OneTouch® Ultra®2 Blood Glucose Meter RS-232 Communication Protocol

Software Developer

Please note that this protocol is not intended to be a substitute for a complete data management software product. We are providing this protocol to you with the understanding that you are very familiar with computers and software development, and will be able to use the information appropriately. This protocol has been reviewed, but it is expected that you will formally test and validate the use of this information with your software product. LifeScan will not be liable for any damages whatsoever.

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OneTouch® Ultra®2 Meter RS-232 Communication Protocol

The following information may be used when attempting to **upload** the OneTouch® Ultra®2 Meter memory to a computer with the OneTouch® Interface Cable.

EQUIPMENT NEEDED

Meter: OneTouch® Ultra®2

Cable: OneTouch® Interface Cable (25-pin, 9-pin or USB)

Computer: IBM® compatible personal computer

Adapter: An adaptor may be required depending on the computer and version of the OneTouch® Interface Cable. For Example: IBM® compatible personal computer: A 25-pin to 9-pin adapter if serial/com port is a 9-pin.

Cable: Connect OneTouch® Interface cable to an available serial or USB port on the computer. Insert the OneTouch® Interface cable stereo plug into the OneTouch® Ultra®2 data port that is located at the bottom of the meter.

Software: A communications software package, such as HyperTerminal.
Select port settings in communications software:

Baud Rate = 9600 bps	Data Bits = 8
Stop Bits = 1	Parity = none
Flow Control = None	Com Port = port # utilized

Initiate the terminal screen of your communications software package. Leave the meter powered **OFF**. The computer screen will be blank until several seconds after you enter a command.

Preparing a Text File

The command text file should be prepared using a HEX Editor and saved. All commands should be preceded by HEX values 11, 0d, 0a, (Meter Acknowledgement Command) followed by the Data Management Command (DM command) required.

For Example: to send the command DMF (See below for definition)

Using the HEX Editor create the following and save as a text file.
11 0d 0a 44 4d 46

Running of DM command
To run the DM command it will have to be in the form of a ".txt" file.

If using HyperTerminal, use the **Transfer – Send Text File** command.
For Example: The DMF command file will look like this when opened in the editor.

□
DMF

This text has the following functional components:
□ = Meter Acknowledgement command (displayed as text –see above for HEX values)
DMF = DM command "F" - upper case text

The Meter Acknowledgement command **must precede** any DM command sent so as to wake up the meter prior to receiving the DM command.

Sending the DM commands by typing directly into the terminal is not possible.

RS-232 Data Management Command Summary

These are the text commands that follow the meter acknowledgement command

- DM? - send the Meter's software version and date
- DM@ - send the Meter's serial number
- DMF - send date and time from the Meter's clock
- DMP - upload blood and control records from the Meter's memory
- DMSU? - Display the glucose **U**nits
- DMST? - Display the **T**ime format (AM/PM or 24hr)

OneTouch® Ultra®2 supports these Data Management commands.

RS-232 Data Management Commands
Serial commands and responses are encoded as ASCII characters. A checksum is generated for all 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.
Commands are handled in the order they are received. They must be sent to the meter in upper case only. The 'DM' prefix is not echoed by the meter. The meter will respond to only one 'DM' command at a time. If more than one command is sent, the meter will respond only to the first command sent.
After sending the ".txt" file, please wait a few moments after the computer sends the command to the meter. The meter will momentarily power itself on and transmit the data. Once the data download is complete, the meter will power itself off. It may take the meter several seconds to respond. Please wait at least 20 seconds before entering another command. If the meter does not respond to a command after 20 seconds, re-send the command.
Any commands sent to the meter will be queried. If found to be an unrecognised command then the meter will not respond and return to sleep mode.

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RETURNED DATA STRINGS

Command	Action / Response
DM?	Returns the software version number and creation date, where "x" is the calibration data block format code ("M" for example), nn.nn.nn" is the software version number ("71.00.00" for example), and "mm/dd/yy" is the software creation date. The month, day, and year portion of the date will be blank. ?xnn.nn.nn<space> mm/dd/yy<space> cksm<CR><LF>
DM@	Returns the meter's unique serial number (MeterSN). This command is intended to be used to identify the meter connected to an external device's serial port. The command will always return a letter "Y" in the right most character field to identify the meter as a OneTouch® Ultra®2. @<space> "XXXXXXXXY"<space>cksm<CR><LF>
DMF	Returns the current date and time from the meter's clock. F<space>"dow","mm/dd/yy","hh:mm:ss<space><space><space>"<space>cksm<CR><LF> "dow" ("day-of-week") = SUN, MON, TUE, WED, THU, FRI, or SAT.

Command	Action / Response
DMP	Transfers the blood and control solution records from the meter's memory in ASCII text format. A header is sent first, which contains information about the format of the data and how many records will follow and includes the meter's unique serial number (MeterSN). Each datalog record is transmitted next. Leading zeros are not suppressed. HEADER P<space>nnn,"MeterSN","MG/DL<space>"<space>cksm<CR><LF>" (1) (2) (3) (1) Number of datalog records to follow (0 – 500) (2) Meter serial number (9 characters) (3) Unit of measure for glucose values EACH DATALOG RECORD P<space>"dow","mm/dd/yy","hh:mm:ss<space><space><space>"," (4) (5) (6) (4) Day of week (SUN, MON, TUE, WED, THU, FRI, SAT) (5) Date of reading (6) Time of reading (If two or more readings were taken within the same minute, they will be separated by 8 second intervals) nnnnnn", (7) (7) Result format: <space><space><space>xxx<space> <space><space>xxx<space> blood test result (mg/dL)* <space><space>xxx? blood test result (mg/dL)* with parity error C<space>xxx<space> for control test record (mg/dL)* C<space>xxx? for control test record (mg/dL)* with parity error "t","cc",<space>00<space>cksm<CR><LF> (8) (9) (8) "t" Alpha value for user flag (see Table1 below) (9) "cc" Numerical value from 00-11 to represent a user meal comment (fixed to two chars) (see Table2 below) * please note that only mg/dL values are returned

Command	Action / Response
DMSU?	Return the glucose Units setting of the meter. SU?,"MG/DL<space>"<space>cksm<CR><LF> - return current setting SU?,"MMOL/L"<space>cksm<CR><LF> - return current setting
DMST?	Return the time format setting of AM/PM or 24:00 ST?,"AM/PM<space>"<space>cksm<CR><LF> ST?,"24:00<space>"<space>cksm<CR><LF>

All data returned from commands sent are returned as decimal values.

Table 1 Meal Flag Definitions

Flag Value	Flag Name	Flag Description
N	None	No Flag Allocated
B	Before Meal	User flags the record as being taken before a meal
A	After Meal	User flags the record as being taken after a meal

Table 2 Meal Comment Definitions

Comment Value	Comment Name
00	No Comment
01	Not Enough Food
02	Too Much Food
03	Mild Exercise
04	Hard Exercise
05	Medication
06	Stress
07	Illness
08	Feel Hypo
09	Menses
10	Vacation
11	Other

CABLING

We recommend using a OneTouch® Interface Cable. These cables can be used to connect a **OneTouch® Ultra®2 Meter** to the communication port of an IBM® compatible personal computer.

DB-9 pin	RS-232 Signal	Description
2	RXD	received data from Meter to computer
3	TXD	transmitted data from computer to Meter
4	DTR	data terminal ready from computer
5	GND	signal ground
6	DSR	data set ready to computer (connected to DTR)
7	RTS	request to send from computer
8	CTS	clear to send to computer (connected to RTS)

USB	USB Signal	Description
1	Vcc	5 Volts supply
2	D-	Bi-directional differential signals
3	D+	Bi-directional differential signals
4	Gnd	Ground

The following conditions must be met to enable the OneTouch® Interface Cable to work with the **OneTouch® Ultra®2 Meter**:

1. The computer must assert (apply a positive RS-232 voltage to) RTS and/or DTR to power the cable circuitry.
2. The computer may leave RTS "open" but may not drive it to a negative RS-232 level.

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