defines how long it will take to connect. The parameter must be aligned to the remote page scan interval (see **S308** register in case the remote device is a BlueMod+B20/BT2.1).

Possible values according to the Bluetooth base band specification are:

Value	Description
0	R0 continuous scan, page scan interval ≤ 1.28 s and = page scan window
1	R1 page scan interval ≤ 1.28 s
2	R2 page scan interval ≤ 2.56 s

Continuous scanning (on both devices) decreases the connect time down to about 200 ms:

- R0: about 200 ms
- R1: about 2.2 s
- R2: about 3.5 s

Note: The page scan window and interval must be set in conformance to the page-scan repetition mode.

S318

Local PIN

ATS318=<PIN>

This command sets the PIN for the device. The PIN is used for legacy pairing (pairing to a Bluetooth 2.0 device) only. It is not used in case of SSP.

The PIN has a maximum length of 16 alphanumeric characters; the factory-default is "0000".

After a bonding has taken place (PIN successful exchanged), Bluetooth links can be established between the bonded devices independently of the settings and of the PIN.

To reset the PIN to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Example:

ATS318=1234	Set PIN to 1234
-------------	-----------------

Note: Prefer a PIN composed of only decimal digits. Do not assume that a remote device with limited user-interface capabilities supports alphabetic characters.

S323

Local Baud Rate

ATS323=<value>

This command determines the baud rate for the UART.

Value	Description
1200	1,200 bps
2400	2,400 bps
4800	4,800 bps
9600	9,600 bps
19200	19,200 bps
38400	38,400 bps
57600	57,600 bps
115200	115,200 bps
230400	230,400 bps
460800	460,800 bps
921600	921,600 bps

Example:

ATS323=9600	Set baud rate to 9,600 bps
-------------	----------------------------

S324 **Data Bits**

ATS324=<value>

This command defines the number of data bits (asynchronous characters).

Value	Description
8	Use 8 data bits

Note: This product supports 8 data bits only!

S325 **Stop Bits**

ATS325=<value>

This command defines the number of stop bits of asynchronous character.

Value	Description
1	One stop bit
2	Two stop bits

S326 **Parity**

ATS326=<value>

This command defines the parity of asynchronous characters.

Value	Description
0	No parity
1	Odd parity
2	Even parity

S327 **Variable Baud Rate**

ATS327=<value>

This command configures the baud rate of the UART interface within the range of 1,200 - 921,600 bps. All values that are a multiple of 244.141 can be set.

Values that are not exactly a multiple of 244.141 will be recalculated internally. So if the value of this command is set to 10,000, $41 \cdot 244.141 = 10009$ will be set.

Be careful in use with this command, if set to a value not supported by your remote device the user PSKEY's have to be reset!

Value	Description
1200-921600	All multiples of 244.141 within this range are possible
115200	115,234 bps

*Note: When **S327** command is set, **S323** command will show the same value. When **S323** command is set, **S327** command will show the same value. So both commands are consistent.*

S329	Outgoing Default UUID
-------------	------------------------------

ATS329=<value>

This command sets the default UUID for outgoing call. The default setting is 0x1101. The module will use this UUID to search the service on the remote device.

Value	Description
0x1101	Serial port (SPP)
0x1103	Dial-up networking
0x1105	OBEX object push
0x1106	OBEX file transfer

To reset the default UUID to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Example:

ATS329=0x1103	Set to DUN
---------------	------------

S330-S332	Auto Connect Device Address
------------------	------------------------------------

ATS330=<Bluetooth address>[,<UUID> | <service channel>]
ATS331=<Bluetooth address>[,<UUID> | <service channel>]
ATS332=<Bluetooth address>[,<UUID> | <service channel>]

This command sets up up to 3 Bluetooth addresses of remote Bluetooth devices that should be connected using an automatic link setup if auto connect mode is enabled in **S404** register. It contains a complete dial string, with an optional UUID (4-digit hex value) or service channel (1 or 2-digit decimal value 1...31). In the default configuration no automatic link setup will be performed.

If auto connect mode is enabled in **S404** register the module tries to connect to the Bluetooth address from **S330** register with the specified UUID or service channel. If no UUID or service channel is stored, the default UUID from **S329** register is used. If **S330** does not contain a Bluetooth address or if the connection setup fails, the device tries to set up a connection to the Bluetooth address from **S331** register. If **S331** does not contain a Bluetooth address or if the connection setup fails, the device tries to set up a connection to the Bluetooth address from **S332** register. If **S332** does not contain a Bluetooth address or if the connection setup fails a call retry starts after a time period from **S334** register. This connection retry has a maximum counter set in **S335** register. It begins with the Bluetooth address from **S330** register again.

ATS330=0, ATS331=0, ATS332=0 deletes the stored dial string.

Example:

ATS330=0123456789AB	Automatic link setup to Bluetooth device 0123456789AB
ATS330=0123456789AB,1103	Automatic link setup to Bluetooth device 0123456789AB to UUID 1103
ATS330=0123456789AB,2	Automatic link setup to Bluetooth device 0123456789AB to rfcomm channel 2

*Note: For an automatic link setup the register **S404** has to be set to 1 and at least one of the registers **S330-S332** has to contain a dial string.*

S334	Call Retry Timer
-------------	-------------------------

ATS334=<value>

This command defines the timeout (in seconds) before making the next call attempt by using auto connect mode. The default setting is 0, no call retry attempt will be performed. The maximum value is 255.

S335	Max Call Retry Counter
-------------	-------------------------------

ATS335=<value>

This command defines the max call retry counter by using auto connect mode. The default setting is 0, call retry will be performed forever. The maximum value is 255.

Value	Description
0	Retry forever
1	Retry 1 time
5	Retry 5 times

S337	Maximum Sniff Interval
-------------	-------------------------------

ATS337?

Read out current value of the maximum sniff interval (in ms) from module. This value is read-only. It depends on the settings of the **S341** command. The default value is 250 ms.

To reset the maximum sniff interval to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

S338	Minimum Sniff Interval
-------------	-------------------------------

ATS338?

Read out current value of the minimum sniff interval (in ms) from module. This value is read-only. It depends on the settings of the **S341** command. The default value is 20 ms.

To reset the minimum sniff interval to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

S339	Sniff Attempt
-------------	----------------------

ATS339?

Read out current value of the sniff attempts from module. This value is read-only. It depends on the settings of the **S341** command. The default value is 1 attempt.

To reset the sniff attempts to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

S340	Sniff Timeout
-------------	----------------------

ATS340?

Read out current value of the sniff timeout from the module. This value is read-only. It depends on the settings of the **S341** command. The default value is 8 time slots.

To reset the sniff timeout to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

S341	Sniff Mode Supported
-------------	-----------------------------

ATS341=<value>

This command sets the supported sniff mode. The factory default setting is 1.

Sniffing is used to reduce power consumption during an active Bluetooth connection. When a Bluetooth link is in sniff mode both connected devices can enter a power-saving state for a short time interval. The length of this interval is called "sniff interval" and is negotiated between the connected devices. The maximum and minimum acceptable values for the sniff interval can be set using the appropriate AT commands. The sniff interval value has an impact on the propagation delay and maximum throughput on the Bluetooth link. Note that in order to enter sniff mode, both devices need to support sniff mode.

Value	Description
0	No sniff support
1	Active sniff support – 250 ms
2	Passive sniff support
3	Active sniff support – 500 ms
4	Active sniff support – 1000 ms

If active sniff support is enabled, the device tries to setup a sniff interval with the value mentioned in the table above.

Passive sniff support means that the device accepts sniff requests from the remote device with an interval negotiated with the remote device.

Example:

ATS341=0	Disable sniff support
ATS341=2	Enable passive sniff support

S342 HSAG Remote Bluetooth Address

ATS342=<Bluetooth address>

This command determines the Bluetooth address of the headset audio gateways (HSAG) remote communication device. The default setting is 000000000000, no Bluetooth address is defined. For further information please refer to the “BlueMod+B2x – HSAG User Manual”.

Note: HSAG is an optional feature of the BlueMod+B20/BT2.1. With the HSAG it is possible to communicate to another Bluetooth device with audio profile.

S343 Maximum Output Power

ATS343=<value>

This command sets the maximum output power for the device.

Value	Description
-128	Use factory default maximum output power
-24...4	Maximum output power in dBm

All other values in the range of -128 to 127 could be set in the register as well, but the equal or next lower value from the power table will be set internally. Furthermore the value will be set to a value amongst minimum and maximum output power value of the device.

Example:

ATS343=-15	The maximum output power will be set to -16 dBm
------------	---

S344	RI Control
-------------	-------------------

ATS344=<value>

This command configures the behavior of the RI signal.

Value	Description
0	RI indicates an incoming Bluetooth link request
1	RI follows the remote RI line status

S345	Restricted Device Address
-------------	----------------------------------

ATS345=<Bluetooth address>

This command configures a Bluetooth address which is restricted for incoming connection requests to BlueMod+B20/BT2.1. The default value is 000000000000, no device is restricted. If a valid Bluetooth address is stored, the according device is restricted and the incoming connection request is refused. ATS345=0 deletes the restriction.

S346	RSSI Value
-------------	-------------------

ATS346?

Read out current absolute receive signal strength (RSSI) value in dBm of an active link. This value is read-only.

Most common values are in the range of -20 dBm to -80 dBm. The higher the value the better the receive signal. In unconnected state the value 127 is shown.

To get the current RSSI value of an active link switch into online command mode either using DTR drop or escape sequence and enter ATS346? command.

S347	Link Quality Value
-------------	---------------------------

ATS347?

Read out current link quality value of an ACL connection. This value is read-only.

The range of the value is from 0 to 255. ATS347 returns a number that is directly equivalent to bit error rate (BER).

Each bit distance between 255 and 215 represents 0.0025% BER:

Value	Description
255	0.0000% BER
254	0.0025% BER
...	
215	0.1000% BER

Each bit distance between 214 and 90 represents 0.08% BER.

Each bit distance between 89 and 0 represents 0.08% BER.

In general, a link with a BER between 0% and 0.1% is workable. Trying to run a link with a BER above 1% will give poor results.

S348	Bonding Timeout
-------------	------------------------

ATS348=<value>

This command defines the bonding timeout in seconds. The factory-default setting is 30. The valid range is 1 - 30.

The bonding timeout parameter is used to control the time for the bonding procedure. If, for any reason, the bonding procedure exceeds the specified value, the bonding fails. This value is used with all connections that require bonding. However only the master device of a Bluetooth connection can set this timeout value for a connection.

To reset the bonding timeout to the factory-default, use the **AT&F** command (Attention: All parameters will be set back to the factory-default).

Example:

ATS348=20	Set bonding timeout to 20 s
-----------	-----------------------------

S350	Local Service Name for SPP
-------------	-----------------------------------

ATS350=<name>

This command allows the modification of the local service name for the serial port of the BlueMod+B20/BT2.1. The service name is shown on a remote Bluetooth device during a service discovery. It is limited to 15 characters.

Example:

ATS350= SPP	Display on remote end: SPP
--------------------	----------------------------

*Note: This command has to be executed with a "=" sign, if a blank is used between **ATS350** and name an **ERROR** is the feedback. This is because blanks are allowed for a service name, e.g. "serial port".*

S401	Bonded Device List Properties
-------------	--------------------------------------

ATS401=<value>

This command controls the storing behavior of the bonded device list.

Value	Description
0	Authenticated devices are not stored on the bonded device list, existing entries are unaffected
1	Authenticated devices are stored on the bonded device list

S402 Firmware Compatibility Register

ATS402=<value>

This command controls the compatibility of the firmware to prior versions. The register contains 16 bits, the value is shown as hex value.

Bit 1 controls the storing behavior of the parameter set.

Bit 1	Function
0	All values are stored in volatile memory only. To store persistently use the AT&W command
1	All values are stored in non volatile memory automatically

Bit 2 controls the escape sequence detection in connected state.

Bit 2	Function
0	Escape sequence detection switched off
1	Escape sequence detection switched on (limited data throughput)

All other bits are reserved and cannot be modified via AT commands.

Examples:

ATS402=0x0001	Auto save to non volatile memory is switched on and escape sequence detection is switched off
ATS402=0x0000	Auto save to non volatile memory is switched off and escape sequence detection is switched off
ATS402=0x0003	Auto save to non volatile memory is switched on and escape sequence detection is switched on

S403 Remote Config Port Access Level

ATS403=<value>

This command defines the accessibility and visibility of the Bluetooth remote configuration port.

Value	Description
0	Config port is neither accessible nor visible
1	Config port is accessible but not visible
2	Config port is accessible and visible

S404	Auto Connect Mode
-------------	--------------------------

ATS404=<value>

This command controls the auto connect behavior of the device.

Value	Description
0	Auto connect off
1	Auto connect on (at least one of the registers S330-S332 has to be set, otherwise no auto connect could be done)

Once the auto connect mode is activated it can be switched off again after resetting the device and immediately (before the connection is established) setting the **S404** register back to "0". If possible it is recommended to power-off the remote device(s) before this operation.

Note: Changes becomes active after resetting the device.

S405	Non Bondable Mode
-------------	--------------------------

ATS405=<value>

This command controls the bonding behavior of the device. If a remote device initiates a pairing and the non bondable mode is active, the device refuses the pairing and the connection is terminated.

Value	Description
0	Non bondable mode disabled
1	Non bondable mode enabled

S406	I/O Capabilities
-------------	-------------------------

ATS406=<value>

This command sets the input and output capabilities of the device used for SSP.

Value	Description
0	Display only
1	Display Yes/No
2	Keyboard only
3	No input no output

S407	Man in the Middle Protection
-------------	-------------------------------------

ATS407=<value>

This command controls the man in the middle (MITM) protection of the device during SSP. It has to be set in context with **S406** command. In SSP there are scenarios where MITM protection is not possible (see table below).

Value	Description
0	Man in the middle protection disabled
1	Man in the middle protection enabled

In case the user choose a scenario where MITM protection is not allowed but one of the communication devices is configured to **S407=1** (MITM protection enabled), the pairing is refused.

Possible combinations of I/O capabilities and the possibility of MITM protection are listed in the table below.

B20 / Remote device	Display only	Display Yes/No	Keyboard only	No input no output
Display only ATS406=0	Just Works (numeric comparison, both automatic confirmation) <i>No MITM protection</i>	Numeric comparison (both displayed, one automatic confirm) <i>No MITM protection</i>	Passkey entry (one display, one input) <i>MITM protection</i> SSPPIN <BT addr> <passkey>	Just Works (Numeric comparison, both automatic confirmation) <i>No MITM protection</i>
Display Yes/No ATS406=1	Numeric comparison (both displayed, one automatic confirm) <i>No MITM protection</i>	Numeric comparison (both displayed, both confirm) <i>MITM protection</i> SSPCONF <BT addr> <passkey> ? AT+SSPCONF <BT addr>, 1	Passkey entry (one display, one input) <i>MITM protection</i> SSPPIN <BT addr> <passkey>	Just Works (numeric comparison, both automatic confirmation) <i>No MITM protection</i>
Keyboard only ATS406=2	Passkey entry (one display, one input) <i>MITM protection</i> SSPPIN <BT addr> ? AT+SSPPIN <BT addr>,<passkey>	Passkey entry (one display, one input) <i>MITM protection</i> SSPPIN <BT addr> ? AT+SSPPIN <BT addr>,<passkey>	Passkey entry (both input) <i>MITM protection</i> SSPPIN <BT addr> ? AT+SSPPIN <BT addr>,<passkey>	Just Works (numeric comparison, both automatic confirmation) <i>No MITM protection</i>
No input no output ATS406=3	Just Works (numeric comparison, both automatic confirmation) <i>No MITM protection</i>	Just Works (numeric comparison, both automatic confirmation) <i>No MITM protection</i>	Just Works (numeric comparison, both automatic confirmation) <i>No MITM protection</i>	Just Works (numeric comparison, both automatic confirmation) <i>No MITM protection</i>

Legend: B20 output message: SSPPIN <BT addr> ?
B20 input request: AT+SSPPIN <BT addr> <passkey>

V Result Message Format

ATV / ATV1

This command determines the format of the result messages.

Param.	Description
ATV	Result message is presented numerically (followed by <CR>)
ATV1	Result message is presented as text

&V Display Configuration

AT&V

This command displays the current configuration of the BlueMod+B20/BT2.1.

W Extended Result Codes

ATW / ATW1

This command enables/disables extended result codes.

Param.	Description
ATW	Result message is presented without extended result codes
ATW1	Result message is presented with extended result codes (include Bluetooth address when CONNECT, include Bluetooth address and UUID when RING, include extended result codes in case of NO CARRIER or NO ANSWER message)

&W Store Active Configuration

AT&W

This command stores the active configuration (parameter set) in non-volatile memory.

Z Load Stored Settings

ATZ

This command loads the stored configuration (parameter set) from non-volatile memory.

Note: This command must be the last command in the AT command line.

+BBND	Bond With a Bluetooth Device
--------------	-------------------------------------

AT+BBND=<Bluetooth address>

This command initiates a bonding process with a remote Bluetooth device.

If the bonding is successful, the BlueMod+B20/BT2.1 returns "SUCCESS", otherwise "FAILED".

After a successful bonding the device is stored on the bonded device list (see **+BBND** command).

Example:

AT+BBND=010203040506	Bond with device with Bluetooth address 010203040506
----------------------	--

BBTA	Set Device to the Bonded Device List with Link Key
-------------	---

AT+BBTA=<Bluetooth address>,<link key>

This command sets a device with a given link key to the bonded device list (see **+BBND** command).

The link key is a 32-digit hex value (0...F) like shown in the example below.

Example:

AT+BBTA=001025011111,00112233445566778899AABBCCDDEEFF
→ Bond with device with Bluetooth address 001025011111 using link key 00112233445566778899AABBCCDDEEFF

+BBTD	Delete Bonding Information
--------------	-----------------------------------

AT+BBTD=<Bluetooth address>

This command deletes the bonding information stored by the BlueMod+B20/BT2.1.

Example:

AT+BBTD=*	Delete whole bonding table
AT+BBTD=010203040506	Delete bonded device with Bluetooth address 010203040506

+BBTL	Show Bonded Device List
--------------	--------------------------------

AT+BBTL

This command shows information about the devices bonded with the BlueMod+B20/BT2.1.

The maximum capacity of this list depends on the implementation in the firmware, actual maximum is 8 entries. If the bonded device list is full and another device is bonded, the least recently used device will be overwritten by the new one.

Example:

AT+BBTL	b01: 00038949AFAC OK
---------	-------------------------

+BINQ	Start Device Inquiry
--------------	-----------------------------

AT+BINQ [class value][,EIR]

This command starts a device inquiry. In the result it lists the found Bluetooth devices with their Bluetooth address, class code and RSSI value. For a detailed description about the class code see **S302** parameter. The RSSI value represents the absolute receive signal strength of the found Bluetooth device.

In the example below “0080250000A7” represents the Bluetooth address, “1F00” the class code and “rssi -68” the RSSI value in dBm.

Example:

Command	Response
AT+BINQ	0080250000A7 1F00 rssi -68 OK

The inquiry time is 10 seconds. During this time several inquiry attempts are made. If a found Bluetooth device answers to each inquiry attempt it can happen that the device occurs more than one time in the list. The number of found Bluetooth devices is limited by the 10 second timeout.

When no class value is given, the device searches for all class codes. If the class value is set, only devices with those bits set in their class of device will be reported. This filter can be made as specific or as general as necessary. Please note that the filter reports devices that have a minimum of the specified bits set, however it is possible that a device also has other bits set in its class of device field. In that case that device will be reported back.

To discover all devices with major device class set to audio/video, set the class value to 0x400. This will result in devices with, class of device set to 0x200404 and 0x200408 to be reported. If, however, we want to limit the device search even further and only discover devices with their class of device set to headset, for example, the class of device field should be set to 0x200404.

Example:

AT+BINQ	0080250000A7 1F00 rssi -68 008025084FBB 1F18 rssi -73 008025084FBA 1F98 rssi -71 0009DD502C46 2010C rssi -83 010203040506 220404 rssi -81 OK
AT+BINQ 0x1F00	0080250000A7 1F00 rssi -66 008025084FBB 1F18 rssi -73 008025084FBA 1F98 rssi -71 OK
AT+BINQ 0x200400	010203040506 220404 rssi -81 OK

The optional identifier EIR sets the inquiry mode to extended inquiry response. The result list can handle EIR of remote devices.

Note: Due to an internal memory problem of CSR the result list by using EIR is limited to 10 entries.

The EIR result list may contain information lead by the following identifiers:

Name	Bluetooth device name of the remote device
UUID16	16-bit UUIDs of provided service
UUID32	32-bit UUIDs of provided service
UUID128	128-bit UUIDs of provided service
MANUF	Manufacturer specific data
TX power	Transmit power

Example:

AT+BINQ, EIR	008025087846 1F00 rssi -52 0080250085FB 1F00 rssi -29 000461851832 0 rssi -44 000272166186 3E0104 rssi -55 Name: WXP-TESTPC UUID16: 1101 0080250000AE 1F9C rssi -74
--------------	---

The result list in the example above contains EIR and normal inquiry data.

+BNAME Get Bluetooth Device Name of Remote Device

AT+BNAME <Bluetooth address>

This command gets the Bluetooth device name of a remote device.

In case the device is not discoverable the command responds with "NO CARRIER".

Example:

Command	Response
AT+BNAME 00802501D11A	BlueMod+B20 D1:1A

+BSRV Start Service Discovery

AT+BSRV <Bluetooth address>

This command starts a service discovery for given Bluetooth address. It responds with the remote device name, UUID, service channel number and the name of profile supported by this device (depending on the device it can be only one UUID or multiple UUID's).

The remote device name is limited to 31 characters. If the name of the remote device is longer than 31 characters, only the first 31 characters are shown.

The first line of the output is reserved for the remote device name. If the name request fails and the service request is successful, the first line in the output is empty.

In the example below “BlueRS+E/G2 D1:1A” represents the remote device name, “1101” the UUID, “1” the service channel number and “serial port” the name of profile.

If the service discovery fails the command responds with “NO CARRIER”.

Example:

Command	Response
AT+BSRV 00802501D11A	BlueRS+E/G2 D1:1A 1101, 1, serial port OK

+EDUT Device Under Test Mode

AT+EDUT

This command sets the device to “device under test mode” for measuring and testing Bluetooth parameters. This mode stays active until the next reset of the device.

+SSPCONF Secure Simple Pairing Request

AT+SSPCONF <Bluetooth address>, <value>

If a SSP is initiated and MITM is active (**S407=1**), depending on the I/O capabilities (**S406**) the AT interface generates an event SSPCONF and asks the user for confirmation.

Event: SSPCONF <Bluetooth address> <SSP passkey> ?

The user has to confirm the SSP passkey with the above command. If no confirmation is sent by the user within the bonding timeout (see **S348**) or in case of active reject, the SSP is rejected with NO CARRIER message.

Value	Description
0	Reject SSP request
1	Accept SSP request

+SSPPIN SSP Passkey Request

AT+SSPPIN <Bluetooth address>, <SSP passkey>

If a SSP is initiated and MITM is active (**S407=1**), depending on the I/O capabilities (**S406**) the AT interface generates an event SSPPIN and asks the user for the SSP passkey.

Event: SSPPIN <Bluetooth address> ?

The user has to answer this request with the SSP passkey displayed on the remote device.

Example:

AT+SSPPIN 008025135FB3,462069	SSP passkey 462069 displayed on remote device 008025135FB3
-------------------------------	---

Event: SSPPIN <Bluetooth address> <passkey>

The user has to enter the displayed passkey at the remote device.

Deprecated commands

The following commands are available in the firmware for compatibility with older versions, but have no functionality anymore:

- S319
- S320
- S321

3 Remote Configuration

The BlueMod+B20/BT2.1 can be configured via Bluetooth by using another Bluetooth device. Make sure the BlueMod+B20/BT2.1 is powered on and in range of the local Bluetooth device.

By default the configuration port of the BlueMod+B20 is not accessible and not visible. To make it visible and accessible for other Bluetooth devices the configuration port must be set to “accessible and visible” first (ATS403=2).

Initiate a new scan of the Bluetooth area. When the BlueMod+B20/BT2.1 is found perform a service discovery. In the result you will get 2 services (ports):

- “SPP” (UUID 0x1101, service channel 1)
- “Remote Config” (UUID 0x1101, service channel 2 or other)

Connect to the “Remote Config” and open the terminal program at the appropriate COM port.

Once the Bluetooth connection is established successfully (signaled with “RC ONLINE” response at the remote BlueMod+B20/BT2.1) the BlueMod+B20/BT2.1 answers the commands in the UART of the remote side. Now you can configure the remote BlueMod+B20/BT2.1 using the AT commands. You can close the connection by using the ATH command (signaled with “RC OFFLINE” response at the remote BlueMod+B20/BT2.1).

The configuration port of the BlueMod+B20/BT2.1 can be disabled using the ATS403=0 command.

4 Restrictions

The local flow control is set to RTS/CTS and cannot be disabled. When using only VCC, GND and UART_Rx, UART_Tx serial lines, UART_CTS# should be set to active state (for further information please refer to the hardware reference).

Note: It is strongly recommended to use hardware flow control. Not using flow control can cause a buffer overflow in the Bluetooth module which blocks the module. Furthermore a loss of data is possible.

The BlueMod+B20/BT2.1 only supports DCE mode.

5 Appendix

5.1 AT Result Codes

Result codes (numerical and verbose):

Numeric	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>	General connection setup error
4	ERROR	Illegal command or error that cannot be indicated otherwise
8	NO ANSWER <berr>	Connection timed out (no response) / remote Bluetooth device not found (e.g. wrong address, out of range)

<radr> = Address of the remote device

<berr> = Bluetooth release (error) cause

5.2 Extended Result Codes

For the result codes NO CARRIER and NO ANSWER the following extended result codes are available (after activation with **ATW1** command).

Result code	Meaning	Numeric AT result code
0x01	Unsuccessful due to a service search failure	8
0x02	Unsuccessful due to a service level connection failure	3
0x03	Unsuccessful due to service level connection already established	3
0x04	Unsuccessful due to RFCOMM connection failing to be established	3
0x05	Unsuccessful due to attempt to connect to unallocated server channel	3
0x06	Unsuccessful due to connection attempt timing out	8
0x07	Unsuccessful due to remote device rejecting connection	3
0x08	Unsuccessful due to remote device terminating the connection	8
0x09	Unsuccessful due to an abnormal disconnect while establishing a rfcmm connection	3
0x11	Authentication timed out	3
0x12	Authentication failed	3
0x13	Authentication failed due to too many repeat attempts	3
0x14	Authentication failed as remote device is not allowing pairing	3
0x15	Authentication failed as unit keys are not supported	3
0x16	Authentication failed as simple pairing is not supported	3
0x17	Authentication failed as host is already busy pairing	3
0x20	Successful disconnection	3
0x21	Disconnection occurred due to link loss	3
0x22	Disconnect attempt failed, no service level connection	3
0x23	Disconnect time out	3
0x24	Unsuccessful for some other reason	3

6 History

Version	Release Date	By	Change description
r01	15.12.2010	TA	Based on BlueMod+B2x SPP AT Command Reference r13, Added new commands for Bluetooth 2.1 support: - S406: I/O Capabilities - S407: Man in the Middle Protection - AT+SSPCONF: Secure Simple Pairing Request - AT+SSPPIN: SSP Passkey Request, Added EIR in +BINQ command, S319, S320, S321 commands not applicable for Bluetooth 2.1 anymore, moved to section "Deprecated commands", Added modified bonding timeout in S348 command, Adjusted description of ATD and S318 commands to Bluetooth 2.1 requirements, Added table with extended result codes for NO CARRIER and NO ANSWER messages, Corrected RSSI value in unconnected state in S346 register, Moved description of maximum length of bonded device list from +BBND to +BBTL, Added new command S312: Name Discovery during Inquiry

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