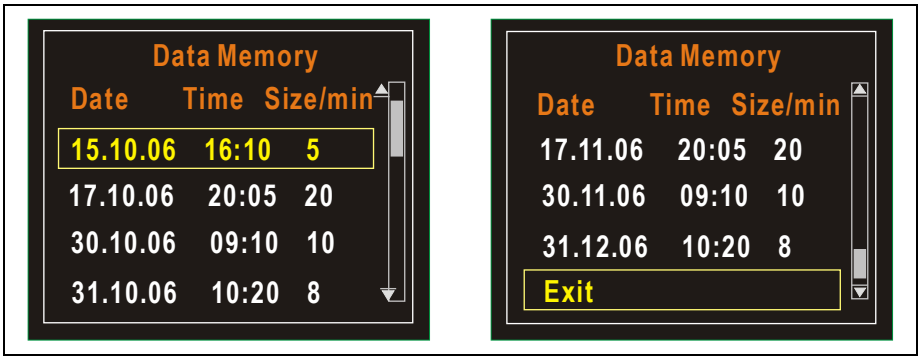
OxyTrue A
UART Protocol for PC Software
V3.2

Changelog

Date	Version	Edited by	changes	Approved by
	V 1.00	Qiao	draft	
27.09.2007	V 2.00	Qiao		WP
30.10.2007	V 3.00	Qiao	Modified time between samples to from 4 to 8 seconds to match 48h data storage	WP
30.10.2007	V 3.10	WP	Added section 3. about calculation of chechsum	HB
30.10.2007	V 3.20	HB	Added explanation about alarm limits	HB

Data management：



The data on the memory of the OxyTrue A is stored as the list on the above figure. Totally 50 files/recorders can be stored and the total time is about 27 hours at a rate of 4 seconds to store a data.

USB communication protocol

The communication between the PC and the OxyTrue A was taken through the USB connection. Here a USB to UART change IC has been used. So through USB port of PC, we can achieve the UART communication. Also, the USB driver software should be installed before the communication.

The content of communication is as following:

The start data of the record, SpO2 value, Pulse rate, Alarm setting.

The length of the file or the data can be calculated through the total received bytes of the data, because between two continue bytes, the time are 8 seconds.

The PC software can automatically detect the available COM port and scan which port is the right port for this device.

The communication between PC and the device is through data package. There are two types of data in the communication: command and data.

Command for PC sending to the device:

0xfe+0xfe （command）	0x05 （parameter of the command）	0x01 （verification

When USB connection is on, the UART of the device is ready。
The PC can scan the serial port and if correct port is found, the PC can send out the command as listed above to ask the device send out all memory data to the PC.

Command for OxyTrue A sending to the PC:

1) Send all memory data to PC

Flag of ready to receive	File 1	…	File n (n<=50)		Flag of sending over

Note:
Flag of ready to receive is 10 byte of 0x00；
Flag of sending over is 10 个 byte 的 0xfc;

2) File format for File 1, 2 …, n：

File directory information（8bytes）	Data information	Verification （1byte）	Flag of sending over

A. **File** directory information:

File No.（1byte）	File length（2byte）	Start of the record（5byte）

Note:
File No. is the ID of the file in the memory. The maximum file number is 50. After 50 files have been reached, the new file will overwrite the first file that is the oldest file.
File length is the total data number in one file. For every 8 seconds one data will be stored, the total data number is calculated as following:
For example, there is a file directory information data:
0x01,0x02, 0x04,0x07,0x03,0x1a,0x10,0x12
Here,
0x01: File No.
0x02, 0x04:File length is (0x02)*256+0x04=516 SpO2 data, and total measurement time of this file: 516*8=4128S

The start of the record is 5Bytes:
For example：0x07, 0x03, 0x1a, 0x10
0x07: 2007 (Year)
0x03: March (Month)
0x1a: 26th (Day)
0x10: 16 (Hour)
0x12: 18 (Minute)
So the start of the record is: March 26,2007,16:18

B. **Data information:**

Every 4 seconds the device will store one data onto the memory. The data information includes: Alarm setting, SpO2 reading, Pulse reading

Alarm setting	SPO2 reading（1byte）	Pulse reading (1byte)

Alarm setting

In order to save memory space, not every 8 seconds the alarm setting will be stored together with the spo2 and pulse rate reading. But Only after the alarm setting has been changed, the alarm setting will be updated.

Alarm setting:

0xfd,…0xfd	SPO2 up limit（46~100）	SPO2low limit （ 45-99）	Pulse up limit （ 21-300）	Pulse low limit （ 20-299）

Note:

the number of 0xfd is not fixed， it is possible for this number to be 2,4,6 or 8.

The number of the alarm limit value is not fixed,so if the alarm limit value can not be stored in the remaining space of the memory page,it will be stored in another memory page,so that the left space in the previous page will be filled with 0xfd.

Followed the several 0xfd， there are four alarm settings.

For example, the following data serials is the two measure value, there is no alarm setting change in the first measure, but in the second measure the alarm setting has been changed.

0x62,0x50,0xfd,0xfd,0xfd,0xfd,0x64,0x55,0x80,0x30,0x63,0x51,

First measure:

0x62:SPO2 reading

0x50: Pulse rate reading

Second measure:

0xfd: indicate that the alarm setting was changed (the number of 0xfd can be 2， 4， 6， or 8. But here it is 4)

0x64:SPO2 alarm up limit (the MSB bit of this byte is the P8 of the pulse rate up limit)

0x55 SPO2 alarm low limit (the MSB bit of this byte is the P8 of the pulse rate low limit)

0x80: Pulse rate up limit (the low 8 bits)

0x30 Pulse rate low limit (the low 8 bits)

0x63:SPO2 reading

0x51:Pulse Rate reading

SpO2 reading

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
P8	S6	S5	S4	S3	S2	S1	S0

Pulse Rate reading

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
P7	S6	S5	S4	S3	S2	S1	S0

SPO2 reading0-100;

Pulse Rate reading 20-300;

The MSB of the SPO2 reading (Bit7) is the P8 of the Pulse Rate reading；If P8=1，it means that the pulse rate is more than 255.

For example1：0xe4, 0x03,
The SpO2 reading is: 0xe4-0x80=100;
Pulse rate reading is 256+0x03=259;

For example2：0x64, 0x50
The SpO2 reading is 0x64=100;
Pulse Rate reading is 0x50=80;

C．Flag of file over：
10 bytes of 0xff;

Checksum calculation

The all data in one package were added into the checksum, but only the last byte has been stored as the checksum. Of course, the 10 byte of 0x00 which are the flag of ready to receive and 10 byte of the 0xfc which are the flag of sending over will not be added into the checksum.