

# Berry Protocol (v1.5)

## 1、Bluetooth Service Information (UUIDs):

Comm Service:	49535343-FE7D-4AE5-8FA9-9FAFD205E455
Send Characteristic:	49535343-1E4D-4BD9-BA61-23C647249616
Receive Characteristic:	49535343-8841-43F4-A8D4-ECBE34729BB3
Rename Characteristic:	00005343-0000-1000-8000-00805F9B34FB
MAC Address Characteristic:	00005344-0000-1000-8000-00805F9B34FB

PS: Host application should use the notification of the 'Send Characteristic' for package fetching.

## 2、Device Packet (Device to Host):

<b>Packet length:</b>	20 bytes
<b>Packet rate:</b>	Adjustable (Default is 100Hz)

### Packet Format:

Byte0: 0xff	Head mark1
Byte1: 0xaa	Head mark2
Byte2: PktIndex	Packet index
Byte3: Status	Measurement status info
Byte4: SpO2Sat	Averaged blood oxygen saturation
Byte5: SpO2SatReal	Real time blood oxygen saturation
Byte6: PulseRate	Averaged pulse rate (i.e. heart rate)
Byte7: PulseRateReal	Real time pulse rate (i.e. heart rate)
Byte8: rrInterval	Low byte of rrInterval
Byte9: rrInterval	High byte of rrInterval
Byte10: PerfuIndex	Averaged blood perfusion index
Byte11: PerfuIndexReal	Real time blood perfusion index
Byte12: PlethWave	Plethysmography wave of blood oxygen
Byte13: ADCSample	Lowest byte of signed int32 ADCSample
Byte14: ADCSample	Lower byte of signed int32 ADCSample
Byte15: ADCSample	Higher byte of signed int32 ADCSample
Byte16: ADCSample	Highest byte of signed int32 ADCSample
Byte17: Battery	Battery power in percent
Byte18: PacketFreq	Current packets sending frequency
Byte19: Checksum	Checksum of the whole packet

PktIndex:	Range (0~255), the index of the current packet
Status:	0x01 SpO2 Sensor Off
	0x02 No finger
	0x04 No pulse signal
	0x08 Pulse Beat Tips

SpO2Sat:	Range (35~100, invalid value=127), unit: %
SpO2SatReal:	Range (35~100, invalid value=127), unit: %
PulseRate:	Range (25~250, invalid value=255), unit: bpm
PulseRateReal:	Range (25~250, invalid value=255), unit: bpm
rrInterval:	RR Interval (heart beat interval), Range (40~600, invalid value=0), Unit: number of samples $rrInterval(ms) = rrInterval * 5ms$
PerfuIndex:	Range (1~200, invalid value=0), unit: ‰
PerfuIndexReal:	Range (1~200, invalid value=0), unit: ‰
PlethWave:	Range (1~100, invalid value=0)
ADCSample:	Range ( $-2^{31}$ ~ $2^{31}$ ), signed int32, Infrared light adc sample
Battery:	Range (0~100), unit: %
PacketFreq:	Current packets sending frequency valid values: 1, 50, 100, 200, means 1Hz, 50Hz, 100Hz, 200Hz
Checksum	Range (0~255) Formula: Checksum = $(Byte0 + Byte1 + \dots + Byte18) \% 256$ , % is mod operator

### 3、Host Command (Host to Device):

Command length: 1 byte

Command type:

0xf0	-----	50 Hz Package rate
0xf1	-----	100 Hz Package rate (Default)
0xf2	-----	200 Hz Package rate
0xf3	-----	1 Hz Package rate
0xf4	-----	ADCSample is Original sampling waveform
0xf5	-----	ADCSample is Filtered sampling waveform
0xf6	-----	Stop sending packet
0xff	-----	Get Software Version
0xfe	-----	Get Hardware Version

Software Version Package Example (20 bytes):

0xff 0xaa 0x53 0x56 0x31 0x2e 0x30 0x34 0x2e 0x30 0x30 0x2e 0x33 0x36 0x00  
0x00 0x00 0x00 0x00 0x3a  
0xff 0xaa ----- Packet head mark  
0x53 ----- ASCII 'S', mark of software version  
0x56 0x31 0x2e 0x30 0x34 0x2e 0x30 0x30 0x2e 0x33 0x36 ----- ASCII string  
'V1.04.00.36', current software version content  
0x00 0x00 0x00 0x00 0x00 ----- Padding bytes of packet  
0x3a ----- Checksum byte

Hardware Version Package Example:

```
0xff 0xaa 0x48 0x56 0x32 0x2e 0x30 0x00 0x00 0x00 0x00 0x00 0x00 0x00
0x00 0x00 0x00 0x00 0x00 0xd7
0xff 0xaa ----- Packet head mark
0x48 ----- ASCII 'H', mark of hardware version
0x56 0x32 0x2e 0x30 ----- ASCII string 'V2.0', current hardware version content
0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 ----- Padding
bytes of packet
0xd7 ----- Checksum byte
```

Demo source code:

Android:

BLE demo: <https://github.com/zh2x/SpO2-BLE-for-Android>

iOS:

Swift demo: <https://github.com/zhuchengji-berry/BluetoothDemo>

Flutter:

Dart demo: [https://github.com/mz-myfc/bci\\_demo](https://github.com/mz-myfc/bci_demo)