Revisions		For revision approval date See CN			
Rev	**Pre-CN #**	**Description**	**Date**	**Reviser**	**Approve**
B	RDODC667	Added new flags, cleaned up formatting, updated document name	12/16/2008	P. Pash	T. Beck
C	RDODC4114	Update Setup command for Read Time and Post Meal Alert Delay	05/09/2011	T. Oelmann	R. Wilson
D	RDODC4689	Update command per CCB	09/26/2011	T. Oelmann	P. Pash
E	RDODC5992	Update control information	8/14/2012	T. Oelmann	K. Klem

ACCU-CHEK Aviva, Performa, Nano
(Read-Write)

Communications Protocol Developer's Guideline

	Originators	**Date**
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Table of Contents

1 Purpose

The purpose of this document is to provide the minimum communication protocol for external developers to extract results from an ACCU-CHEK® blood glucose meter. The audiences of this document are software development professionals who are interested in developing an interface between Roche Diagnostics ACCU-CHEK meter and an external host.

This document only provides information for Roche Diagnostic's meters in the family of Aviva, Performa and Nano. Other Roche Diagnostic meters are supported in separate CPDG documents.

2 Disclaimer

The developer using this document to extract data from a Roche Diagnostics meter assumes all responsibility for conforming to this standard. Data extracted from a Roche Diagnostics meter is not to be manipulated by an external process. Data should be used only for transmission to a central repository or data analysis system. Roche Diagnostics is not responsible for inaccurate or misdiagnosis of a patient condition due to mishandling of data extracted from a Roche Diagnostics blood glucose meter.

3 Definitions

bG – Abbreviation for **b**lood **G**lucose.
Host – Device communicating to meter, such as a PC.
IR – Infrared light
Monitor – A blood Glucose monitor, referred to as a meter in this document.
Number – Any sequence of numeric characters ('0'-'9').
Date – A string of ASCII characters that form a date using YYMMDD format.
Time – A string of ASCII characters that represent a time using hhmmss format.
Function – A single ASCII character used as a sub-division of a command.
Fixed Hex Word – Any string of 4 ASCII characters that a hexadecimal number can be formed.
Fixed Hex Double Word – Any string of 8 ASCII characters that a hexadecimal number can be formed.
Hex Word – Any string of 1 to 4 ASCII characters that a hexadecimal number can be formed.
Fixed Hex Byte – Any string of 2 ASCII characters that a hexadecimal number can be formed.
Hex Byte – Any string of 1 to 2 ASCII characters that a hexadecimal number can be formed.
String – Any string of printable ASCII characters.

4 References

4.1 Manuals

ACCU-CHEK Aviva User Manual
Accu-Chek Performa User Manual
Accu-Chek Nano User Manual

4.2 Cables

ACCU-CHEK Infrared Cable (IR-210B Infrared Adapter by TekRam Technology), Roche Diagnostics Catalog No. 3183408

ACCU-CHEK Universal Cable: Roche Diagnostics Catalog No. 03062678001

This document does not provide information for connection to the Roche Diagnostics USB interface cable.

5 Document Legend

Legend:	Example	Description
{ } Hex value represented using ASCII	{4A}	Two bytes, '4' and 'A', are placed into the data stream
< > Serial Control Character	<CR>	Carriage return is placed into the data stream
[ ] Hex value	[4A]	4A hex gets placed into the data stream
→ From host to meter		Represents the direction of data or commands to meter
← From meter to host		Represents the direction of data or commands from meter
^ Control character	^K	The uppercase K is pressed while holding down the CTRL key

Serial Control Characters:

<STX> = [02]	<ETX> = [03]	<EOT> = [04]	<ACK> = [06]
<TAB> = [09]	<LF> = [0A]	<CR> = [0D]	<NAK> = [15]
<CAN> = [18]			

Key Points:

- Input and Output parameters are <TAB> delimited
- All BG results are transmitted in mg/dL units. If mmol/L units are desired, then they **must** be converted using the formula: 1 mmol/L = 18.02 mg/dl

6 ACCU-CHEK Meter Protocol

6.1 Communication Requirements and Serial Port Settings

The ACCU-CHEK meter serial communications are at **9600** baud with **8** data bits, **1** start bit, **1** stop bit and **NO** parity checking. The ACCU-CHEK meter communicates via Infrared (IR). In order for a Host to communicate with the meter, an IR Cable must be attached to the PC. Cables for this function are available from Roche Diagnostics. The ACCU-CHEK meter **must be in Communication mode** to allow serial communications. With the meter powered down, press and hold the left and right arrow buttons at the same time to get the meter into Communication mode. The automatic power off time is 2 minutes.

The protocol shall only support half-duplex communications. When switching from receiving to transmitting, the meter shall insert a 10ms delay before transmitting. When switching from transmitting to receiving, the meter shall expect 10ms delay from the host.

When the meter is receiving data frames, the meter requires a two-millisecond delay between each character. When the meter is transmitting data frames, an inter-character delay may be present.

6.2 Protocol Command Structure

Each command consists of at least a command (one character) and a command terminator. The number of parameters for each command and the allowed parameter range are specified in the command reference.

The meter will echo back each command character and each single parameter character to increase the reliability of the communication protocol as soon as it is received. The command terminator is not echoed back.

Commands can be accepted or rejected by the meter. If the meter accepts the command sent from the host, it will answer with an <ACK> directly after receiving the command terminator.

The meter shall reject commands by sending a <NAK> (after receiving the command terminator) if one of the following cases happened:

- the meter receives an unknown command
- the meter receives unexpected characters within the parameters
- the meter receives invalid number of parameters for the command
- one of the parameters is outside its allowed range
- the meter is in an error state, i.e., the status register is not zero

After receiving an accepted command and answering with <ACK> the firmware starts to execute the command.

After executing the command, the meter will send another <ACK> or <NAK> indicating successful/faulty completion of the command. Any problems while executing the command shall lead to storing the appropriate error number and answering with a <NAK>, otherwise the answer shall be an <ACK>.

If an error occurs in communication mode because of a wrong command or during the execution of the command, the firmware shall send a <NAK> as command response to the host and enter an error state. If the meter is in an error state, it will reject all commands by sending a <NAK> after receiving the command terminator until the error status is read out and cleared. The 'Read and Clear' command is the

only command accepted by the meter if it is in an error state. See Section 9 Status Register Values for definition of error codes.

6.2.1 DATA BLOCKS

Upload and download data shall be transferred in data blocks controlled by <STX> and <ETX> or <EOT> characters. These data blocks will have the following format:

<STX>{# of bytes}<TAB>Data<TAB>{CRC}<ETX> or <EOT>

STX:	STX is the start of packet indicator.
# of bytes:	This is a two-byte ASCII string containing the number of data bytes, including the Tabs, as a hexadecimal number.
TAB:	Used for Field delimitation.
Data:	A stream of ASCII characters
TAB:	Used for Field delimitation.
CRC:	This is a two-byte ASCII string containing the 8-bit checksum value as a hexadecimal number.
ETX:	ETX is used if more data blocks will be sent.
EOT:	EOT is used if this is the last data block to be sent.

6.2.2 MULTIPLE DATA BLOCKS

In upload mode, the host has to send an <ACK> or <NAK> after each received data block. If the host sends, other characters, the meter aborts upload and sets the status to [FD], Aborted Command. In case of <NAK> the meter has to repeat the last data block. The host is notified that the meter has no more data blocks to send by the EOT terminator.

6.2.3 CHECKSUM CALCULATOR

To assure a reliable data transfer process, data blocks are protected by an 8-bit checksum (CRC). The checksum (CRC) is computed by bitwise XORing the data bytes with the previous checksum value. The initial value is [6E]. Only the <TAB>s and the data bytes are included in the checksum calculation, <STX> and # of bytes are not.

	STX	Length		TAB	Data					TAB	CRC		ETX/EOT
Data	<STX>	0	7	<TAB>	A	v	i	v	a	<TAB>	2	7	<EOT>
(Hex)	[02]	[30]	[37]	[09]	[41]	[76]	[69]	[76]	[61]	[09]	[32]	[37]	[04]
CRC	Initial value is [6E]			[67]	[26]	[50]	[39]	[4F]	[2E]	[27]			

6.2.4 COMMAND INTERRUPTION

The host as the communication master has the possibility to interrupt the meter receiving commands by sending a <CAN> character. This cancel command might be necessary e.g. after receiving an unexpected byte echo or wanting to abort a lengthy results download.

In this case the meter shall:

- Throw away all received command/parameter characters,

- Answer a <NAK> to the host,
- Wait for new commands from the host.

At this time, the Host will have to issue the Read and Clear Status Command before issuing any other commands.

The meter is capable of sending a <CAN>. If this happens, the meter will immediately send a <NAK> following the <CAN> and then return to command processing mode waiting for the next command.

6.3 Normal Sequence of Commands for Data Extraction

Example of initialization sequence required by ACCU-CHEK Infrared Cable*

Host	Description
Set DTR := True Set RTS := False Wait (50 us) Send Control Byte = [14] Set RTS := True Set DTR := True Wait (50 us)	[14] sets baud rate to 9600 and sets output pulse to 1.6 ms. See device technical spec for more information.

***No initialization sequence is needed for use with the ACCU-CHEK Universal Cable. However, it may be necessary to send a different initialization sequence if a different IR device (dongle) is used.**

Example of communication required for data results extraction.

Data Stream	Description
→ <CAN> ← <NAK>	Initial communication
→ [0B] ← [0B] → <CR> ← <ACK> ← status stream → <ACK> ← <ACK>	Read and clear status Status stream will be in a data packet, see section 6.2.1
→ [43] ← [43] → [09] ← [09] → [31] ← [31] → <CR> ← <ACK> ← version stream → <ACK> ← <ACK>	Read the software version Version stream will be in a data packet, see section 6.2.1
→ [43] ← [43] → [09]	Read the model number Model number stream will be in a data packet, see section 6.2.1

Data Stream	Description
← [09] → [34] ← [34] → <CR> ← <ACK> ← model number stream → <ACK> ← <ACK>	
→ [43] ← [43] → [09] ← [09] → [33] ← [33] → <CR> ← <ACK> ← serial number stream → <ACK> ← <ACK>	Read the serial number Serial number stream will be in a data packet, see section 6.2.1
→ [53] ← [53] → [09] ← [09] → [33] ← [33] → <CR> ← <ACK> ← units stream → <ACK> ← <ACK>	Read the bG units Units stream will be in a data packet, see section 6.2.1
→ [60] ← [60] → <CR> ← <ACK> ← number of results stream → <ACK> ← <ACK>	Read the number of results stored Number of results stream will be in a data packet, see section 6.2.1
→ [61] ← [61] → [09] ← [09] → [xx] ← [xx] → [09] ← [09] → [yy] ← [yy] → <CR> ← <ACK> ← results stream → <ACK>	Extract meter records Results stream will be in a data packet, see section 6.2.1 Xx and yy represent the beginning and ending record numbers

Data Stream	Description
← <ACK>	
→ [1D] ← [1D] → <CR> ← <ACK> ← <ACK>	Meter power down

7 Commands Reference

7.1 Example of Commands with Parameters

Example of Commands with parameters			
Command Character This section contains the command character.	*This section contains a general description of the command.*		
This section contains the command character plus, if present, the command sub-function. Both the command and the function are one character separated by a <tab>.	**Input/Output Name** This column contains the name of the given parameter.	**Input/Output Type** This column contains the data type information. The data types are defined in Section 3 Definitions.	**Input/Output Range** This column contains limits or range of the given parameter.
	This section typically contains an example of the command, plus additional information such as notes and sources.		

8 ACCU-CHEK Meter Commands

8.1 Connect – <CAN>

Command Character <CAN>	The <CAN> command is used to initialize communication with the meter. <CAN> may also be used to interrupt commands in process.
	Example: Turn on the meter. →<CAN> ←<NAK> **Note:** The host must issue the Read and Clear Status command ([0B]) to clear the NAK response. If the <CAN> command is issued again, a <NAK> character is returned.

8.2 Power Down – [1D]

Command Character [1D]	The 1D command shall power down the meter to "off" state.
	Example: **Turn off the meter, power down in "off" state.** →[1D] ←[1D] →<CR> ←<ACK> ←<ACK>

8.3 Read & Clear Status – [0B] or ^K

Command Character [0B] or ^K	The [0B] or ^K command shall read and clear the meter status.		
	Output Name Status Register	**Output Type** Fixed Hex Word	**Output Range** 0000H – 00FFH
	Example: Initial instrument communications established →[0B] ←[0B] →<CR> ←<ACK> ←<STX>{LEN}<TAB>{ASCII Data}<TAB>{CRC}<EOT> →<ACK> ←<ACK> **Note:** The status register values are defined in the "Status Register Values" section of this document, section 9.		

8.4 Configuration – [43] or 'C'

Command Character
[43] or 'C'

The [43] or 'C' commands shall be used to read information about the meter's configuration.

C<TAB>1 — Read software version number

The C<TAB>1 command shall return the meter software version number

Output Name	Output Type	Output Range
Software Version	String	1 – 7 characters

Example: Version number = B.04

→C
←C
→<TAB>
←<TAB>
→1
←1
→<CR>
←<ACK>
←<STX>{LEN}<TAB>B.04<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

C<TAB>2 — Read meter hardware version number

The C<TAB>2 command shall return the meter's hardware version

Output Name	Output Type	Output Range
Hardware Version	String	1 – 8 characters

Example: Version number = B.04

→C
←C
→<TAB>
←<TAB>
→2
←2
→<CR>
←<ACK>
←<STX>{LEN}<TAB>B.04<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

8.4 Configuration – [43] or 'C'

C<TAB>3 — Read instrument serial number

The C<TAB>3 command shall return the meter's serial number

Output Name	Output Type	Output Range
Serial Number	String	1 – 11 characters

Example: Serial number = 7000000

→C
←C
→<TAB>
←<TAB>
→3
←3
→<CR>
←<ACK>
←<STX>{LEN}<TAB>7000000<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

C<TAB>4 — Read model number

The C<TAB>4 command shall return the meter's model number

Output Name	Output Type	Output Range
Model Number	String	1 – 7 characters

Example: Model number = 535

→C
←C
→<TAB>
←<TAB>
→4
←4
→<CR>
←<ACK>
←<STX>{LEN}<TAB>535<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

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8.4 Configuration – [43] or 'C'

C<TAB>5 — Read transmit time (in sec) for max. records @ 9600 baud

The C<TAB>5 command shall return the time to transmit the maximum number of records at 9600 baud

Output Name	Output Type	Output Range
Max. Transmit Time	Number	0 – 65535

Example: Transmit time = 12000 seconds

→C
←C
→<TAB>
←<TAB>
→5
←5
→<CR>
←<ACK>
←<STX>{LEN}<TAB>12000<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

Note:
The transmit time reported is based on a theoretical model and will vary from the actual time.

C<TAB>6 — Read maximum number of records that can be stored

The C<TAB>6 command shall return the sum of the maximum number of control records and bG review records possible

Output Name	Output Type	Output Range
Max. Number of Records	Number	0 – 520

Example: Maximum number of records = 520

→C
←C
→<TAB>
←<TAB>
→6
←6
→<CR>
←<ACK>
←<STX>{LEN}<TAB>520<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

8.5 Instrument Name – [49] or 'I'

Command Character [49] or 'I'	The [49] or 'I' command shall be used to read the instrument name.		
	Output Name Name	**Output Type** String	**Output Range** 1 – 32 characters
	Example: →I<CR> ←I<ACK> ←<STX>{LEN}<TAB>Aviva<TAB>{CRC}<EOT> →<ACK> ←<ACK> **Note**: The 'Aviva' in this example shall vary by model number. This is an example only.		

8.6 Read Setup – [53] or 'S'

Command Character [53] or 'S'	The [53] or 'S' commands shall allow the host to extract the meter settings from the meter.		
S<TAB>1 — Read date	The S<TAB>1 command shall read the date.		
	Output Name Date	**Output Type** Date	**Output Range** 040101 – 311231 Date format is yymmdd
	Example: February 3, 2004 →S ←S →<TAB> ←<TAB> →1 ←1 →<CR> ←<ACK> ←<STX>{LEN}<TAB>040203<TAB>{CRC}<EOT> →<ACK> ←<ACK>		

8.6 Read Setup – [53] or 'S'

S<TAB>2 — Read time

The S<TAB>2 command shall read the time.

Output Name	Output Type	Output Range
Time	Time	000000 – 235959 Time format is 24-hour

Example: 3:45 PM

→S
←S
→<TAB>
←<TAB>
→2
←2
→<CR>
←<ACK>
←<STX>{LEN}<TAB>154500<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

S<TAB>3 — Read display units

The S<TAB>3 command shall read the display units

Output Name	Output Type	Output Range
Units	String	"mg/dl" or "mmol/l"

Example: Display units = mg/dl

→S
←S
→<TAB>
←<TAB>
→3
←3
→<CR>
←<ACK>
←<STX>{LEN}<TAB>mg/dl<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

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<table>
<tr><td>S<TAB>6 — Read Patient Hypo. Threshold</td><td colspan="3">The S<TAB>6 command shall return the Hypo level</td></tr>
<tr><td></td><td>Output Name
Hypo. Threshold</td><td>Output Type
Number</td><td>Output Range
60 – 80 mg/dL
50 – 90 mg/dL for the Nano family of meters</td></tr>
<tr><td></td><td colspan="3">Example: 66 mg/dl
→S
←S
→<TAB>
←<TAB>
→6
←6
→<CR>
←<ACK>
←<STX>{LEN}<TAB>66<TAB>{CRC}<EOT>
→<ACK>
←<ACK></td></tr>
<tr><td>S<TAB>8 — Read date format</td><td colspan="3">The S<TAB>8 command shall read the date format.</td></tr>
<tr><td></td><td>Output Name
Date Format</td><td>Output Type
Number</td><td>Output Range
1 – 2
1 = ddmmyy
2 = mmddyy</td></tr>
<tr><td></td><td colspan="3">Example: mmddyy
→S
←S
→<TAB>
←<TAB>
→8
←8
→<CR>
←<ACK>
←<STX>{LEN}<TAB>2<TAB>{CRC}<EOT>
→<ACK>
←<ACK></td></tr>
</table>

8.6 Read Setup – [53] or 'S'

S<TAB>9 — Read time format

The S<TAB>9 command shall read the time format

Output Name	Output Type	Output Range
Time Format	Number	1 – 2 1 = 24 2 = 12

Example: 12-Hour

→S
←S
→<TAB>
←<TAB>
→9
←9
→<CR>
←<ACK>
←<STX>{LEN}<TAB>2<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

S<TAB>O — Read beeper status

The S<TAB>O command shall read the beeper status

Output Name	Output Type	Output Range
Beeper Status	Number	0 – 1 (0 = disabled)

Example: Beeper Enabled

→S
←S
→<TAB>
←<TAB>
→O
←O
→<CR>
←<ACK>
←<STX>{LEN}<TAB>1<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

Note:
The O in this command is [4F] and not the number zero.

8.6 Read Setup – [53] or 'S'

S<TAB>V — Test Alert

The S<TAB>V command shall return a time derived from the corresponding alarm hour and alarm minute parameters. Four combinations of alarm hour and alarm minute are possible.

Input Name	Input Type	Input Range
Alert Number	Number	1 – 4
Output Name	**Output Type**	**Output Range**
Alert Time	Time	000000 – 234500

Example: Test Alert 1 at 12:15 PM

→S
←S
→<TAB>
←<TAB>
→V
←V
→<TAB>
←<TAB>
→1
←1
→<CR>
←<ACK>
←<STX>{LEN}<TAB>121500<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

S<TAB>h — Hypo Status

The S<TAB>h command shall return the Hypo status

Output Name	Output Type	Output Range
Hypo Status	Number	0 – 1 (0 = disabled)

Example: Hypo Alert Enabled

→S
←S
→<TAB>
←<TAB>
→h
←h
→<CR>
←<ACK>
←<STX>{LEN}<TAB>1<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

8.6 Read Setup – [53] or 'S'

S<TAB>v — Test Alert Status

The S<TAB>v command shall read the test alert status

Input Name	Input Type	Input Range
Alert Number	Number	1 – 4
Output Name	**Output Type**	**Output Range**
Alert Status	Number	0 – 1 (0 = disabled)

Example: Test Alert 1 Enabled

→S
←S
→<TAB>
←<TAB>
→v
←v
→<TAB>
←<TAB>
→1
←1
→<CR>
←<ACK>
←<STX>{LEN}<TAB>1<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

S<TAB>W— Post Test Marker Prompt

The S<TAB>W command shall return the Meal Marker Status.
NOTE: This command is supported only by the Nano family of meters.

Output Name	Output Type	Output Range
Post Test marker Prompt	Number	0 – 1 (0 = disabled)

Example: Post Test Marker Prompt Disabled

→S
←S
→<TAB>
←<TAB>
→W
←W
→<CR>
←<ACK>
←<STX>{LEN}<TAB>0<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

S<TAB>X— Post Meal Alert Delay

The S<TAB>X command shall return the Post Meal Alert Delay.
NOTE: This command is supported only by the Nano family of meters.

8.6 Read Setup – [53] or 'S'

	Output Name	Output Type	Output Range
	Post Meal Alert Delay	Number	1 – 2 1 = 1 Hour 2 = 2 Hour

Example: Post Meal Alert Delay 1 hour

→S
←S
→<TAB>
←<TAB>
→X
←X
→<CR>
←<ACK>
←<STX>{LEN}<TAB>1<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

8.7 Change Setup – [0C] or ^L

Command Character [0C] or ^L	The [0C] or ^L commands shall allow the host to alter the settings of the meter.
[0C]<TAB>1 — Set date	The [0C]<TAB>1 command shall set the meter's date

Input Name	Input Type	Input Range
Date	Date (yymmdd)	090101 – 311231

Example: Set date to February 10, 2009

→[0C]
←[0C]
→<TAB>
←<TAB>
→1
←1
→<CR>
←<ACK>
→<STX>{LEN}<TAB>090210<TAB>{CRC}<EOT>
←<ACK>

NOTE: Setting the meter to an invalid date will result in a meter error.

8.7 Change Setup – [0C] or ^L

[0C]<TAB>2 — Set time

The [0C]<TAB>2 command shall set the meter's time.

Input Name	Input Type	Input Range
Time	Time (hhmmss)	000000 – 235959

Example: Set time to 3:45 PM

→[0C]
←[0C]
→<TAB>
←<TAB>
→2
←2
→<CR>
←<ACK>
→<STX>{LEN}<TAB>154500<TAB>{CRC}<EOT>
←<ACK>
←<ACK>

[0C]<TAB>6 — Set Patient Hypo. Threshold

The [0C]<TAB>6 command shall set the Hypo level.

Input Name	Input Type	Input Range
Hypo. Threshold	Number (two digits or less including leading zeros)	60 – 80 mg/dL 50 – 90 mg/dL for the Nano family of meters

Example: Set hypo threshold to 66 mg/dl

→[0C]
←[0C]
→<TAB>
←<TAB>
→6
←6
→<CR>
←<ACK>
→<STX>{LEN}<TAB>66<TAB>{CRC}<EOT>
←<ACK>
←<ACK>

8.7 Change Setup – [0C] or ^L

[0C]<TAB>8 — Set date format	The [0C]<TAB>8 command shall set the meter's date format		
	Input Name Date Format	**Input Type** Number	**Input Range** 1 – 2 1 = ddmmyy 2 = mmddyy
	Example: Set date format to mmddyy →[0C] ←[0C] →<TAB> ←<TAB> →8 ←8 →<CR> ←<ACK> →<STX>{LEN}<TAB>2<TAB>{CRC}<EOT> ←<ACK> ←<ACK>		
[0C]<TAB>9 — Set time format	The [0C]<TAB>9 command shall set the meter's time format		
	Input Name Time Format	**Input Type** Number	**Input Range** 1 – 2 1 = 24 2 = 12
	Example: Set time format to 12-Hour →[0C] ←[0C] →<TAB> ←<TAB> →9 ←9 →<CR> ←<ACK> →<STX>{LEN}<TAB>2<TAB>{CRC}<EOT> ←<ACK> ←<ACK>		

8.7 Change Setup – [0C] or ^L

[0C]<TAB>O — Set beeper status	**Input Name** Beeper Status	**Input Type** Number	**Input Range** 0 – 1 (0 = disable)
	Example: **Enable beeper** →[0C] ←[0C] →<TAB> ←<TAB> →O ←O →<CR> ←<ACK> →<STX>{LEN}<TAB>1<TAB>{CRC}<EOT> ←<ACK> ←<ACK> **Note**: The O in this command is [4F] and not the number zero.		
[0C]<TAB>W — Set meal Marker Status	The [0C]<TAB>W command shall set the Meal Marker Status. NOTE: This command is supported only by the Nano family of meters.		
	Input Name Post Test Marker Prompt	**Input Type** Number	**Input Range** 0 – 1 (0 = disable)
	Example: Disable Post Test Marker Prompt →[0C] ←[0C] →<TAB> ←<TAB> →W ←W →<CR> ←<ACK> →<STX>{LEN}<TAB>0<TAB>{CRC}<EOT> ←<ACK> ←<ACK>		

[0C]<TAB>X — Set Post Meal Alert Delay

The [0C]<TAB>X command shall set the Post Meal Alert Delay.
NOTE: This command is supported only by the Nano family of meters.

Input Name	Input Type	Input Range
Post Meal Alert Delay	Number	1 – 2 1 = 1 Hour 2 = 2 Hour

Example: Set Post Meal Alert Delay to 1 hour

→[0C]
←[0C]
→<TAB>
←<TAB>
→X
←X
→<CR>
←<ACK>
→<STX>{LEN}<TAB>1<TAB>{CRC}<EOT>
←<ACK>
←<ACK>

[0C]<TAB>V — Set Alert

The [0C]<TAB>V command shall set a meter alert. If the received alert number is within the alert number range, the command shall set the corresponding alarm hour and alarm minute. Four combinations of alarm hour and alarm minute are possible. For Nano, the hours and minutes are a multiple of a quarter hour. Seconds are ignored and set to 00.

Input Name	Input Type	Input Range
Alert Number	Number	1 – 4
Alert Time	Time	000000 – 234559

Example:
→[0C]
←[0C]
→<TAB>
←<TAB>
→V
←V
→<CR>
←<ACK>
→<STX>{LEN}<TAB>1<TAB>001500<TAB>{CRC}<EOT>
←<ACK>
←<ACK>

Note:
All alert times may only be set for 00, 15, 30 and 45 minutes past the hour.

<table>
<tr><td>[0C]<TAB>h — Set Hypo Status</td><td>The [0C]<TAB>h command shall set the hypo status.
<table>
<tr><th>Input Name</th><th>Input Type</th><th>Input Range</th></tr>
<tr><td>Hypo Status</td><td>Number</td><td>0 – 1
(0 = disable)</td></tr>
</table>
Example: Enable Hypo Alert
→[0C]
←[0C]
→<TAB>
←<TAB>
→h
←h
→<CR>
←<ACK>
→<STX>{LEN}<TAB>1<TAB>{CRC}<EOT>
←<ACK>
←<ACK></td></tr>
<tr><td>[0C]<TAB>v — Set Alert Status</td><td>The [0C]<TAB>v command shall set a meter alert status.
<table>
<tr><th>Input Name</th><th>Input Type</th><th>Input Range</th></tr>
<tr><td>Alert Number</td><td>Number</td><td>1 – 4</td></tr>
<tr><td>Alert Status</td><td>Number</td><td>0 – 1
(0 = disable)</td></tr>
</table>
Example: Enable alert 1
→[0C]
←[0C]
→<TAB>
←<TAB>
→v
←v
→<CR>
←<ACK>
→<STX>{LEN}<TAB>1<TAB>1<TAB>{CRC}<EOT>
←<ACK>
←<ACK></td></tr>
</table>

8.8 Enable/Disable Timers – [5A] or 'Z'

Command Character [5A] or 'Z'	The 5A or Z command shall toggle the meter's timeout timers.		
Z<TAB>0 — Disable selected timeouts	The Z<TAB>0 command shall disable the selected timeouts		
	Input Name Timers	**Input Type** Function	**Input Range** '0' – '9', 'A' – 'F'
	Example: Disable all timeouts →Z ←Z →<TAB> ←<TAB> →0 ←0 →<TAB> ←<TAB> →F ←F →<CR> ←<ACK> ←<ACK> **Note 1**: The '0' in this command is the digit zero and not the letter 'O'. The input parameter is a bit field representing the four available timeouts. The bits are mapped as follows: 0 - Disable auto-power off timer 1 - Disable command timeout 2 - Disable data exchange timeout 3 - Disable inter-character timeout		

8.8 Enable/Disable Timers – [5A] or 'Z'

Z<TAB>1 — Enable selected timeouts

The Z<TAB>1 command shall enable selected timeouts

Input Name	Input Type	Input Range
Timers	Function	'0' – '9', 'A' – 'F'

Example: Enable all timeout

→Z
←Z
→<TAB>
←<TAB>
→1
←1
→<TAB>
←<TAB>
→F
←F
→<CR>
←<ACK>
←<ACK>

Note 1:
The input parameter is a bit field representing the four available timeouts. The bits are mapped as follows:

0 - Enable auto-power off timer
1 - Enable command timeout
2 - Enable data exchange timeout
3 - Enable inter-character timeout

Note 2:
Auto-power off timeout – If the meter goes more than 120 seconds without a button, strip or command being sent it automatically shuts down.

8.9 Obtain Number of Results – [60]

Command Character
[60]

The [60] command shall return the number of results stored in the meter.

Output Name	Output Type	Output Range
Number Records	Number	0 – 520

Example: Number of results = 520

→[60]
←[60]
→<CR>
←<ACK>
←<STX>{LEN}<TAB>520<TAB>{CRC}<EOT>
→<ACK>
←<ACK>

Note 1:
Corrupted records are not transmitted, however are included in the total number of records.

8.10 Send Results from Start to End – [61] or 'a'

Command Character
[61] or 'a'

The [61] or 'a' command shall return the requested range of bG results.

Input Name	Input Type	Input Range
Start Value	Number	1 – Number of records stored
End Value	Number	1 – Number of records stored

Output Name	Output Type	Output Range
Glucose value	Number (mg/dl)	0 – 999
Time	Time (hhmm)	0000 – 2359
Date	Date (YYMMDD)	010101 – 311231
Flags	Fixed Hex Double Word	See bit pattern below.
DM Data Block	empty	empty

8.10 Send Results from Start to End – [61] or 'a'

Example: Read 10 results starting with result 1

→[61]
←[61]
→<TAB>
←<TAB>
→1
←1
→<TAB>
←<TAB>
→1
←1
→0
←0
→<CR>
←<ACK>
←<STX>{LEN}<TAB>120<TAB>2359<TAB>030612<TAB>00000010<TAB><TAB>{CRC}<ETX>
→<ACK>
…
←<STX>{LEN}<TAB>120<TAB>1234<TAB>030612<TAB>00000020<TAB><TAB>{CRC}<EOT>
→<ACK>
←<ACK>

Note:
The flags field will transmit all zeros if no flags are set**.**

Note 1:
Corrupted records are not transmitted, however are included in the total number of records.

Flags:

0x00000000	No flags
0x00000002	Strip warning – Means strips are about to expire. Flag is not used in all models.
0x00000004	Result too low
0x00000008	Result too high
0x00000010	Control solution level 2
0x00000020	Control solution level 1
0x00000400	Control solution level 3*
0x00000040	Result out of temperature range
0x00000200	Result below hypo
0x00000800	User's result below his personal target range or control result below control's target range
0x00001000	User's result above his personal target range or control result above control's target range

8.10 Send Results from Start to End – [61] or 'a'

	0x00004000	General Flag (Asterisk)
	0x00008000	Control not identified
	0x00040000	Before Meal (flag not used in all models)
	0x00080000	After Meal (flag not used in all models)

*Note: This flag is reported with meters that support one control level

8.11 Reset Results Memory – [52] or 'R'

Command Character [52] or 'R'	The [52] or 'R' command shall clear results memory.
	Example: Clear results memory →R ←R →<CR> ←<ACK> ←<ACK> **Note:** This function clears all results memory. This includes both bG and cG results.

9 Status Register Values

Status Value (hex)	Status Register Value Meaning
0000h	No Errors
0001h – 00EFh	Internal Meter Errors
00F0h	Command Canceled
00F1h	STX Expected Error
00F2h	Length Expected Error
00F3h	Not used.
00F4h	Not Used
00F5h	Not used.
00F6h	IR Data Overrun
00F7h	Invalid Number of Bytes
00F8h	Invalid Parameter
00F9h	Invalid Number of Parameters
00FAh	Receive Buffer Full
00FBh	Communication Timeout
00FCh	Command Not Implemented
00FDh	Command Aborted
00FEh	Not Valid Command
00FFh	Initial Communication