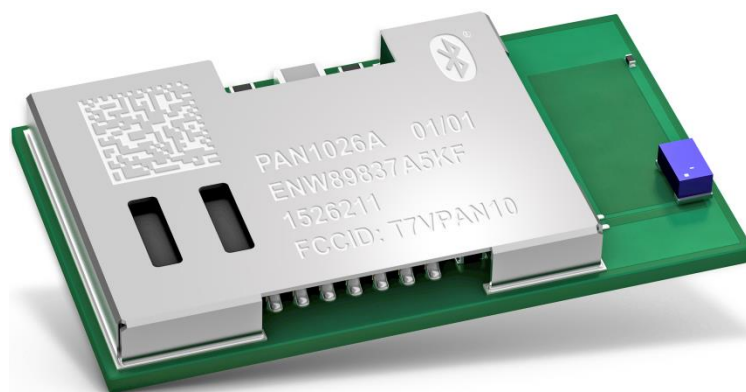


PAN1026A

PAN1322 to PAN1026A

Migration Guide

Rev. 1.0



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1 About This Document

1.1 Purpose and Audience

This Migration Guide describes the migration process from the discontinued PAN1322 Bluetooth module to the PAN1026A Bluetooth module. Necessary hardware as well as software changes are described with the intention of quick and easy migration.



The products are referred to as “the PAN1322” respectively “the PAN1026A” or “the modules” within this document.

The document is intended for hardware as well as software engineers.

1.2 Revision History

Revision	Date	Modifications/Remarks
0.1	12.07.2017	Initial draft
1.0	16.08.2017	Editorial review

1.3 Use of Symbols

Symbol	Description
	Note Indicates important information for the proper use of the product. Non-observance can lead to errors.
	Attention Indicates important notes that, if not observed, can put the product's functionality at risk.
⇒ [chapter number] [chapter title]	Cross reference Indicates cross references within the document. Example: Description of the symbols used in this document ⇒ 1.3 Use of Symbols.

1.4 Related Documents

- [1] Panasonic. eUniStone PAN1322 Design Guide Rev.1.2
- [2] Intel. eUniStone SPP-AT Application SW 3.1 Rev.0.2
- [3] Panasonic. PAN1026A Product Specification Rev.1.0
- [4] Toshiba. TC35661-ROM551 Extended HCI Command Interface Document
- [5] Toshiba. TC35661-ROM551 Bluetooth Basic Management Command Interface Document
- [6] Toshiba. TC35661-ROM551 SPP Command Interface Document

Please refer to the Panasonic website for more information as well as related documents
⇒ 5.1.2 Product Information.

2 Overview

PAN1322

- Overall size of 15.6 mm x 8.7 mm x 2.8 mm
- Industrial temperature range of -40 °C to + 85 °C
- Operational voltage range of 2.9 V to 4.1 V
- Output power of +4 dBm
- Receiver sensitivity of -86 dBm
- Integrated 32 kB EEPROM for device configuration data and application
- GPIOs with interrupt and wake-up capabilities
- AT command set
- Follows EMC, Safety, EN300328, FCC and IC regulations

PAN1026A

- Overall size of 15.6 mm x 8.7 mm x 1.9 mm
- Industrial temperature range of -40 °C to + 85 °C
- Operational voltage range of 2.7 V to 3.6 V
- Output power of +4 dBm
- Receiver sensitivity of -88 dBm
- Integrated 32 kB EEPROM for device configuration data and application
- GPIOs and wake-up control pins
- High-level API commands
- Follows EMC, Safety, EN300328, FCC, MIC and IC regulations

2.1 Bluetooth Features

PAN1322

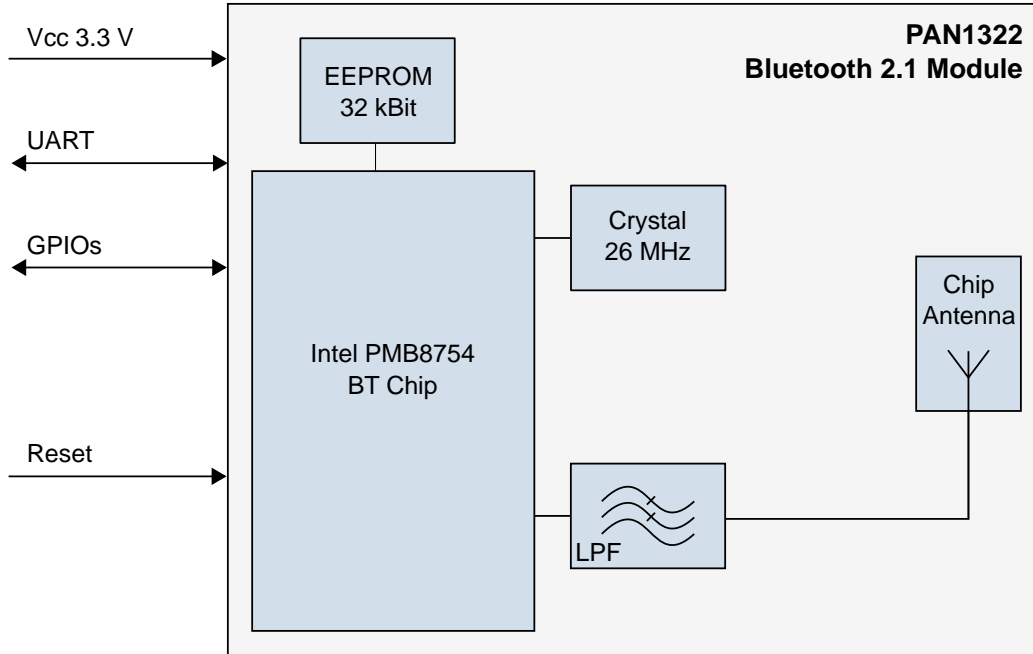
- Bluetooth 2.1 compliant
- Bluetooth class 2 device
- SPP profile support
- Single active connection

PAN1026A

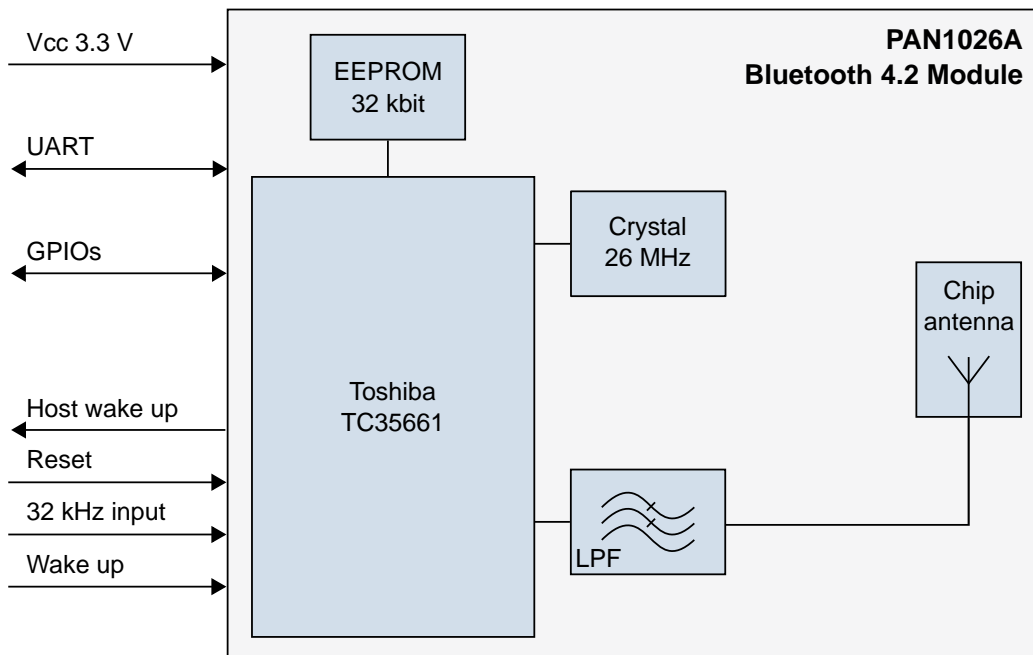
- Bluetooth 2.1 and 4.2 standard compliant
- Bluetooth class 2 device
- Bluetooth Basic Rate SPP profile support
- Bluetooth Low Energy GATT profile support for server and client mode
- Single active connection for Bluetooth Classic and Low Energy

2.2 Block Diagram

PAN1322



PAN1026A

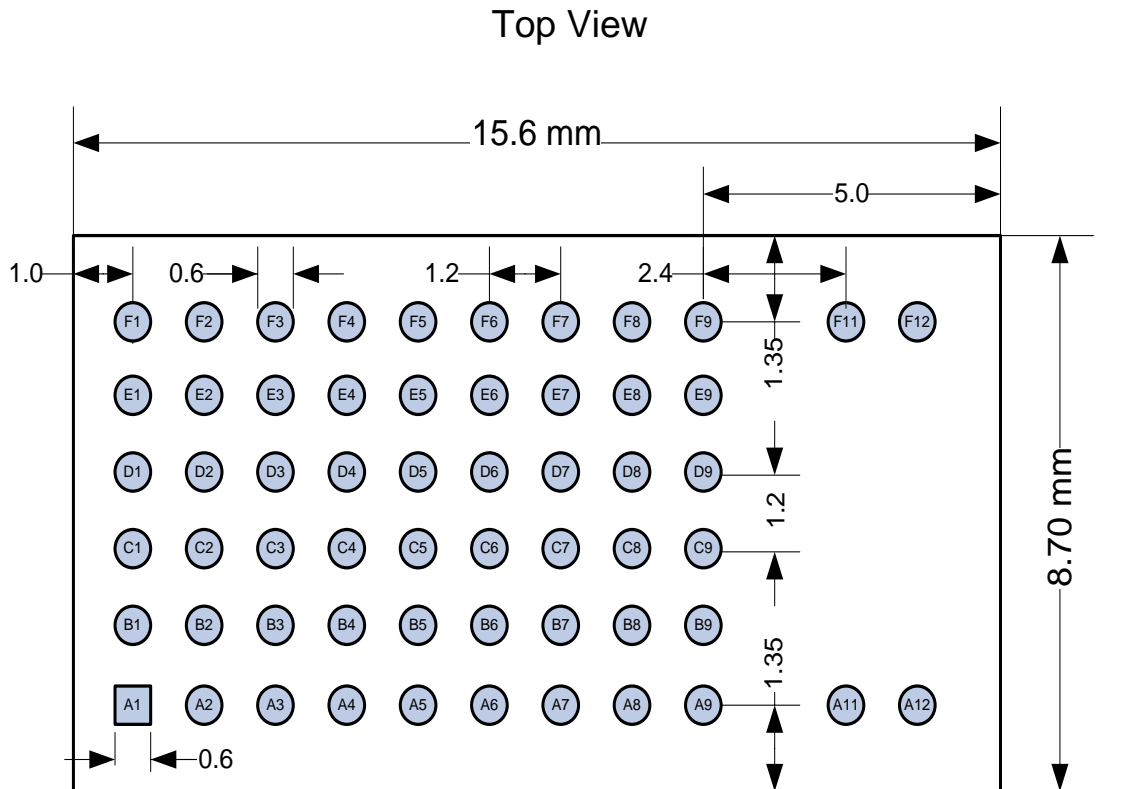


3 Hardware

3.1 Pin Configuration

Pin Layout

The pin layout of the PAN1322 and the PAN1026A are based on the same module footprint, which is depicted below.



Pin Assignment Comparison

Although the footprint of the modules is identical, not all of the pins have the same assignment. Thus, the following table compares both pin assignments and notes the changes to be made.

No	Pin Name PAN1026A	Pin Name PAN1322	Change notice
A1	GND	GND	
A2	NC	P1.6	Check if this port is used
A3	Reset	RESET	
A4	VCC	VCC	
A5	VCC	VCC	
A6	VCC	VCC	
A7	GND	GND	

No	Pin Name PAN1026A	Pin Name PAN1322	Change notice
A8	NC	P1.5	Check if this port is used
A9	GND	GND	
A11	GND	X	Connect to GND
A12	GND	X	Connect to GND
B1	NC	P1.7	Check if this port is used
B2	BTS	P1.8	Check if this port is used
B3	BTA	P1.0	Check if this port is used
B4	NC	P1.4	Check if this port is used
B5	NC	ONOFF	Check if this port is used
B6	NC	NC	
B7	NC	NC	
B8	NC	NC	
B9	NC	SLEEPX	Host sleep mode is implemented via UART
C1	CS0X	VREG	Check if this port is used
C2	BTI	P0.9	Check if this port is used
C3	WIA	JTAG#	
C4	NC	TRST#	
C5	NC	VDD1	
C6	PCMCLK	NC	
C7	FSYNC	NC	
C8	GND	GND	
C9	GND	GND	
D1	CS1X	P0.10	
D2	DIN	P0.8	
D3	GPIO1	P1.1	Check if this port is used
D4	GPIO0	P0.3	Check if this port is used
D5	NC	P0.2	Check if this port is used
D6	PCMIN	NC	
D7	GND	GND	
D8	GND	GND	
D9	ANT	ANT	

No	Pin Name PAN1026A	Pin Name PAN1322	Change notice
E1	SDA	SDA0	
E2	SCL	SCL0	
E3	GND	P1.3	Check if this port is used
E4	USB	P0.0	Check if this port is used
E5	CLKREQ	P0.1	Check if this port is used
E6	UARTRXD	UARTRXD	
E7	PCMOUT	NC	
E8	GND	GND	
E9	GND	GND	
F1	GND	GND	
F2	EEPROM_WP	P1.2	Check if this port is used
F3	GND	P0.11	Check if this port is used
F4	GND	P0.14	Check if this port is used
F5	UART CTS	UARTCTS	HW flow control is mandatory
F6	SLEEPCLK	VDDUART	When not used, pull down with 100 kΩ
F7	UARTTXD	UARTTXD	
F8	UARTRTS	UARTRTS	HW flow control is mandatory
F9	GND	GND	
F11	GND	X	Connect to GND
F12	GND	X	Connect to GND

3.2 UART Interface

As the pin comparison table in section ⇒ [3.1 Pin Configuration](#) shows, the UART interfaces of the PAN1322 and the PAN1026A are identical. Both modules require a 4 wire UART interface featuring hardware flow control pins.

4 Software Migration

4.1 Introduction

In order to migrate the software from the PAN1322 to the PAN1026A, it is important to understand the different command interfaces of the modules. The PAN1322 uses human-readable AT commands for module interaction, while the PAN1026A uses binary commands for module interaction. This binary-based interaction is separated into Host Controller Interface (HCI) commands for low level configuration commands and Toshiba Control Unit (TCU) commands for high level abstraction commands similar to the AT abstraction level.

The following sections will describe the PAN1322 commands and the associated PAN1026A Bluetooth Classic binary commands only. The Bluetooth Low Energy commands for the PAN1026A will not be described within this document.

A set of example command sequences for initialization, device discovery, service discovery, connection handling and data exchange can be found in the last section.

4.2 General Device Configuration

4.2.1 UART Configuration

The following table lists both default UART configurations.

Module	Baudrate	Data Bits	Parity	Stop Bits	Flow Control
PAN1322	115200 bps	8	None	1	Hardware (RTS/CTS)
PAN1026A	115200 bps	8	None	1	Hardware (RTS/CTS)

4.2.2 End-Of-Line Markers

The PAN1322 and PAN1026A modules use different end-of-line-markers.

While the PAN1322 ends all commands, responses and events with carriage return (CR) and line feed (LF), the PAN1026A uses a different approach.

For HCI commands, the length of a command, request or event cannot be fully determined without parsing. However, HCI commands will only be used for low level configuration after the startup of the module.

After that, the command mode will be changed to TCU mode, in which commands, responses and events use the first three bytes to determine the length of the message.

4.2.3 Device Initialization

The PAN1026A is using an internal EEPROM, which contains pre-programmed information such as the Bluetooth Device (BD) address. During the initialization of the module this address needs to be read from the EEPROM and has to be stored in RAM. In order to do that, the I²C interface of the chip has to be enabled. For the PAN1322 such an initialization was not required. The commands needed for the PAN1026A initialization are listed and described below. The usage of these commands can be found in an example sequence in chapter [⇒ 4.7.1 Initialization](#).

4.2.3.1 Resetting the device

PAN1322

Command	AT+JRES
Description	Software reset of the PAN1322.
Response	ROK
Description	Startup response.

PAN1026A

Command	HCI_RESET_REQ 01 03 0C 00
Description	Software reset of the PAN1026A.
Response	HCI_RESET_RESP 04 0E 04 04 03 0C 00
Description	Software reset response of the PAN1026A.

4.2.3.2 Enabling the I²C Interface

PAN1026A

Command	HCI_M2_BTL_SET_I2C_ENABLE_REQ 01 08 FC 0B 00 A0 00 00 00 14 5B FF 02 03 01
Description	Enable I ² C of the PAN1026A.
Response	HCI_M2_BTL_SET_I2C_ENABLE_RESP 04 FF 0A 08 00 A0 00 00 00 14 5B 00 00
Description	Enable I ² C response of the PAN1026A.

4.2.3.3 Reading the BD Address from EEPROM

PAN1026A

Command	HCI_M2_GENERAL_READ_EEPROM_REQ 01 08 FC 10 00 A1 00 00 00 14 88 FF 10 06 A0 01 01 06 02 00
Description	Reads the BD address from EEPROM of the PAN1026A.
Response	HCI_M2_GENERAL_READ_EEPROM_RESP 04 FF 11 08 00 A1 00 00 00 14 88 00 10 06 BD BD BD BD BD BD BD: Local Device Address (6 bytes): The local Bluetooth device address. Note: The BD address is passed MSB first!
Description	Reads the BD address from EEPROM response of the PAN1026A.

4.2.3.4 Writing the BD Address to RAM

PAN1026A

Command	HCI_WRITE_BD_ADDR_REQ 01 13 10 06 BD BD BD BD BD BD: Local Device Address (6 bytes): The local Bluetooth device address. Note: The BD address has to be passed LSB first!
Description	Writes the BD address previously read from EEPROM to RAM of the PAN1026A.
Response	HCI_WRITE_BD_ADDR_RESP 04 0E 04 04 13 10 ST ST: Status (1 byte): The status of the write process. Successful 0x00 Failure 0xFF (anything > 0x00)
Description	Write BD address to RAM response of the PAN1026A.

4.2.3.5 Switching the API Mode

As initially mentioned, the PAN1026A uses HCI and TCU modes to interact with the host controller. To change from HCI to TCU mode, the following command has to be used.

PAN1026A

Command	HCI_SET_MODE_REQ 01 08 FC 03 00 99 01
Description	Request to switch from HCI to TCU mode.
Response	HCI_SET_MODE_RESP 04 FF 05 08 00 99 ST 01 ST: Status (1 byte): Successful 0x00 Failure 0xFF (anything > 0x00)
Description	Response to the request to switch from HCI to TCU mode.



Once in the TCU mode, the HCI mode is no longer available for configuration. The module has to be reset in order to perform another configuration in the HCI mode.

Please note that HCI and TCU commands can only be sent in the appropriate command mode. Sending HCI commands in TCU mode and vice versa will not work.

4.2.3.6 Initializing the Firmware

In order to initialize the PAN1026A firmware and to set the device name the following command has to be used.

PAN1026A

Command	TCU_MNG_INIT_REQ RL 00 00 E1 01 PL 00 04 00 LD DN ... RL: Request length (1 byte): The length of the total request. PL: Parameter length (1 byte): The length of the following parameters -1. LD: Device name length (1 byte): The length of the device name (0x00-0x80). DN: Device name (LD bytes): The UTF-8 encoded device name (max. 128 bytes).
Description	TCU_MNG_INIT_REQ initializes the PAN1026A firmware and sets the device name.
Response	TCU_MNG_INIT_RESP 0E 00 00 E1 01 07 00 ST BD BD BD BD BD BD ST: Status (1 byte): Successful 0x00 Parameter failure 0x01 Device Initialization finished 0x02 BD: Local Device Address (6 bytes): The local Bluetooth device address. If status is failed, it will be 0xFFFFFFFFFFFF.
Description	TCU_MNG_INIT_RESP is the acknowledging response for TCU_MNG_INIT_REQ.



Please note that the use of the command TCU_MNG_INIT_REQ is mandatory and that it can only be executed once per runtime.

4.2.3.7 Setting Up the SPP Device

PAN1026A

Command	TCU_SPP_SETUP_REQ 07 00 00 E5 01 00 00
Description	TCU_SPP_SETUP_REQ sets up the SPP device. TCU_SPP_SETUP_RESP is generated, when this command is completed.
Response	TCU_SPP_SETUP_RESP 08 00 00 E5 81 01 00 ST ST: Status (1 byte): Successful 0x00 Parameter Failure 0x01 No Device Initialization 0x03 Setup SPP 0x40
Description	The response for TCU_SPP_SETUP_REQ.

4.2.4 Setting the Device Name

PAN1322

Command	<p>AT+JSLN= <length_friendly_name>, <friendly_name></p> <p><length_friendly_name> (2 characters (DEC)): The length of the friendly name (max. 18).</p> <p><friendly_name> (<length_friendly_name> characters): The friendly name used for EIR and RNR. It should be written at start-up or reset. The default name after reset is “eUniStone SPP BT2.1 features”.</p>								
Description	Sets the local device name.								
Response	<p><general_response></p> <p><general_response> (2 or 6 characters (DEC)): The general response of the module for requests indicating that the executing went OK or that an error occurred.</p> <table border="0"> <tr> <td>OK</td> <td>Syntax correct, execution allowed and successful</td> </tr> <tr> <td>ERR=-1</td> <td>Syntax error</td> </tr> <tr> <td>ERR=-2</td> <td>Command not allowed at present execution status</td> </tr> <tr> <td>ERR=-3</td> <td>Internal unknown protocol stack error</td> </tr> </table>	OK	Syntax correct, execution allowed and successful	ERR=-1	Syntax error	ERR=-2	Command not allowed at present execution status	ERR=-3	Internal unknown protocol stack error
OK	Syntax correct, execution allowed and successful								
ERR=-1	Syntax error								
ERR=-2	Command not allowed at present execution status								
ERR=-3	Internal unknown protocol stack error								
Description	The general response to requests.								

Setting the device name on the PAN1026A can only be achieved once during the initialization phase using the command TCU_MNG_INIT_REQ.

4.2.5 Enabling Security

PAN1322

Command	<p>AT+JSEC= <security_mode>,<PIN_type>, <length_PIN_code>,<PIN_code>, <Input_capability>,<Output_capability></p> <p><security_mode> (1 char (DEC)): The security mode.</p> <table border="0"> <tr> <td>N/A</td> <td>1</td> </tr> <tr> <td>N/A</td> <td>2</td> </tr> <tr> <td>N/A</td> <td>3</td> </tr> <tr> <td>Security Mode 4</td> <td>4</td> </tr> </table> <p><PIN_type> (1 char (DEC)): The PIN code type.</p> <table border="0"> <tr> <td>Variable PIN (default)</td> <td>1</td> </tr> <tr> <td>Fixed PIN</td> <td>2</td> </tr> </table> <p><length_PIN_code> (2 chars (DEC)): The length of the PIN code. The maximum PIN length value is 16.</p> <p><PIN_code> (<length_PIN_code> chars): Normal user PIN, for example “0000”. This parameter is taken into account if the Pin type is fixed.</p> <p><Input_capability> (1 char (DEC)):</p>	N/A	1	N/A	2	N/A	3	Security Mode 4	4	Variable PIN (default)	1	Fixed PIN	2
N/A	1												
N/A	2												
N/A	3												
Security Mode 4	4												
Variable PIN (default)	1												
Fixed PIN	2												

	OK	Syntax correct, execution allowed and successful
	ERR=-1	Syntax error
	ERR=-2	Command not allowed at present execution status
	ERR=-3	Internal unknown protocol stack error
Description	The general response to requests.	

PAN1026A

Command	<p>TCU_MNG_STANDARD_HCI_SET_REQ_WriteClassOfDeviceCommand</p> <p>0D 00 00 E1 3D 06 00 24 0C 03 CD CD CD</p> <p>CD: Class of Device (3 bytes): The class of the device (LSB, LSB+1, MSB).</p> <p>TCU_SPP_UUID_ASSIGN_REQ</p> <p>RL 00 00 E5 20 PL 00 IT IV ... AT AV ...</p> <p>RL: Request Length (1 byte): The length of the total request.</p> <p>PL: Parameter Length (1 byte): The length of the following fields -1.</p> <p>IT: Initiate UUID Data Type (1 byte): The UUID data type for initiation.</p> <table> <tr> <td>UUID16</td> <td>0x19</td> </tr> <tr> <td>UUID32</td> <td>0x1A</td> </tr> <tr> <td>UUID128</td> <td>0x1C</td> </tr> </table> <p>IV: Initiate UUID Value (2 / 4 /16 bytes): The UUID value for initiate connection.</p> <p>AT: Accept UUID Data Type (1 byte): The UUID data type for initiation.</p> <table> <tr> <td>UUID16</td> <td>0x19</td> </tr> <tr> <td>UUID32</td> <td>0x1A</td> </tr> <tr> <td>UUID128</td> <td>0x1C</td> </tr> </table> <p>AV: Accept UUID Value (2 / 4 /16 bytes): The UUID value for accept connection.</p>	UUID16	0x19	UUID32	0x1A	UUID128	0x1C	UUID16	0x19	UUID32	0x1A	UUID128	0x1C
UUID16	0x19												
UUID32	0x1A												
UUID128	0x1C												
UUID16	0x19												
UUID32	0x1A												
UUID128	0x1C												
Description	<p>The command TCU_MNG_STANDARD_HCI_SET_REQ_WriteClassOfDeviceCommand requests to write the class of device to the module.</p> <p>The command TCU_SPP_UUID_ASSIGN_REQ requests to set the service class ID for SPP. It is used to connect to the service with UUID the Bluetooth SIG does not specify. The command sets the UUID for both initiator and acceptor. TCU_SPP_UUID_ASSIGN_RESP is generated, when this command is completed.</p> <p>Note: There is a default service configuration that uses the well-known SPP service UUID and the service channel “5”.</p> <p>Thus, this command does only have to be used when the desired SPP service UUID deviates from the default. However, the service channel cannot be changed.</p>												
Response	<p>TCU_MNG_STANDARD_HCI_SET_RESP_WriteClassOfDeviceResponse</p> <p>RL 00 00 E1 BD PL 00 ST PE 0E 04 01 24 0C SA</p> <p>RL: Response Length (1 byte): The length of the total response.</p> <table> <tr> <td>No Error occurred</td> <td>0x0F</td> </tr> <tr> <td>Error occurred</td> <td>0x09</td> </tr> </table> <p>PL: Parameter Length (1 byte): The length of TCU_MNG_STANDARD_HCI_SET_RESP.</p>	No Error occurred	0x0F	Error occurred	0x09								
No Error occurred	0x0F												
Error occurred	0x09												

	<p>No Error occurred 0x06</p> <p>Error occurred 0x02</p> <p>ST: Status (1 byte): The status of the TCU_MNG_STANDARD_HCI_SET_RESP.</p> <p>Successful 0x00</p> <p>Parameter Failure 0x01</p> <p>No Device Initialization 0x03</p> <p>PE: Parameter Length (1 byte): The length of WriteClassOfDeviceResponse.</p> <p>No Error occurred 0x06</p> <p>Error occurred 0x02</p> <p>SA: Status parameter (1 byte): The status of WriteClassOfDeviceResponse.</p> <p>TCU_SPP_UUID_ASSIGN_RESP</p> <p>08 00 00 E5 A0 01 00 ST</p> <p>ST: Status (1 byte):</p> <p>Successful 0x00</p> <p>Parameter failure 0x01</p> <p>No Device Initialization 0x03</p> <p>Setup SPP 0x40</p>
Description	<p>TCU_MNG_STANDARD_HCI_SET_RESP_WriteClassOfDeviceResponse is the response to TCU_MNG_STANDARD_HCI_SET_REQ_WriteClassOfDeviceCommand indicating the status of the class of device writing request.</p> <p>TCU_SPP_UUID_ASSIGN_RESP is the response to TCU_SPP_UUID_ASSIGN_REQ indicating the status of the UUID setting request.</p>

4.3 Device Discovery

4.3.1 Making the device discoverable

PAN1322

Command	<p>AT+JDIS=<discoverable></p> <p><discoverable> (1 character (DEC)):</p> <p>No scans enabled 0</p> <p>Inquiry Scan enabled (visible) 1</p> <p>Page Scan enabled (connectable) 2</p> <p>Inquiry & Page Scan enabled (visible & connectable) 3</p>
Description	<p>Forces PAN1322 into Page Scan / Inquiry Scan.</p> <p>Scan is automatically disabled when connected and at disconnection they are automatically enabled. Default configuration after a HW or SW reset is no scans enabled. A device with no service registered and discoverable, will not accept any incoming SPP connection request.</p>
Response	<p><general_response></p> <p><general_response> (2 or 6 characters (DEC)):</p> <p>The general response of the module for requests indicating that the executing</p>

	went OK or that an error occurred.
	OK Syntax correct, execution allowed and successful
	ERR=-1 Syntax error
	ERR=-2 Command not allowed at present execution status
	ERR=-3 Internal unknown protocol stack error
Description	The general response to requests.

PAN1026A

Command	TCU_MNG_SET_SCAN_REQ 08 00 00 E1 0C 01 00 SM SM: Scan Mode (1 byte): Inquiry Scan OFF, Page Scan OFF 0x00 Inquiry Scan ON, Page Scan OFF 0x01 Inquiry Scan OFF, Page Scan ON 0x02 Inquiry Scan ON, Page Scan ON 0x03
Description	Set Inquiry Scan and/or Page Scan. When this command is completed, TCU_MNG_SET_SCAN_RESP is generated.
Response	TCU_MNG_SET_SCAN_RESP 08 00 00 E1 8C 01 00 ST Status (ST) (1 byte): Successful 0x00 Parameter failure 0x01 No device initialization 0x03 No setup profile 0x08
Description	This response is generated, when Inquiry Scan and Page Scan setting is completed.

4.3.2 Starting the device discovery

PAN1322

Command	AT+JDDS=<Extended_Inquiry> <Extended Inquiry> (1 character (DEC)): No remote name needed: Only information from EIR (Extended Inquiry Response) is used no RNR (Remote Name Request) is performed, all found addresses and the CoD are presented. 0 Shortened name requested: Shortened name is used if it is available. If it is not available RNR is performed. 1 Full name requested: RNR is performed for devices that do not respond with full name in EIR. 2
Description	Causes PAN1322 to start a Device Discovery (Inquiry and Remote Name Request).
Responses	<general_response> <general_response> (2 or 6 chars (DEC)):

	<p>The general response of the module for requests indicating that the executing went OK or that an error occurred.</p> <table border="0"> <tr> <td>OK</td> <td>Syntax correct, execution allowed and successful</td> </tr> <tr> <td>ERR=-1</td> <td>Syntax error</td> </tr> <tr> <td>ERR=-2</td> <td>Command not allowed at present execution status</td> </tr> <tr> <td>ERR=-3</td> <td>Internal unknown protocol stack error</td> </tr> </table> <p>Then, if responses are returned:</p> <p>+RDDSRES=<bd_addr>,<remote_name>,<COD></p> <p><bd_addr> (12 chars (HEX)): The BD address of the remote device</p> <p><remote_name> (variable length): The name of the remote device.</p> <p>If Extended Inquiry = 0, then remote name will be empty if no name is available.</p> <p>If Extended Inquiry = 1 or 2, remote_name will be page timeout if the RNR does not find any devices answering.</p> <p><COD> (6 chars (HEX)): The class of the remote device.</p> <p>Completed by:</p> <p>+RDDSCNF=<status></p> <p><status> (1 char (DEC)): The status of the device discovery process.</p> <table border="0"> <tr> <td>Success</td> <td>0</td> </tr> <tr> <td>Failure</td> <td>Anything > 0</td> </tr> </table>	OK	Syntax correct, execution allowed and successful	ERR=-1	Syntax error	ERR=-2	Command not allowed at present execution status	ERR=-3	Internal unknown protocol stack error	Success	0	Failure	Anything > 0
OK	Syntax correct, execution allowed and successful												
ERR=-1	Syntax error												
ERR=-2	Command not allowed at present execution status												
ERR=-3	Internal unknown protocol stack error												
Success	0												
Failure	Anything > 0												
Description	Returns the discovered devices.												

PAN1026A

Command	<p>TCU_MNG_DISCOVER_REMOTE_DEVICE_REQ</p> <p>08 00 00 E1 03 01 00 NR</p> <p>NR: Number of Reports (1 byte):</p> <table border="0"> <tr> <td>Number of searched devices</td> <td>0x01 – 0x10</td> </tr> </table>	Number of searched devices	0x01 – 0x10
Number of searched devices	0x01 – 0x10		
Description	<p>Set remote device discovery.</p> <p>When the PAN1026A starts the device discovery, TCU_ACCEPT is generated.</p> <p>In case remote devices were found, TCU_MNG_DISCOVER_REMOTE_DEVICE_RESULT_EVENT is generated.</p> <p>When this command is completed, TCU_MNG_DISCOVER_REMOTE_DEVICE_COMPLETE_EVENT is generated.</p> <p>When the PAN1026A finds the remote devices and the number of searched devices reaches the setting number, the PAN1026A continues to get the names of the discovered remote devices and transfers the remote device information to the Host CPU.</p> <p>If the number of discovered devices does not reach the setting number, the PAN1026A continues to get the device names 10.24 s later.</p> <p>After PAN1026A created a result event for all searched devices, the complete event is generated to Host CPU.</p>		
Responses	<p>TCU_ACCEPT</p> <p>0A 00 00 E1 F1 03 00 ST E1 03</p>		

	<p>ST Status (1 byte):</p> <table border="0"> <tr> <td>Successful</td> <td>0x00</td> </tr> <tr> <td>Parameter failure</td> <td>0x01</td> </tr> <tr> <td>No device initialization</td> <td>0x03</td> </tr> <tr> <td>On searching device</td> <td>0x04</td> </tr> <tr> <td>On searching device service</td> <td>0x05</td> </tr> <tr> <td>On progress of other profile connection</td> <td>0x0E</td> </tr> <tr> <td>On releasing SPP connection</td> <td>0x43</td> </tr> </table> <p>TCU_MNG_DISCOVER_REMOTE_DEVICE_RESULT_EVENT</p> <p>RL 00 00 E1 44 PL 00 BD BD BD BD BD BD CD CD CD LD DN ...</p> <p>RL: Response length (1 byte): The total length of the response (0x11 – 0x8F).</p> <p>PL: Parameter length (1 byte): The length of the following parameters -1 (0x0A – 0x8A).</p> <p>BD: BD address (6 bytes): The BD address of the remote device.</p> <p>CD: Class of Device (3 bytes): The device class of the remote device.</p> <p>LD: Length of Device Name (1 byte): The length of the user-friendly name (0x00 – 0x80).</p> <p>DN: Device Name (max. 128 bytes): The UTF-8 encoded User-friendly name.</p> <p>TCU_MNG_DISCOVER_REMOTE_DEVICE_COMPLETE_EVENT</p> <p>07 00 00 E1 43 00 00</p>	Successful	0x00	Parameter failure	0x01	No device initialization	0x03	On searching device	0x04	On searching device service	0x05	On progress of other profile connection	0x0E	On releasing SPP connection	0x43
Successful	0x00														
Parameter failure	0x01														
No device initialization	0x03														
On searching device	0x04														
On searching device service	0x05														
On progress of other profile connection	0x0E														
On releasing SPP connection	0x43														
Description	<p>The TCU_ACCEPT event is used to notify that the module has received the command from the host controller. After this event has been received, the host can send the next command to the module.</p> <p>The TCU_MNG_DISCOVER_REMOTE_DEVICE_RESULT_EVENT is generated, when remote devices were found.</p> <p>When device discovery is complete, the TCU_MNG_DISCOVER_REMOTE_DEVICE_COMPLETE_EVENT is generated.</p>														

4.4 Service Discovery

PAN1322

Command	<p>AT+JSDS= <bd_addr>,<length_uuid>, <uuid></p> <p><bd_addr> (12 chars (HEX)): The BD address of the remote device.</p> <p><length_uuid> (2 chars (DEC)): The length of the UUID (04 or 32).</p> <p><uuid> (4/32 chars (HEX)): The service UUID to search for eg. 1101 or 0000110100001000800000805F9B34FB for Serial Port Profile.</p>
Description	<p>AT+JSDS causes the PAN1322 to start a specified service discovery of a specified remote device with the given BD address and UUID.</p>
Response	<p><general_response></p> <p><general_response> (2 or 6 chars (DEC)):</p>

	<p>The general response of the module for requests indicating that the executing went OK or that an error occurred.</p> <table border="0"> <tr> <td>OK</td> <td>Syntax correct, execution allowed and successful</td> </tr> <tr> <td>ERR=-1</td> <td>Syntax error</td> </tr> <tr> <td>ERR=-2</td> <td>Command not allowed at present execution status</td> </tr> <tr> <td>ERR=-3</td> <td>Internal unknown protocol stack error</td> </tr> </table> <p>Then, if responses are returned:</p> <p>+RSDSRES=<remote_service_name>,<remote_service_channel></p> <p><remote_service_name> (variable length): The name of the remote service. <remote_service_channel> (2 chars (DEC)): The channel of the service.</p> <p>Completed by:</p> <p>+RSDSCNF=<status></p> <p><status> (1 char (DEC)): The status of the service discovery process.</p> <table border="0"> <tr> <td>Success</td> <td>0</td> </tr> <tr> <td>Failure</td> <td>Anything > 0</td> </tr> </table>	OK	Syntax correct, execution allowed and successful	ERR=-1	Syntax error	ERR=-2	Command not allowed at present execution status	ERR=-3	Internal unknown protocol stack error	Success	0	Failure	Anything > 0
OK	Syntax correct, execution allowed and successful												
ERR=-1	Syntax error												
ERR=-2	Command not allowed at present execution status												
ERR=-3	Internal unknown protocol stack error												
Success	0												
Failure	Anything > 0												
Description	Returns the discovered services.												

PAN1026A

Command	<p>TCU_MNG_DISCOVER_REMOTE_SERVICE_REQ</p> <p>RL 00 00 E1 05 PL 00 SM BD BD BD BD BD BD UL LK ...</p> <p>RL: Request length (1 byte): The total length of the request (0x0F or 0x1F). PL: Parameter length (1 byte): The length of the following parameters -1 (0x08 or 0x18). SM: Security Mode (1 byte): Set of Bluetooth security modes.</p> <table border="0"> <tr> <td>Mode 3</td> <td>0x00</td> </tr> <tr> <td>Mode 2</td> <td>0x01</td> </tr> </table> <p>BD: BD Address (6 bytes): The BD address of the remote device. UL: Use of link key (1 byte): Set link key for Bluetooth connection.</p> <table border="0"> <tr> <td>No</td> <td>0x00</td> </tr> <tr> <td>Yes</td> <td>0x01</td> </tr> </table> <p>LK: Link key (16 bytes): The link key of the connection. This field can be omitted when UL is 0x00.</p> <p>Note: PAN1026A link keys have to be handled and stored by the host controller.</p>	Mode 3	0x00	Mode 2	0x01	No	0x00	Yes	0x01
Mode 3	0x00								
Mode 2	0x01								
No	0x00								
Yes	0x01								
Description	<p>TCU_MNG_DISCOVER_REMOTE_SERVICE_REQ causes the PAN1026A to search the remote device for services. TCU_ACCEPT is generated to notify to Host CPU, when this command operation is started. TCU_MNG_DISCOVER_REMOTE_SERVICE_EVENT is generated, when this command is completed.</p>								
Response	<p>TCU_ACCEPT</p> <p>0A 00 00 E1 F1 03 00 ST E1 05</p>								

ST Status (1 byte):	
Successful	0x00
Parameter failure	0x01
No device initialization	0x03
On searching device	0x04
On searching device service	0x05
On progress of other profile connection	0x0E
On progress of SPP connection or establishing SPP	0x42
On releasing SPP connection	0x43
TCU_MNG_DISCOVER_REMOTE_SERVICE_EVENT	
RL RL 00 E1 45 PL 00 ST BD BD BD BD BD BD SC SE ... IP IL EI	
RL: Response length (2 bytes): The total length of the response (0xXX – 0xXX).	
PL: Parameter length (1 byte): The length of the following parameters -1 (0x08 – 0xFF).	
ST: Status (1 byte): The operation result status.	
Successful	0x00
SDP connection failure	0x8C
No supported SDP	0x8D
BD: BD address (6 bytes): The BD address of the remote device.	
SC: Service count (1 byte): The number of services on the remote device.	
SE: Service type (1 byte): The profile indicator for each supported profile.	
SPP (B-Party)	0x03
Device ID (DI)	0x0E
IP: Extension info profile (1 byte): The profile that has additional information.	
SPP	0x02
Device ID	0x03
IL: Extension info length (1 byte): The length of the additional information.	
EI: Extension info (186 bytes): The additional information.	
Example: Device ID and SPP	
Parameter length:	0x1D
Status:	0x00
BD Address:	0x001343XXXXXX
Service count:	0x02
Service type:	0x03 (SPP)
Service type:	0x0B (Device ID)
Extension info profile:	0x02 (SPP)
Extension info length:	0x03
Extension info:	0x02 (Number of server channels)
Extension info:	0x01 (Server channel 1)
Extension info:	0x02 (Server channel 2)

	Extension info profile: 0x03 (Device ID) Extension info length: 0x0B (Device ID description length) Extension info: 0XXXXX (Specification ID) Extension info: 0XXXXX (Vendor ID) Extension info: 0XXXXX (Product ID) Extension info: 0XXXXX (Version) Extension info: 0XXX (Primary record) Extension info: 0XXXXX (Vendor ID source)
Description	TCU_MNG_DISCOVER_REMOTE_SERVICE_EVENT is generated, when the service information of a remote device was found. With this event, the BD_ADDR and service information of a remote device is transferred to the host CPU.

In addition to the mentioned commands above, the PAN1026A provides a function to cancel an ongoing service discovery. This command and its response are described in the following table.

PAN1026A

Command	TCU_MNG_DISCOVER_REMOTE_SERVICE_CANCEL_REQ 0D 00 00 E1 12 06 00 BD BD BD BD BD BD BD: BD address (6 bytes): The BD address of the remote device.
Description	TCU_MNG_DISCOVER_REMOTE_SERVICE_CANCEL_REQ causes the PAN1026A to cancel the service discovery. TCU_ACCEPT is generated to notify the host controller, when this command operation is started.
Response	TCU_ACCEPT 0A 00 00 E1 F1 03 00 ST E1 12 ST Status (1 byte): Successful 0x00 Parameter failure 0x01 No device initialization 0x03 TCU_MNG_DISCOVER_REMOTE_SERVICE_CANCEL_EVENT 0D 00 00 E1 52 06 00 BD BD BD BD BD BD BD: BD address (6 bytes): The BD address of the remote device.
Description	TCU_MNG_DISCOVER_REMOTE_SERVICE_CANCEL_REQ is the acknowledging response for the TCU_MNG_DISCOVER_REMOTE_SERVICE_CANCEL_REQ.

4.5 Device Connection

4.5.1 Connecting an SPP Link

PAN1322

Command	<p>AT+JCCR=<bd_addr>, <service channel></p> <p><bd_addr> (12 chars (HEX)): The bluetooth address of the remote device.</p> <p><service_channel> (2 chars (DEC)):</p> <p>The service channel to connect to (01 - 30). It can be received from a service discovery AT+JSDS.</p>								
Description	Instructs the PAN1322 to connect to a remote Bluetooth device.								
Response	<p><general_response></p> <p><general_response> (2 or 6 chars (DEC)):</p> <p>The general response of the module for requests indicating that the executing went OK or that an error occurred.</p> <table border="0"> <tr> <td>OK</td> <td>Syntax correct, execution allowed and successful</td> </tr> <tr> <td>ERR=-1</td> <td>Syntax error</td> </tr> <tr> <td>ERR=-2</td> <td>Command not allowed at present execution status</td> </tr> <tr> <td>ERR=-3</td> <td>Internal unknown protocol stack error</td> </tr> </table> <p>Followed by:</p> <p>+RCCRCNF = <MTU_size>, <service>, <status></p> <p><MTU_size> (3 chars (DEC)): The maximum transmission unit (01 to 500).</p> <p><service> (4 or 32 chars (DEC)):</p> <p>The service the remote device is connected to. The host of the initializing device specifies which service it connects to in AT+JCCR.</p> <p><status> (1 char (DEC)):</p> <p>The status of the request. If maximum number of allowed connections already exists: ERR=-2.</p>	OK	Syntax correct, execution allowed and successful	ERR=-1	Syntax error	ERR=-2	Command not allowed at present execution status	ERR=-3	Internal unknown protocol stack error
OK	Syntax correct, execution allowed and successful								
ERR=-1	Syntax error								
ERR=-2	Command not allowed at present execution status								
ERR=-3	Internal unknown protocol stack error								
Description	Indicates the status of the connection process.								

PAN1026A

Command	<p>TCU_SPP_CONNECT_REQ</p> <p>RL 00 00 E5 03 PL 00 BD BD BD BD BD BD 07 03 00 00 00 00 00 00 UL LK ...</p> <p>RL: Request length (1 byte): The total length of the request (0x16 or 0x26).</p> <p>PL: Parameter length (1 byte): The length of the following parameters (0x0F or 0x1F).</p> <p>BD: BD Address (6 bytes): The Bluetooth device address of the remote device.</p> <p>UL: Use of Link Key (1 byte): The link key usage setting.</p> <table border="0"> <tr> <td>Don't use link key. Pairing will be performed again.</td> <td>0x00</td> </tr> <tr> <td>Use a link key, if it is available from a previous pairing process</td> <td>0x01</td> </tr> </table> <p>LK: Link Key (16 bytes): The link key of a previous pairing process.</p> <p>Note: PAN1026A link keys have to be handled and stored by the host controller.</p>	Don't use link key. Pairing will be performed again.	0x00	Use a link key, if it is available from a previous pairing process	0x01
Don't use link key. Pairing will be performed again.	0x00				
Use a link key, if it is available from a previous pairing process	0x01				

Description	To establish an SPP connection with a specific remote device. TCU_ACCEPT is generated to notify the command operation started on host controller. When the service level connection is established, TCU_SPP_CONNECT_EVENT is generated.																										
Response	<p>TCU_ACCEPT</p> <p>0A 00 00 E1 F1 03 00 ST E5 03</p> <p>ST: Status (1 byte):</p> <table border="0"> <tr><td>Successful</td><td>0x00</td></tr> <tr><td>Parameter failure</td><td>0x01</td></tr> <tr><td>No device initialization</td><td>0x03</td></tr> <tr><td>On Searching device</td><td>0x04</td></tr> <tr><td>On searching device service</td><td>0x05</td></tr> <tr><td>Under connection setup of other profile</td><td>0x0E</td></tr> <tr><td>No setup SPP</td><td>0x41</td></tr> <tr><td>On progress SPP connection or Establish SPP</td><td>0x42</td></tr> <tr><td>Releasing SPP</td><td>0x43</td></tr> </table> <p>TCU_SPP_CONNECT_EVENT</p> <p>EL 00 00 E5 43 PL 00 ST BD BD BD BD BD BD NF NF LN DN ...</p> <p>EL: Event length (2 bytes): The total length of the event (0x11 – 0x29).</p> <p>PL: Parameter length (1 byte): The length of the following parameters -1 (0xA – 0x22).</p> <p>ST: Status (1 byte): The status of the connection establishment.</p> <table border="0"> <tr><td>Successful</td><td>0x00</td></tr> <tr><td>No Simple Device Pairing (SDP) service supported</td><td>0x8D</td></tr> <tr><td>SPP connection timeout</td><td>0xD0</td></tr> <tr><td>SPP connection failure</td><td>0xD3</td></tr> </table> <p>BD: BD Address (6 bytes): The Bluetooth device address of the remote device.</p> <p>NF: Negotiated Frame Size (NF) (2 bytes):</p> <p>The maximum frame size of an SPP frame. This value has to be used in the Length of Data field of the TCU_SPP_DATA_TRANSFER_REQ request.</p> <p>LN: Length of device name (1 byte):</p> <p>The length of the remote device name. When no name is set the value is 0x00.</p> <p>DN: Device Name (max. 24 bytes):</p> <p>The UTF-8 encoded remote device name. Not present if the length is 0x00.</p>	Successful	0x00	Parameter failure	0x01	No device initialization	0x03	On Searching device	0x04	On searching device service	0x05	Under connection setup of other profile	0x0E	No setup SPP	0x41	On progress SPP connection or Establish SPP	0x42	Releasing SPP	0x43	Successful	0x00	No Simple Device Pairing (SDP) service supported	0x8D	SPP connection timeout	0xD0	SPP connection failure	0xD3
Successful	0x00																										
Parameter failure	0x01																										
No device initialization	0x03																										
On Searching device	0x04																										
On searching device service	0x05																										
Under connection setup of other profile	0x0E																										
No setup SPP	0x41																										
On progress SPP connection or Establish SPP	0x42																										
Releasing SPP	0x43																										
Successful	0x00																										
No Simple Device Pairing (SDP) service supported	0x8D																										
SPP connection timeout	0xD0																										
SPP connection failure	0xD3																										
Description	<p>The TCU_ACCEPT event is used to notify that the module has received the command from the host controller. After this event has been received, the host can send the next command to the module.</p> <p>TCU_SPP_CONNECT_EVENT is generated, when SPP connection is established.</p>																										

4.5.2 Incoming Connection Request Events

PAN1322

Response	+RCOI=<bd_addr> <bd_addr> (12 chars (HEX)): The Bluetooth device address of the remote device.
Description	Indicates a remote connection request. This request can be answered with the command AT+JACR= <accept>.

PAN1026A

Event	TCU_MNG_CONNECTION_REQUEST_EVENT 10 00 00 E1 55 07 00 BD BD BD BD BD BD CD CD CD BD: BD address (6 bytes): BD address of the remote device. CD: Class of device (3 bytes): The class of the remote device.
Description	TCU_MNG_CONNECTION_REQUEST_EVENT is generated when a remote device requests to connect to the PAN1026A. If the host controller does not execute TCU_MNG_CONNECTION_ACCEPT_REQ within 5 seconds, the PAN1026A will automatically cancel the request and generate TCU_MNG_CONNECTION_STATUS_EVENT.

4.5.3 Accepting Connection Requests

PAN1322

Command	AT+JACR=<accept> <accept> (1 char (DEC)): The parameter to control connection acceptance. Do not accept 0 Accept 1
Description	AT+JACR=<accept> is used to answer to a connection indication (+RCOI).
Response	<general_response> <general_response> (2 or 6 chars (DEC)): The general response of the module for requests indicating that the executing went OK or that an error occurred. OK Syntax correct, execution allowed and successful ERR=-1 Syntax error ERR=-2 Command not allowed at present execution status ERR=-3 Internal unknown protocol stack error
Description	The different responses possible to the request.

PAN1026A

Command	TCU_MNG_CONNECTION_ACCEPT_REQ RL 00 00 E1 13 PL 00 RT BD BD BD BD BD BD UL LK ... RL: Request length (1 byte): The total length of the request. PL: Parameter length (1 byte): The length of the parameters. RT: Response Type (1 byte): The response type of the request.
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	<p>DisplayOnly 0x00</p> <p>DisplayYesNo 0x01</p> <p>KeyboardOnly 0x02</p> <p>NoInputNoOutput 0x03</p> <p>Reserved for future use 0x04 – 0xFF</p> <p>OB: OOB data present (1 byte):</p> <p>The indication whether OOB authentication data is present or not.</p> <p>OOB authentication data not present 0x00</p> <p>OOB authentication data from remote device present 0x01</p> <p>Reserved for future use 0x02 – 0xFF</p> <p>AR: Authentication requirement (1 byte):</p> <p>MITM and general/dedicated bonding.</p> <p>MITM protection not required – No bonding. 0x00 Numeric comparison with automatic accept allowed.</p> <p>MITM protection required – No bonding. 0x01 Use IO capabilities to determine authentication procedure.</p> <p>MITM protection required – Dedicated bonding. 0x02 Numeric comparison with automatic accept allowed.</p> <p>MITM Protection Required – Dedicated Bonding. 0x03 Use IO Capabilities to determine authentication procedure.</p> <p>MITM Protection Not Required – General Bonding. 0x04 Numeric Comparison with automatic accept allowed.</p> <p>MITM Protection Required – General Bonding. 0x05 Use IO capabilities to determine authentication procedure.</p> <p>Reserved for future use. 0x06 – 0xFF</p>
Description	TCU_MNG_SSP_SET_REQ_HCI_IO_Capability_Request_Reply is used to reply to a TCU_MNG_SSP_INFO_EVENT_HCI_IO_Capability_Request_Event and specifies the current I/O capabilities of the host. This includes the host input, output and out-of-band (OOB) capabilities.
Response	<p>TCU_MNG_SSP_SET_RESP_HCI_IO_Capability_Request_Reply_Response</p> <p>15 00 00 E1 BD 0E 00 00 0C 0E 0A 01 2B 04 ST BD BD BD BD BD BD</p> <p>ST: Status (1 byte):</p> <p>Command success 0x00</p> <p>Command failure 0xFF (anything > 0x00)</p> <p>BD: BD address (6 bytes): The BD address of the remote device (LSB first).</p>
Description	TCU_MNG_SSP_SET_RESP_HCI_IO_Capability_Request_Reply_Response is the response to the TCU_MNG_SSP_SET_REQ_HCI_IO_Capability_Request_Reply.
Command	<p>TCU_MNG_SSP_SET_REQ_HCI_IO_Capability_Request_Negative_Reply</p> <p>11 00 00 E1 3D 0C 00 34 04 07 BD BD BD BD BD BD 38</p> <p>BD: BD address (6 bytes): The BD address of the remote device (LSB first).</p>
Description	TCU_MNG_SSP_SET_REQ_HCI_IO_Capability_Request_Negative_Reply is used to reject a pairing attempt after a TCU_MNG_SSP_INFO_EVENT_HCI_IO_Capability_Request_Event has been received by the host.

Response	<p>TCU_MNG_SSP_SET_RESP_HCI_IO_Capability_Request_Negative_Reply_Response 15 00 00 E1 BD 0E 00 00 0C 0E 0A 01 34 04 ST BD BD BD BD BD BD</p> <p>ST: Status (1 byte):</p> <table> <tr> <td>Command success</td> <td>0x00</td> </tr> <tr> <td>Command failure</td> <td>0xXX (anything > 0x00)</td> </tr> </table> <p>BD: BD address (6 bytes): The BD address of the remote device (LSB first).</p>	Command success	0x00	Command failure	0xXX (anything > 0x00)
Command success	0x00				
Command failure	0xXX (anything > 0x00)				
Description	<p>TCU_MNG_SSP_SET_RESP_HCI_IO_Capability_Request_Negative_Reply_Response is the response to the TCU_MNG_SSP_SET_REQ_HCI_IO_Capability_Request_Negative_Reply.</p>				

Event	<p>TCU_MNG_SSP_INFO_EVENT_HCI_IO_Capability_Response_Event 12 00 00 E1 7D 0B 00 32 09 BD BD BD BD BD BD IO OB AR</p> <p>BD: BD address (6 bytes): The BD address of the remote device (LSB first).</p> <p>IO: IO capability (1 byte): The IO capability of the remote device.</p> <table> <tr> <td>DisplayOnly</td> <td>0x00</td> </tr> <tr> <td>DisplayYesNo</td> <td>0x01</td> </tr> <tr> <td>KeyboardOnly</td> <td>0x02</td> </tr> <tr> <td>NoInputNoOutput</td> <td>0x03</td> </tr> <tr> <td>Reserved for future use</td> <td>0x04 – 0xFF</td> </tr> </table> <p>OB: OOB data present (1 byte):</p> <p>The indication whether OOB authentication data is present or not.</p> <table> <tr> <td>OOB authentication data not present</td> <td>0x00</td> </tr> <tr> <td>OOB authentication data from remote device present</td> <td>0x01</td> </tr> <tr> <td>Reserved for future use</td> <td>0x02 – 0xFF</td> </tr> </table> <p>AR: Authentication requirement (1 byte):</p> <p>Man in the middle (MITM) and general/dedicated bonding.</p> <table> <tr> <td>MITM protection not required – No bonding. Numeric comparison with automatic accept allowed.</td> <td>0x00</td> </tr> <tr> <td>MITM protection required – No bonding. Use IO capabilities to determine authentication procedure.</td> <td>0x01</td> </tr> <tr> <td>MITM protection required – Dedicated bonding. Numeric comparison with automatic accept allowed.</td> <td>0x02</td> </tr> <tr> <td>MITM Protection Required – Dedicated Bonding. Use IO Capabilities to determine authentication procedure.</td> <td>0x03</td> </tr> <tr> <td>MITM Protection Not Required – General Bonding. Numeric Comparison with automatic accept allowed.</td> <td>0x04</td> </tr> <tr> <td>MITM Protection Required – General Bonding. Use IO capabilities to determine authentication procedure.</td> <td>0x05</td> </tr> <tr> <td>Reserved for future use.</td> <td>0x06 – 0xFF</td> </tr> </table>	DisplayOnly	0x00	DisplayYesNo	0x01	KeyboardOnly	0x02	NoInputNoOutput	0x03	Reserved for future use	0x04 – 0xFF	OOB authentication data not present	0x00	OOB authentication data from remote device present	0x01	Reserved for future use	0x02 – 0xFF	MITM protection not required – No bonding. Numeric comparison with automatic accept allowed.	0x00	MITM protection required – No bonding. Use IO capabilities to determine authentication procedure.	0x01	MITM protection required – Dedicated bonding. Numeric comparison with automatic accept allowed.	0x02	MITM Protection Required – Dedicated Bonding. Use IO Capabilities to determine authentication procedure.	0x03	MITM Protection Not Required – General Bonding. Numeric Comparison with automatic accept allowed.	0x04	MITM Protection Required – General Bonding. Use IO capabilities to determine authentication procedure.	0x05	Reserved for future use.	0x06 – 0xFF
DisplayOnly	0x00																														
DisplayYesNo	0x01																														
KeyboardOnly	0x02																														
NoInputNoOutput	0x03																														
Reserved for future use	0x04 – 0xFF																														
OOB authentication data not present	0x00																														
OOB authentication data from remote device present	0x01																														
Reserved for future use	0x02 – 0xFF																														
MITM protection not required – No bonding. Numeric comparison with automatic accept allowed.	0x00																														
MITM protection required – No bonding. Use IO capabilities to determine authentication procedure.	0x01																														
MITM protection required – Dedicated bonding. Numeric comparison with automatic accept allowed.	0x02																														
MITM Protection Required – Dedicated Bonding. Use IO Capabilities to determine authentication procedure.	0x03																														
MITM Protection Not Required – General Bonding. Numeric Comparison with automatic accept allowed.	0x04																														
MITM Protection Required – General Bonding. Use IO capabilities to determine authentication procedure.	0x05																														
Reserved for future use.	0x06 – 0xFF																														
Description	<p>Indicates to the host that IO capabilities from a remote device specified by BD address have been received during a simple pairing process.</p>																														

Description	The response to TCU_MNG_SSP_SET_REQ_HCI_User_Confirmation_Request_Negative_Reply.
Event	TCU_MNG_SSP_INFO_EVENT_HCI_Simple_Pairing_Complete_Event 10 00 00 E1 7D 09 00 36 07 ST BD BD BD BD BD BD ST: Status (1 byte): The status of the event. Command success 0x00 Command failure 0xFF (anything > 0x00) BD: BD address (6 bytes): The BD address of the remote device (LSB first).
Description	Indicates that the simple pairing process has completed. A host that is displaying a numeric value can use this event to change its UI.

4.5.6 Disconnecting SPP Link

PAN1322

Command	AT+JSDR
Description	Forces an SPP disconnection.
Response	OK
Description	Disconnection Response.

PAN1026A

Command	TCU_SPP_DISCONNECT_REQ 07 00 00 E5 04 00 00
Description	TCU_SPP_DISCONNECT_REQ requests to disconnect an SPP connection. TCU_ACCEPT is generated to notify the start of this command operation. When the connection is disconnected, TCU_SPP_DISCONNECT_EVENT is generated.
Response	TCU_ACCEPT 0A 00 00 E1 F1 03 00 ST E5 04 ST: Status (1 byte): Success 0x00 Parameter failure 0x01 No device initialization 0x03 Under Connection setup of other profile 0x0E No setup SPP 0x41 TCU_SPP_DISCONNECT_EVENT 0F 00 00 E5 44 08 00 ST BD BD BD BD BD BD RE ST: Status (1 byte): The status of the disconnection. Successful 0x00 SPP release timeout 0xD2 BD: BD Address (6 bytes): The BD address of the remote device. RE: Reason (1 byte): The reason for the disconnection.

	Releasing required from local host	0x01
	Releasing required from remote device	0x02
	Disconnection error	0x03
	Link loss	0x04
Description	TCU_ACCEPT is generated to notify the start of the TCU_SPP_DISCONNECT command execution. TCU_SPP_DISCONNECT_EVENT is generated, when the SPP disconnection is completed.	

4.5.7 Connection Status Events

To provide a connection status feedback to the host controller, the PAN1322 uses multiple events, which are listed below.

PAN1322

Event	+RSLE
Description	Indicates that a secure link has been established.

PAN1322

Event	+RDII
Description	Indicates the disconnection.

The PAN1026A combines its connection status information in the following event.

PAN1026A

Event	TCU_MNG_CONNECTION_STATUS_EVENT EL 00 00 E1 47 PL 00 ST BD ... CS LK ... LT SI ..
	EL: Event length (1 byte): The length of the event.
	PL: Parameter length (1 byte): The length of the following parameters -1.
	ST: Status (1 byte): The status of the process.
	Successful 0x00
	Page timeout 0x80
	Local device connection reject 0x81
	Link loss 0x82
	Pin code input timeout 0x83
	Pin code failure 0x84
	Local device pin code input reject 0x85
	Remote device pin code input reject 0x86
	Link key failure 0x87
	BD: BD Address (6 bytes): The BD address of the remote device.
	CS: Connection status (1 byte): The status of the connection process.
	Connected 0x00
	Disconnected 0x01
	Connection failure 0x02

	<p>Link key 0x03</p> <p>Mode change active 0x04</p> <p>Mode change hold 0x05</p> <p>Mode change sniff 0x06</p> <p>Mode change park 0x07</p> <p>LK: Link key (16 bytes): The link key of the pairing process.</p> <p>If the connection status is 0x00 – 0x02, this parameter is omitted.</p> <p>LT: Link key type (1 byte): The type of the link key.</p> <p>Combination key 0x00</p> <p>Local unit key 0x01</p> <p>Remote unit key 0x02</p> <p>Debug combination key 0x03</p> <p>Unauthenticated combination key 0x04</p> <p>Authenticated combination key 0x05</p> <p>Changed combination key 0x06</p> <p>Reserved 0x07 – 0xFF</p> <p>SI: Sniff Interval (2 bytes): The sniff interval to set sniff subrating.</p> <p>When sniff subrating on TCU_MNG_INIT_REQ is selected, and the connection status on this event is “Mode Change Sniff”, this parameter is generated.</p> <p>Note: PAN1026A link keys have to be handled and stored by the host controller.</p>
Description	<p>TCU_MNG_CONNECTION_STATUS_EVENT is generated for the following situations:</p> <ul style="list-style-type: none"> • Establish ACL connection • Disconnect ACL connection • Pairing is successful and link key is generated • Pairing or authentication is failed

4.6 Data Transmission

4.6.1 Transferring Data

PAN1322

Command	<p>AT+JSDA=<length>, <data></p> <p><length> (3 chars (DEC)): The amount of bytes to be sent. Can be 001 to max MTU size.</p> <p><data> (001 – max MTU size): The data to be sent.</p>
Description	<p>Sends a specified amount of data. The maximum number of bytes for each packet is reported at connection confirmation (MTU size). The value for this parameter is negotiated by the two devices during the connection setup.</p>
Response	<p><general_response></p> <p><general_response> (2 or 6 chars (DEC)): The general response of the module for requests indicating that the executing went OK or that an error occurred.</p> <p>OK Syntax correct, execution allowed and successful</p> <p>ERR=-1 Syntax error</p>

	ERR=-2	Command not allowed at present execution status
	ERR=-3	Internal unknown protocol stack error
Description	The general responses to a request.	

PAN1026A

Command	<p>TCU_SPP_DATA_TRANSFER_REQ</p> <p>RL RL 00 E5 08 PL PL LD LD DA ...</p> <p>RL: Request length (2 bytes): The total length of the request.</p> <p>PL: Parameter length (2 bytes): The length of the following parameters.</p> <p>LD: Length of data (2 bytes): The length of the data to be sent.</p> <p>This can be 0x01 to max MTU size. The actual MTU size has to be taken from the TCU_SPP_CONNECT_EVENT parameter "Negotiated frame size".</p> <p>DA: Data (1 byte to LD bytes – max MTU size bytes): The data to be sent.</p>														
Description	<p>TCU_SPP_DATA_TRANSFER_REQ is used to send SPP data to a remote device.</p> <p>TCU_ACCEPT is generated to notify the execution of this command. Afterwards, TCU_SPP_DATA_SEND_EVENT is generated, when this command is completed.</p>														
Response	<p>TCU_ACCEPT</p> <p>0A 00 00 E1 F1 03 00 ST E5 08</p> <p>ST: Status (1 byte):</p> <table border="0"> <tr> <td>Success</td> <td>0x00</td> </tr> <tr> <td>Parameter failure</td> <td>0x01</td> </tr> <tr> <td>No device initialization</td> <td>0x03</td> </tr> <tr> <td>No setup SPP</td> <td>0x41</td> </tr> <tr> <td>Releasing SPP</td> <td>0x43</td> </tr> <tr> <td>No SPP connection</td> <td>0x44</td> </tr> <tr> <td>On transferring SPP data</td> <td>0x46</td> </tr> </table> <p>TCU_SPP_DATA_SEND_EVENT</p> <p>07 00 00 E5 F1 00 00</p>	Success	0x00	Parameter failure	0x01	No device initialization	0x03	No setup SPP	0x41	Releasing SPP	0x43	No SPP connection	0x44	On transferring SPP data	0x46
Success	0x00														
Parameter failure	0x01														
No device initialization	0x03														
No setup SPP	0x41														
Releasing SPP	0x43														
No SPP connection	0x44														
On transferring SPP data	0x46														
Description	<p>TCU_ACCEPT is generated to notify the start of the TCU_SPP_DATA_TRANSFER_REQ command execution.</p> <p>TCU_SPP_DATA_SEND_EVENT is generated when the PAN1026A has completed sending data to the remote device.</p>														

4.6.2 Receiving Data

PAN1322

Response	+RDAI=<length>, <data> <length> (3 chars (DEC)): The amount of bytes received. <data> (<length> chars): The received data.
Description	Indicate that data has been received. This response is not available during stream mode.

PAN1026A

Event	TCU_SPP_DATA_RECEIVE_EVENT EL EL 00 E5 48 PL PL LD LD DA ... EL: Event length (2 bytes): The total length of the event. PL: Parameter length (2 bytes): The length of the following parameters. LD: Length of data (2 bytes): The length of the received SPP data. DA: Data (1 byte to LD bytes – max. 543 bytes): The received SPP data.
Description	TCU_SPP_DATA_RECEIVE_EVENT notifies the host that data has been received from the remote device.

4.6.3 Switching Transmission Modes

The PAN1322 can use two operation modes: Command Mode and Stream Mode.

In Command Mode, the module will execute the AT commands sent from the host controller via UART. The mode is used to control the module behavior as well as to transmit data bursts and packetized data to a remote device that has a Bluetooth connection on SPP level with the PAN1322.

In Stream Mode, the host controller can send un-packetized data to the PAN1322, which will transfer this data to the remote device. This mode is used when transmitting a small amount of data in a random way and for serial cable replacement applications.



The Command Mode yields higher throughput than Stream Mode, because the filling of Bluetooth packets can be optimized.

The following commands are used to switch back and forth between the modes.

PAN1322

Command	AT+JSCR
Description	The stream connection request, requests the PAN1322 to switch from Command Mode and to Stream Mode.
Response	OK
Description	Response that indicates a successful command execution.

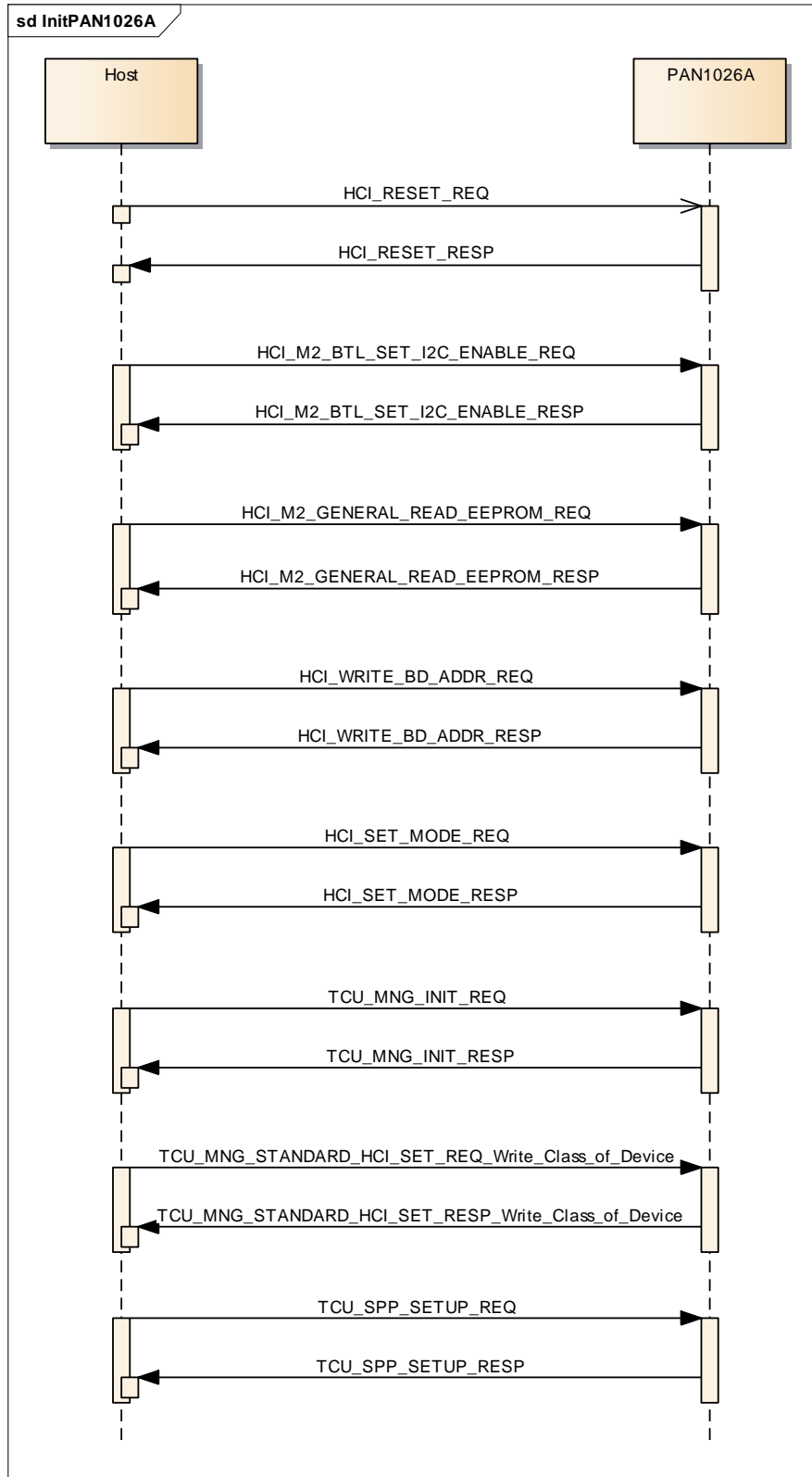
PAN1322

Command	^^^
Description	Escape character sequence, that causes the PAN1322 to switch from Stream Mode to Command Mode. A wait time greater than 100 ms after the last byte transmission is mandatory. This sequence is not terminated with <CR><LF>.
Response	OK
Description	Response that indicates a successful command execution.

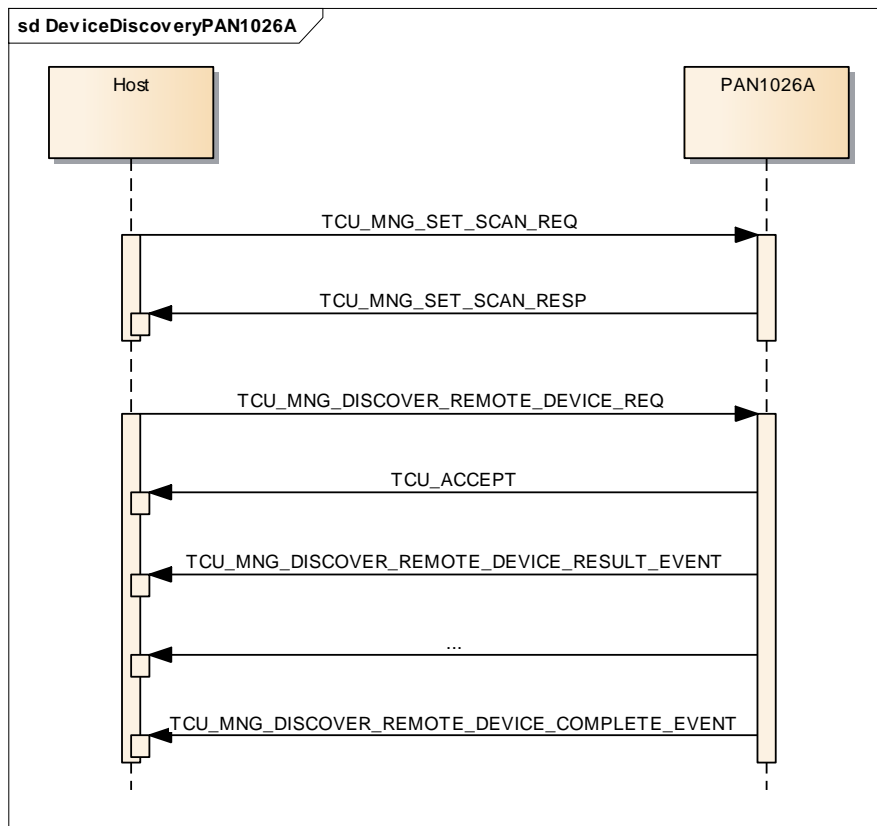
The PAN1026A does not provide a Stream Mode. Data has to be sent using the appropriate command similar to the Command Mode of the PAN1322.


4.7 PAN1026A Example Sequences

4.7.1 Initialization

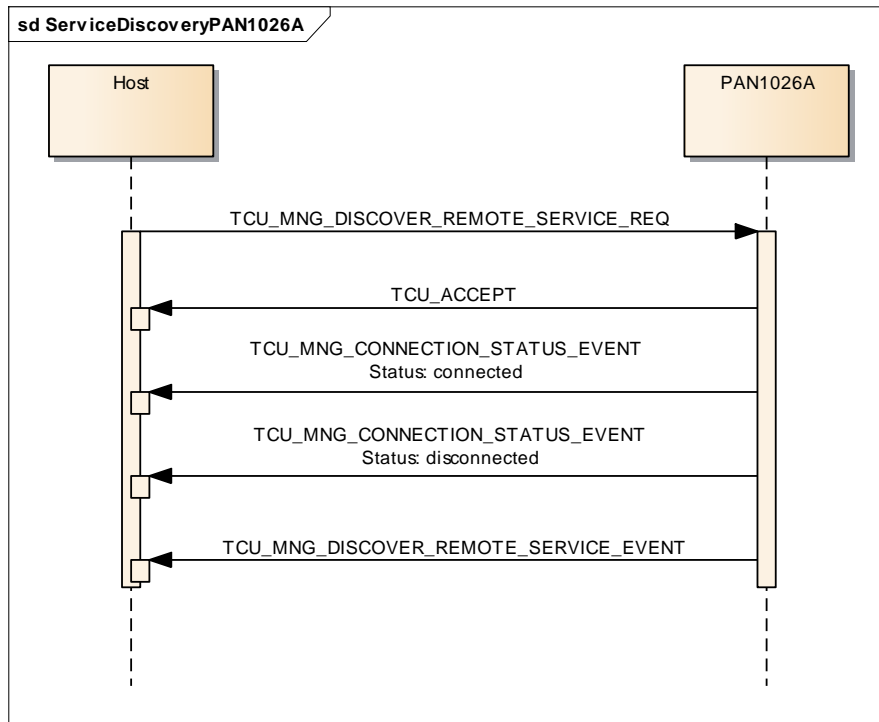


4.7.2 Device Discovery



 Please note that the device discovery can only be performed after the initialization has been successful.

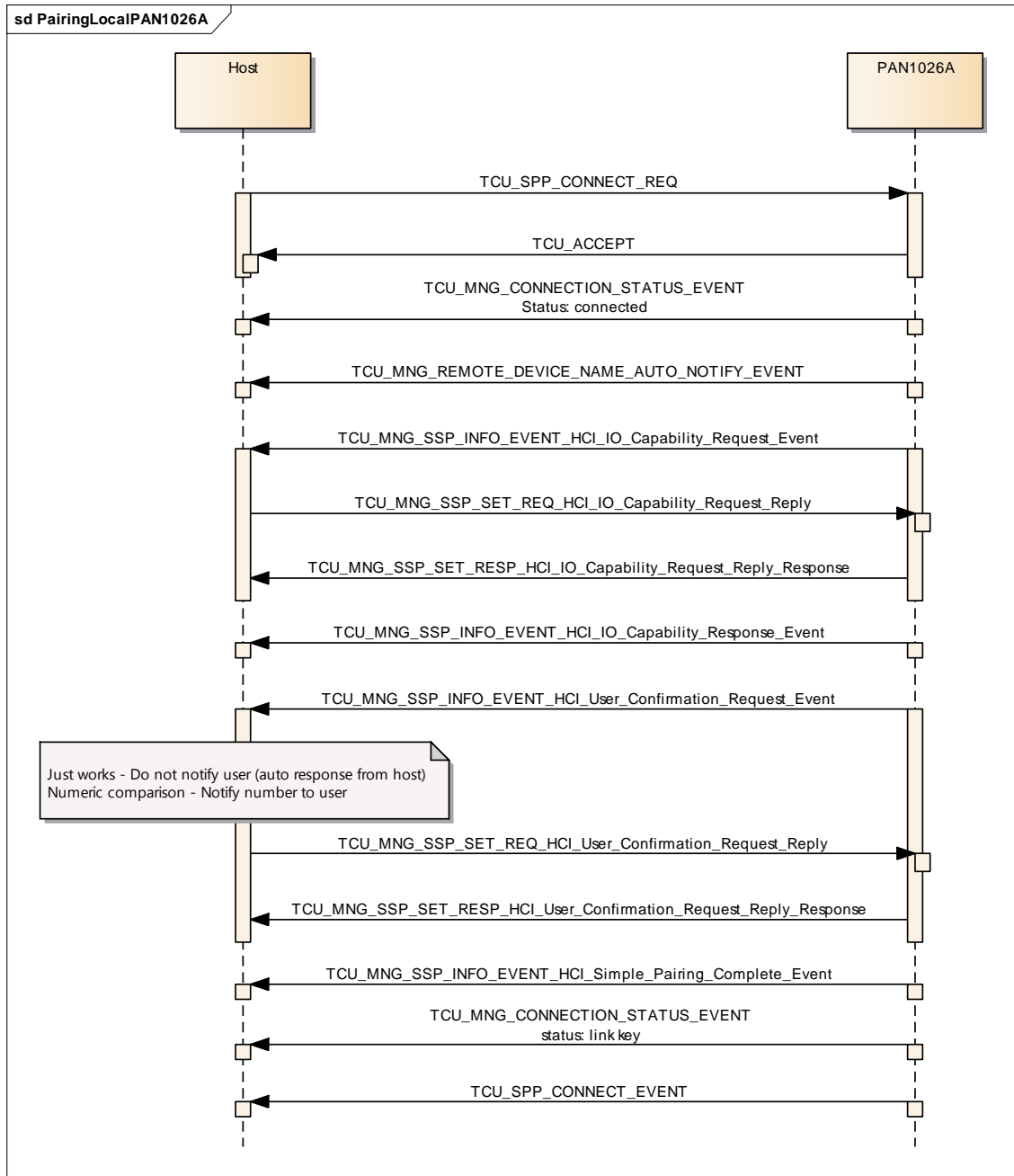
4.7.3 Service Discovery




Please note that the service discovery can only be performed after the initialization has been successful.

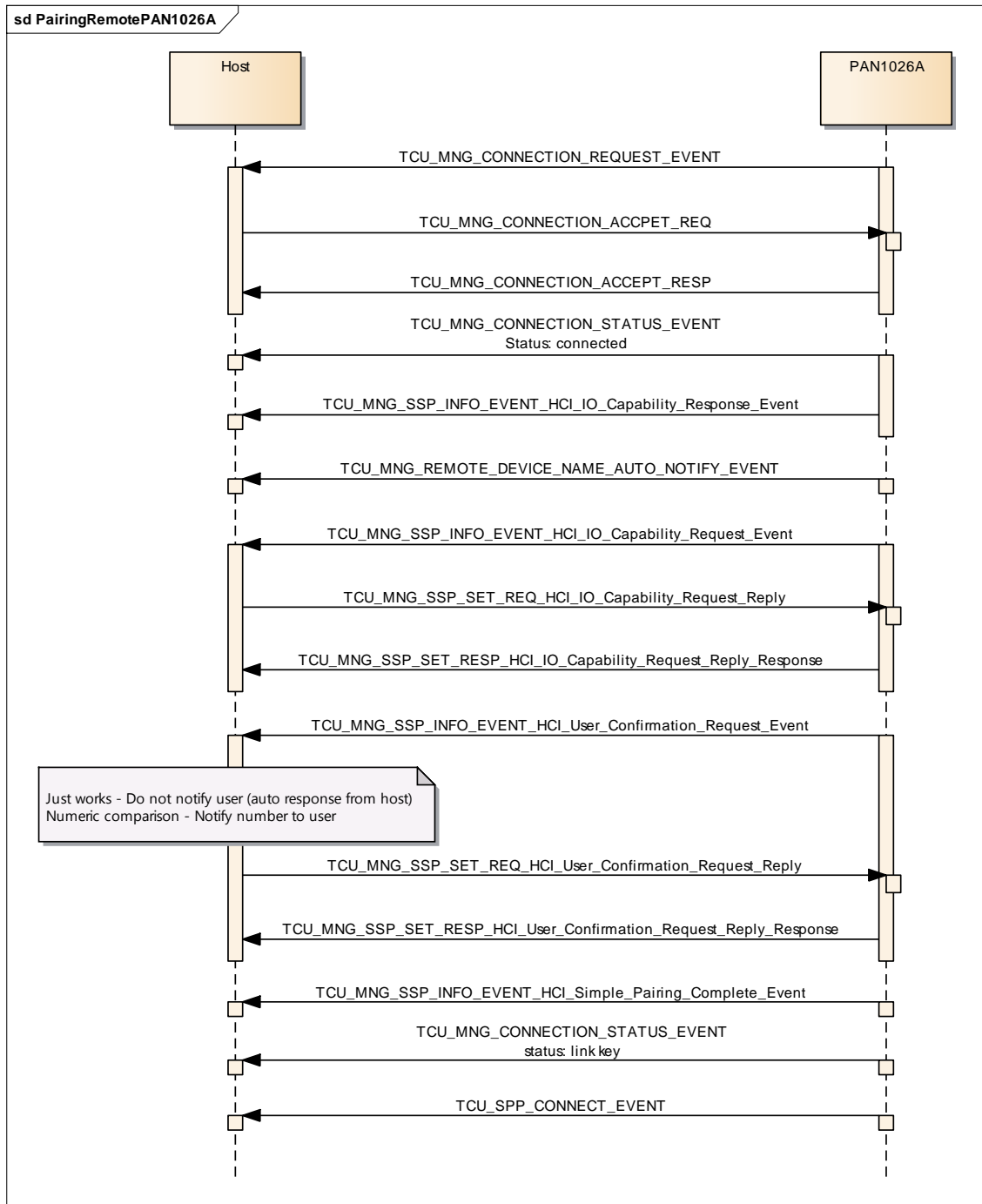
4.7.4 Connection Establishment

4.7.4.1 Pairing from Local Device



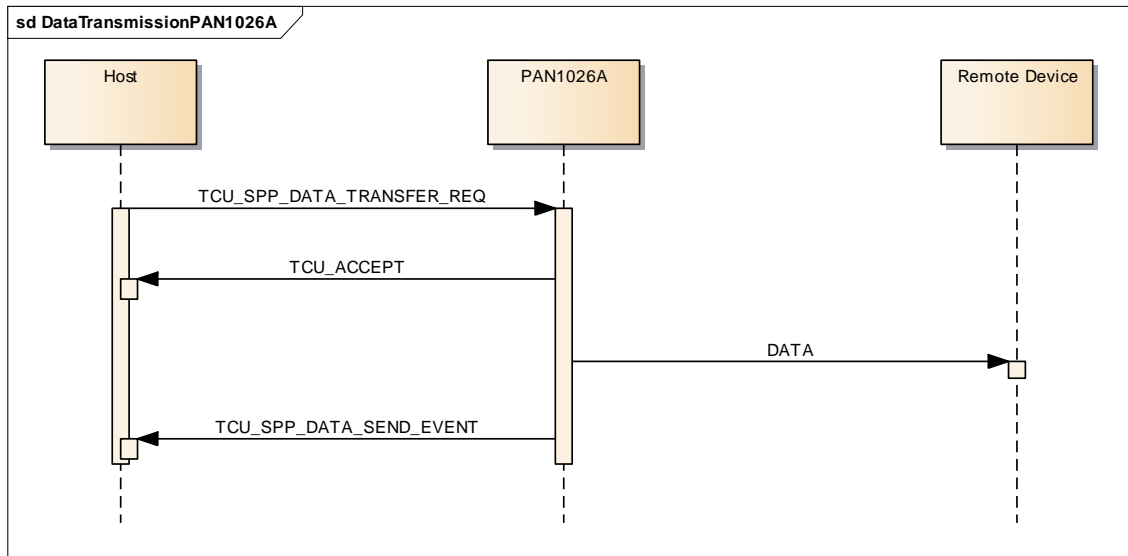
 Please note that the connection establishment can only be performed after the initialization has been successful.

4.7.4.2 Pairing from Remote Device



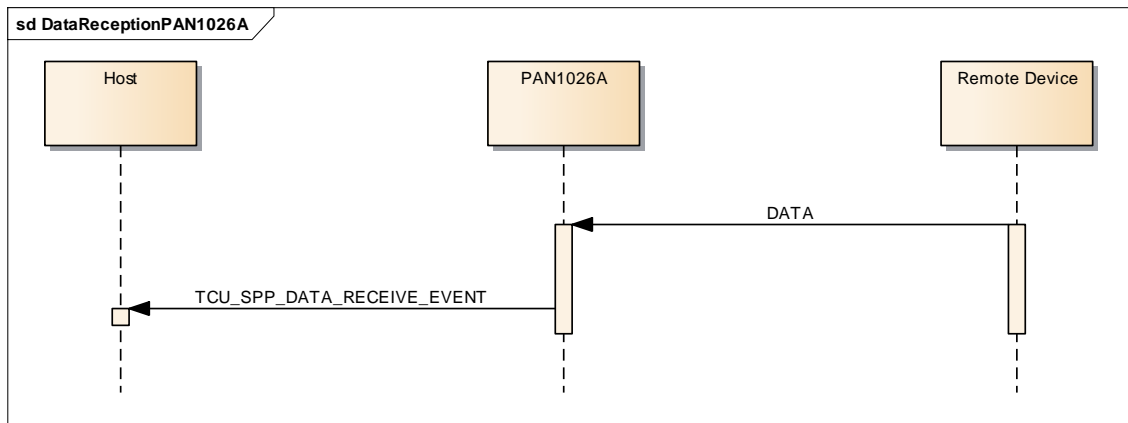
Please note that the connection establishment can only be performed after the initialization has been successful.

4.7.5 Data Transmission



i Please note that the data transmission can only be performed after the initialization and connection establishment has been successful.

4.7.6 Data Reception



i Please note that the data transmission can only be performed after the initialization and connection establishment has been successful.

5 Appendix

5.1 Contact Details

5.1.1 Contact Us

Please contact your local Panasonic Sales office for details on additional product options and services:

For Panasonic Sales assistance in the **EU**, visit

<https://eu.industrial.panasonic.com/about-us/contact-us>

Email: wireless@eu.panasonic.com

For Panasonic Sales assistance in **North America**, visit the Panasonic Sales & Support Tool to find assistance near you at

<https://na.industrial.panasonic.com/distributors>

Please visit the **Panasonic Wireless Technical Forum** to submit a question at

<https://forum.na.industrial.panasonic.com>

5.1.2 Product Information

Please refer to the Panasonic Wireless Connectivity website for further information on our products and related documents:

For complete Panasonic product details in the **EU**, visit

<http://pideu.panasonic.de/products/wireless-modules.html>

For complete Panasonic product details in **North America**, visit

<http://www.panasonic.com/rfmodules>