



BlueMod+P2x/G2/IEEE

Agent API Reference

Release r03

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Introduction

This document describes the communication between an external system (DTE) and the Stollmann Bluetooth module BlueMod+P2x/G2/IEEE. The BlueMod+P2x/G2/IEEE handles all necessary protocol elements to be conform to the Continua specifications for health devices communication via Bluetooth links. The necessary data exchange is kept as simple as possible to have a minimum of implementation effort at customer side.

The communication is exchanged via the asynchronous serial port of the module. For detailed description of the interfacing and characteristics of the serial port please read the hardware reference guide of the module.

There are four different versions available:

- BlueMod+P2x/G2/IEEE/404 (pulse oximeter)
- BlueMod+P2x/G2/IEEE/407 (blood pressure monitor)
- BlueMod+P2x/G2/IEEE/415 (weighing scale)
- BlueMod+P2x/G2/IEEE/417 (blood glucose meter)

1 BlueMod+P2x/G2/IEEE versions

1.1 BlueMod+P2x/G2/IEEE/404 (pulse oximeter)

The pulse oximeter implementation supports two different configurations. The first supported configuration is standard configuration “400” which supports the transmission of SPO2 and PULSRATE numeric values. The second supported configuration is standard configuration “401” which supports the transmission of the numeric values SPO2, PULSE with DATETIME as a SPOT measurement.

The BlueMod+P2x/G2/IEEE/404 automatically use the correct configuration depending on whether the user provides “DATETIME” or not with the numeric values.

1.2 BlueMod+P2x/G2/IEEE/407 (blood pressure monitor)

The blood pressure monitor implementation supports the standard configuration “700” which supports the transmission of the numeric values PRESSURE, PULSE with DATETIME.

The BlueMod+P2x/G2/IEEE/407 automatically adds “DATETIME” from its internal software clock when the user doesn’t provide a “DATETIME” value for the measurement.

1.3 BlueMod+P2x/G2/IEEE/415 (weighing scale)

The weighing scale implementation supports the standard configuration “1500” which supports the transmission of the numeric value WHEIGHT with DATETIME.

The BlueMod+P2x/G2/IEEE/415 automatically adds “DATETIME” from its internal software clock when the user doesn’t provide a “DATETIME” value for the measurement.

1.4 BlueMod+P2x/G2/IEEE/417 (blood glucose meter)

The glucose meter implementation supports the standard configuration “1700” which supports the transmission of the numeric value GLUCOSE with DATETIME.

The BlueMod+P2x/G2/IEEE/415 automatically adds “DATETIME” from its internal software clock when the user doesn’t provide a “DATETIME” value for the measurement.

2 Commands, Indications and Responses

The following sections details the indications, commands and result codes for the Stollmann Bluetooth IEEE Agent modules (BlueMod+P2x/G2/IEEE).

Each indication and result code sent from the DCE to the DTE consists of a body, and a terminator. The body is a string of characters in the ASCII range 032-255. The terminator is <CR><LF>.

Each command sent from the DTE to the DCE consists of a body, and a terminator. The body is a string of characters in the ASCII range 032-255. Control characters other than <CR> are ignored. The terminator is <CR>.

Only upper-case characters are used for commands, indications and responses. A command can have a maximum length of 80 characters. It is automatically discarded if the input is longer. Multiple commands on the same command line are not allowed. There is no echo of the transferred commands.

If an unknown command is received, an ERRORIND COMMANDERR is generated.

ERRORIND	Error Indication
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Syntax: **ERRORIND <error>**

This indication tells the DTE that the module has recognized a command error.

error	Description
COMMANDERR	Unknown command received

2.1 Mandatory Commands, Indications and Responses

This chapter explains the commands, indications and responses that a customer device at least has to handle.

2.1.1 Activation indication - ACTIND

ACTIND	Event Indication
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Syntax: **ACTIND** <DevSpec>

This indication tells the DTE that the module is initialized and able to handle commands from the DTE. The DTE has to wait for this indication until it sends commands to the DCE. The parameter <DevSpec> indicates the implemented agent device specialization.

DevSpec	Description
404	Module implements an IEEE 10404 compatible pulse oximeter
407	Module implements an IEEE 10407 compatible blood pressure monitor
415	Module implements an IEEE 10415 compatible weighing scale
417	Module implements an IEEE 10417 compatible blood glucose meter

2.1.2 Device status indication - STATUSIND

STATUSIND	Status Indication
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Syntax: **STATUSIND** <status>

This indication tells the DTE the status of the DCE. The DTE can use this information for its user interface. The module should only be powered off after receiving the status "IDLE". Initial status of the DCE after receiving the ACTIND is "IDLE".

Status	Description
IDLE	Module is idle. No Bluetooth active. Power off is allowed.
PAIRABLE	Module is in pairable mode and visible and connectable.
BONDED	Module has saved a bond during pairable mode. This ends pairable Mode.
CONNECTING	Module tries to connect to the last paired manager.
CONNECTED	Module is connected and can to transfers data to the manager.
DISCONNECTING	Module disconnects from the manager.

2.1.3 Send data request - SENDDATAREQ

SENDDATAREQ	Command
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Syntax: **SENDDATAREQ** <data ...>

With this command the DTE requests data transmission to the bonded manager. The module connects automatically to the bonded manager and transfers the data. After data transmission the connection is automatically disconnected.

data ...	Description	Used in
WEIGHT	Weight in kg	415
PRESSURE	Compound pressure value (Systolic, diastolic, and mean arterial pressure) in mmHg	407
PULSE	Pulse rate in bpm (beats per minute)	407, 404
SPO2	Arterial haemoglobin oxygen saturation in percent	404
GLUCOSE	Capillary whole blood glucose in mg/dl	417
DATETIME	Date and Time	all
MORE	More data indicator	all

2.1.3.1 Detailed parameter description

2.1.3.1.1 WEIGHT (415)

WEIGHT**data** where "*data*" is a FLOAT_Type value in kg and "*" are the data delimiters. A FLOAT_Type value is coded with 1 Byte exponent (E) 3 Byte mantissa (M) 0xEEMMMMM; e.g. 15.3 is coded as exponent 0xFF (-1) and mantissa 0x99 (153) -> 0xFF000099.

Example: For 15.3 kg the complete data part is "WEIGHT*0xFF000099*".

2.1.3.1.2 PRESSURE (407)

PRESSURE*SYSdata#DIAdata#MAPdata* where "***data" values are SFLOAT_Type values in mmHg. "*" and "#" are the data delimiters. A SFLOAT_Type value is coded with 4 Bit exponent (E) 12 Bit mantissa (M) 0xEEMMM; e.g. 180 is coded as exponent 0x0 (0) and mantissa 0xB4 (180) -> 0x00B4. If a pressure value is not measured send SFLOAT_NaN value 0x07FF.

Example: For Systolic 130 mmHG, Diastolic 80 mmHG, no MAP measured the complete data part is "PRESSURE*0x0082#0x0050#0x07FF*".

2.1.3.1.3 PULSE (407, 404)

PULSE*data* where “data” is a SFLOAT_Type value in beats per minute and “*” are the data delimiters. A SFLOAT_Type value is coded with 4 Bit exponent (E) 12 Bit mantissa (M) 0xE MMM; e.g. 68 is coded as exponent 0x0 (0) and mantissa 0x44 (68) -> 0x0044.

Example: For 68 bpm the complete data part is PULSE*0x0044*.

2.1.3.1.4 SPO2 (404)

SPO2*data* where “data” is a SFLOAT_Type value in percent and “*” are the data delimiters. A SFLOAT_Type value is coded with 4 Bit exponent (E) 12 Bit mantissa (M) 0xE MMM; e.g. 96 is coded as exponent 0x0 (0) and mantissa 0x60 (96) -> 0x0060.

Example: For 96 % the complete data part is SPO2*0x0060*.

2.1.3.1.5 GLUCOSE (417)

GLUCOSE*data* where “data” is a SFLOAT_Type value in mg/dl and “*” are the data delimiters. A SFLOAT_Type value is coded with 4 Bit exponent (E) 12 Bit mantissa (M) 0xE MMM; e.g. 97 is coded as exponent 0x0 (0) and mantissa 0x61 (96) -> 0x0061.

Example: For 97 mg/dl the complete data part is GLUCOSE*0x0061*.

2.1.3.1.6 DATETIME (all)

DATETIME*date#time* where *date* is coded BCD in following order “century year month day” and *time* is coded BCD in the following order “hour minute second”. “*” are the data delimiters and “#” is the separator between date and time.

Example: For 2010-07-16 13:01:45 the complete data part is coded as “DATETIME*20100716#130145*”.

If the internal software realtime clock of BlueMod+P2x/G2/IEEE was not set before using the SETCONFREQ TIME message, this time is used to set the internal realtime clock.

2.1.3.1.7 MORE (all)

If MORE is added to the “data ...” string, the module does not disconnect the IEEE connection to the manager. The next SENDDATAREQ <data ...> message directly transfers the data on the established connection. First SENDDATAREQ <data ...> message without MORE disconnects the connection. To disconnect a connection without data, send single SENDDATAREQ without the MORE indicator.

Examples:

- 1) Connect to bonded manager with sending data and auto disconnect
"SENDDATAREQ WEIGHT*0xFF000099**"
- 2) Connect to bonded manager with sending data and no disconnect
"SENDDATAREQ WEIGHT*0xFF000099* MORE"
- 3) Connect to bonded manager without sending data and no disconnect
"SENDDATAREQ MORE"
- 4) Send data to connected manager and no disconnect
"SENDDATAREQ WEIGHT*0xFF000099**" MORE
- 5) Send data to connected manager and auto disconnect
"SENDDATAREQ WEIGHT*0xFF000099**"
- 6) Manual disconnect from connected manager
"SENDDATAREQ"

2.1.4 Send data response - SENDDATARSP

SENDDATARSP	Result Response
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Syntax: SENDDATARSP <result>

This response tells the DTE the result of the last SENDDATAREQ. The DTE shall wait for this response after issuing a SENDDATAREQ command. It should examine the "result" and handle it.

Result	Description
OK	Command ended successful.
PARAMERR	Parameter error in last command.
NOBOND	No bond available to establish connection. Use PMODEREQ first to bond with a manager. SENDDATAREQ not successful.
NOCONNECTION	Bonded manager not reachable. SENDDATAREQ not successful.
IEEEERR	Error in IEEE communication level. SENDDATAREQ perhaps not successful.
STATEERR	Command not allowed in this DCE state.

2.1.5 Pairable mode request - PMODEREQ

PMODEREQ	Command
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Syntax: **PMODEREQ** <timeout>

With this command the DTE puts the DCE into pairable mode. This mode ends after the specified timeout or a successful bonding automatically. Only during the pairable mode the device is visible, connectable and pairable. The device does not answer incoming IEEE connections. This mode is only for establishing a Bluetooth bond.

Timeout	Timeout in seconds (decimal value). Pairable mode ends automatically after this timeframe. Value Range: 1-1800 seconds.
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2.1.6 Pairable mode response – PMODERSP

PMODERSP	Result Response
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Syntax: **PMODERSP** <result>

This response tells the DTE the result of the last PMODEREQ. The DTE shall wait for this response after issuing a PMODEREQ command. It should examine the “result” and handle it.

Result	Description
OK	Command ended successful.
PARAMERR	Parameter error in last command. E.g. no timeout specified.
PTIMEOUT	PMODEREQ timed out without a new bond.
STATEERR	Command not allowed in this DCE state.

2.2 Optional Commands, Indications and Responses

This chapter explains the commands, indications and responses that a customer device can use for advanced functionality and configuration purpose.

2.2.1 Set time indication – SETTIMEIND

SETTIMEIND	Event Indication
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Syntax: **SETTIMEIND** <data>

This indication tells the DTE that the manager has updated the time of the Agent of the DCE. The DTE should use this information to set its internal clock.

data	Description
DATETIME	Date and Time, used for all device specializations

DATETIME:

DATETIME**date*#*time** where *date* is coded BCD in following order “century year month day” and *time* is coded BCD in the following order “hour minute second”. “*” are the data delimiters and “#” is the separator between date and time.

Example: For 2010-07-16 13:01:45 the complete data part is coded as “DATETIME*20100716#130145*”.

2.2.2 Set configuration request - SETCONFREQ

SETCONFREQ	Command
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Syntax: **SETCONFREQ** <parameter data>

With this command the DTE is able to change some configuration parameters from default values to its own requirements. The command accepts only one parameter. The values are not stored over power cycle. The DTE has to set these values during every boot to its own defaults.

Parameter	Description	Default
"DEVICENAME"	BT device name. Visible during inquiry. Max. 19 Characters. No spaces.	10404 – "BlueMod+IEEE/404" 10407 – "BlueMod+IEEE/407" 10415 – "BlueMod+IEEE/415" 10417 – "BlueMod+IEEE/417"
"SERVICENAME"	BT service name. Visible during service discovery. Different values for different device specializations. Max. 23 Characters. No spaces	10404 – "pulse oximeter" 10407 – "blood_pressure" 10415 – "weighing_scale" 10417 – "glucose_meter"
"TIME"	Set software realtime clock of DCE. Format "DATETIME" as used for SENDDATREQ.	Clock starts at 01.01.2011 00:00:00
"PIN"	BT Pin used only for legacy BT 2.0 pairing. Enter "oldPin newPin" Example : "PIN 000000 123456"	"000000"

2.2.3 Set configuration response - SETCONFRSP

SETCONFRSP	Result Response
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Syntax: **SETCONFRSP** <result>

This response tells the DTE the result of the last SETCONFREQ. The DTE shall wait for this response after issuing a SETCONFREQ command. It should examine the "result" and handle it.

Result	Description
OK	Command ended successful.
PARAMERR	Parameter error in last command.

2.2.4 Switch debug mode request- DEBUGMODEREQ

DEBUGMODEREQ	Command
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Syntax: **DEBUGMODEREQ <switch>**

With this command the DTE sets the DCE into debug mode for BT 2.1. In this mode it is possible to trace the BT traffic on air, with a BT-sniffer. This mode is shall only be used for debugging purpose. It is valid for the next connection. Established connection could not change the mode.

Switch	“on” – enter debug mode, “off” – exit debug mode
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2.2.5 Switch debug mode response - DEBUGMODERSP

DEBUGMODERSP	Result Response
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Syntax: **DEBUGMODERSP <result>**

This response tells the DTE the result of the last DEBUGMODEREQ. The DTE shall wait for this response after issuing a DEBUGMODEREQ command. It should examine the “result” and handle it.

Result	Description
OK	Command ended successful.
PARAMERR	Parameter error in last command.

2.2.6 Delete bond table request - DELETEBONDREQ

DELETEBONDREQ	Command
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Syntax: **DELETEBONDREQ**

With this command the DTE deletes the stored bond in the DCE. It's not possible to transfer data before a successful new pairing is performed leading into a new stored bond.

2.2.7 Delete bond table response - DELETEBONDRSP

DELETEBONDRSP Result Response

Syntax: **DELETEBONDRSP** <result>

This response tells the DTE the result of the last DELETEBONDREQ.

Result	Description
OK	Bond table is empty now.

2.2.8 Reset module request- RESETREQ

RESETREQ Command

Syntax: **RESETREQ**

With this command the DTE resets the DCE. After reset is complete an ACTIND xxx message is send to the DTE.

2.2.9 Reset module response - RESETRSP

RESETRSP Result Response

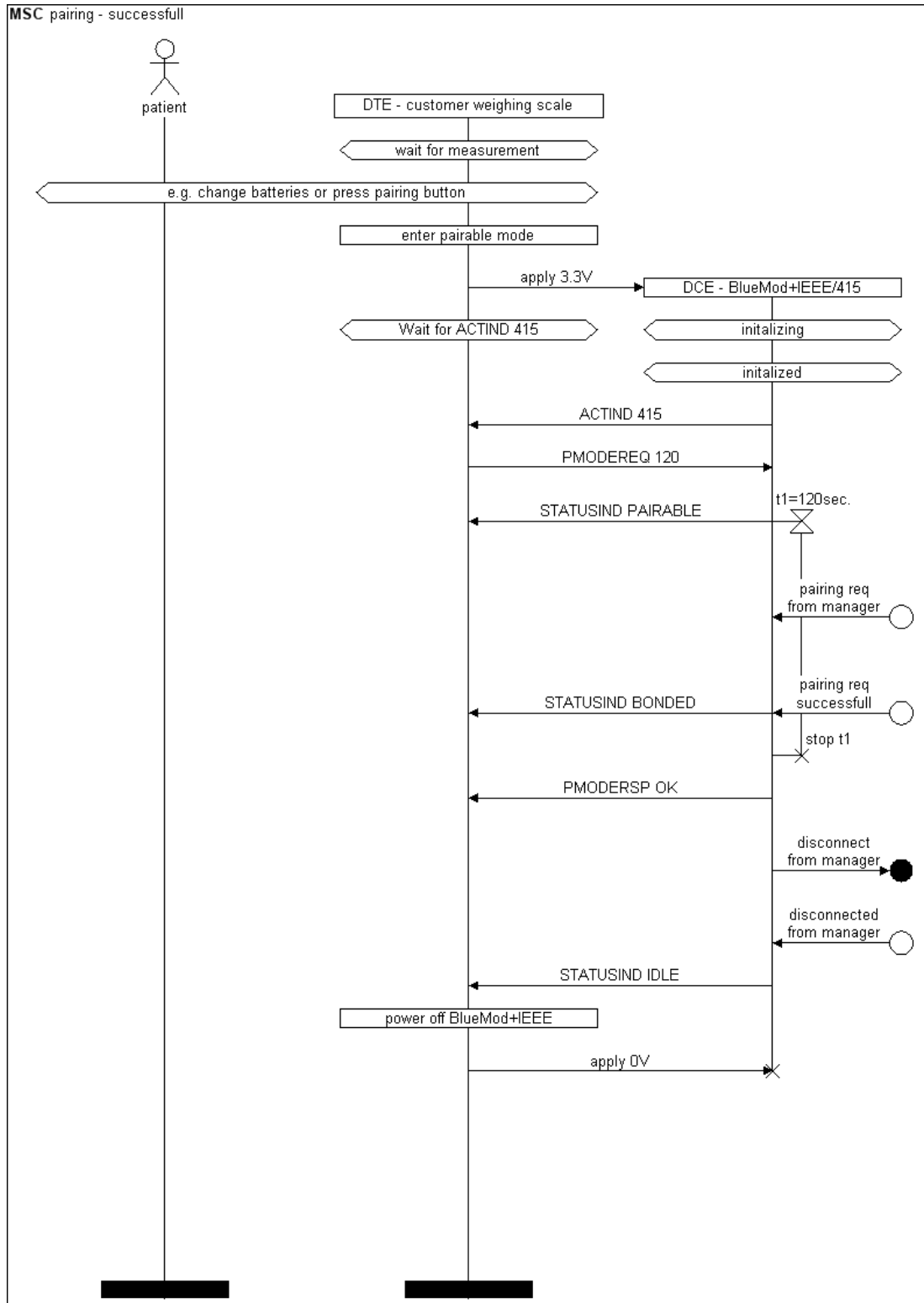
Syntax: **RESETRSP** <result>

This response tells the DTE the result of the last RESETREQ. The DTE shall wait for an "ACTIND xxx" indication before it could proceed with further requests.

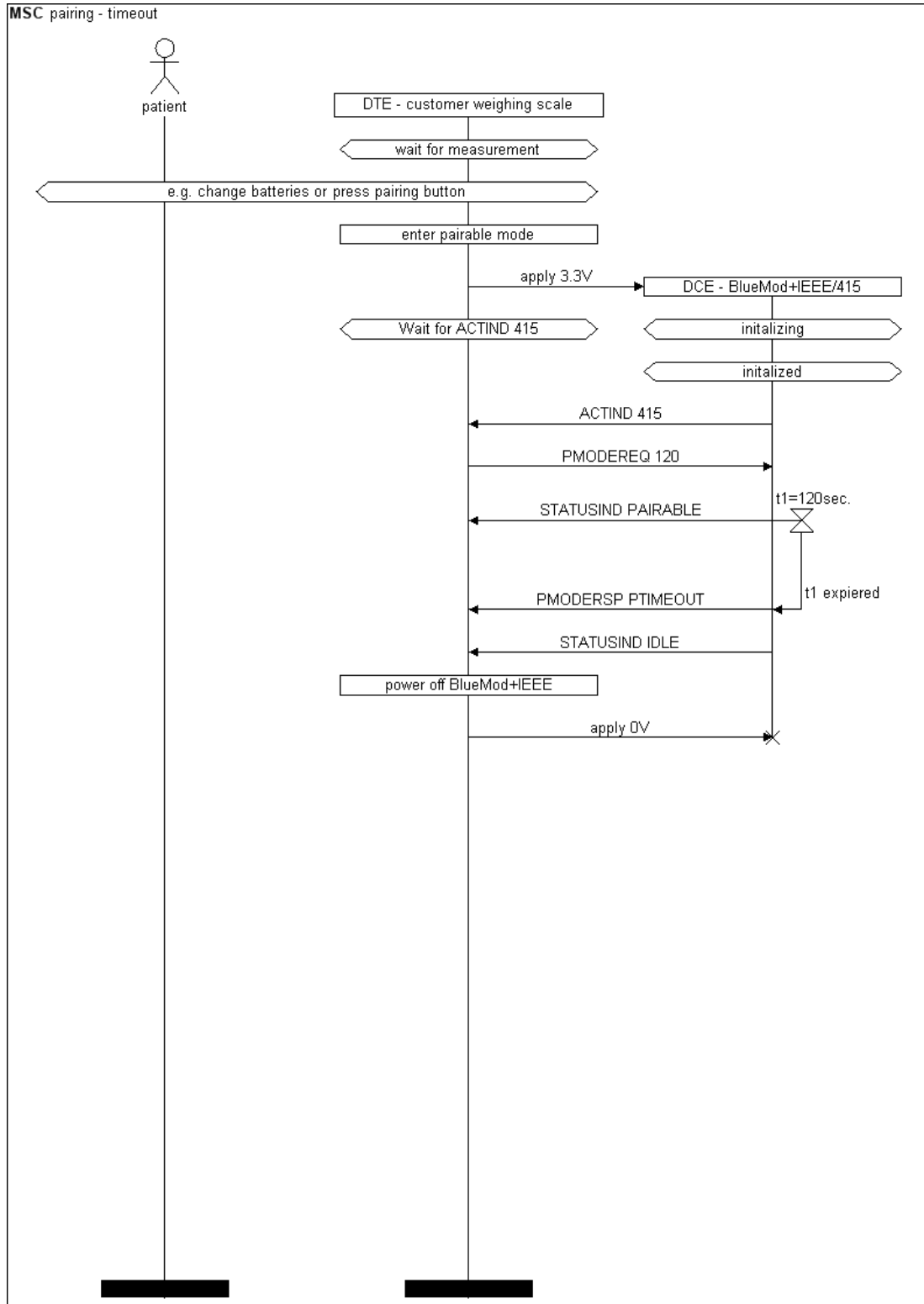
Result	Description
OK	DCE is resetting. Wait for "ACTIND xxx"

3 Example Command Flow Charts

3.1 Successful pairing

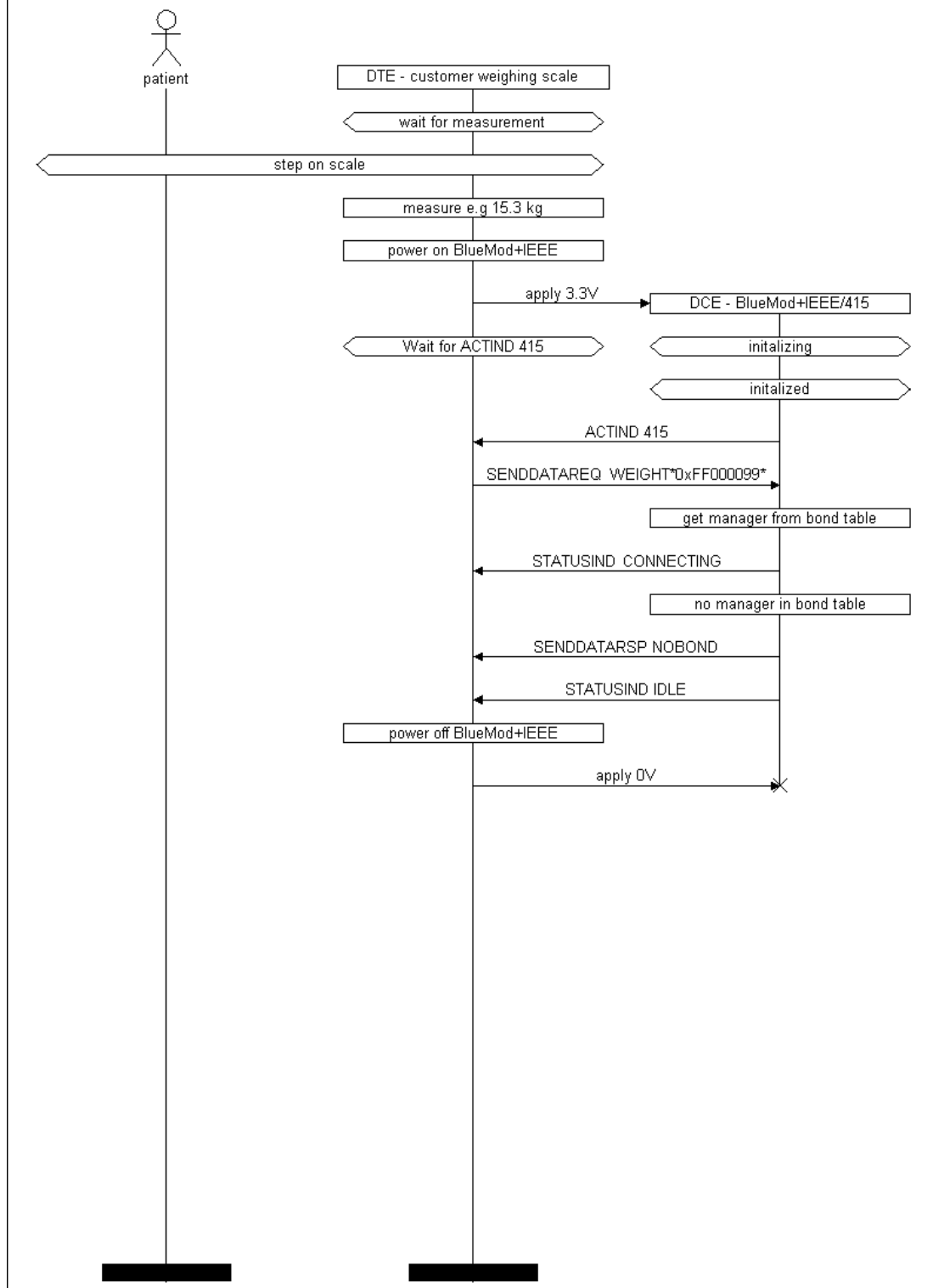


3.2 Pairing timeout



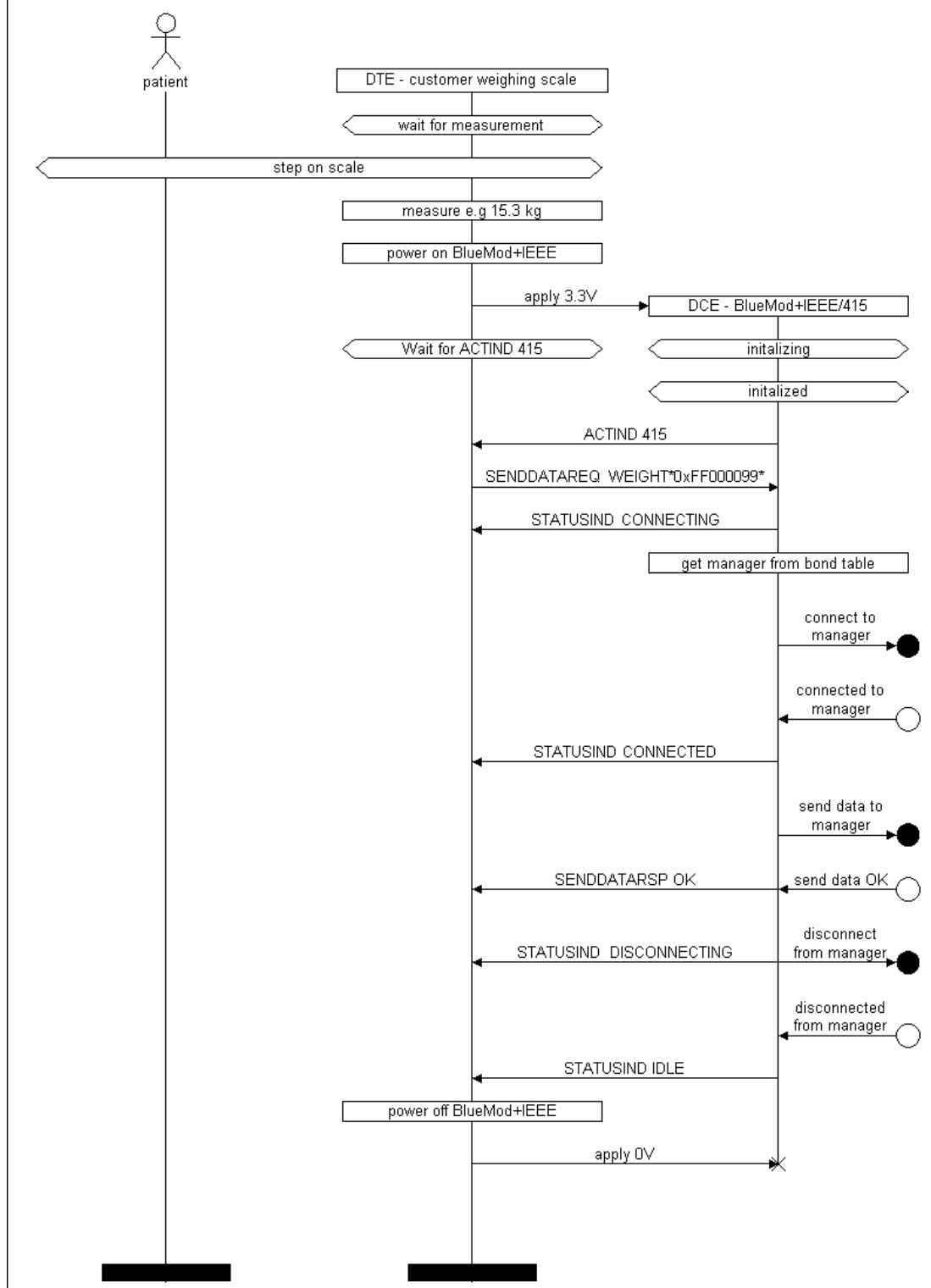
3.3 Send data with no bond

MSC data transmission - no bond



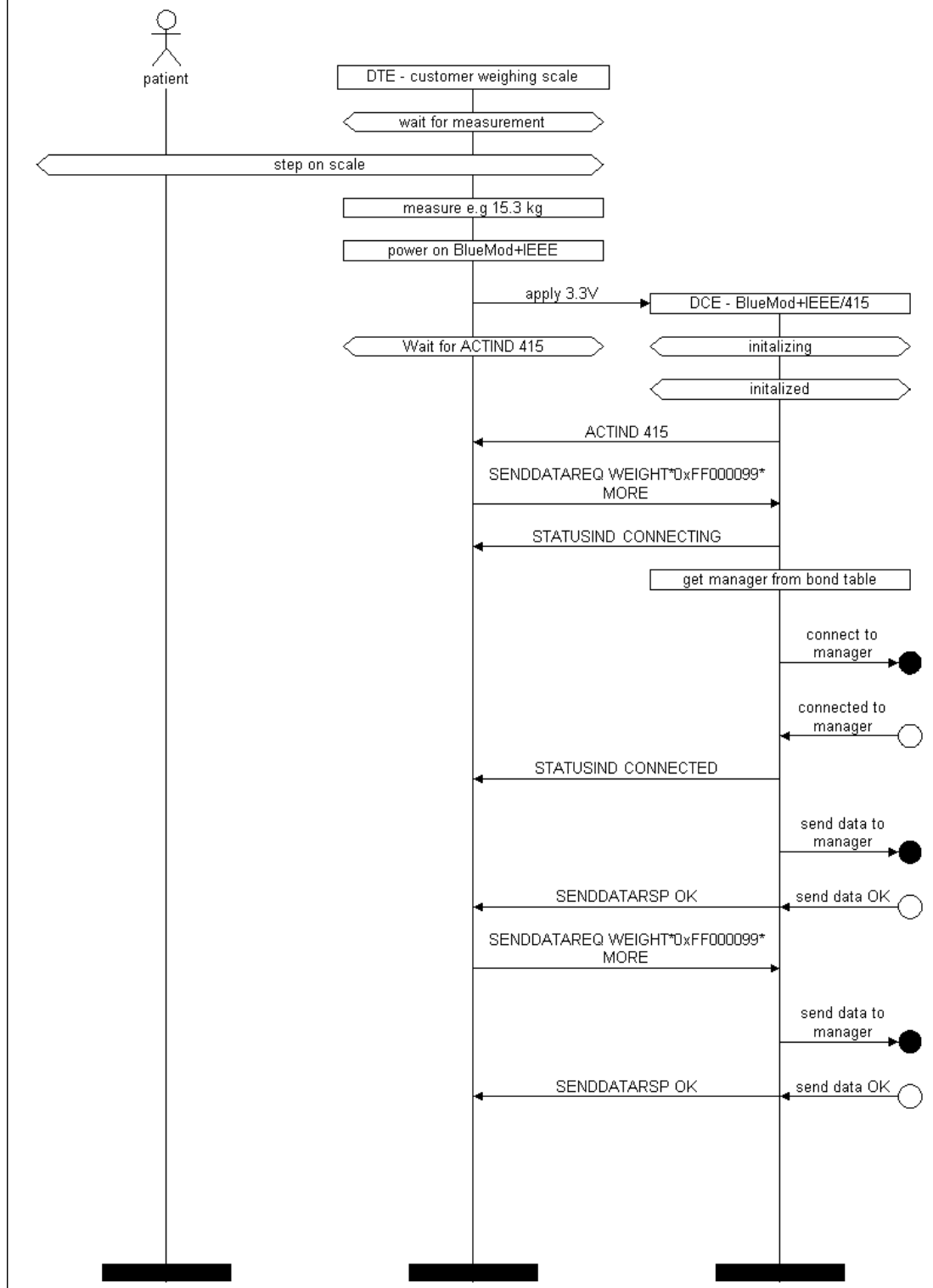
3.4 Successful send data with auto disconnect

MSC data transmission with auto disconnect - successful



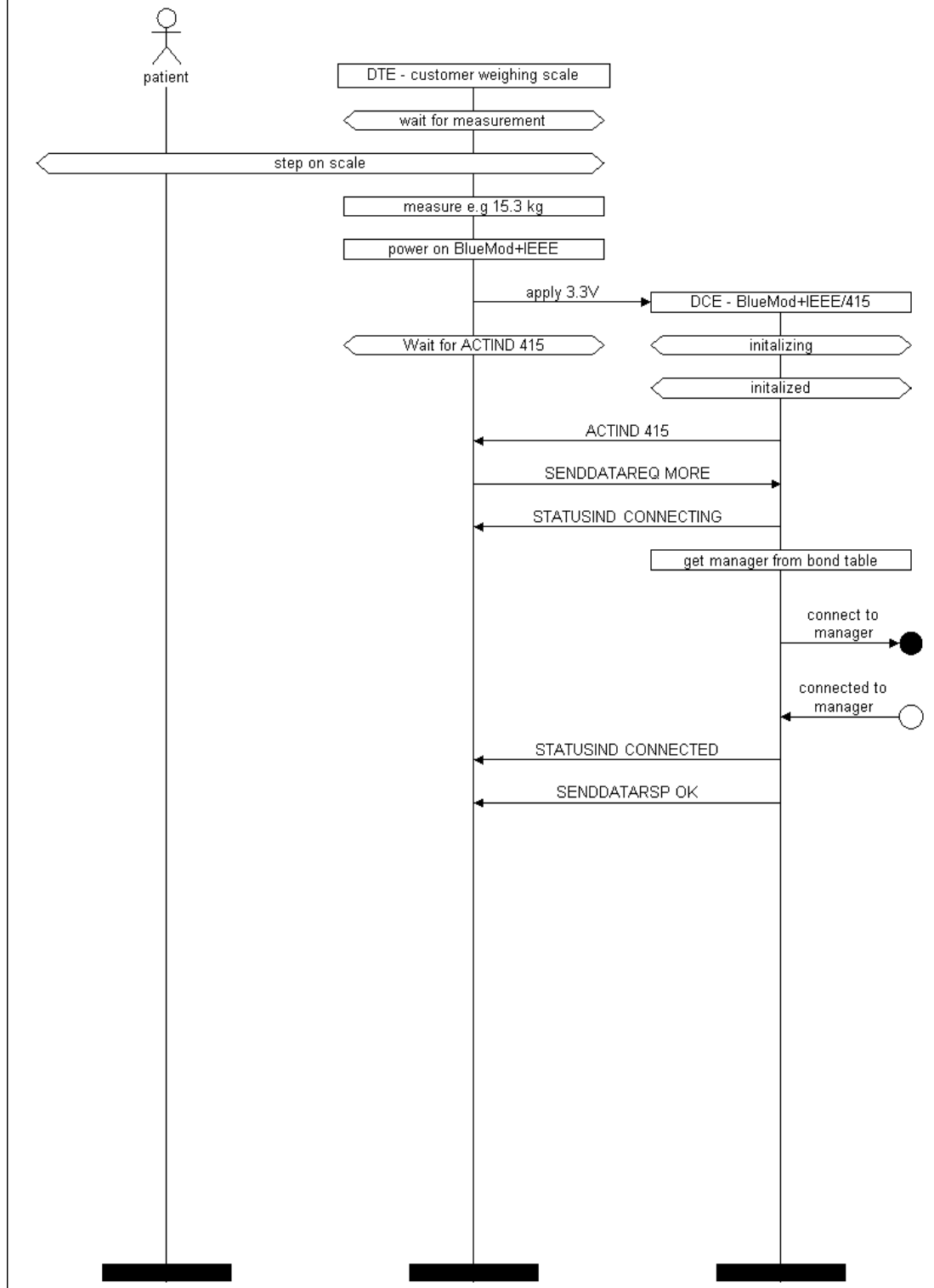
3.5 Successful send data with parameter MORE

MSC MORE data transmission - successful



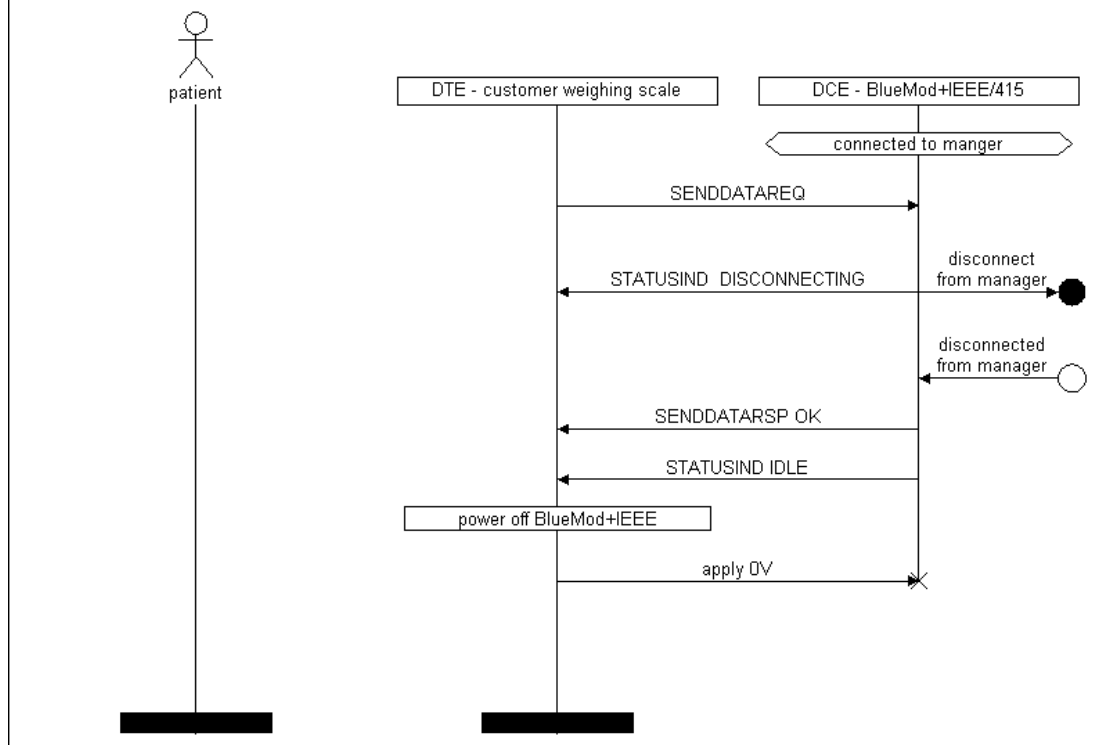
3.6 Successful connect without sending data

MSC connect only - successful



3.7 Successful disconnect from manager

MSC disconnect from manager - successful



4 Restrictions

- Only one command should be active. Wait for the related response.
- Only outgoing data connections are supported using the "SENDDATAREQ".
- The module is meant to be powered off after STATUSIND IDLE to save battery power.

5 History

Version	Release Date	By	Change description
r01d01	03.11.09	bg	New note, life support policy deleted
r01d02	11.01.11	or	First version
r01d03	05.04.11	or	First complete version for 415
r01d04	08.04.11	or	New structure. Error corrections.
r01d05	13.04.11	or	Return code terminator changed to <CR><LF>
r01d06	14.04.11	ta	Formal corrections
r01d07	26.04.11	or	Added blood pressure monitor data
r01d08	26.04.11	or	Corrected MSCs data values
r01d09	05.05.11	bs	Change max. value length of command SETCONFREQ DEVICENAME to 19 and SERVICENAME to 23.
r01	10.05.11	or	First released version
r02d01	17.06.11	or	Added 404, corrected some typos and added device specialization descriptions.
r02	05.07.11	bs	Second released version
r03d01	29.07.11	or	Added 417, corrected some typos.
r03	31.08.2011	Bs	Third released version

Stollmann Entwicklungs- und Vertriebs-GmbH
Mendelssohnstraße 15 D
22761 Hamburg
Germany

Phone: +49 (0)40 890 88-0
Fax: +49 (0)40 890 88-444
E-mail: info@stollmann.de
www.stollmann.de