UA-767PC RS-232C Command Sets and Data Format Specification

Version 2.1 (Updated on Jan. 28, 2002)

1. General Information

UA-767PC has five different modes. They are defined as follows:

Stand-by mode: UA-767PC shows the hour and minute of current time. It is under low power stage.

Communication mode: This is when UA-767PC receives an RS-232C command from the host.

Measurement mode: This is when the "START" button is pushed by the patient. The cuff will start inflating.

Display mode: This is the time to show current measurement results on the LCD display.

Time setting mode: After pressing the "CLOCK setting" button, patient can enter the current time and date into the UA-767PC.

Memory Display Mode: Show the previous measurements results on the LCD display.

The software is designed to move among these modes. Please refer to the following table. "Yes" means that the move is allowed. "No" means that the move is not allowed. "N/A" means that UA-767PC is already in this mode.

From / To	Stand-by	Communication	Measurement	Display	Time setting	Memory display
Stand-by	N/A	Yes	Yes	No	Yes	Yes
Communication	Yes	N/A	No / Yes *	No	No	No
Measurement	Yes	No	N/A	Yes	No	No
Display	Yes	No	No	N/A	No	No
Time setting	Yes	No	No	No	N/A	No
Memory display	No	No	Yes	No	No	N/A

* : No – The measurement from the "START" button is disabled. "Yes"- "Measurement can start with a RS-232C command.

2. Transmission Protocol

Method: Asynchronous transmission, bi-directional

Baud rate: 9600 bps

Data bit: 8 bit

Parity: none

Start bit: 1 bit

Stop bit: 2 bits

Code: ASCII

X-ON/OFF: Yes, used
DTR & RTS: No, not used

3. Communication Procedure

- UA-767PC will enter Communication Mode by detecting an active-low signal from the RS-232C communication port. This can be achieved by send any command from the host to UA-767PC. Basically, this command wakes up the UA-767PC and changes it from the "Stand-by Mode" to the "Communication Mode". This is the only time that UA-767PC will not respond an "ACK" or "NAK" back to the host.

- When UA-767PC is in the Communication Mode, you will see "------" dashes on the LCD display. With the dashes shown on the LCD display, you need to issue the "05" command to open the communication port. Once the communication port is opened, you will see the dashes start moving on the LCD display. Please refer to the next page for the open port command in detail. Basically, the UA-767PC is ready to receive other commands, such as "10" to retrieve data. You need to close the communication port by issuing a "04" command which will stop the movement of the dashes. There is a 5 minutes time-out (between X ON and X OFF commands). If there is no communication activities in 5 minutes, UA-767PC will exit Communication Mode and enter Stand-by Mode.

- Use of X-parameter: Data output is triggered when the buffer is full. As an exception, it is activated when the unit is in emergency stop. Receiver side terminates data output when it receives X OFF command. And then, retrieve data output when it receives X ON command, at the point of previous data termination. (X OFF = 13H, X ON = 11H). X-parameter transmission = 1 byte.

- NAK response: Maximum limit of continuous NAK code is 3 times. By receiving this code, error trap routine should be taken due to hazardous condition on hardware or software.

- Minimum response time from receiving command to processing is 100 msec. In other word, a command will be executed after 100 msec from receipt of the command. The maximum response time from receiving command to processing is 3 seconds.

4. Control Codes

Code (HEX)	Descriptions

06	(ACK) Response (yes)
15	(NAK) Response (no)
11	(XON) Retrieve communication
13	(XOFF) Temporary stop of transmission

PC/externals to UA-767PC

ASCII Code	Descriptions
30 + 34	End of transmission (OFF LINE request)
30 + 35	Open communication port (ON LINE request)
31 + 30	Inquire BP & pulse data from memory
31 + 31	Inquire preset event(s) information
31 + 32	Clear all BP & pulse data in memory
31 + 33	Inquire time & date information
33 + 30	Set event(s)
33 + 31	Set time & date
34 + 30	Start blood pressure measuring
37 + 30	Inquire device ID
37 + 31	Set device ID

Note: After "34 + 30" command, the UA-767PC will inflate, deflate, and show the BP results on the LCD automatically. At that time, patient can either press the blue START button or wait 60 seconds. UA-767PC will go back to the "COMMUNICATION" mode and is ready to receive other commands from the host.

Communication Data Format

1. Control Data ("ACK" or "NAK" response, etc.) Format

"SH"(fixed)	Data Send From	Data Send To	Control Code
01(HEX)<1byte>	2 bytes "PC" (50+43) for PC "70"(37+30) for UA767PC	2 bytes "70"(37+30) for UA767PC "PC"(50+43) for PC	1 byte 06(HEX):ACK 15(HEX):NAK

* Example: ACK Response (from UA-767PC to PC)

  |01|37+30|50+43|06|

* Example: NAK Response (from PC to UA-767PC)

  |01|50+43|37+30|15|

2. Command Data (Request Data or Condition, etc.) Format

"SX"(fixed)	"C"(fixed)	Data Send From	Command Code	Check SUM
02(HEX)<1byte>	43(HEX)	2 bytes	2bytes	1 byte, Sum totals w/o "SX"

* Example: Request of open communication port (from PC to UA-767PC)

|02|43|50+43|30+35|3B|

-Check SUM: 43+50+43+30+35=13b(HEX) (setting 1 byte only)

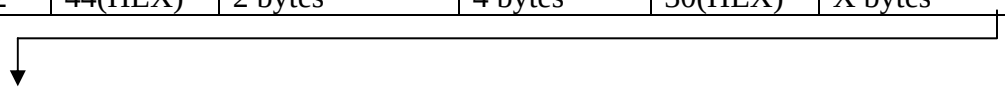
* Example: Request Measurement Data (from PC to UA-767PC)

|02|43|50+43|31+30|37|

-Check SUM: 43+50+43+31+30=137(HEX) (setting 1 byte only)

3. Data (Measurement data, Condition data, etc)

"SX"	"D"(fixed)	Data Send From	Data Length	"0"(fixed)	Request Data	Check SUM
02	44(HEX)	2 bytes	4 bytes	30(HEX)	X bytes	1 byte



*** Data Format**

-Measurement Data and clock data

|SYS - DIA| DIA | PUL | 30+30 | 30+30 | Year | Month | Day | Hour | Min | 30+30 |

Each section has 2 bytes. **Total: 22 bytes for each measurement**

* Example: No data in memory. The response back to PC is as follows:

|02|D7000000[sum] --→ Data length is "0000" with no data. Request Data is omitted.

* Example: Measurement Data (from UA767PC to PC)

On 3/30/1998 at 13:05 with measurement 120(SYS) 80(DIA) and 60(PULSE)

|02|44|37+30|30+30+31+36|30|32+38|35+30|33+43|30+30|30+30|
|36+32|30+33|31+45|30+44|30+35|30+30|[SUM]

Data length=16(HEX), SYS-DIA=28(HEX), DIA=50(HEX), PULSE=3C(HEX)
Year=62(HEX), Mon=03(HEX), Day=1E(HEX), Hour=0D(HEX), Minute=05(HEX)
Year is calculated from minus YYYY by 1900 and presents the result in HEX. In the example, 1998-1900 is 98. In HEX, 98 is 62. 2001 can be converted to 65(HEX).

For the data length, we have only one measurement in the example. Each BP measurement has 22 bytes of data. So, 22 bytes in hex is 16. If you have 3 BP measurements in the memory to transfer, you will have 66 bytes (22 x 3) of data. In hex, 66 bytes is 42. So, you will have |30+30+34+32| in the data length bytes.

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* Example: Clock Data (from PC to UA767PC)
(05/29/2002-15:20)
|02|44|50+43|30+30+30+41|30|36+36|30+35|31+44|30+46|31+34|sum|

PC Site		UA-767PC Site
|02|CPC31[sum] - - - - ->		
	<- - - - -	|01|70PC|06| - - ACK
|02|DPC000A066051D0F14[sum] - - - ->		
	<- - - - -	|01|70PC|06|

* Example: After receiving clock inquiry command from PC. UA-767PC will respond as follows. Assume the clock information in UA-767PC is 06/22/1999 14:20.

PC Site		UA-767PC Site
|02|CPC13[sum] - - - - ->		
	<- - - - - - - - - -	|01|70PC|06| - - ACK
	<- - - - - - - - - - -	|02|D70000A06306160E14[sum]
|01|PC70|06| - - - - - - - - - ->		

* Example: Set device ID = 1234A142P4 from PC to UA-767PC

PC Site		UA-767PC Site
|02|CPC71[sum] - - - - ->		
	<- - - - -	|01|70PC|06| - - ACK
|02|DPC000A01234A412P4[sum] - - - ->		
	<- - - - -	|01|70PC|06|

* Example: Inquire device ID from PC to UA-767PC with ID=C4152A1234. The factory default setting for the device ID is 0000000000.

PC Site		UA-767PC Site
|02|CPC70[sum] - - - - ->		
	<- - - - -	|01|70PC|06| - - ACK
	<- - - - -	|02|D70000A0C4152A1234[sum]
01PC7006 - - - - - - - - - ->		

* Example: Set 6-programmable events at 6:10, 8:25, 10:40, 15:30, 20:50, and 22:05.

PC Site		UA-767PC Site

|02|CPC30[sum] - - - - ->

<- - - - - |01|70PC|06| - - ACK

|02|DPC00200000000060A08190A280F1E1432160500[sum] - - - ->

<- - - - - |01|70PC|06| - - ACK

Note 1: Each event has four bytes, two bytes for hour and the other two bytes for minutes. The total data length is fixed at 32 bytes (0020). So, we need to add six 0's at the beginning of the events and two 0's at the end. If you have only one event at 8:25, the signal will be as follows from PC to UA-767PC:
|02|DPC00A000819000[sum]

Note 2: In order to remove the programmable events, UA-767PC needs to receive the "HOUR" field more than or equal to 24. For example, 24:00 will disable that specific event.