


Network Interface Appendix Anybus[®]-CC Passive Bluetooth

Rev. 1.01

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About This Document

How To Use This Document

This document is intended to provide a good understanding of the functionality offered by the Anybus-CompactCom Passive Bluetooth communication module. The document only describes the specific features of the Anybus-CompactCom Passive Bluetooth, i.e. for general information regarding the Anybus-CompactCom platform, consult the Anybus-CompactCom Hardware- and Software Design Guides.

The reader of this document is expected to be familiar with high level software design, and communication systems in general.

For more information, documentation etc., please visit the HMS website, 'www.anybus.com'.

Important: This is a preliminary document; information may be missing or incorrect.

Important User Information

Anybus-CompactCom and the technology used in Anybus-CompactCom is protected by patent, pending patents, copyright and trademark laws under the United States of America and international law.

The data and illustrations found in this document are not binding. We, HMS Industrial Networks AB, reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be considered as a commitment by HMS Industrial Networks AB. HMS Industrial Networks AB assumes no responsibility for any errors that may appear in this document.

There are many applications of this product. Those responsible for the use of this device must ensure that all the necessary steps have been taken to verify that the application meets all performance and safety requirements including any applicable laws, regulations, codes, and standards.

Anybus® is a registered trademark of HMS Industrial Networks AB. All other trademarks are the property of their respective holders.

The examples and illustrations in this document are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular implementation, HMS cannot assume responsibility or liability for actual use based on these examples and illustrations.

Warning:	This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
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ESD Note:	This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.
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Conventions & Terminology

The following terms and conventions are used throughout this document:

- Numbered lists provide sequential steps
- Bulleted lists provide information, not procedural steps
- The terms ‘Anybus’ or ‘module’ is used when referring to the Anybus-CompactCom module.
- The terms ‘host’ or ‘host application’ is used when referring to the hardware and software that hosts the Anybus-CompactCom module.
- The terms ‘remote side’ and ‘remote device’ refers to the device that communicates with the Anybus module via Bluetooth.
- Hexadecimal values are written in the format NNNNh, where NNNN is the hexadecimal value.

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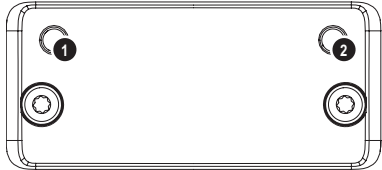
About the Anybus-CC Passive Bluetooth

General

The Anybus-CompactCom Passive Bluetooth acts as a physical layer converter, allowing the serial host interface signals to be accessed via Bluetooth.

IMPORTANT: *This document describes basic usage when using the factory default settings of this product. Due to its flexibility, it is possible for advanced users to alter the product's behaviour in such a way that the examples described herein becomes irrelevant. Such usage is not supported by HMS.*

Front View

#	Item	
1	Bluetooth Status LED	
2	Power LED	
3	Antenna	

Bluetooth Status LED

State	Indication
Off	No power - or - no connection established
Green	Bluetooth connection established

Power LED

State	Indication
Off	No power
Green	Module powered

Operation

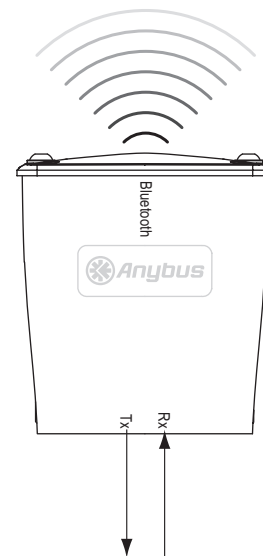
General

The Anybus-CompactCom Passive Bluetooth converts the serial bit stream of the serial host interface to Bluetooth and vice versa.

By default, the Anybus module appears as a generic Bluetooth serial port, which allows it to be used in a wide range of software without requiring any alterations.

IMPORTANT: *The Anybus-CompactCom Passive Bluetooth supports the AT-command set. To gain access to this functionality, a special character sequence is used. Make sure not to issue this sequence unintentionally to avoid unwanted side effects.*

For more information, see 3-5 “Data Mode vs. AT Mode”



Implementation Details

Supported Baudrates

By default, the Anybus-CompactCom Passive Bluetooth operates at 57.6kbps. To use other baudrates, one must issue a special AT-command sequence from the Bluetooth host.

Note: Since the module is to be regarded as a cable replacement, it is important to note that one must use equal settings on both ends of the connection, just as one would do on a typical serial connection.

See also...

- 3-5 “Changing the Baudrate”

DE (Data Enable) Behaviour

The module acts as a full duplex interface and thus does not use this signal.

/CA (Communication Active) Behaviour

This signal goes low as soon as a Bluetooth serial port connection has been properly established.

Reset Behaviour

Upon reset, the Bluetooth connection will be terminated, and the /CA signal will indicate to the host application that no communication is possible until the reset is released and a new connection has been established.

Identification Code

The identification code for the Anybus-CompactCom Passive Bluetooth is 05h.

Installation

General Information

The Anybus-CompactCom module operates using the Serial Port Profile (SPP), which means that it can be used just as any other serial port on the remote system.

To be able to establish a Bluetooth connection, the Anybus module needs to be added to the Bluetooth setup in the remote system.

See also...

- 3-2 “Installing the Bluetooth Device (Microsoft Windows)”
- 3-3 “Installing the Bluetooth Device (Mac OS X)”

As mentioned previously, setting up communication parameters (i.e. baudrate, parity etc.) requires a special procedure.

See also...

- 3-5 “Changing the Baudrate”

Installing the Bluetooth Device (Microsoft Windows)

System Requirements

This example assumes the following:

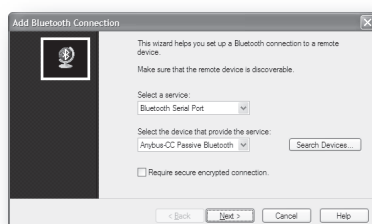
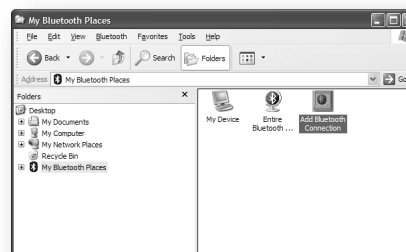
- PC w. Bluetooth capability
- Microsoft Windows XP/2000/2003 or newer

Note: This example assumes Windows XP. The procedure might be slightly different in newer versions of the Windows operating system.

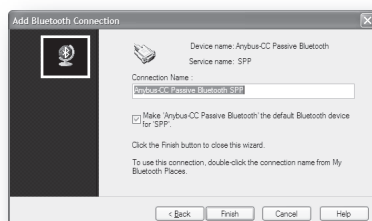
Add the Device to My Bluetooth Places

To add the Anybus-CompactCom to your Bluetooth setup, perform the following steps:

1. Open 'My Bluetooth Places' in the Explorer
2. Double-click on 'Add Bluetooth Connection' to open the Bluetooth wizard.
3. Select the 'Bluetooth Serial Port'-service and wait while the computer is scanning for detectable devices.



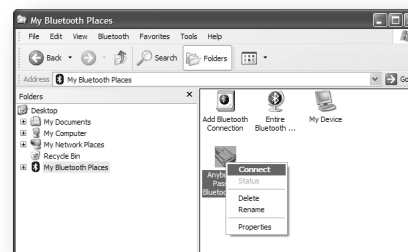
4. Select 'Anybus-CC Passive Bluetooth' in the list of detected devices
5. Uncheck 'Require secure encrypted connection', and click 'Next' to continue
6. Name the detected device as desired.



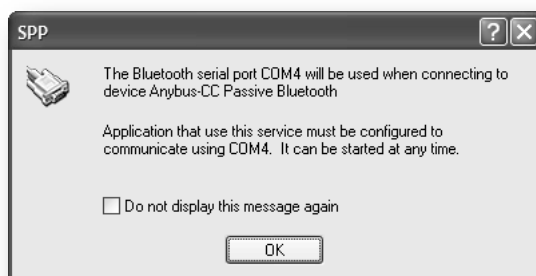
Establish a Connection

To establish a connection (i.e. a physical link) between the Windows PC and the Anybus-CompactCom, perform the following steps:

1. Right-click on the device in 'My Bluetooth Places' and select 'Connect'. Wait while the connection is being established.



2. When ready, a dialog appears, stating which COM-port that has been associated with the device. Make sure to note this number for future use.



3. To terminate the connection at a later stage, right-click on the device in 'My Bluetooth Places' and select 'Disconnect'.

Installing the Bluetooth Device (Mac OS X)

System Requirements

This example assumes the following:

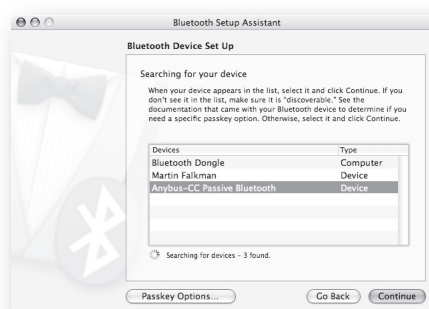
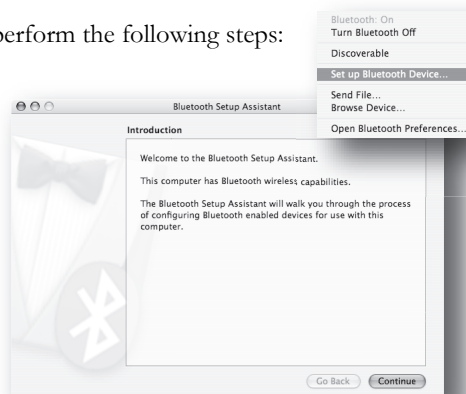
- Macintosh w. Bluetooth capability
- Mac OS X 10.4.x or newer

Note: This example assumes OS X Tiger. The procedure might be slightly different in newer versions of the Mac OS X operating system.

Add the Device to Your Setup

To add the Anybus-CompactCom to your setup, perform the following steps:

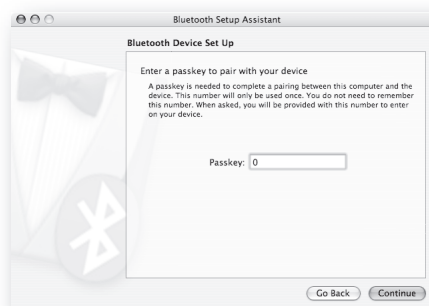
1. Open the Bluetooth Setup Assistant by selecting the ‘Set up Bluetooth Device’-entry in the Bluetooth-menu (upper right corner).
2. Click ‘Continue’ to start the set up process
3. When asked to ‘Select Device Type’, highlight ‘Any Device’ and click ‘Continue’. Wait while the list is being populated.



4. Highlight the ‘Anybus-CC Passive Bluetooth’ in the list and click ‘Continue’.
5. Wait while OS X gathers information about the device, and click ‘Continue’.
6. When prompted for a passkey, enter ‘0’ (zero) and click ‘Continue’. Wait while the system completes the device pairing.
7. When prompted for services to use, just click ‘Continue’.

Note: OS X may state that “There were no supported services found on your device”. This is perfectly normal; the device will be installed as a standard serial (TTY) device in /dev/.

8. The Anybus-CompactCom has been added to your setup. Click ‘Quit’ to finish.



Establish a Connection

A connection will be established automatically once an application opens the serial (TTY) device file associated with the Anybus-CompactCom. Similarly, the connection will be terminated when the application closes the device file.

To establish the name of the device file associated with the Anybus module, open the Terminal prompt and type the following:

```
ls /dev/tty.* <enter>
```

The Anybus module should appear as ‘/dev/tty.Anybus-CCPassiveBluetooth-1’ or similar.

Changing the Baudrate

General Information

As mentioned previously, the module will communicate at 57.6kbps unless instructed otherwise. To specify a different baudrate, one must issue a special command sequence from the remote system.

Data Mode vs. AT Mode

The module features two distinct operational modes:

- **Data Mode (Default)**
This is the normal condition, where data is exchanged transparently.
- **AT Mode**
In this mode, the module accepts special commands on the remote side (known as AT-commands), which affect the general operational characteristics of the device.

To enter AT Mode, the remote system must issue a special escape sequence as follows:

1. Keep the serial communication silent for at least one second.
2. On the remote side, issue three forward slash characters¹ (“///”) within 200ms.
3. Keep the serial communication silent for at least one second.
4. The module is now running in AT Mode, accepting standard AT-commands on the remote side.

See also...

- 3-6 “AT-Command: Write_232_Settings”
- 3-7 “AT-Command: Data_Mode”
- 3-8 “Example (HyperTerminal)”
- A-1 “Technical Specification” (A-1 “Bluetooth Interface”)

1. Can be customized as necessary.

AT-Command: Write_232_Settings

To change the baudrate, issue the following command sequence:

```
AT*AMRS=<baud>,<data>,<stop>,<parity>,<flow>,<mode>,<store><CR>
```

Parameter	Description																																																
<baud>	Baudrate enumeration as follows: <table border="1"> <thead> <tr> <th>Value:</th> <th>Baudrate:</th> <th>Value:</th> <th>Baudrate:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>300bps</td> <td>12</td> <td>921.6kbps</td> </tr> <tr> <td>2</td> <td>1200bps</td> <td>17</td> <td>7200bps</td> </tr> <tr> <td>3</td> <td>2400bps</td> <td>18</td> <td>31.25kbps</td> </tr> <tr> <td>4</td> <td>4800bps</td> <td>19</td> <td>75.0kbps</td> </tr> <tr> <td>5</td> <td>9600bps</td> <td>20</td> <td>93.75kbps</td> </tr> <tr> <td>6</td> <td>19.2kbps</td> <td>21</td> <td>136.0kbps</td> </tr> <tr> <td>7</td> <td>38.4kbps</td> <td>22</td> <td>187.5kbps</td> </tr> <tr> <td>8</td> <td>57.6kbps</td> <td>23</td> <td>230.0kbps</td> </tr> <tr> <td>9</td> <td>115.2kbps (default)</td> <td>24</td> <td>125.0kbps</td> </tr> <tr> <td>10</td> <td>230.4kbps</td> <td>25</td> <td>312.5kbps</td> </tr> <tr> <td>11</td> <td>460.8kbps</td> <td>26</td> <td>625.0kbps</td> </tr> </tbody> </table> <p>Note: If specifying a value >256, the module attempts to generate the baudrate based on the actual value. If not successful (i.e. if the resulting baudrate is outside a 2% error margin), the command will be rejected (see below).</p>	Value:	Baudrate:	Value:	Baudrate:	1	300bps	12	921.6kbps	2	1200bps	17	7200bps	3	2400bps	18	31.25kbps	4	4800bps	19	75.0kbps	5	9600bps	20	93.75kbps	6	19.2kbps	21	136.0kbps	7	38.4kbps	22	187.5kbps	8	57.6kbps	23	230.0kbps	9	115.2kbps (default)	24	125.0kbps	10	230.4kbps	25	312.5kbps	11	460.8kbps	26	625.0kbps
Value:	Baudrate:	Value:	Baudrate:																																														
1	300bps	12	921.6kbps																																														
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<data>	Enumeration of the number of data bits as follows: <table border="1"> <thead> <tr> <th>Value:</th> <th>Number of bits:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>8 data bits (default)</td> </tr> <tr> <td>2</td> <td>7 data bits</td> </tr> <tr> <td>3</td> <td>6 data bits</td> </tr> <tr> <td>4</td> <td>5 data bits</td> </tr> </tbody> </table>	Value:	Number of bits:	1	8 data bits (default)	2	7 data bits	3	6 data bits	4	5 data bits																																						
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1	8 data bits (default)																																																
2	7 data bits																																																
3	6 data bits																																																
4	5 data bits																																																
<stop>	Enumeration of the number of stop bits as follows: <table border="1"> <thead> <tr> <th>Value:</th> <th>Number of bits:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1 stop bits (default)</td> </tr> <tr> <td>2</td> <td>2 stop bits</td> </tr> </tbody> </table>	Value:	Number of bits:	1	1 stop bits (default)	2	2 stop bits																																										
Value:	Number of bits:																																																
1	1 stop bits (default)																																																
2	2 stop bits																																																
<parity>	Enumeration of the parity setting as follows: <table border="1"> <thead> <tr> <th>Value:</th> <th>Number of bits:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>No parity (default)</td> </tr> <tr> <td>2</td> <td>Odd parity</td> </tr> <tr> <td>3</td> <td>Even parity</td> </tr> </tbody> </table>	Value:	Number of bits:	1	No parity (default)	2	Odd parity	3	Even parity																																								
Value:	Number of bits:																																																
1	No parity (default)																																																
2	Odd parity																																																
3	Even parity																																																
<flow>	Enumeration of the flow control setting as follows: <table border="1"> <thead> <tr> <th>Value:</th> <th>Flow control:</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Hardware (CTS/RTS) (default)</td> </tr> <tr> <td>2</td> <td>No flow control</td> </tr> </tbody> </table>	Value:	Flow control:	1	Hardware (CTS/RTS) (default)	2	No flow control																																										
Value:	Flow control:																																																
1	Hardware (CTS/RTS) (default)																																																
2	No flow control																																																
<mode>	Determines when the new settings shall be operational: <table border="1"> <thead> <tr> <th>Value:</th> <th>Flow control:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Settings will take effect after next power cycle</td> </tr> <tr> <td>1</td> <td>Settings will have effect as soon as the module responds</td> </tr> </tbody> </table>	Value:	Flow control:	0	Settings will take effect after next power cycle	1	Settings will have effect as soon as the module responds																																										
Value:	Flow control:																																																
0	Settings will take effect after next power cycle																																																
1	Settings will have effect as soon as the module responds																																																
<store>	Determines whether or not to store the new settings in non-volatile memory. <table border="1"> <thead> <tr> <th>Value:</th> <th>Flow control:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Settings will be valid for the current power cycle only</td> </tr> <tr> <td>1</td> <td>Store the new settings in non-volatile memory</td> </tr> </tbody> </table>	Value:	Flow control:	0	Settings will be valid for the current power cycle only	1	Store the new settings in non-volatile memory																																										
Value:	Flow control:																																																
0	Settings will be valid for the current power cycle only																																																
1	Store the new settings in non-volatile memory																																																
<CR>	(Carriage return, i.e. ASCII 13)																																																

The module responds as follows:

```
<CRLF><result><CRLF>
```

Parameter	Description						
<result>	Result in clear text as follows: <table border="0"> <tr> <td><u>Value:</u></td> <td><u>Result:</u></td> </tr> <tr> <td>OK</td> <td>Settings accepted</td> </tr> <tr> <td>ERROR</td> <td>Settings rejected</td> </tr> </table>	<u>Value:</u>	<u>Result:</u>	OK	Settings accepted	ERROR	Settings rejected
<u>Value:</u>	<u>Result:</u>						
OK	Settings accepted						
ERROR	Settings rejected						
<CRLF>	(Carriage Return followed by Line Feed, i.e. ASCII 13 + ASCII 10)						

AT-Command: Data_Mode

To return to Data Mode, issue the following sequence:

```
AT*ADDM<CR>
```

Parameter	Description
AT*ADDM	Instructs the module to return to Data Mode
<CR>	(Carriage Return, i.e. ASCII 13)

The module responds as follows:

```
<CRLF><result><CRLF>
```

Parameter	Description						
<result>	Result in clear text as follows: <table border="0"> <tr> <td><u>Value:</u></td> <td><u>Result:</u></td> </tr> <tr> <td>OK</td> <td>Command accepted</td> </tr> <tr> <td>ERROR</td> <td>Command rejected</td> </tr> </table>	<u>Value:</u>	<u>Result:</u>	OK	Command accepted	ERROR	Command rejected
<u>Value:</u>	<u>Result:</u>						
OK	Command accepted						
ERROR	Command rejected						
<CRLF>	(Carriage Return followed by Line Feed, i.e. ASCII 13 + ASCII 10)						

See also...

- 3-5 “Data Mode vs. AT Mode”

Example (HyperTerminal)

In the following example, pre-made text-files, containing the relevant command sequences, is downloaded into the module as to change its baudrate. It is assumed that a Bluetooth connection has been successfully established between the Anybus module and a Windows PC running HyperTerminal.

The text files are formatted as follows:

File: 'escape.txt'

```
///
```

Note: It is important not to add any additional characters (including line feeds or carriage returns etc.) before - or after - the escape sequence, since doing so will prevent the module from entering AT Mode.

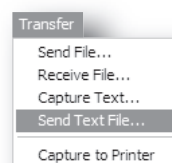
File: 'at_commands.txt'

```
AT*AMRS=6,1,1,1,1,2,1,1<CR>
AT*ADDM<CR>
```

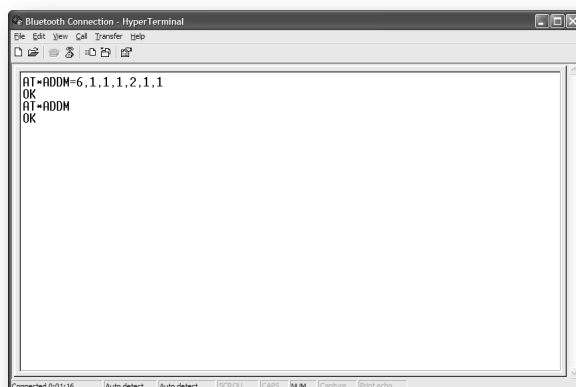
Note: <CR> represents Carriage Return (ASCII 13).

To download the text file into the module, perform the following steps:

1. Create the text files as specified above.
2. Wait one second to ensure that the module accepts the escape sequence.
3. Select the 'Send Text File...'-entry in the 'Transfer'-menu.
4. Select 'escape.txt' and click 'Open'
5. Wait one second to ensure that the module accepts the escape sequence.
6. Select the 'Send Text File...'-entry in the 'Transfer'-menu.
7. Select 'at_commands.txt' and click 'Open'
8. Done.



If successful, the baudrate will be changed to 19200, and the new settings will be stored in non-volatile memory. The settings will be effective immediately, and the module shall return to Data Mode.



See also...

- 3-5 "Data Mode vs. AT Mode"
- 3-6 "AT-Command: Write_232_Settings"

- 3-7 “AT-Command: Data_Mode”

Technical Specification

Bluetooth Interface

Profiles

By default, the module operates according to the Serial Port Profile (SPP). Optionally, advanced users may use the Generic Access Profile (GAP) or the Dial-up Networking Profile (DUN GW, DUN DT).

For more information, contact HMS.

Technical Data

The module is based on the CB-OEMSPA311 series from Connect Blue.

Bluetooth radio	Philips BGB203
Bluetooth base band controller	Philips BGB203
RT output power	Class 1, max. 7dBm (5mW)
Receive sensitive level	-90dBm
Receive input level (max.)	+15dBm
Output frequency	2.402... 2.480GHz, USM band.
Bluetooth stack	Embedded
Bluetooth qualification	2.0

AT Command Compatibility

For in-depth information about the AT-commands supported by the module, consult 'Serial Port Adapter - AT Commands' (publication: cBProject-0501-11 (15)) from Connect Blue.

AT Command	Supported	Comments
AT	Yes	-
AT*	Yes	-
ATZ	No	-
AT&F	Yes	-
ATS2	Yes	-
ATE	Yes	-
AT*AGDM	Yes ^a	-
AT*AGCM	Yes	-
AT*AGPM	Yes	-
AT*AGSM	Yes	-
AT*AGND	Yes ^a	-
AT*AGDD	Yes	-
AT*AGI	Yes	-
AT*AGB	No	-
AT*AGUB	Yes	-
AT*AGBD	Yes	-
AT*AGFP	Yes	-
AT*AGLN	Yes ^a	-
AT*AGLC	Yes	-
AT*AGMSR	No	-

AT Command	Supported	Comments
AT*AGCMSR	No	-
AT*AGMSP	Yes	-
AT*AGRSS	No	-
AT*ARSS	Yes ^a	-
AT*ADDM	Yes	See 3-7 "AT-Command: Data_Mode"
AT*ADCP	Yes ^a	-
AT*ADCC	Yes	-
AT*ADDCP	Yes	-
AT*ADDCP	Yes ^a	-
AT*ADDSP	Yes ^a	-
AT*ADMRP	No	-
AT*ADNRP	Yes	-
AT*ADRDRP	Yes	-
AT*ADWDRP	Yes ^a	-
AT*ADIT	No	-
AT*ADWM	No	-
AT*AILBA	Yes	-
AT*AILVI	Yes	-
AT*AMRS	Yes	See 3-6 "AT-Command: Write_232_Settings"
AT*AMSIT	Yes	-
AT*ACF	No	-
AT*ACACF	No	-
AT*ACDF	No	-
AT*ACCB	Yes	-
AT*AMPM	Yes ^a	-
AT*AMMP	Yes	-
AT*AMET	Yes	-
AT*AMBOR	No	-
AT*AMBO	No	-
AT*AMLO	No	-
AT*AMSF	No ^a	-
AT*AMWS	Yes	-
AT*AMDS	Yes	-
AT*AML P	Yes	-
AT*AMWFM	Yes	-
AT*AMRFM	Yes	-
*ADCCO	Yes	-

a. Certain limitations may apply; typically some parameter value is not permitted or in other ways limited.

See also...

- 3-5 "Changing the Baudrate"

Electrical Characteristics

Protective Earth (PE) Requirements

Unlike most other Anybus-CompactCom products, the Anybus-CompactCom Passive Bluetooth does not feature a connection to protective earth.

Power Supply

Supply Voltage

The module requires a regulated 3.3V power source as specified in the Anybus-CompactCom Hardware Design Guide.

Power Consumption

The Anybus-CompactCom Passive Bluetooth is designed to fulfil the requirements of a Class A module. For more information about the power consumption classification used on the Anybus-CompactCom platform, consult the general Anybus-CompactCom Hardware Design Guide.

The current hardware design consumes up to 50mA¹.

Environmental Specification

Consult the Anybus-CompactCom Hardware Design Guide for further information.

EMC Compliance

Consult the Anybus-CompactCom Hardware Design Guide for further information.

1. Note that in line with HMS policy of continuous product development, we reserve the right to change the exact power requirements of this product without prior notification. Note however that in any case, the Anybus-CompactCom Passive Bluetooth will remain as a Class A module.

