

Dear SureStep<sup>®</sup> Meter User:

Thank you for requesting additional information regarding your SureStep Blood Glucose Monitoring Meter. We hope the following **SureStep Meter RS-232 Communication Specification** is helpful to you.

Please note that this specification is not intended to be a substitute for a complete data management software product. We are providing this specification to you with the understanding that you are very familiar with computers and computer programming and will be able to use the information appropriately.

For your information, we have found the use of most standard communications packages extremely helpful in establishing meter to computer communications and performing meter data downloading. Additionally, the use of a commercial spreadsheet program can be useful for data analysis.

If you are interested in obtaining the LifeScan Interface Cable described in this specification, please contact us. Within the U.S. please call the Data Management Professional Line at 1 800 382-7226, M-F, 8AM to 5PM, PST, or send us an e-mail at [LifeScan@lfsus.jnj.com](mailto:LifeScan@lfsus.jnj.com). In Canada please call our Customer Care Line at 1 800 663-5521. Outside of the U.S. and Canada, please contact your local country office for product availability information. A list of countries is available via the [Around The World](#) section of the LifeScan Web site.

Thank you for your interest in LifeScan products.

## SureStep® Meter RS-232 Communication Specification

The following information may be used when attempting to **upload** the SureStep Meter memory to a computer while using a communications package and the LifeScan Interface Cable. The information may also be used to **erase** the Meter's data log. For additional technical information, see the following pages, call our Data Management Line at 1 800 382-7226, or send us an e-mail at [LifeScan@lfsus.jnj.com](mailto:LifeScan@lfsus.jnj.com).

### EQUIPMENT NEEDED

- Meter:** SureStep with data port  
**Cable:** LifeScan Interface Cable  
**Computer:** IBM®, IBM compatible or Macintosh®  
**Adapter:** IBM or compatible: A 25-pin to 9-pin adapter if serial/com port is a 9-pin  
Macintosh: Hayes Modem cable or equivalent  
**Software:** A communications software package

### PROCEDURE

- Cable:** Insert cable into meter data port and available serial/com port on computer.  
**Software:** Select port settings in communications software:  
Baud Rate = 9600 bps                      Data Bits = 8  
Stop Bits = 1                                  Parity = none  
Flow Control = Xon/Xoff                  Com. Port = port # utilized

Initiate the terminal screen of your communications software package. Turn the meter on. The screen should mimic (see section on mimicking at the end of this document) the contents of the SURE STEP®™ display, for example:

```
<0x85>85<CR> - apply sample  
<0x86>86<CR> - insert strip
```

The meter is now communicating with your computer. You may now issue the following commands to download and erase the results stored in the Meter's memory.

- To **download** data, type "**DMP**" - displays the results stored in the Meter's memory.
- To **erase** the data, type "**DMZ**" - erases results stored in the Meter's memory.

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### RS-232 COMMUNICATION

The SureStep Meter supports asynchronous, RS-232 communications via the data port at 9600 baud only. Data are transferred as 8-bit characters with no parity and one stop bit. Communications is via three-wire (RS-232 designations of BA, BB, AB) cable with XON/XOFF handshaking supported on transmissions from the Meter, except for mimicked messages (see end of document).

### RS-232 COMMAND SUMMARY

- DM? - send the Meter's software version and date
- DM@ - send the Meter's serial number
- DM^[nnn] - change or display the Meter's "new data marker"
- DMF - send date and time from the Meter's clock
- DMP - dump data log from the Meter's memory
- DMS... - change or display the Meter's Status
  - DMS? - send all options settings
  - DMSA'x' - change or display the Averages display option
  - DMSB'x' - change or display the current Beep setting
  - DMSD'x' - change or display the Date display format
  - DMSM'x' - change or display the current Memory display option
  - DMSS'x' - change or display the Strip lot calibration code
  - DMST'x' - change or display the Time display format
  - DMSU'x' - change or display the glucose Units
- DMTmm/dd/yy hh:mm[:ss] - set the date and time of the Meter's clock
- DMZ - Zero the Meter's data log

### RS-232 "DM" COMMANDS

Serial commands and responses are encoded as ASCII characters. A checksum is generated for all non "mimicked" messages and the hexadecimal representation of the least significant 16 bits of the checksum (a blank followed by 4 characters) is placed at the end of each response message, just before the carriage return (<CR>), line feed (<LF>) pair.

In order to keep the meter from automatically powering down, the external device should periodically send "DMT<CR>". This causes the meter to respond with "T 0054" and to reset the automatic power-down time-out to 2 minutes. Note that the "DMS...", "DMP", and "DM^" commands also reset the automatic power-down time-out to 2 minutes.

Commands are handled in the order they are received. Note that some commands require termination with a carriage return (<CR>) while others do not. Also note that brackets (" [ ]") denote optional parameters and are NOT part of the actual command. The 'DM' prefix is not echoed by the meter.

**Note: It may take the meter a moment to respond. Please wait at least 2 seconds before sending another command. If the meter does not respond to a command after 2 seconds, re-send the command. For higher performance, wait about 50 milliseconds between sending each character of the command. If no response to command after about 100 milliseconds, then re-send the command.**

<u>Command</u>	<u>Action / Response</u>
DM?	Returns the software version number and creation date, where “x” is the calibration data block format code (“R” for example), “nn.nn.nn” is the software version number (“01.00.00” for example), and “mm/dd/yy” is the software creation date.  ?xnn.nn.nn mm/dd/yy cksm<CR><LF>
DM@	Returns the meter’s unique, twelve-digit serial number assigned during calibration. This command is intended to be used to identify the meter connected to an external device’s serial port.  @ “LXXXXRBXXXXX” cksm<CR><LF>
DM^[nnn]<CR>	Changes the current “new-data-marker” to “nnn” (0 - 150) and returns the new value. If “nnn” is invalid or not specified, the current setting is returned. This value represents the number of readings taken since the “new-data-marker” was last set. For example, if only the most recent 100 results were desired, sending “DM^100” would effectively erase results older than the most recent 100 results. Sending “DM^150” recovers all the results. Sending “DM^0” erases all results. Note that this command manipulates the datalog information record, but does not affect any of the stored results.  ^ nnn cksm<CR><LF>
DMF	Returns the current date and time from the meter’s clock in the selected time and date formats. F “dow”, “mm/dd/yy”, “hh:mm:ss xM” cksm<CR><LF> for (M-D-Y, AM/PM) F “dow”, “mm/dd/yy”, “hh:mm:ss ” cksm<CR><LF> for (M-D-Y, 24:00) F “dow”, “dd/mm/yy”, “hh:mm:ss xM” cksm<CR><LF> for (D-M-Y, AM/PM) F “dow”, “dd/mm/yy”, “hh:mm:ss ” cksm<CR><LF> for (D-M-Y, 24:00) “dow” (“day-of-week”) = SUN, MON, TUE, WED, THU, FRI, or SAT.

### Command

### Action / Response

DMP

Dumps the datalog from the meter's memory. The response is always transmitted in the selected units, date, and time formats. A header is sent first, which contains information about the format of the data and how many records will follow. Each datalog record is transmitted next. Leading zeros are suppressed.

#### HEADER

P nnn, "LXXXXRBXXXXX", "ENGL. ", " M.D.Y. ", "AM/PM", "MG/DL "  
 (1) (2) (3) (4) (5) (6)  
 cksm<CR><LF>

- (1) Number of datalog records to follow (0 - 150)
- (2) Meter serial number (12 characters)
- (3) Always "ENGL. "
- (4) Date format (M-D-Y shown)
- (5) Time format (AM/PM shown)
- (6) Unit of measure for glucose values (mg/dL shown)

#### EACH DATALOG RECORD

P "dow", "mm/dd/yy", "hh:mm:00 xM", "xxxxx ", n cksm<CR><LF>  
 (7) (8) (9) (10) (11)

- (7) Day-of-week (SUN, MON, TUE, WED, THU, FRI, SAT)
  - (8) Date of reading in selected format (M-D-Y shown)
  - (9) Time of reading in selected format (AM/PM shown)
  - (10) Result format:
    - " nnn " - blood test result (mg/dL)
    - " nn.n " - blood test result (mmol/L)
    - " HIGH " - blood test result > 500 mg/dL
    - "C nnn " - control solution test result (mg/dL)
    - "C nn.n " - control solution test result (mmol/L)
    - "CHIGH " - control solution test result > 500 mg/dL
    - " ERn " - error result (n = 1 to 6)
  - (11) n is always 0.
- (The sixth character will be a question mark if the datalog record checksum is bad.)

DMSn

Invalid 'DMS' sub-command ("n") received. The valid 'DMS' sub-commands are (? , A, B, D, M, S, T, and U)

S 0053<CR><LF>

DMS?

Return all user options settings.

S? Sn Bn Un Mn An Tn Dn cksm<CR><LF>  
 S0-SK : Strip Cal. Code (0 - 9 corresponds to 1 - 10, A - K corresponds to 11 - 21)  
 B0|B1 : Beeper (0 = ON, 1 = OFF)  
 U0|U1 : Units (0 = mg/dL, 1 = mmol/L)  
 M0|M1 : Memory display (0 = ON, 1 = OFF)  
 A0|A1 : Average display (0 = ON, 1 = OFF)  
 T0|T1 : Time format (0 = AM/PM, 1 = 24:00)  
 D0|D1 : Date format (0 = M-D-Y, 1 = D-M-Y)

<b>Command</b>	<b>Action / Response</b>
DMSAx	Change and/or return the averages display option. SA0, "AVERAG" 02EA<CR><LF> - select averages display in memory mode SA1, "NO AVG" 02D0<CR><LF> - skip averages display in memory mode SA+, "xxxxxxx" cksm<CR><LF> - toggle, return new setting SA?, "xxxxxxx" cksm<CR><LF> - invalid command, return current setting
DMSBx	Change and/or return the current Beep setting. Beeper sounds if turned ON or left ON. SB0, "BEEP" 0291<CR><LF> - turn ON, return new setting SB1, "NOBEEP" 02EF<CR><LF> - turn OFF, return new setting SB+, "xxxxxxx" cksm<CR><LF> - toggle, return new setting SB?, "xxxxxxx" cksm<CR><LF> - invalid command, return current setting
DMSDx	Change and/or return the Date format. SD0, "M.D.Y." 030B<CR><LF> - select month/day/year, return new setting SD1, "D.M.Y." 030C<CR><LF> - select day/month/year, return new setting SD+, "xxxxxxx" cksm<CR><LF> - toggle, return new setting SD?, "xxxxxxx" cksm<CR><LF> - invalid command, return current setting
DMSMx	Change and/or return the memory display option. SM0, "MEMORY" 0319<CR><LF> - select display of most recent result SM1, "NO MEM" 02DD<CR><LF> - skip display of most recent result SM+, "xxxxxxx" cksm<CR><LF> - toggle, return new setting SM?, "xxxxxxx" cksm<CR><LF> - invalid command, return current setting
DMSSx	Change and/or return the current Strip lot calibration code (SCC). SS0, "CODE 1" 02B2<CR><LF> - set SCC = 1 : SS9, "CODE10" 02CB<CR><LF> - set SCC = 10 SSA, "CODE11" 02D4<CR><LF> - set SCC = 11 : SSK, "CODE21" 02DF<CR><LF> - set SCC = 21 SS+, "CODEnn" cksm<CR><LF> - increment SCC (wrap from 21 to 0), return new setting SS?, "CODEnn" cksm<CR><LF> - invalid command, return current setting
DMSTx	Change and/or return the Time format. ST0, "AM/PM" 02C1<CR><LF> - select AM/PM, return new setting ST1, "24:00" 0288<CR><LF> - select 24 hour, return new setting ST+, "xxxxxxx" cksm<CR><LF> - toggle, return new setting ST?, "xxxxxxx" cksm<CR><LF> - invalid command, return current setting
DMSUx	Change and/or return the glucose Units setting. SU0, "MG/DL" 02BB<CR><LF> - select mg/dL, return new setting SU1, "MMOL/L" 02F9<CR><LF> - select mmol/L, return new setting SU+, "xxxxxxx" cksm<CR><LF> - toggle, return new setting SU?, "xxxxxxx" cksm<CR><LF> - invalid command, return current setting

<b>Command</b>	<b>Action / Response</b>
DMTmm/dd/yy hh:mm[:ss] <CR>	Sets the meter clock with the specified date (entered in M-D-Y format) and time (entered in 24 hour format). If seconds are not specified, seconds are set to zero. Returns the new meter clock date and time after the clock has been successfully set, or returns "T 0054" if the date and/or time specified was invalid. The date must be specified as "month-day-year", and the separator can be slash ("/") or dash ("-"). The clock setting range is 1/1/92, 00:00:00 through 12/31/22, 23:59:59. The date and time returned will be in the selected time and date formats. "dow" ("day-of-week") is always in English (SUN, MON, TUE, WED, THU, FRI, or SAT). This command will also reset the automatic shut-off time to 2 minutes.  T "dow" , "mm/dd/yy" , "hh:mm:ss xM" cksm<CR><LF> for (M-D-Y, AM/PM) T "dow" , "mm/dd/yy" , "hh:mm:ss " cksm<CR><LF> for (M-D-Y, 24:00) T "dow" , "dd/mm/yy" , "hh:mm:ss xM" cksm<CR><LF> for (D-M-Y, AM/PM) T "dow" , "dd/mm/yy" , "hh:mm:ss " cksm<CR><LF> for (D-M-Y, 24:00) T 0054<CR><LF> - specified date and/or time invalid
DMZ	Zeros the meter's datalog stored in EEPROM and resets the meter.  Z 005A<CR><LF>

### **MIMICKING**

The SureStep Meter "mimics" its LCD screen by transmitting messages containing screen and beep information. Each possible screen or beep has a number associated with it. These numbers are displayed in Table 1. Only values from 0x80 to 0xFF are used. The format for mimic messages is described below:

Format: The syntax for mimic strings is as follows:

*s*[*t*][*f*]*CK*< CR>

where each element is defined as follows:

- s* - Screen/beep number (0x80 to 0xFF). Bit six is set if a low battery condition exists.
- t* Optional. Contains the characters displayed on the three seven-segment characters on the Sure Step screen. If no characters are displayed with these digits on the Sure Step screen then this field is not needed, though it may still be included as three spaces.
- f* Optional. Contains the characters displayed on the four seven-segment characters on the Sure Step screen. If no characters are displayed with these digits on the Sure Step screen then this field is not needed, though it may still be included as four spaces.
- CK*< CR> - Two character hexadecimal representation of 8-bit checksum of previous characters. Is followed by carriage-return character.

Mimic messages are not preceded or followed by XON or XOFF characters. Mimic messages NEVER have a line-feed character following the carriage-return character. Refer to Table 1 for complete set of mimic messages.

## SureStep® Meter RS-232 Communication Specification

The following Table displays the number associated with each screen displayed by the SureStep and the different beeps. This table was constructed with the intention of assigning certain bits in the mimic message number with certain icons on the LCD screen.

Number	Screen Or Beep Assigned To Number
0x80	Blank screen
0x81	mg/dL enunciator
0x82	mmol/L & decimal point enunciators
0x83	Swab icon
0x84	Strip icon
0x85	Apply sample (strip, hand, & drop icons)
0x86	Insert strip (strip, blood on strip, & insert arrow icons)
0x87	Remove strip (strip & remove arrow icons)
0x88	Memory icon
0x89	Memory & mg/dL enunciators
0x8A	Memory, mmol/L, & decimal point enunciators
0x8B	Battery icon
0x8C	Clock icon
0x8D	CODE enunciator
0x8E	AM/PM enunciator
0x8F	Beep I
0x90	3 characters
0x91	3 characters & mg/dL enunciator
0x92	3 characters, mmol/L & decimal point
0x93	3 characters & swab icon
0x94	3 characters & strip icon
0x95	3 characters & apply sample (strip, hand, & drop) icons
0x96	3 characters & insert strip (strip, sample, & insert arrow) icons
0x97	3 characters & remove strip (strip & remove arrow) icons
0x98	3 characters & memory icon
0x99	3 characters, memory icon & mg/dL icon
0x9A	3 characters, memory icon, mmol/L, & decimal point
0x9B	3 characters & battery icon
0x9C	3 characters & clock icon
0x9D	3 characters & CODE icon
0x9E	3 characters & AM/PM enunciator
0x9F	Beep II
0xA0	3 characters & 4 characters
0xA1	3 characters, mg/dL, & 4 characters
0xA2	3 characters, mmol/L, decimal point, & 4 characters
0xA3	3 characters & date with hyphen
0xA4	3 characters, mg/dL & date with hyphen
0xA5	3 characters, mmol/L, decimal point, & date with hyphen
0xA6	3 characters & time with colon (24:00)
0xA7	3 characters & mg/dL & time with colon (24:00)
0xA8	3 characters, mmol/L, decimal point, & time with colon (24:00)
0xA9	3 characters & time with colon (AM)
0xAA	3 characters, mg/dL & time with colon (AM)



## SureStep® Meter RS-232 Communication Specification

Number	Screen Or Beep Assigned To Number
0xAB	3 characters, mmol/L, decimal point, & time with colon (AM)
0xAC	3 characters & time with colon (PM)
0xAD	3 characters, mg/dL & time with colon (PM)
0xAE	3 characters, mmol/L, decimal point, & time with colon (PM)
0xAF	Beep III
0xB0	Memory icon, 3 characters, & 4 characters
0xB1	Memory icon, 3 characters, mg/dL, & 4 characters
0xB2	Memory icon, 3 characters, mmol/L, decimal point, & 4 characters
0xB3	Memory icon, 3 characters & date with hyphen
0xB4	Memory icon, 3 characters, mg/dL & date with hyphen
0xB5	Memory icon, 3 characters, mmol/L, decimal point, & date with hyphen
0xB6	Memory icon, 3 characters, & time with colon (24:00)
0xB7	Memory icon, 3 characters, mg/dL, & time with colon (24:00)
0xB8	Memory icon, 3 characters, mmol/L, decimal point, & time with colon (24:00)
0xB9	Memory icon, 3 characters, & time with colon (AM)
0xBA	Memory icon, 3 characters, mg/dL, & time with colon (AM)
0xBB	Memory icon, 3 characters, mmol/L, decimal point, & time with colon (AM)
0xBC	Memory icon, 3 characters, & time with colon (PM)
0xBD	Memory icon, 3 characters, mg/dL, & time with colon (PM)
0xBE	Memory icon, 3 characters, mmol/L, decimal point, & time with colon (PM)
0xBF	Unused
0xC0 – 0xFF	0xC0 through 0xFF are equivalent screens with the battery icon displayed

**CABLING**

We recommend using the Interface Cable from LifeScan. This cable can be used to connect a SureStep Meter to the serial port (communication port) of an IBM®, or compatible, personal computer. The LifeScan Interface Cable may be adapted for use with a Macintosh® computer by using a Hayes Modem, or equivalent, cable which will interface the DB-25 connector to the Macintosh communication port.

For cable availability, please contact us. In the U.S., please call the LifeScan Data Management Line at 800 382-7226, M-F, 8AM-5PM, PST, or send us an e-mail at [LifeScan@lfsus.jnj.com](mailto:LifeScan@lfsus.jnj.com). In Canada, please call our Customer Care Line at 800 663-5521. For cable availability outside of the U.S. and Canada, please contact your local country office. A list of countries is available via the [Around The World](#) section of the LifeScan Web site.

LifeScan Interface Cable Pin-out:

<u>DB-25 pin</u>	<u>RS-232 Signal</u>	<u>Description</u>
2	TXD	transmitted data from computer to Meter
3	RXD	received data from Meter to computer
4	RTS	request to send from computer
6	DSR	data set ready to computer (connected to DTR)
7	GND	signal ground
20	DTR	data terminal ready from computer

The following conditions must be met to enable the LifeScan Interface Cable to work with the SureStep Meter:

1. The computer must assert (apply a positive RS-232 voltage to) RTS and/or DTR. Either or both of these signals supply power to the cable circuitry.
2. The computer may leave RTS "open" but may not drive it to a negative RS-232 level.
3. The computer communications port must be set to 9600 baud, 8 data bits, no parity, and one stop bit.