Technical Interface Specification BCC

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Author:	T. Lahmer
	Software Developer Space Infusion System
Review & Approval:	R. Pronk
	Software Developer Space Infusion System
Approval:	H. Schmoll
	Head of Req. Management and Verification

Effective

1 General

1.1 Authors

M. Paetzold B. Braun, HC-MS
S. Möller B. Braun, HC-RD
T. Lahmer B. Braun, HC-RD
T. Schmidt B. Braun, HC-RD
F. Heerdegen Yatta Solutions GmbH
L. Geiger Yatta Solutions GmbH
A. Koch Yatta Solutions GmbH

1.2 Table of Contents

1.3 References

Reference	ID	Title
/TIS BCC/	M690_000191	Technical Interface Specification BCC (legacy Space version)

2 Introduction

The ComDevice represents the central point for the data produced by the pumps in the Infusion Workplace from the company B. Braun Melsungen AG. A documentation system, which requests data from the pumps, has to communicate with that central interface. For this purpose, a simple ASCII oriented protocol was implemented. For single pump operation, Wireless Modules are provided (not available for Compact^{Plus}). Those Wireless Modules also implement the ASCII oriented protocol, mentioned above. Bedside Communication Controller (BCC) is a general communication protocol. The versions of BCC define the available parameters within this protocol. Via the website of the ComDevice the parameters can be activated or deactivated to define the content of the protocol. The Link layer, see chapter 3.2.3, of all versions is the same. So it is possible to run BCC version 3.30 with the parameter set of BCC 2.25 or BCC 3.26 by deactivating the newer parameters.

Do always keep the intended use of the devices used in mind, when implementing this interface!

2.1 Differences to BCC 3.25/3.26

BCC 3.3x is adapted to the requirements of DoseTrac. DoseTrac needs more data in the protocol for the documentation and is able to receive data from ComDevice on a cyclic time base. The general structure of the protocol is the same. **BCC 3.3x is backwards compatible to BCC 3.25 and 3.26.**

2.2 Purpose

Description of the communication protocol BCC between a ComDevice and a BCC client.

2.3 Scope

This Document is valid for software versions:

- xxxU000060
- xxxL000080
- I0050A0010

and the software versions after these for Space. It is also valid for all software versions after these for the Compact^{Plus} platform.

2.4 Glossary and Abbreviations

BCC Bedside Communication Controller

3 Interface Specification

3.1 System structure

The InfusionWorkplace is build up on single frame and each frame can be equipped with (up to 4 for Space generation) infusion pumps. In difference to the ComDevice the infusion pumps can be mixed within one frame. For Space a total amount of 6 frames can be stacked so that a total amount of 24 pumps can be organized at one bed. Per bed one ComDevice is necessary. The 6 frames can be stacked on top of each other or organized in pillars, with a limitation of 3 pillars in total for Space and two pillars for Compact^{Plus}. The addresses of the pumps are counted bottom up and starts with address 1 in every pillar.

Example chart for Space generation.

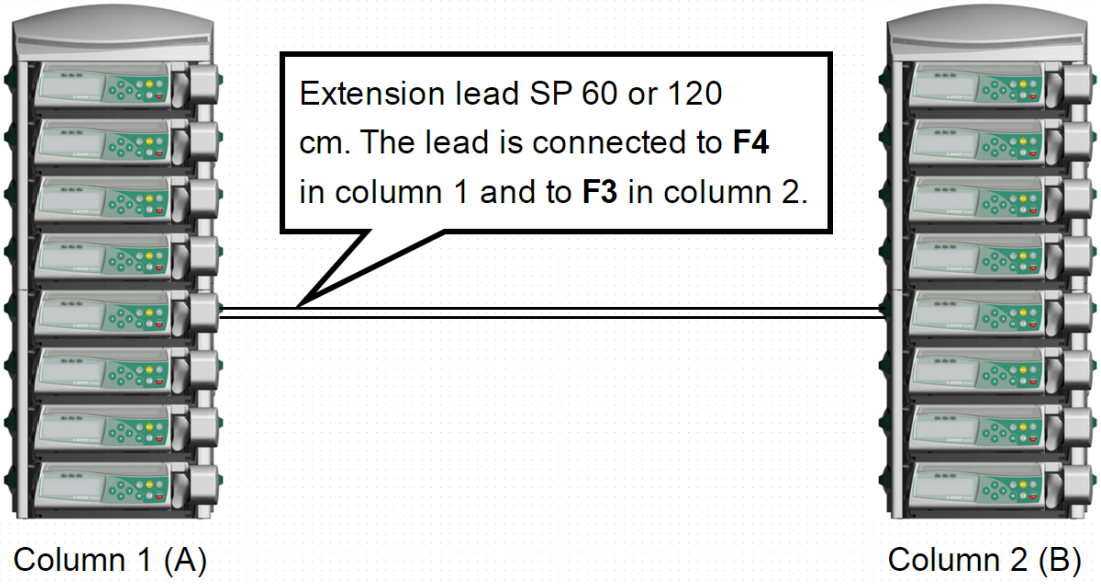
	1 pillar	2 pillars		3 pillars		
	A	A	B	A	B	C
SpaceCover Comfort (for Space generation)	1	1	(1)	1	(1)	(1)
SpaceCover Standard (for Space generation)	(1)	(1)	1	(1)	1	1
RackFrame	1 … 6	1… 5	1 … 5	1 … 4	1 … 4	1 … 4
Addresses xy (see Responses and GETSLOT)	X = 1 Y = 1 … O	X = 1 Y = 1 …K	X = 2 Y = 1 …K	X = 1 Y = 1 .. G	X = 2 Y = 1 .. G	X = 3 Y = 1 .. G
Restriction	A = 6	Σ A + B = 6		Σ A + B + C = 6		

(x) alternative usage possible A, B, C number of RackFrame

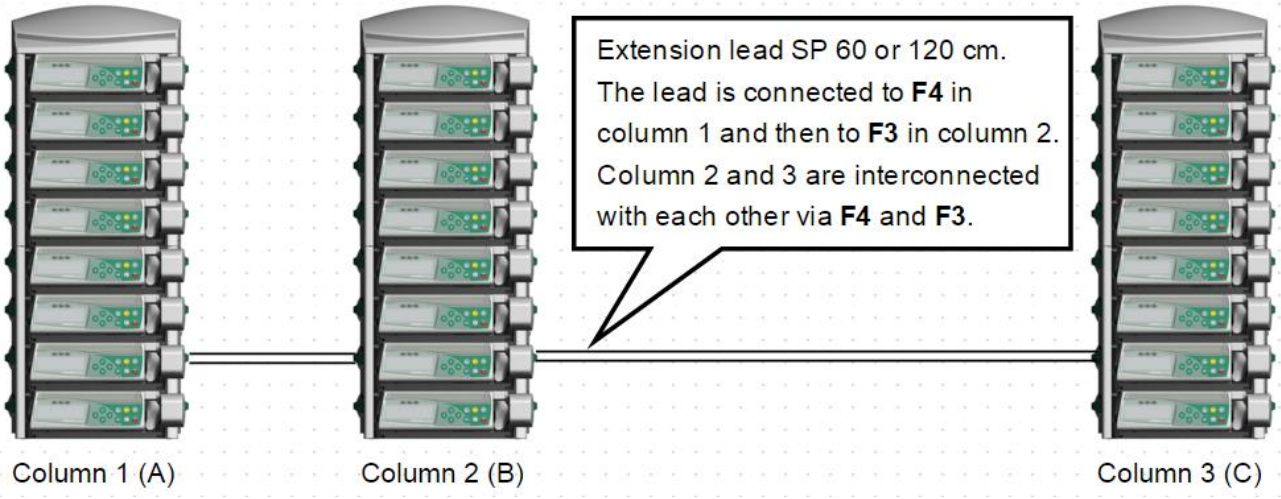
Every pillar has to be covered by SpaceCover standard or comfort (for Space). The cover cannot be queried by an external system.

> **Caution:** Other configurations, such as more than three columns or exceeding the number of RackFrames within a column, are not permitted and result in configuration error.

If a system consists of several columns, these should be arranged logically and physically from left to right.



Every single column must be covered with a SpaceCover.



Note: If you connect the RackFrame in a wrong way (F3 to F4), the information you get from BCC protocol will not fit the actual system structure.

3.2 Layers of communication

3.2.1 Physical layer RS232

CS-7069 - Physical layer RS232
The communication port of the ComSystem has the following settings:

Type	RS-232 galvanic isolated 4 kV Mini-DIN
Baud rate	9600 **default**, 115200, 19200, 38400 or 57600 Baud

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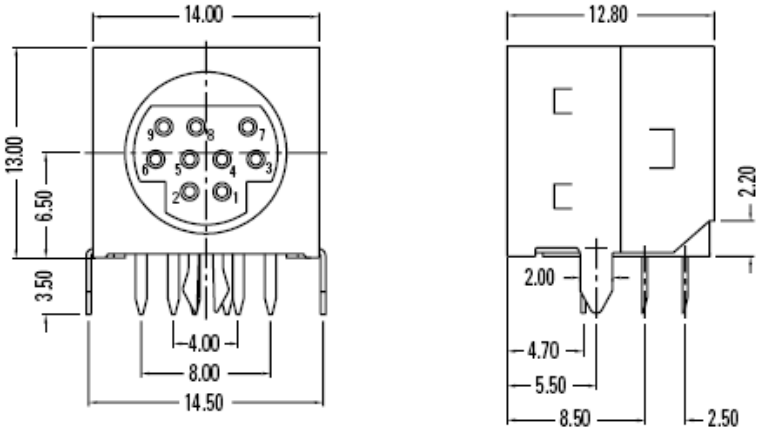
Data bits	8
Parity	None
Stop bits	1
Handshake	None

www.kycon.com

KMDG-9S-BS (9 Position, Fully Shielded)



Used PINs are: 2 RxD / 3 TxD / 5 GND

Factory default is 9600 Baud. Please refer chapter 3.6 to get more information how to change the settings.

3.2.1.1 Pin-connection of RS232

Use the dedicated RS232 CROSS-OVER CABLE SP, Art. no. 871 3237 to communicate with ComSystem. The PIN layout at the Sub-D side is configured for the direct connection to a PC.
If you have preconfigured cables with crossed lines, please use RS232 CONNECTOR-CONVERTER SP, art. No. 871 3238.

3.2.2 Physical layer Ethernet

CS-7070 - Physical layer Ethernet
With Software-Version D of ComDevice BCC is available via Ethernet TCP/IP. The port at ComSystem is 4001.

Type	Ethernet TCP/IP galvanic isolated 4 kV RJ45
Port	4001

ComDevice is set up as a server. The client, e. g. PDMS, must use the port 4001 to connect to ComDevice via Ethernet if request mode is configured (see chapter 3.6.1.5). The BCC protocol settings via the website of the ComDevice has to be changed to TCP/IP as well. In cyclic mode BCC periodically sends messages to the connected client via TCP/IP.

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3.2.3 Link Layer

CS-7099 - Link Layer
In request mode, the ComDevice only sends data after a request from the host system. In cyclic mode this is done repeatedly in a configurable period. The protocol frame has the following general form:

<soh>length<stx>bedId/1/1>information<etb>check<eot>
or
<soh>length<stx>bedId/1/1>information<etx>check<eot>

<soh>: ASCII-character **'start of header'** (01h)

length: length of the complete message (including <soh> and <eot>) coded as a 5-digit ASCII-string with leading zeros. Example: if the length of the msg is 123, then you will have 00123 in the *length* field

<stx>: ASCII-character **'start of text'** (02h)

bedId: unique identification of an intensive care unit (ICU); please note that the bedId is followed by '/1/1>'!

information: the real Information; in a request, the host has to place the command here, in responses this field contains the requested data (eventually more than one block), confirmations or error messages

<etx>: ASCII-character **'end of text'** (03h). This notifies that the actual data block was the last one

or

<etb>: ASCII-character **'end of text block'** (17h); This notifies that more data blocks are available

check: checksum as 5-digit ASCII-string with leading zeroes (s. *length*). The checksum is calculated as a "modulo 256"-sum over all chars between <soh> and <etx>/<etb> (inclusive <soh> and <etx>/<etb>)

<eot>: ASCII-character **'end of transmission'** (04h)

If ComDevice detects an error in the request (i.e. wrong checksum or syntax error) it will respond with GNERR, see below.
If the host system receives a data block without errors, it must acknowledge by sending the ASCII-character <ack> (06h) to the ComDevice. If the host system finds an error, it must send the ASCII-character <nak> (15h). In that case the last data block will be retransmitted.
If the host system sends a complete new request (neither <ack> nor <nak>), the ComDevice will respond with the first data block again. In this case the parameter values in the block may be updated.

3.2.3.1 Character Stuffing

CS-7100 - Character Stuffing
To keep the protocol compatible with older versions, neither a request nor a response may contain the characters 'd' or 'D'. Therefore the following replacement table has to be considered by the host system:

character 'D'	is replaced by the string	'EX'
character 'E'	is replaced by the string	'EE'
character 'd'	is replaced by the string	'ex'
character 'e'	is replaced by the string	'ee'

The host system creates its request, calculates the checksum and stuffs the complete message (directly before sending the message). The response has to be destuffed first and then checked! That means: the content of the field length and check relates to a **non-stuffed** message!

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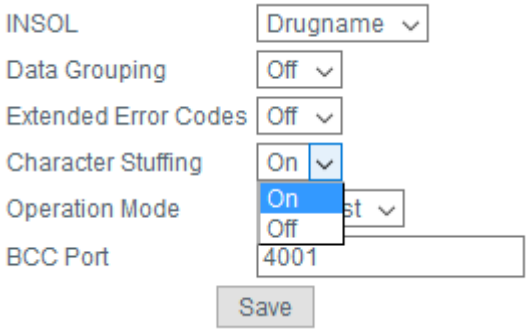


The character stuffing can be disabled via the website of the ComDevice.

Note: Please note, that search and replace-mechanisms can not be used for destuffing, since they will produce incorrect results in some cases. For example “EEX” will be destuffed as

- "ED”, if “EX” is replaced by “D” first,
- and as “D” if “EE” is replaced by “E” first and than “EX” is replaced by “D”.
- However the correct value would be “EX”, because “EE” appears first and the resulting “E” is not to be destuffed again.

3.2.4 Transport layer

CS-7101 - Transport layer
The field *bedId* gives a unique identification of every ComDevice.
This string identifies a bed site ComDevice. Its maximum length for the bedId is 15 character and can be set via the Web-Interface of the ComDevice. As described in the LinkLayer, the bedID is always followed by the characters "/1/1>" to be compatible with older BCC protocol versions. The default bedId (with postfix) for request with ADMIN:ALIVE is**1/1/1>**. With the response from ComDevice to this request you will get the actual bedId of the system. This bedId has to be used for further requests.

Note: If you do not use the responded bedId for next requests you will get an error.

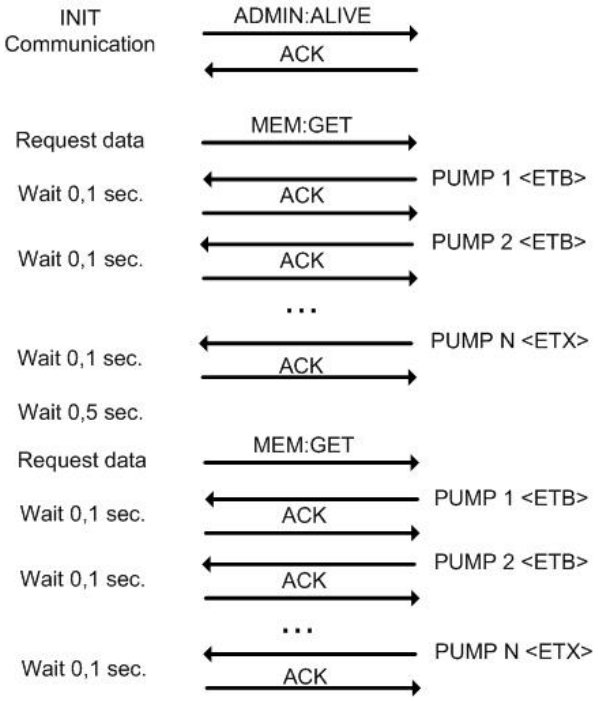
In the Bed-ID only ASCII characters between ASCII-Code 47 to 57 and 65 to 122.

3.2.5 Application layer

CS-7102 - Application layer
The content of the field *information* depends on the direction of communication: either the host system sends a request or ComDevice sends a response.

3.2.5.1 Timing

CS-7103 - Timing
It is recommended to include a wait until an <ACK> is send after receiving a data block from a pump of 0,1 seconds. Before requesting new information with MEM:GET implement a wait state of minimum 0,5 seconds.



3.2.5.2 Requests

CS-7072 - Requests
A request has the general format:
area:command

Note: the colon is part of the request!

The requests are divided into three parts and there are different commands in every area (s.b.).

3.2.5.3 Responses

CS-7104 - Responses
Every response from the ComDevice consists of one or more of so called *quadruple* with the general format in the *information*-field:
time,address,parameter,value

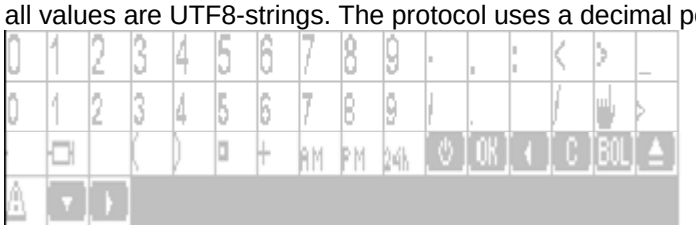
Note: the commas are part of the quadruple!
time: time since ComDevice was switched on (unit: seconds)

address: the address has always 5 digits in the following format:
501xy

x is the number of the pillars, which delivers the following parameter and y is the number of the pump in this tower (x), which delivers the parameter value. For x you will find the values 1 to 3. For y you must note that the pumps at one ComDevice are counted bottom-up. So the possible values for y are 1 to 9 and A to O (character).

parameter: the parameter code. You find a list with all parameters in chapter 3.4.

value: all values are UTF8-strings. The protocol uses a decimal point ' . ' in any case.



The pump uses special characters.
These are in private use area of Unicode from U+E000 till U+F8FF.
For example the character **0** has the Unicode U+E000.
Another example the hand symbol has the Unicode U+E01F.
NOTE: BCCShow does not show these characters correctly.

There may be more than one quadruple in one response data block. The quadruples are separated by the ASCII-character 'record separator' (1Eh).

3.2.6 Implemented requests

Every request is answered by the possible responses listed in the chapter of the requests. If no value is available, the value is set to _NV (NO VALUE) this is not to be interpreted as zero.

Since 3.36 it is also possible to configure BCC to send _NA (Not Available) instead of _NV for values that are temporary not available due to technical reasons (e.g. the given key is currently asynchronous).

3.2.6.1 ADMIN:ALIVE

With this request the host system can initialize the connection to ComDevice. It has to be used at startup a link and also after a timeout or interrupted communication.

NOTE: Do not use this command to check the communication during an established link to ComDevice.

Possible responses are:
<time>,50100,GNACK,0
<time>,50100,GNERR,<errCode>

Note: you will find a list with all <errCode>-values in chapter 3.3.

3.2.6.2 ADMIN:VERSION

With this request the host asks for the protocol version of the ComDevice. Please note that the response has a different format of the *information*-field!

Possible responses are:
<time>,50100,<version> <version> gives the actual version
<time>,50100,GNERR,<errCode>

Note: in the response there is no value-field

3.2.6.3 MEM:GET

CS-7071 - MEM:GET
With this request the host asks for **all** actual parameter values of the ComDevice / pumps.

Possible responses are:
quadruple for syntax of a quadruple see above

The data from the pumps are split into several blocks, related to the number of pumps in the system. Instead of the limiter <ETX> you will get <ETB>. To get the next block of information it is necessary to send <ACK>. If you do not send <ACK> with the next MEM:GET command you will get the data from the first pump again, you won't get information from the other pumps. The <ETX> limiter identifies the last block.

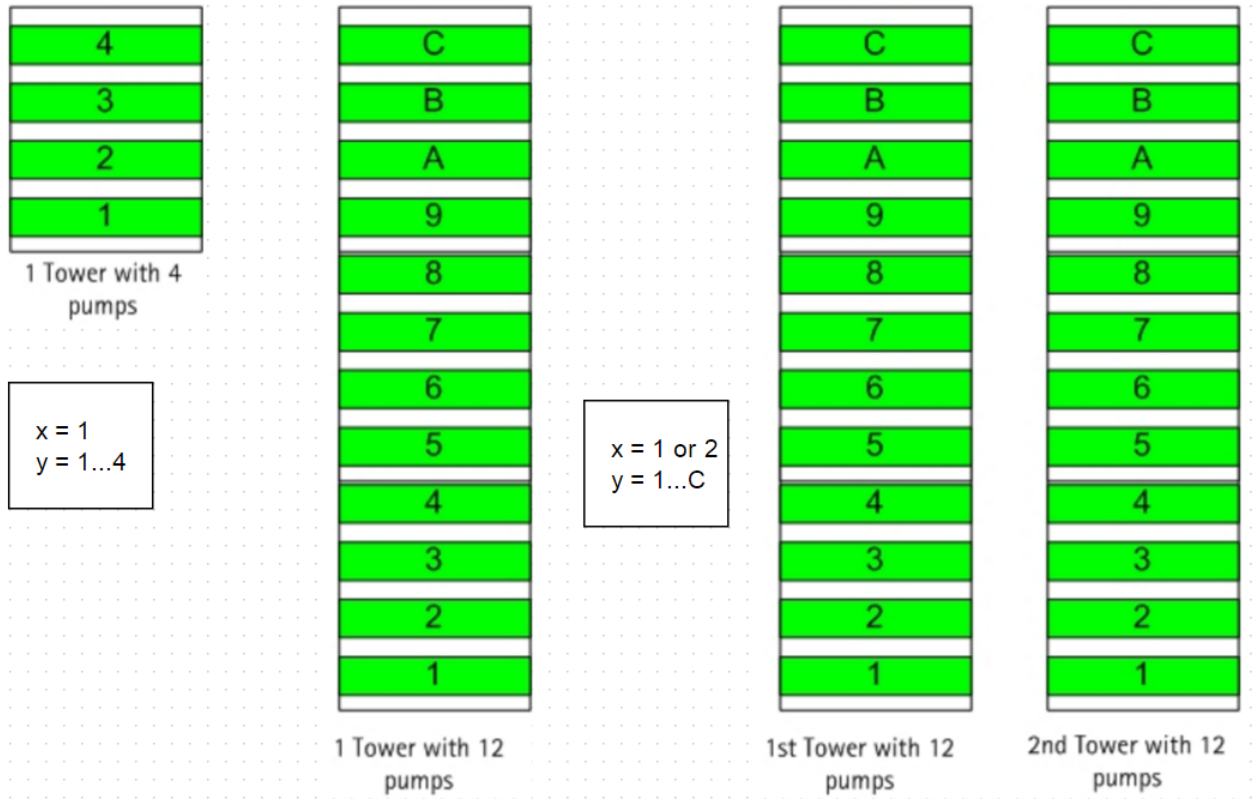
Example:

OUT: <SOH>00031<STX>1/1/1>ADMIN:ALIVE<ETX>00061<EOT>
IN: <SOH>00044<STX>ComSystem/1/1>206,50100,GNACK,0<ETX>00109<EOT>
OUT: <ACK>
OUT: <SOH>00040<STX>ComSystem/1/1>ADMIN:VERSION<ETX>00140<EOT>
IN: <SOH>00042<STX>ComSystem/1/1>207,50100,V3.30<ETX>00198<EOT>
OUT: <ACK>
OUT: <SOH>00034<STX>ComSystem/1/1>MEM:GET<ETX>00191<EOT>
IN:
<SOH>01151<STX>ComSystem/1/1>214,50100,FMNOR,1<RS>214,50100,FMSTAT,00051<RS>214,50100,FMDONGLE,T<RS>214,50100,FMBANY,_NV<RS>214,50100,FMRT,FMS1NSNS<RS>214,50100,FMRSTAT,00051<RS>214,50111,GNNEW,688F030006<RS>214,50111,INRT,0<RS>214,50111,INSOL,_NV<RS>214,50111,INSOLSN,_NV<RS>214,50111,INSOLID,_NV<RS>214,50111,INVOLACT,0<RS>214,50111,INRMT,0<RS>214,50111,INDOCAL,0<RS>214,50111,INDCON,0<RS>214,50111,INDCONU,23<RS>214,50111,INDORT,0<RS>214,50111,INDORTU,23<RS>214,50111,INVI,0<RS>214,50111,INTIME,0<RS>214,50111,INBORT,800.00<RS>214,50111,INNR,60008D98<RS>214,50111,INP1,4<RS>214,50111,INP2,0<RS>214,50111,INSYR,0<RS>214,50111,INSTBY,0<RS>214,50111,INSERNUM,36248<RS>214,50111,INDTNR,6144<RS>214,50111,DSSTATUS,00050<RS>214,50111,INBOVAL,0.0<RS>214,50111,INBOCNT,0<RS>214,50111,INM1,1<RS>214,50111,INM2,0<RS>214,50111,INM3,0<RS>214,50111,INM4,_NV<RS>214,50111,INM5,0<RS>214,50111,INM6,0<RS>214,50111,INM7,0<RS>214,50111,INM8,1<RS>214,50111,INM9,_NV<RS>214,50111,INM10,0<RS>214,50111,INM11,0<RS>214,50111,INM12,0<RS>214,50111,INA1,0<RS>214,50111,INA2,0<RS>214,50111,INA3,0<RS>214,50111,INA4,0<RS>214,50111,INA5,0<RS>214,50111,INA6,_NV<RS>214,50111,INA7,0<RS>214,50111,INA8,0<RS>214,50111,INA9,0<RS>214,50111,INA10,_NV<RS>214,50111,INA11,0<RS>214,50111,INA12,0<RS>214,50111,INA13,_NV<RS>214,50111,INA14,0<RS>214,50111,INA15,0<ETB>00042<EOT>
18.09.08, 15:35:57 > OUT: <ACK>
IN:
<SOH>01064<STX>ComSystem/1/1>215,50113,GNNEW,688F030006<RS>215,50113,INRT,0.30<RS>215,50113,INSOL,Arterenol
4mg/50<RS>215,50113,INSOLSN,Arteren<EE><80><A1><RS>215,50113,INSOLID,33~4mg/5002<RS>215,50113,INVOLACT,47.64<RS>215,50113,INRMT,65535<RS>215,50113,INDOCAL,0<RS>215,50113,INDCON,0<RS>215,50113,INDCONU,32<RS>215,50113,INDORT,0<RS>215,50113,INDORTU,50<RS>215,50113,INVI,1.4<RS>215,50113,INTIME,97<RS>215,50113,INBORT,800.00<RS>215,50113,INNR,60009FA0<RS>215,50113,INP1,4<RS>215,50113,INP2,35<RS>215,50113,INSYR,50<RS>215,50113,INSTBY,0<RS>215,50113,INSERNUM,40864<RS>215,50113,INDTNR,6144<RS>215,50113,DSSTATUS,00051<RS>215,50113,INBOVAL,0.0<RS>215,50113,INBOCNT,0<RS>215,50113,INM1,

0<RS>215,50113,INM2,0<RS>215,50113,INM3,1<RS>215,50113,INM4,_NV<RS>215,50113,INM5,1<RS>215,50113,INM6,0<RS>215,50113,INM7,0<RS>215,50113,INM8,1<RS>215,50113,INM9,_NV<RS>215,50113,INM10,0<RS>215,50113,INM11,0<RS>215,50113,INM12,0<RS>215,50113,INA1,0<RS>215,50113,INA2,0<RS>215,50113,INA3,0<RS>215,50113,INA4,0<RS>215,50113,INA5,0<RS>215,50113,INA6,_NV<RS>215,50113,INA7,0<RS>215,50113,INA8,0<RS>215,50113,INA9,0<RS>215,50113,INA10,_NV<RS>215,50113,INA11,0<RS>215,50113,INA12,0<RS>215,50113,INA13,_NV<RS>215,50113,INA14,0<RS>215,50113,INA15,0<ETB>00145<EOT>
OUT: <ACK>
IN:
<SOH>01067<STX>ComSystem/1/1>215,50114,GNNEW,688F030006<RS>215,50114,INRT,0.10<RS>215,50114,INSOL,Beloc
25mg/50<RS>215,50114,INSOLSN,Beloc25<RS>215,50114,INSOLID,43~25mg/5003<RS>215,50114,INVOLACT,20.39<RS>215,50114,INRMT,65535<RS>215,50114,INDOCAL,0<RS>215,50114,INDCON,0<RS>215,50114,INDCONU,32<RS>215,50114,INDORT,0<RS>215,50114,INDORTU,50<RS>215,50114,INVI,19.0<RS>215,50114,INTIME,6000<RS>215,50114,INBORT,800.00<RS>215,50114,INNR,60000717<RS>215,50114,INP1,4<RS>215,50114,INP2,0<RS>215,50114,INSYR,60<RS>215,50114,INSTBY,1434<RS>215,50114,INSERNUM,1815<RS>215,50114,INDTNR,6144<RS>215,50114,DSSTATUS,00051<RS>215,50114,INBOVAL,0.0<RS>215,50114,INBOCNT,0<RS>215,50114,INM1,0<RS>215,50114,INM2,0<RS>215,50114,INM3,1<RS>215,50114,INM4,_NV<RS>215,50114,INM5,1<RS>215,50114,INM6,0<RS>215,50114,INM7,0<RS>215,50114,INM8,1<RS>215,50114,INM9,_NV<RS>215,50114,INM10,0<RS>215,50114,INM11,0<RS>215,50114,INM12,0<RS>215,50114,INA1,0<RS>215,50114,INA2,0<RS>215,50114,INA3,0<RS>215,50114,INA4,0<RS>215,50114,INA5,0<RS>215,50114,INA6,_NV<RS>215,50114,INA7,0<RS>215,50114,INA8,0<RS>215,50114,INA9,0<RS>215,50114,INA10,_NV<RS>215,50114,INA11,0<RS>215,50114,INA12,0<RS>215,50114,INA13,_NV<RS>215,50114,INA14,0<RS>215,50114,INA15,0<ETX>00127<EOT>

3.2.6.4 MEM:GETSLOT#xy

CS-7097 - MEM:GETSLOT#xy
With this request the host-system asks for **all** actual parameter values of the **pump y at pillar x**. The pumps are counted from the bottom to the top of the system (Perfusor; syringe pumps or Infusomat; volumetric pumps) and towers are counted from the left to the right.



Possible responses are:
quadruple for syntax of a quadruple see above
<time>,501xy,GNERR,<errCode>

Example:
OUT: <SOH>00031<STX>1/1/1>ADMIN:ALIVE<ETX>00061<EOT>
IN: <SOH>00044<STX>ComSystem/1/1>624,50100,GNACK,0<ETX>00113<EOT>
OUT: <ACK>
OUT: <SOH>00040<STX>ComSystem/1/1>ADMIN:VERSION<ETX>00140<EOT>
IN: <SOH>00042<STX>ComSystem/1/1>626,50100,V3.30<ETX>00203<EOT>
OUT: <ACK>
OUT: <SOH>00041<STX>ComSystem/1/1>MEM:GETSLOT#13<ETX>00134<EOT>
IN:
<SOH>01198<STX>ComSystem/1/1>627,50100,FMNOR,1<RS>627,50100,FMSTAT,00051<RS>627,50100,FMDONGLE,T<RS>627,50100,FMBANY,_NV<RS>627,50100,FMRT,FMS1NSNS<RS>627,50100,FMRSTAT,00051<RS>627,50113,GNMODEL,688F030006<RS>627,50113,INRT,0.30<RS>627,50113,INSOL,Arterenol4mg/50<RS>627,50113,INSOLSN,Arteren<EE><80><A1><RS>627,50113,INSOLID,33~4mg/5002<RS>627,50113,INVOLACT,47.60<RS>627,50113,INRMT,65535<RS>627,50113,INDOCAL,0<RS>627,50113,INDCON,0<RS>627,50113,INDCONU,32<RS>627,50113,INDORT,0<RS>627,50113,INDORTU,50<RS>627,50113,INVI,1.5<RS>627,50113,INTIME,104<RS>627,50113,INBORT,800.00<RS>627,50113,INNR,60009FA0<RS>627,50113,INP1,4<RS>627,50113,INP2,35<RS>627,50113,INSYR,50<RS>627,50113,INSTBY,0<RS>627,50113,INSERNUM,40864<RS>627,50113,INDTNR,6144<RS>627,50113,DSSTATUS,00051<RS>627,50113,INBOVAL,0.0<RS>627,50113,INBOCNT,0<RS>627,50113,INM1,0<RS>627,50113,INM2,0<RS>627,50113,INM3,1<RS>627,50113,INM4,_NV<RS>627,50113,INM5,1<RS>627,50113,INM6,0<RS>627,50113,INM7,0<RS>627,50113,INM8,1<RS>627,50113,INM9,_NV<RS>627,50113,INM10,0<RS>627,50113,INM11,0<RS>627,50113,INM12,0<RS>627,50113,INA1,0<RS>627,50113,INA2,0<RS>627,50113,INA3,0<RS>627,50113,INA4,0<RS>627,50113,INA5,0<RS>627,50113,INA6,_NV<RS>627,50113,INA7,0<RS>627,50113,INA8,0<RS>627,50113,INA9,0<RS>627,50113,INA10,_NV<RS>627,50113,INA11,0<RS>627,50113,INA12,0<RS>627,50113,INA13,_NV<RS>627,50113,INA14,0<RS>627,50113,INA15,0<ETX>00103<EOT>
18.09.08, 15:42:49 >
OUT: <ACK>

Effective

3.3 Error codes

The following error codes are possible (in the value field of a quadruple), if you find the parameter GNERR in a quadruple:

Code	Meaning
11	no further data available or no pumps in the system
39	pump was removed from rack frame (You will get GNERR39 if a pump was removed since the last request. This Error message is only transferred once. The address of the pump which is removed you will find in the address-field of the quadruple.) or can't be reached by a request
68	request has a wrong syntax or checksum
811	a wrong address of a pump or pillar was given in the *address*-field in the request GETSLOT#xy

3.3.1 Extended error codes

CS-7073 - Extended error codes
The extended error codes have to be enabled via the website of the ComDevice, by default the extended error codes are disabled.
GNERR codes starting with 4 describe a pump communication error and will be sent for the corresponding slot.
GNERR codes starting with 5 will be sent if the topology data is invalid. For Space that means that the Space Cover Comfort or the whole system is not working correctly or no Space Cover Comfort is connected. For Compact^{Plus} that means that a RackSystem is not working correctly or sends a message indicating an invalid topology.

Example:
OUT: <SOH>00031<STX>1/1/1>ADMIN:ALIVE<ETX>00061<EOT>
IN: <SOH>00044<STX>ComSystem/1/1>206,50100,GNACK,0<ETX>00109<EOT>
OUT: <ACK>
OUT: <SOH>00040<STX>ComSystem/1/1>ADMIN:VERSION<ETX>00140<EOT>
IN: <SOH>00042<STX>ComSystem/1/1>207,50100,V3.30<ETX>00198<EOT>
OUT: <ACK>
OUT: <SOH>00034<STX>ComSystem/1/1>MEM:GET<ETX>00191<EOT>
IN: <SOH>01151<STX>ComSystem/1/1>**214,50100,GNERR,51**<ETX>0005<EOT>

This example shows an error in the whole system, hence no data from any pump will be transmitted in the response.

Example:
OUT: <SOH>00031<STX>1/1/1>ADMIN:ALIVE<ETX>00061<EOT>
IN: <SOH>00044<STX>ComSystem/1/1>206,50100,GNACK,0<ETX>00109<EOT>
OUT: <ACK>
OUT: <SOH>00040<STX>ComSystem/1/1>ADMIN:VERSION<ETX>00140<EOT>
IN: <SOH>00042<STX>ComSystem/1/1>207,50100,V3.30<ETX>00198<EOT>
OUT: <ACK>
OUT:<SOH>00034<STX>ComSystem/1/1>MEM:GET<ETX>00057<EOT>

IN:<SOH>00488<STX>ComSystem/1/1>207,50100,FMNOR,1<RS>207,50100,FMSTAT,00051<RS>207,50100,FMDONGLE,T<RS>207,
50100,FMBANY,_NV<RS>207,50100,FMRT,FMS2NSNS<RS>207,50100,FMRSTAT,00051<RS>207,50117,DSSTATUS,00050<RS>207,
50117,GNMODEL,686L030007<RS>207,50117,INRT,0.00<RS>207,50117,INAVRT,0.00<RS>207,50117,INSOL,_NV<RS>207,50117,
INVI,0.00<RS>207,50117,INTIME,0<RS>207,50117,INAKKU,993<RS>207,50117,INSTBY,0<RS>207,50117,INP2,0<RS>207,50117,
INNR,6800F18A<RS>207,50117,INSERNUM,61834<RS>207,50117,INM8,1<RS>207,50117,INA4,0<RS>207,50117,INA5,0<RS>207, 50117,INA16,0<ETB>00100<EOT>
OUT:<ACK>
IN:<SOH>00358<STX>ComSystem/1/1>207,**50115**,DSSTATUS,00050<RS>207,50115,GNMODEL,688L030007<RS>207,50115,INRT,
0.00<RS>207,50115,INAVRT,0.00<RS>207,50115,INSOL,_NV<RS>207,50115,INVI,0.00<RS>207,50115,INTIME,0<RS>207,50115,
INAKKU,889<RS>207,50115,INSTBY,0<RS>207,50115,INP2,0<RS>207,50115,INNR,6001FCAA<RS>207,50115,INSERNUM,130218
<RS>207,50115,INM8,1<RS>207,50115,INA4,0<RS>207,50115,INA5,0<RS>207,50115,INA16,0<ETB>00219<EOT>
OUT:<ACK>
IN:<SOH>00046<STX>ComSystem/1/1>**207,50111,GNERR,41**<ETX>00058<EOT>

In the second example a communication error occurred for slot 11. Two other pumps (slot 17 and 15) did not have communication errors and sent their data in the response.

Please note, that for Space for using the extended error codes a Space Cover Comfort must exist in the system - however the Battery Pack SP with Wi-Fi does not need a Space Cover Comfort. As a result of this GNERR codes starting with 5 will not be thrown for that device. For Compact^{Plus} an RackSystem needs to be connected.

Please note, that while initialize of a new pump in the system an GNERR code starting with 4 can occur till the new pump is fully initialized.

3.4 List of parameters

Note: The host system should skip unknown parameters to be compatible. New added parameter must have the syntax of a quadruple. The information the data stream contains can differ depending on the type of the requested pump.
Note: Some parameters might not be supported for a given generation like e.g. Compact^{Plus}
. Unsupported parameters if existing are documented for each generation in Appendix 4.1.

3.4.1 General parameter

CS-7074 - General parameter

Name	Meaning	Unit	Values
FMNOR	number of connected pillars	-	1 to 3
FMSTAT	state of ComDevice	-	00051
FMDONGLE	hardware protection (not used)	-	always T
FMBANY	last scanned barcode	-	_NV
FMRT	type of a segment	-	see below
FMRSTAT	state of a segment	-	00051

Additional parameters for BCC 3.34

Name	Meaning	Unit	Values
COMSERIALNO	Serial Number of the Communication Device	-	0 to 2^{64} - 1
COMSWVERSION	Software Version of the Communication Device	UTF-8	Software Version of the Communication Device

Note: Parameter FMRT
General format of parameter is **FMSxSySz**. The following possibilities are defined for xx, yy and zz:

Sx: First pillar with x segments each 4 pumps

Sy: Second pillar with y segments each 4 pumps

Sz: Third pillar with z segments each 4 pumps

NS: segment is not defined (yet)

no data: segment is not available

Examples for type data:
FMS3NSNS: 3 segments with 12 pumps in total

FMS3S2: 3 segments in one pillar and 2 segments in second pillar

3.4.2 Parameters for infusion pumps

CS-7075 - Parameters for infusion pumps
Please note, that in order for any of these parameters to be available it has to be enabled via the website of the ComDevice and it has to be supported by the given infusion pump type and version.

Parameter name	Meaning	Unit	Value	Event trigger if status changes
GNNEW	name of the pump NOTE: only if a new pump is connected with the first answer you will get GNNEW. With the following answers GNMODEL is sent.	---	see GNMODEL	x
GNMODEL	name of the pump software version NOTE: conclude with ASCII-char <cr> (0Dh)	---	e.g. 686xyyzzzz Infusomat Space 687xyyzzzz Infusomat Space P 688xyyzzzz Perfusor Space 586xyyzzzz Infusomat Space US Software Version 587xyyzzzz Infusomat Space	x

			P US Software Version 588xyyzzzz Perfusor Space US Software Version I0002xyyzz Perfusor Compact+ I0003xyyzz Infusomat Compact+	
INRT	Rate	ml/h	0.00 to 1800.00	x
INVTB	volume to be infused	ml	0.0 to 9999.9	
INPSOLL	pressure value (0=lowest pressure)	---	0 to 8	
INSOL	medication long name	String acc. to SDSCS-7104 - Responses	max. 25 chars, if no drug name is associated to a pump you will get _NV or drug ID will be transferred. Default is drug name. Can only be changes by B.Braun Service	x
INSOLSN	medication short name	String acc. to SDSCS-7104 - Responses	max. 8 chars, if no drug name is associated to a pump you will get _NV	
INSOLID	medication ID	String acc. to SDSCS-7104 - Responses	max. 20 chars	
INSYR	size of syringe	ml	0 to 60	
INVOLACT	actual volume in syringe	ml	0 to 60 (decreasing)	
INRMT	Remaining time until end of infusion	sec	0 to 65535	
INVI	volume infused	ml	0.0 to 9999.9 if the max. value is reached it has to be reset at the pump.	
INTIME	infusion time	min	0 to 6000 if the max. value is reached it has to be reset at the pump.	
INAKKU	Battery time	min	0 to 1440	
INSTBY	rest of standby time	min	0 to 1440	
INBORT	rate of bolus	ml/h	0.00 to 1800.00	

INBOVAL	bolus volume delivered by pump	ml	0.00 to 500.00	x
INDOCAL	Dose Mode active	---	0=no, 1=yes	
INDCON	drug concentration	---	0,000 to 99999	
INDCONU	drug concentration unit	Byte	see 0	
INDORT	dose rate (configured)	---	0,000 to 99999	x
INDORTU	dose rate unit (configured)	Byte	see 0	
INP1	actual pressure setting	---	0 to 8	
INP2	actual pressure in % of the maximum pressure 100% = pressure alarm	---	0 to 100	
INM1	ready for infusion	---	0=no, 1=yes	
INM2	bolus active	---	0=no, 1=yes	x
INM3 (INM3 is also set if purge function at pump is active. INM14 will show the status of purge.)	active pumping	---	0=no, 1=yes	x
INM4	CC-function	---	0=no, 1=yes	
INM5	bolus function is released	---	0=no, 1=yes	
INM6	standby function on	---	0=no, 1=yes	x
INM7	Data-Lock on	---	0=no, 1=yes	x
INM8	power supply	---	0=accu, 1=external	
INM9	Disposable changed	---	_NV	
INM10	KOR/KVO-function	---	0=no, 1=yes	x
INM11	without drop –sensor-control	---	always 0	
INM12	Softlimit low undergone	---	0=no, 1=yes	x
INM13	Softlimit high overgone	---	0=no, 1=yes	x
INA1	battery empty	---	0=no, 1=alarm	x

INA2	syringe empty	---	0=no, 1=alarm	x
INA3	pressure alarm	---	0=no, 1=alarm	x
INA4	standby expire in two minutes	---	always 0	
INA5	standby over	---	0=no, 1=alarm	x
INA6	CC-alarm	---	0=no, 1=alarm	x
INA7	end of volume	---	0=no, 1=alarm	x
INA8	time over	---	0=no, 1=alarm	x
INA9	syringe alarm	---	0=no, 1=alarm	x
INA10	not used	---	_NV	
INA11	battery pre-alarm	---	0=no, 1=alarm	x
INA12	syringe empty pre-alarm	---	0=no, 1=alarm	x
INA13	door of pump open (only Infusomat)	---	_NV	
INA14	drop alarm	---	0=no, 1=alarm	x
INA15	air alarm	---	0=no, 1=alarm	x
INA16	KVO end	---	0=no, 1=alarm	x
INNR	unique identifier	long (Space) String (Compact^{Plus})	0 to 7FFFFFFFh (Space) 12 chars (Compact^{Plus})	
INDTNR	DiaNet-type number of device	long (Space)	from INNR (Space) _NV (Compact^{Plus})	
INPATW	Patient weight in kg Has been replaced by PATW in BCC 3.3x	kg	0.250 to 250 kg	x
INSERNUM	serial number of device	long	from INNR	
DSSTATUS	operation condition of a pump (switched on or switched off)	---	00050 = off 00051 = on	
INBOCNT	Counter for bolus given between two requests	Integer	0...9 see 3.4.2.1	x
INAVRT	Average rate between two requests	---	See INRT and chapter 3.4.2.2	

Additional parameters for DoseTrac and BCC 3.3x

Parameter name	Meaning	Unit	Value	Event trigger if status changes
VERSION	actual version number of protocol	ASCII	3.30 or higher	
OPMODE	operation mode of pump	---	0 = Continuous 1 = Ramp/Taper 2 = Programming 3 = PiggyBack 4 = PCA mode 5 = TCI mode 7 = Interval Bolus mode	x
DATE	actual date set in ComDevice	---	YYYYMMDD	
TIME	actual time set in ComDevice	---	HHMMSS	
TIMEOFINF	Pre-selected time of infusion	min	0 to 65535 _NV = time > 65535 (1092h:16min).	
ALARM1	Alarm	Long	0x00000000h	x
ALARM2	Alarm	Long	0x00000000h	x
STATUS1	Condition	Long	0x00000000h	x
STATUS2	Condition	Long	_NV	x
PREALARM	Pre alarm	Long	0x00000000h	x
DGDSTATUS	Status of DOSEGURAD	String acc. to CS-7104 - Responses	0 = No limits for rate or dose rate are set 1 = Soft limit low undergone 2 = Only soft limit high is defined and rate under this limit -> okay 3 = Soft limit high exceeded 4 = Only soft limit low is defined and rate over this limit -> okay 5 = Rate within limits 6 = No limits are defined	x

DGDALERTSLL	DoseGuard alert of soft limit low. This parameter contains two information, a soft limit was reached and the user action.	String acc. to SDSCS-7104 - Responses	0 = No soft limit alert active 1 = Overrule soft limit low is selected 2 = Reject soft limit low is selected	x
DGDALERTSLH	DoseGuard alert of soft limit high. This parameter contains two information, a soft limit was reached and the user action.	String acc. to SDSCS-7104 - Responses	0 = No soft limit alert active 1 = Overrule soft limit high is selected 2 = Reject soft limit high is selected	x
DGDALERTHLH	DoseGuard alert of hard limit high	String acc. to SDSCS-7104 - Responses	0 = No hard limit alert active 1 = Hard limit high alert	x
DISPCHG	Disposable change. The value is stored in ComDevice until the next request.	String acc. to SDSCS-7104 - Responses	0 = no change since last data transfer 1 = disposable was changed	x
PATIDBADGE	Scanned patient ID from badge	String acc. to SDSCS-7104 - Responses	15 alpha-numeric character	x
PATIDDRUG	Scanned patient ID from drug label	String acc. to SDSCS-7104 - Responses	15 alpha-numeric character	x
PATID	Stored patient id in pump	String acc. to SDSCS-7104 - Responses	15 alpha-numeric character	x
PATW	Patient weight in kg	kg	0.250 to 250 kg	x
PATH	Height of patient, unit always centimeter [cm]	cm	15.0 to 250.0 cm	
PATAGE	Age of the patient	years	0 to 200 years	
BOLTYPE	Type of given bolus	---	0 = no bolus was given 1 = manual bolus 2 = bolus with volume/time pre selection	
BOLRTSLLOW	Bolus rate soft limit low.	ml/h	0,00 to 1800,0	
BOLRTSLHIGH	Bolus rate soft limit high.	ml/h	0,00 to 1800,0	

BOLRTHLHIGH	Bolus rate hard limit high.	ml/h	0,00 to 1800,0	
BOLVOLSLLOW	Bolus volume soft limit value	---	0,00 to 99999	
BOLVOLSLHIGH	Bolus volume soft limit value	---	0,00 to 99999	
BOLVOLHLHIGH	Bolus volume hard limit value	---	0,00 to 99999	
BOLVOLLIMUT	Unit of all bolus volume limits	---	see 3.4.2.1	
ACTCHAN	active channel	---	0 = piggyback 1 = primary	x
RUNSTATE	Indicates the status of a pump in a bit field	BYTE	bit 0 = stop bit 1 = run bit 2 = alarm bit 3 = KVO active bit 4 = menu mode bit 5 = pre alarm	x
SLLOW	Soft limit low value. Depending on settings in DLE	String acc. to SDS CS-7104 - Responses	value is depending on the operation mode of the pump.	
SLHIGH	Soft limit high value. Depending on settings in DLE	String acc. to SDS CS-7104 - Responses	value is depending on the operation mode of the pump.	
HLHIGH	Hard limit high value. Depending on settings in DLE	String acc. to SDS CS-7104 - Responses	value is depending on the operation mode of the pump.	
RTLIMUT	Unit of rate limit	---	see 0	
LASTDA	Last device alarm given by pump	---	1000 to 2999	
DRUGCAT	Drug category	String acc. to SDS CS-7104 - Responses	25 character	
DLNAME	Name of Drug list	String acc. to SDS CS-7104 - Responses	Name of Drug list	

DLCRETIME	Creation time of Drug List	Unix-Time	since 01.01.1970	
NURSEID	Scanned Nurse identifier	String acc. to SDSCS-7104 - Responses	15 alpha-numeric character	
DRUGORDERNO	Pharmacy System drug order number	String acc. to SDSCS-7104 - Responses	15 alpha-numeric character	
DISPNAME	Brand of selected disposable	String acc. to SDSCS-7104 - Responses	25 character	
INSOLPRIO	Alarm priority defined for drug	---	1 = high 2 = medium 3 = low	
INSOLCOL	Color definition for drug	---	0 = magenta 1 = blue 2 = cyan 3 = green 4 = brown 5 = white	
TCIMOD	Selected TCI mode	---	0 = mode undefined 1 = Plasma mode 2 = Effect mode 3 = Info mode	
TCIMODEL	Selected TCI model	---	0 = model undefined 1 = Marsh 2 = Schnider 3 = Kataria 4 = Minto 5 = Gepts	
TCIAWA	Calculated wake up time	min	0 to 20 or 10000 = ">20 min”	
TCIPLA	actual plasma value	see TCIUT	0 to 100	
TCIEFF	actual effect value	see TCIUT	0 to 100	
TCITAR	entered target value for plasma or effect concentration	see TCIUT	0 to 100	

TCIUT	Unit of TCI values	---	can be mcg/ml or ng/ml	

Additional parameters for BCC 3.32

Parameter name	Meaning	Unit	Value	Event trigger if status changes
DRROUNDED	dose rate was rounded	---	0= not rounded 1 = rounded	

Additional parameters for BCC 3.33

Parameter name	Meaning	Unit	Value	Event trigger if status changes
PCAAD	the PCA A/D ratio in percent	%	0…100	
PCABR	the number of PCA boli that were requested by the patient	---	0.. 65535	
PCALOT	the set lock out time	min	varying	
PCABA	the absolute value of applied boli	---	0.. 65535	
PROGSTAT	the step number of the programming mode	---	0..11	
AUTOPROGSTATE	state of AutoProgramming mechanism	---	0: no AutoProgramming suggestion available 1: Suggestion is being signaled 2: confirmation dialog is active 3: activation is in progress 4: Suggestion has been activated 5: confirmation has been canceled 6: error during parsing or activation	
LASTAUTOPROGERR	Last error reported by AutoProgramming	---	see chapter 3.4.2.7	

Additional parameters for BCC 3.34

Parameter name	Meaning	Unit	Value	Event trigger if status changes

CAREUNIT	Name of the care unit selected from the drug library	String acc. to CS-7104 - Responses	Value entered into drug library	
COMSERIALNO	Serial Number of the Communication device	String acc. to CS-7104 - Responses	Serial Number as String	
COMSWVERSION	Software Version of the Communication Device	String acc. to CS-7104 - Responses	Software version as String	
INM14	Status of Purge (Prime of line)	---	0= currently not priming, 1= priming	x

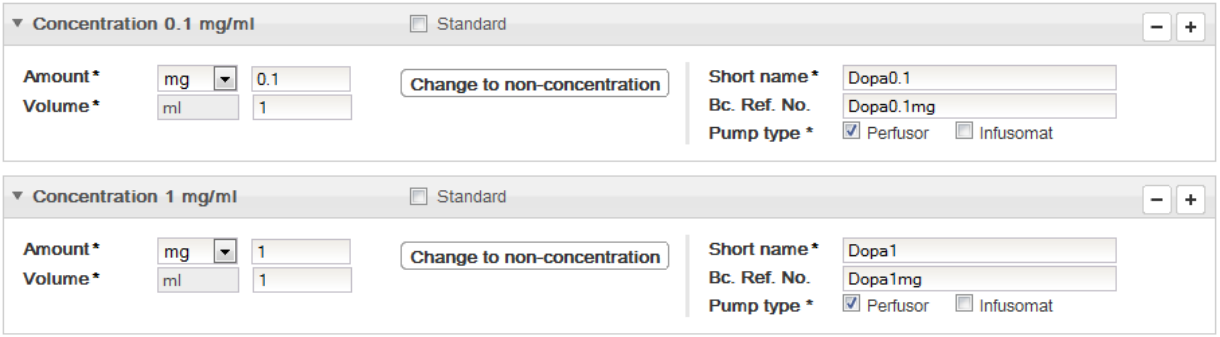
Additional parameters for BCC 3.36

Parameter name	Meaning	Unit	Value	Event trigger if status changes
VOLREMAIN	Remaining volume until end of infusion	ml	0,00 to 99999	
DORT	current dose rate (being delivered)		0,000 to 99999,000	x
DORTU	current dose rate unit (being delivered)	Byte	see 3.4.2.3	
BOVAL	pump internal bolus volume see BOL_VOL_AKT in chapter 3.4.2.1	ml	0.00 to 500.00	
BOCNT	amount of boluses delivered during the current therapy. **Note:** There is a difference between Compact+ and Space when a manual bolus is pressed and released in short order. While Space counts these as one bolus as long as the bolus menu is not left, for Compact+ those are individual boluses.	byte	0 to 255	x
BASRT	basal rate configured in the infusion pump	ml/h	0.00 to 1800.00	x

Note: In case ALARM1, ALARM2, STATUS OR PREALARM is activated, INAxx and INMxx are disabled automatically.

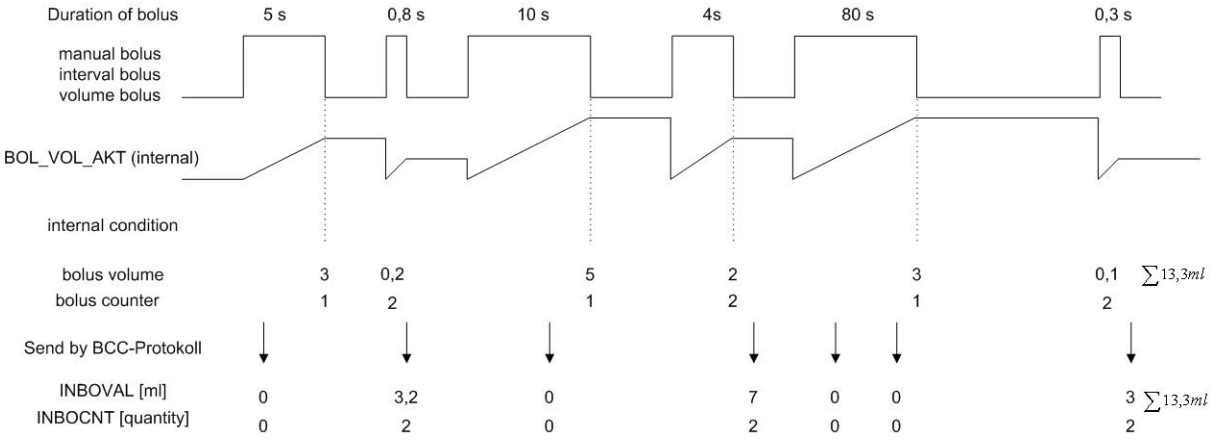
Note: INSOLID is supported by the parameter Barcode Reference Number (Bc Ref.No.) defined in the drug library of a pump.

Effective



3.4.2.1 INBOCNT

CS-7078 - INBOCNT
When the bolus key at the pump is released the parameter INBOCNT will be increased**. During the bolus is running the bolus information will not be send**. With this parameter you get a more precise possibility for the documentation of a bolus. The amount of the last given bolus is stored in the parameter INBOVAL and the quantity of single boli are counted in the parameter INBOCNT. The system is able to show a bolus with a minimum volume of 0,1 ml.



Note: There is a difference between Compact+ and Space when a manual bolus is pressed and released in short order. While Space counts these as one bolus as long as the bolus menu is not left, for Compact+ those are individual boluses.

3.4.2.2 INAVRT

CS-7079 - INAVRT
INAVRT contains the average rate between two request from an external system.
With the help of the different parameter, see below, it is possible to determine the situation of the pump. The values are automatic initialized after the first request, ADMIN:ALIVE from an external system. The average rate is calculated with every request. In case of no rate changes the average rate is equal to the rate (INAVRT = INRT). If the rate was changed during the requests, the average rate is different from the rate itself (INAVRT ≠ INRT).

3.4.2.3 Definition of Bytes for Units

Value	Unit	Value	Unit
1	ml/h	79	mmol/kg/day
2	ml	80	mEq/kg/minute
3	hh:mm	81	mEq/kg/ hour
4	min:sec	82	mEq/kg/day
5	Years	83	IU/kg/minute
6	mm	84	IU/kg/ hour
7	nl	85	IU/kg/day
8	degree (angle)	86	mmHg
9	N	87	kPa
10	mbar	88	lbs
11	square mm	89	mmol/liter
12	mA	90	mg/dl
13	ms	91	g(CH)
14	Unixtime	92	g(CH)
15	Percent	93	g(CH)
16	mV	94	hour
17	degree Celsius	95	cm
18	mAh	96	inch
19	m	97	ng/m^2
20	BMI acc. to DUBOIS	98	ng/m^2/minute

21	BMI acc. to Boyd	99	ng/m^2/hour
22	kg	100	ng/m^2/day
23	ng	101	mcg/m^2
24	mg	102	mcg/m^2/minute
25	micro gram (µg)	103	mcg/m^2/hour
26	g	104	mcg/m^2/day
27	mmol	105	mg/m^2
28	mEq	106	mg/m^2/minute
29	IU	107	mg/m^2/hour
30	ng/ml	108	mg/m^2/day
31	mg/ml	109	g/m^2
32	ug/ml	110	g/m^2/minute
33	g/ml	111	g/m^2/hour
34	mmol/ml	112	g/m^2/day
35	mEq/ml	113	IU/m^2
36	IE/ml	114	IU/m^2/minute
37	ng/kg	115	IU/m^2/hour
38	mg/kg	116	IU/m^2/day
39	micro gram/kg	117	mIU
40	g/kg	118	mIU/ml
41	mmol/kg	119	mIU/kg
42	mEq/kg	120	mIU/m^2
43	IU/kg	121	mIU/minute

Effective

44	ng/minute	122	mIU/hour
45	ng/hour	123	mIU/day
46	ng/day	124	mIU/kg/min
47	mg/minute	125	mIU/kg/hour
48	mg/ hour	126	mIU//kg/day
49	mg/day	127	mIU/m^2/minute
50	micro gram/minute	128	mIU/m^2/hour
51	micro gram/hour	129	mIU/m^2/day
52	micro gram/day	130	kIU [kilo/thousand]
53	gram/minute	131	kIU/ml
54	gram/hour	132	kIU/kg
55	gram/day	133	kIU/hour
56	mmol/minute	134	kIU/day
57	mmol/hour	135	kIU/kg/hour
58	mmol/day	136	kIU/kg/day
59	mEq/minute	137	MIU [MEGA/Million]
60	mEq/hour	138	MIU/ml
61	mEq/day	139	MIU/kg
62	IU/minute	140	MIU/hour
63	IU/hour	141	MIU/day
64	IU/day	142	MIU/kg/hour
65	ng/kg/minute	143	MIU/kg/day
66	ng/kg/ hour	144	mEq/m^2

67	ng/kg/day	145	mEq/m^2/minute
68	mg/kg/minute	146	mEq/m^2/hour
69	mg/kg/ hour	147	mEq/m^2/day
70	mg/kg/day	148	kcal
71	micro gram/kg/minute	149	kcal/kg
72	micro gram/kg/hour	150	kcal/ml
73	micro gram/kg/day	151	kcal/day
74	gram/kg/minute	152	kcal/kg/day
75	gram/kg/hour	153	ml/kg
76	gram/kg/day	154	ml/ml
77	mmol/kg/minute	155	ml/kg/hour
78	mmol/kg/hour	156	Mbps

Note: All units containing "g" and "ng" are not supported by pumps with SW version G or previous.

3.4.2.4 Definition of ALARM1 and ALARM2

CS-7080 - Definition of ALARM1 and ALARM2
The alarms are sent as a long (4 Byte). The meaning of the value is described in the following tables.
ALARM1

Position	Meaning	Alarm will trigger EVENT in BCC if any value changes
bit 0	no alarm	
bit 1	Calibration data corrupt	x
bit 2	Battery alarm	x
bit 3	Therapy data corrupt	x
bit 4	Therapy data and pump settings corrupt	x
bit 5	Battery voltage too low	x
bit 6	Battery not in pump	x
bit 7	Battery flat at power on	x

bit 8	Battery cover open	x
bit 9	Syringe empty	x
bit 10	Pressure too high	x
bit 11	Pressure too high, drive blocked	x
bit 12	Standby time expired	x
bit 13	Volume infused	x
bit 14	Infusion time expired	x
bit 15	Claw malfunction	x
bit 16	Pressure sensor defect	x
bit 17	Syringe holder open	x
bit 18	Syringe not inserted correct	x
bit 19	KVO end	x
bit 20	Pressure alarm upstream sensor	x
bit 21	Dummy	x
bit 22	Drop alarm, summary of all drop alarms	x
bit 23	Drop alarm: no drops	x
bit 24	Drop alarm: too less drops	x
bit 25	Drop alarm: too many drops	x
bit 26	Drop alarm: Free flow	x
bit 27	Drop alarm: no drop sensor con. but required	x
bit 28	Air alarm, summary of all air alarms	x
bit 29	Air alarm: Air bubble too large > 0,3 ml	x
bit 30	Air alarm: Air rate exceeded > 4 ml/h	x
bit 31	Air alarm: sensor test faulty	x

ALARM2

Position	Meaning	Alarm will trigger EVENT in BCC if any value changes
bit 0	Dummy	
bit 1	Data-lock unauthorized manipulation	x
bit 2	x hour limit is reached. Only for PCA operation	x
bit 3	SGC-End alarm	x

bit 4	Take over mode syringe end	x
bit 5	Take over failed	x
bit 6	Take over mode slave	x
bit 7	Danger of free flow	x
bit 29	(Infusomat) occlusion test encounters an error (Compact^{Plus} only)	x
bit 30	(Infusomat) Door was opened during the infusion (Compact^{Plus} only)	x
bit 31	(Perfusor) Syringe not inserted "securely" (Compact^{Plus} only)	x

3.4.2.5 Definition of STATUS1 and STATUS2

CS-7086 - Definition of STATUS1 and STATUS2
STATUS1

Position	Meaning	Change in Status will trigger event in BCC in case of any change
bit 0	1: Pump switched on	x
bit 1	1: Mains power operation	x
bit 2	1: Standby active	x
bit 3	1: Start-up menu at pump active	x
bit 4	1: Prime active	x
bit 5	1: Drive in parking position	x
bit 6	1: Pump is ready to start	x
bit 7	1: Pump is running/infusing	x
bit 8	1: Therapy has started	x
bit 9	1: Ready to start bolus	x
bit 10	1: Manual bolus is active	x
bit 11	1: Volume bolus is active	x
bit 12	1: KVO function released	x
bit 13	1: KVO active	x
bit 14	1: Data lock active	x
bit 15	1: Pump is operating in dose mode	x

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bit 16	1: Dose bolus with body weight	x
bit 17	1: Patient data stored in pump	x
bit 18	always 0	
bit 19	1: act. Alarm is quit	x
bit 20	1: act. pre alarm is quit	x
bit 21	1: Space-Control is connected to pump	x
bit 22	1: Air sensor is switched off	x
bit 23	0: Piggyback active 1: primary active	x
bit 24	1: Editor at pump is active, e.g. rate is edited	x
bit 25	always 0	
bit 26	always 0	

3.4.2.6 Definition of Pre-alarm

CS-7087 - Definition of Pre-Alarm

Position	Meaning	will trigger event in BCC in case of any change
bit 0	No pre alarm	
bit 1	Disposable not inserted	x
bit 2	Volume to be delivered near end	x
bit 3	Time near end	x
bit 4	Battery near flat	x
bit 5	KVO operation	x
bit 6	Data lock unauthorized manipulation	x
bit 7	Incompatible CAN-BUS device detected	x
bit 8	Piggyback: secondary volume infused	x
bit 9	SGC pre alarm	x
bit 10	IDPG occlusion	x
bit 11	IDPG Pressure leap high	x
bitt 12	IDPG Pressure leap low	x
bit 13	Syringe pre alarm in TOM master	x
bit 14	Slave failure in TOM master	x

bit 15	Battery defective (Compact^{Plus} only)	x

3.4.2.7 Definition of LASTAUTOPROGERR

CS-7089 - Definition of LASTAUTOPROGERR

Value	Meaning
0	ok, no error detected
1	drug / concentration was not found in drug library
100	one of the passed parameters was not valid
101	Longname should be found, but was not
102	Catalog name should be found but was not
103	Given DrugName did not match with given DrugId
104	concentration and a non-concentration assigned to drug
105	more than one concentration assigned to a drug and no search criteria given.
106	No Concentration found but concentration required
107	Given concentration does not match
108	Inconsistent concentration input
109	Given short name does not match
110	Pump type does not match
111	Ward invalid
112	Patient profile invalid
113	Therapy CONT, unit error
114	Therapy DOT, unit error
115	Found drug with Therapy CONT not activated
116	Found drug with Therapy DOT not activated
117	Therapy not supported
118	Therapy filter setting error
119	Given concentration assigned to non-concentration
120	Not allowed for Secondary mode

121	Fatal error
122	Not allowed for Primary mode
123	Drug has no data for the given patient at the selected care unit
124	Unused
125	Pump in wrong Menu for AutoProgramming
201	internal error
202	Lookup-mode is disabled
203	no druglib available
204	Lookup is being performed
500	AutoProgramming in Idle-State, no AutoProgramming active
1000	Syntax error or CRC fail in received dataset
1001	No valid dataset in proposal
1002	Lookup returned "not found" but lookup always mode is active
1003	--
1004	User didn't confirm that no lookup was performed (cancel)
1005	--
1006	The amount of datasets is not 1. Direct addressing
1007	The received concentration of a second proposal is not equal to the concentration of the primary infusion
1008	Primary infusion is not continuous therapy
1009	Rate Unit of received dataset is not equal to rate unit of primary
1010	Received rate is out of limits
1011	Received VTBI is out of limits
1012	Secondary infusion is indirect addressed
1013	Wrong pump type. Secondary infusion is only valid for Infusomat
1014	--
1015	Primary therapy is not continuous therapy
1016	Primary does not allow a secondary infusion

1017	--
1018	Received dataset did not contain a rate or a unit
1019	Received shortname does not match current shortname
1020	--
1021	--
1022	--
1023	received CatalogID does not match current CatalogID
1024	received DrugAmount does not match current DrugAmount
1025	Invalid Parameters for Online Parameter Change
1026	Identical values sent for Online Parameter Change
1027	no search text (Longname. ShortName, CalalogId) received
1028	No serial number received
1029	dose over time with wrong rate unit (i.e. not ml/h) received
1030	received vtbi and time
1031	received concentration and amount
1032	kvo data received but kvo not enabled in pump
1033	range error in received amount
1034	range error in received container
1035	range error in received concentration
1036	patient weight unit error
1037	range error in received patient weight
1038	pump has active patient weight, change not valid
1039	patient height unit error
1040	range error in received patient height
1041	pump has active patient height, change not valid
1042	no log or shortname received
1043	Amount without container or container without amount received

1044	DataLock Level 3 is active
1045	Loading Dose is pending
1046	Dose over Time with Rate and DOT-Time received
1047	Continuous with DOT-Dose received
1048	Continuous with DOT-Time received
1049	Dose over Time VTBI without Rate received
1050	Dose over Time with Rate without VTBI received
1051	Dose over Time no DOT unit received without lookup
1052	patient surface unit error
1053	patient surface range error
1054	pump has active patient surface, change not valid
1055	DOT with Unit EDB_ML received and concentration not 1ml/ml

3.5 Data Synchronization

CS-7090 - Data Synchronization
If the pump supports it, the transmitted values are synchronized according to the following groups. This means, that the value of each parameter is _NV, until it is synchronous to all groups it appears in. For Space, the data synchronicity can be activated or deactivated by using the DataGrouping option on the website.
Please note that the group-names do not appear in the transmission.
Please also note that the data synchronicity is by default deactivated.

ALARM_DATA:
- ALARM1
- ALARM2
- INA1
- INA11
- INA12
- INA14
- INA15
- INA16
- INA2
- INA3
- INA5
- INA7
- INA8
- INA9
- LASTDA
- PREALARM
- RUNSTATE

ALERT_DATA:
- DGDALERTHLH
- DGDALERTSLH
- DGDALERTSLL
- DGDSTATUS
- INM12
- INM13

AUTOPROGRAMMING_DATA:
- AUTOPROGSTATE
- DRUGORDERNO
- LASTAUTOPROGERR

BASIC_SERVICE_DATA:
- COMSWVERSION
- GNMODEL
- GNNEW

BATTERY_DATA:
- INAKKU

BOLUS_DATA:
- BOCNT
- BOLTYPE
- BOVAL
- INBOCNT
- INBORT
- INBOVAL
- INVI

BOLUS_DATA_BCC_DOSELINK_SPACE (DataGrouping for this group is only available for Space):
- ACTCHAN
- BOCNT
- BOLTYPE
- BOVAL
- DSSTATUS
- INBOCNT
- INBORT
- INBOVAL
- INM1
- INM10
- INM14
- INM2
- INM3
- INM5
- INM6
- INM7
- INM8
- INVI
- RUNSTATE
- STATUS1
- STATUS2

CURRENT_DRUGLIB_DETAILS:
- DLNAME

CURRENT_INFUSION:
- ACTCHAN
- DGDSTATUS
- DSSTATUS
- INAVRT
- INM1
- INM10
- INM12
- INM13
- INM14
- INM2
- INM3
- INM5
- INM6
- INM7
- INM8
- INRMT
- INRT
- INTIME
- INVI
- INVOLACT
- RUNSTATE
- STATUS1
- STATUS2
- VOLREMAIN

CURRENT_INFUSION_SETTINGS:
- ACTCHAN
- BASRT
- DORT
- DORTU
- DSSTATUS
- INDOCAL
- INM1
- INM10
- INM14
- INM2
- INM3
- INM5
- INM6
- INM7
- INM8
- INVI
- INVTB
- OPMODE
- RUNSTATE
- STATUS1
- STATUS2
- TIMEOFINF

DISPOSABLE_DATA:

DISPNAME
INSYR

DOSE_RATE_DATA:
DRROUNDED
INDCON
INDCONU
INDORT
INDORTU

DOSE_RATE_DATA_SPACE (DataGrouping for this group is only available for Space):
INDOCAL
INDORT
INDORTU
INDCON
INCONU
DRROUNDED
INVTB

DRUG_BOLUS_DATA:
BOLRTHLHIGH
BOLRTSLHIGH
BOLRTSLLOW
BOLVOLHLHIGH
BOLVOLLIMUT
BOLVOLSLHIGH
BOLVOLSLLOW

DRUG_CONT_DATA:
HLHIGH
RTLIMUT
SLHIGH
SLLOW

DRUG_CONT_DATA_BCC_DOSELINK_SPACE (DataGrouping for this group is only available for Space):
HLHIGH
INSOL
INSOLID
RTLIMUT
SLHIGH
SLLOW

DRUG_DISPLAY_DATA:
INSOL
INSOLCOL
INSOLPRIO
INSOLSN

DRUG_INFO:
CAREUNIT
DRUGCAT

PATIENT_DATA:
NURSEID

PATAGE
PATH
PATID
PATIDBADGE
PATIDDRUG
PATSEX
PATW

PCA:
PCAAD
PCABA
PCABR
PCALOT

PRESSURE_LEVELS:
INP1
INP2
INPSOLL

PROGRAM_MODE_DATA:
PROGSTAT

SUPPLEMENTARY_SERVICE_DATA:
DISPCHG
DLCRETIME
DLNAME

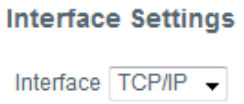
TCI_DATA:
TCIAWA
TCIEFF
TCIMOD
TCIMODEL
TCIPLA
TCITAR
TCIUT

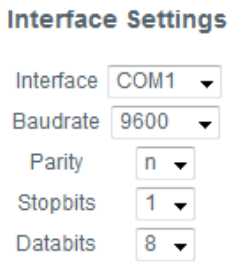
TIMES:
INAKKU
INRMT
INSTBY

3.6 Configuration of BCC protocol

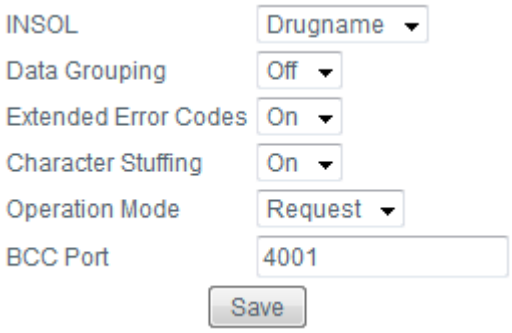
CS-7091 - Configuration of BCC protocol
The configuration of the BCC protocol is done via the website of the ComDevice. Please refer to the documentation of RackFrame and ComDevice for detailed information.
Access the website of the ComDevice, choose 'Configuration' and log in. The default log in credentials are: username 'config'; password 'config'. Then select BCC Protocol settings.

Now you can setup the interface:





Note: In case TCP/IP is selected the following parameter settings like baud rate are not valid any more.
Note: For TCP/IP connection the IP-Port is 4001. This port can be changed:



The **Bed-ID** or Station name of the website of the ComDevice can be changed in "Database settings".
The contents of the BCC protocol can be defined in the following table "BCC Protocol settings".
The settings depend on the required information of the connected Patient Data Management System.

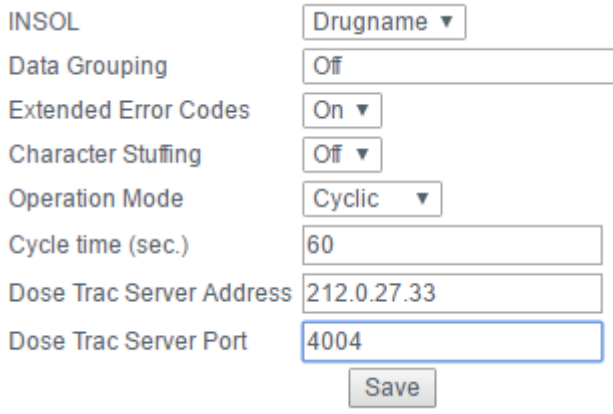
Name	Visible	Name	Visible	Name	Visible	Name	Visible
GNNEW	☑	GNMODEL	☑	INRT	☑	INAVRT	☑
INVTB	☑	INPSOLL	☑	INSOL	☑	INSOLSN	☐
INSOLID	☐	INSYR	☑	INVOLACT	☐	INRMT	☐
INVI	☑	INTIME	☑	INAKKU	☑	INSTBY	☑
INBORT	☑	INBOVAL	☑	INDOCAL	☐	INDCON	☐
INDCONU	☐	INDORT	☐	INDORTU	☐	INBOCNT	☑
INP1	☑	INP2	☑	INNR	☑	INSERNUM	☑
INDTNR	☑	INM1	☐	INM2	☐	INM3	☐
INM4	☐	INM5	☐	INM6	☐	INM7	☐
INM8	☐	INM9	☐	INM10	☐	INM11	☐
INM12	☐	INM13	☐	INM14	☐	INA1	☐
INA2	☐	INA3	☐	INA4	☐	INA5	☐
INA6	☐	INA7	☐	INA8	☐	INA9	☐
INA10	☐	INA11	☐	INA12	☐	INA13	☐
INA14	☐	INA15	☐	INA16	☐	VERSION	☑
OPMODE	☑	DATE	☑	TIME	☑	TIMEOFINF	☑
ALARM1	☑	ALARM2	☑	STATUS1	☑	STATUS2	☑
PREALARM	☑	DGDSTATUS	☑	DGDALERTSLL	☑	DGDALERTSLH	☑
DGDALERTHLH	☑	DISPCHG	☑	PATIDBADGE	☑	PATIDDRUG	☑
PATID	☑	PATW	☑	PATH	☑	PATAGE	☑
PATSEX	☑	BOLTYPE	☑	BOLRTSLLOW	☑	BOLRTSLHIGH	☑
BOLRTHLHIGH	☑	BOLVOLSLLOW	☑	BOLVOLSLHIGH	☑	BOLVOLHLHIGH	☑
BOLVOLLIMUT	☑	ACTCHAN	☑	RUNSTATE	☑	SLLOW	☑
SLHIGH	☑	HLHIGH	☑	RTLIMUT	☑	LASTDA	☑
DRUGCAT	☑	DLNAME	☑	DLCRETIME	☑	NURSEID	☑
DRUGORDERNO	☑	DISPNAME	☑	INSOLPRIO	☑	INSOLCOL	☑
TCIMOD	☑	TCIMODEL	☑	TCIAWA	☑	TCIPLA	☑
TCIEFF	☑	TCITAR	☑	TCIUT	☑	DRROUNDED	☐
PCALOT	☐	PCAAD	☐	PCABR	☐	PCABA	☐
PROGSTAT	☐	AUTOPROGSTATE	☐	LASTAUTOPROGERR	☐	CAREUNIT	☐
COMSERIALNO	☐	COMSWVERSION	☐				

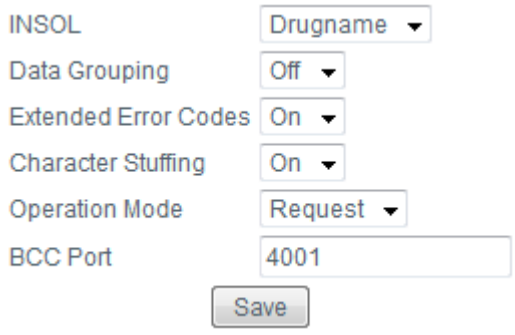
3.6.1 Selection of type of protocol

In case you want to link the website of the ComDevice
to the US software from B. Braun called DoseTrac please select BCC 3.3x as the protocol type. Following settings are set automatically:

- Content of Protocol (parameters from pump, see chapter 0)
- Cyclic sending of data, time to be defined, default is 5 seconds
- Events are send immediately
- Character stuffing is switched off
- DoseTrac Server Address and other required TCP/IP settings have to be entered manually

In case the PDMS is designed to communicated with newer version of BCC, you can select BCC 3.30. In this case you can select the parameter from previous BCC 3.26 and new parameters defined for DoseTrac via ComSystemOnline setting. In addition, you can switch on and off the character stuffing. The Operation mode can be selected in two different modes. **Cyclic** sending or **Request** mode as known from BCC 3.26.





3.6.1.1 INSOL

CS-7092 - INSOL
It is possible to select if you want to send the drug name assigned to a pump or the drug ID which is defined within a drug data base of a pump within the parameter INSOL.

Example:

INSOL = Drugname <RS>,123,50122,INSOL,Fentanyl<RS>
INSOL = DrugID <RS>,123,50122,INSOL,1245~10mg/50$2<RS>

3.6.1.2 Data Grouping

CS-7094 - Data Grouping
Select whether the data synchronicity of key groups should be given or not. See chapter 3.5.

3.6.1.3 Extended Error Codes

CS-7095 - Extended Error Codes
Select whether the extended error codes should be disabled or enabled. See Chapter 3.3.1

3.6.1.4 Character Stuffing

CS-7105 - Character Stuffing
Select whether certain character shall be stuffed or not. See chapter 3.2.3.1.

3.6.1.5 Operation mode

CS-7096 - Operation mode
Since SW G of ComDevice for Space with BCC 3.30 it is possible to select whether data are sent out only on request, like BCC 3.25 and BCC 3.26, or if the information of a pump sent on a defined time base automatically.

Cyclic:
Data are sent out on a fix time base, see Cycle time. In this case all data currently available are sent starting from pump 1 to the last pump in the system. Additionally the ComDevice checks the pump values every second and should any of the selected trigger keys change, it will send the data package of this pump is out immediately.

Note: After each data package of a pump, an <ACK> has to be sent otherwise no further data might be sent by ComDevice. To continue or restart the communication you must send an <ACK> or close and reopen the port at the Server site.

Furthermore note, that should the TCP send buffers of the ComDevice fill up, it will reestablish the TCP connection, so please ensure to have sufficient receive buffer configured (Note that some virtualization solutions intercept TCP connections and do their own buffering).
With the introduction of L80/U60/A10 the send buffers of the ComDevice were increased to 96K Bytes to ensure the receiving systems have sufficient time to send TCP-ACKs. Assuming a full system with 24 Pumps and all parameters selected, this boils down to a tcp-roundtrip time for the messages send by the Com that needs to be less than a second for L80/U60/A10 and less than 20ms for previous versions.

Request:
This mode is similar to the BCC 2.25 and 3.26 setting. With BCC it is now possible to send more data and also not stuffed information. The ComDevice is waiting for a request from an external system, ADMIN:ALIVE to init the communication, or MEM:GET (MEM:GETSLOT#xy) for the request of all defined/activated BCC parameter. In this mode ComDevice is designed as a Server and waits for an incoming connection at the configured Port (Default value is 4001).

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3.6.1.6 DoseTrac Server IP Address

CS-7106 - DoseTrac Server IP Address
This address defines the IP of any server which shall be connected by this ComDevice.

3.6.1.7 DoseTrac Server Port

CS-7107 - DoseTrac Server Port
Defines the TCP/IP port at the server.

4 Appendix

4.1 Unsupported Parameters

4.1.1 Compact Plus

The following keys are not supported for generation Compact^{Plus}:
AUTOPROGSTATE
DGDALERTHLH
DRROUNDED
DRUGORDERNO
INSOLPRIO
LASTAUTOPROGERR
NURSEID
PATAGE
PATID
PATIDBADGE
PATIDDRUG
PATSEX
PCAAD
PCABA
PCABR
PCALOT
PROGSTAT
RUNSTATE
TCIAWA
TCIEFF
TCIMOD
TCIMODEL
TCIPLA
TCITAR
TCIUT

4.2 Document Creation

This document has been created according to the standard Specification template HC-DDDD-A-5-2-04-2-09 (Version 3.0). The associated working copy resides in the ComSystem section of the CoE AIS Polarion database.

4.3 History of changes

Version	Author	Date	Change
1.0	T. Lahmer F. Heerdegen F. Klar T. Schmidt	2016-09-15	Replaced document /TIS BCC/ This document is valid for Compact^{Plus} and Space.

1.1	T. Schmidt T. Lahmer L. Geiger, T. Lahmer	2016-06-01 2016-07-04 2017-02-22	Correct log examples Chapter 3.2.3.1 added note on usage of replace functions to perform destuffing. Fixed definition of INSOLPRIO Updated String format used from ASCII to the format described in chapter 3.2.5.3 to match pump implementation. Chapter 2.3: updated software versions this document is valid for. Chapter 3.4.2 & 3.5: added VOLREMAIN, DORT and DORTU, BOVAL, BORT, BASRT, added Gepts TCI model Chapter 3.2.6: added ability to send _NA instead of _NV Chapter 3.6.1: removed IP from DoseTrac Server IP Address since now also DNS names are allowed
1.2	T. Lahmer	2017-10-27	Chapter 3.4.2.4: ALARM1 Bit 11 – description updated
1.3	L. Geiger	2018-02-27	Chapter 3.4.2: Added variant for INNR, INDTNR for Compact^{Plus} pumps Chapter 3.4.2.5: Bit 18, 25 and 26 are always zero Chapter 3.4.2: Added TCI model Gepts. Chapter 3.5: Updated assemblies Chapter 3.1: Added link to topology
1.4	T. Lahmer	2018-04-17	Chapter 3.2.3 & 3.2.4: Improved description of Bed-Id to ensure to clarify that the "/1/1>" following it do not count towards the length of the bedID
1.5	L. Geiger T. Lahmer	2018-05-11	Appendix 4.1: Added unsupported keys for Compact^{Plus}. Chapter 3.3.1: Extended error codes for Compact^{Plus}.
1.6	L. Geiger T. Lahmer	2018-09-07	Chapter 3.4.2.4, Chapter 3.4.2.6: added additional alarms for Compact^{Plus}
1.7	T. Lahmer	2018-09-11	Chapter 3.4.2.7 Added AutoProgramming error codes from M588_000020 V5.0 - Values 124, 125, 500, 1002, 1003, 1005, 1019-1025, 1054 & 1055 were added - Description of 1026 and 1027 ware updated Chapter 3.6.1.5: Described connection reset due to full send buffers in cyclic mode; Improved description of messages send due to trigger keys.
1.8	L. Geiger T. Lahmer	2018-10-17	Chapter 3.5: Updated assemblies Chapter 3.4.2.4: Updated Compact Plus alarms
1.9	A. Koch T. Lahmer	2018-11-14	Chapter 3.4.2: Adapted limits of PATH to use one decimal place
2.0	T. Lahmer	2018-11-28	Added notes regarding the differences in the behavior of INBOCNT and BOCNT for Compact+ and Space. Updated template to version 3.0 - incorporating all changes of previous minor versions

2.1	T. Lahmer	2019-02-22	CS-7096: - added details on TCP-Roundtrip times - clarified cyclic mode package contends
3.0	T. Lahmer	2019-03-06	CS-7075: - added Space US Software versions and Compact+ Software versions to GNMODEL
4.0	T. Lahmer	2019-03-20	fixed typos CS-7075: was "Additional parameters for BCC 3.6" correct is "Additional parameters for BCC 3.36" Chapter 3.2.3: removed superfluous characters at the end of the chapter

Title: Technical Interface Specification BCC Initiator: Thomas ? Lahmer

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