

MicroLifeDevice SDK (WBP Office - Windows)

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Revise history

Date	Document Version	Description
2022/5/19	1.0	First release.
2022/5/27	1.1	Adding resting time, interval timing range in 4.1.4
2023/8/22	1.2	Adding section 3-1-17. Read device SN
2023/9/22	1.3	Adding section 6-16. (0Fh-00) Read serial number from BPM

Chapter 1 Development Environment

This user manual serves as a quick guide to MicroLifeDeviceSDK / APIs and shows how to integrate into a Windows C# Demo App.

Development Environment in the following

Compatible Development Tools	Microsoft Visual Studio 2019 (recommended)
Programming language:	C#
Target framework:	.NET Standard 2.0

Importing steps are described below.

1.1. First of all, add WBP_Office.dll & Connection.dll into a development project.

1.2. Import class as bellows.

```
using WBP_Office.Class;
```

```
using Connection;
```

```
using Connection.Class;
```

Chapter 2 Connection Sequence of WBP_Office

The WBP_Office object is applied managing the USB/Bluetooth communication.

2.1 Initiate WBP_Office Object with API key and set connected/disconnected/received data delegation for WBP_Office.

```
office = new WBP_Office.WBP_Office("");
office.OnConnected += Office_OnConnected;
office.OnDisConnected += Office_OnDisConnected;
office.OnReceived += Office_OnReceived;
```

2.2 Call InitDeviceWatcher to initialize WBP_Office monitoring for USB/Bluetooth status.

```
office.InitDeviceWatcher();
```

2.3 Connection

2.3-1 For USB, the OnConnected delegate will be called automatically when the device is connected to the computer via USB.

2.3-2 For BLE, Call ConnectWithBLE API with device's BLE id, the OnConnected delegate will be called automatically when the device is connected successfully.

2.4 When the data is transferred via USB/Bluetooth, OnReceived delegate will receive the parsed data.

2.5 The OnDisConnected delegate will be called when the device is disconnected.

The following is the sample code.

```
private static WBP_Office.WBP_Office office;

0 references
public MainWindow()
{
    InitializeComponent();
    office = new WBP_Office.WBP_Office("");
    office.OnConnected += Office_OnConnected;
    office.OnDisConnected += Office_OnDisConnected;
    office.OnReceived += Office_OnReceived;
    office.InitDeviceWatcher();
}

1 reference
private void Office_OnReceived(Command command)
{
}

1 reference
private void Office_OnConnected()
{
}

1 reference
private void Office_OnDisConnected()
{
}
```

Chapter 3 APIs of WBP_Office

This chapter will explain the application of each API and the meaning of its parameters. Because this device supports remote measurement, some commands such as remote start measurement need to be waited for the machine's response after the command is sent, and the API will only reply whether the command itself is successfully sent or not.

3-1.Send Command to device

	(bool Success, Command Command) SendMessage (Message message, Func<Command, bool> predicate = null, int retry = 3, bool ResetCommand = true, int timeout = 0);
Function	Transmit message to the Device.
Return object	Success: Indicates whether the command was successfully written to the device. Command: A class containing parsed data and message which sent to the device, described in 4-1-1. ** If the Success is true, and the Command.CMD is not NACK, the device has successfully received this command.
Parameter	Message: A class containing message which sent to the device. Predicate: If the command requires additional data, it will be provided here. Retry: Retry times ResetCommand: Whether to clear the last command timeout: timeout in milliseconds ** The contents of the above parameters are generated by the following API.

****The following commands will receive a response immediately after they are sent.**

3-1-1. Read all history data from BPM

Command	dataReadAll
API	SendMessage(WBP_Office.SendMessage.ToCommand.dataReadAll());
Return Command Data Type.	The object type of Command.data is MData class, which is a class containing parsed BP data, described in 4-1-2.

3-1-2. Clear the all history data of the BPM

Command	dataClear
API	SendMessage(WBP_Office.SendMessage.ToCommand.dataClear());
Return Command Data Type.	None. ** If the Success is true, and the Command.CMD is not NACK, the device has successfully received this command.

3-1-3. Read user ID and version data from BPM.

Command	userInfoRead
API	SendMessage(WBP_Office.SendMessage.ToCommand.userInfoRead());
Return Command Data Type.	The object type of Command.data is UserInfo class, which is a class containing parsed user's information data, described in 4-1-3.

3-1-4. Write a new user ID to BPM.

Command	userIDWrite
API	SendMessage(WBP_Office.SendMessage.ToCommand.userIDWrite(string ID));
Return Command Data Type.	None. ** If the Success is true, and the Command.CMD is not NACK, the device has successfully received this command.
Parameter	ID: User ID string to be written

3-1-5. Read BPM setting values from BPM.

Command	settingRead_BPM_Function
API	SendMessage(WBP_Office.SendMessage.ToCommand.settingRead_BPM_Function());
Return Command Data Type.	The object type of Command.data is Setting_BPM class, which is a class containing parsed BPM setting data, described in 4-1-4 .

3-1-6. Write BPM setting values to BPM.

Command	settingWrite_BPM
API	SendMessage(WBP_Office.SendMessage.ToCommand.settingWrite_BPM(Setting_BPM setting));
Return Command Data Type.	None. ** If the Success is true, and the Command.CMD is not NACK, the device has successfully received this command.
Parameter	setting: BPM Setting to be written, described in 4-1-4 .

3-1-7. Read device ID and info from BPM.

Command	deviceIDRead
API	SendMessage(WBP_Office.SendMessage.ToCommand.deviceIDRead());
Return	The object type of Command.data is DeviceID_and_Info class, which is a

Command Data Type.	class containing parsed Device ID & info data, described in 4-1-5 .
--------------------	---

3-1-8. Read device Time from BPM.

Command	timeRead
API	SendMessage(WBP_Office.SendMessage.ToCommand.timeRead ());
Return Command Data Type.	The object type of Command.data is DateTime.

3-1-9. Write device Time to BPM.

Command	timeWrite
API	SendMessage(WBP_Office.SendMessage.ToCommand.timeWrite(DateTime dateTime));
Return Command Data Type.	None. ** If the Success is true, and the Command.CMD is not NACK, the device has successfully received this command.
Parameter	dateTime: DateTime to be written.

3-1-10. Read BPM function setting value from BPM.

Command	settingRead_BPM_Function
API	SendMessage(WBP_Office.SendMessage.ToCommand.settingRead_BPM_Function ());
Return Command Data Type.	The object type of Command.data is Setting BPM Function class, which is a class containing parsed BPM function data. These values are set at the factory and are only available for reading and cannot be rewrite, described in 4-1-6 .

3-1-11. Read BTmodule name from BPM.

Command	bluetoothnameRead
API	SendMessage(WBP_Office.SendMessage.ToCommand.bluetoothnameRead());
Return Command Data Type.	The object type of Command.data is string.

**** The following commands should be waited for a follow-up response from the BPM after they are sent, and the responding data will be received from OnReceived delegate.**

3-1-12. Read central BP memory data by index from BPM

Command	dataRead
API	SendMessage(WBP_Office.SendMessage.ToCommand. dataRead (int index, DataFormat format));;
Parameter	Index :Data index. format : A Enum of format, described in 4-2-6 .
received from OnReceived delegate.	command.CMD : dataRead command.Data : The object type of Command.data is Data class, which is a class containing CBPdata & CalCBP data, described in 4-1-7 .

3-1-13. Start remote measurement

Command	StartRemoteMeasurement
API	SendMessage(WBP_Office.SendMessage.ToCommand. StartRemoteMeasurement (DataFormat format));;
Parameter	format : A Enum of format, described in 4-2-6 .
received from OnReceived delegate.	command.CMD : StartRemoteMeasurement command.Data : The object type of Command.data is format Enum, which is a Enum of format, described in 4-2-6 ..

3-1-14. Stop remote measurement

Command	StopRemoteMeasurement
API	SendMessage(WBP_Office.SendMessage.ToCommand. StopRemoteMeasurement ());;
Parameter	none.
received from OnReceived delegate.	command.CMD : StopRemoteMeasurement

****The following Commands are sent by the device actively, and the software does not need to send any Command.**

3-1-15. RemoteStatus

received from OnReceived delegate.	command.CMD : RemoteStatus command.Data : The object type of Command.data is Remote_Measurement_Status class, which is a class containing remote measurement status data, described in 4-1-8 .
---	---

3-1-16. MeasurementResults

received from OnReceived delegate.	command.CMD: MeasurementResults command.Data: The object type of Command.data is MData_Measurement class, which is a class containing remote measurement result data, described in 4-1-9 .
---	---

****The following Commands can only be used when the Device's Protocol ID is greater than or equal to 2.0.0.1. For Protocol ID, please refer to 3-1-3 and 4-1-3.**

3-1-17. Read device SN

Command	deviceSNRead
API	SendMessage(WBP_Office.SendMessage.ToCommand. deviceSNRead ());
Return Command Data Type.	command.CMD: deviceSNRead command.Data: The object type of Command.data is String.

Chapter 4 Class & Object of WBP_Office

4-1 Class

4-1-1.Command Class

Name:	Command
Definition	A class containing parsed data and message sent to the device.
members	byte CMD : Record the current command, if it is NACK, it means the transmission failed. byte Device :Record the device.type. object Data : parsed data

4-1-2.MData Class

Name:	MData
Definition	A class containing parsed BP data.
members	int CPP :The value of CPP. int CDIA : The value of CDIA. int CSBP : The value of CSBP bool CBP_Error : Record if this is a CBP error. int PVR_length :The value of PVR length. int Mean_CBP_data :The value of mean CBP data. int MAP :The value of MAP. bool Afib : true : afib detected bool WithPVPWave : true : PVP Wave included in measurement. bool Start_of_a_manual_measurement : true : start of a manual measurement detected bool LowBattery : true : low battery detected(battery contains < 4.75V) DateTimeOffset Time : Record time int Hr : heart rate int DiaStole :The value of diastole int Systole :The value of systole ** If the Condition is EmptyBattery or BPErrror, these three values are 0. ** If Heart rate>=240 or <30, Hr will be 0, and note HI(Heart rate>=240), LO(Heart rate <30) in Code. bool AverageCalculationWhenMeasurement : Send Average calculation when measurement to APP. true : Average is not include first memory data when measurement. false : Average is include first memory data when measurement.

	Condition Condition: A Enum of Condition, described in 4-2-1. int Index: Data index bool Anti_Artifact: true: anti-artifact detected List<string> Code: List of error codes or special cases, described in 4-3-1
--	--

4-1-3. UserInfo Class

Name:	UserInfo
Definition	A class containing parsed user' s information data.
members	string UserID: User ID, maximum 30 characters string FMVersion: FW version in BPM, send the ASCII code DateTimeOffset FMDate: The release date of firmware. int MaxMemory: Maximum of memory data can be saved for every user. bool CBP: true:CBP Enbale. bool Afib: true:AFIB Enbale bool IHB: Deprecated true:IHB Enbale float BatteryVoltage: Voltage of the device battery. string ProtocolID: Protocol ID arrhythmiaDisplay arrhythmiaDisplay: Display arrhythmia name in software. It may be one of NONE, IHB, PAD described in 4-2-2

4-1-4. Setting_BPM Class

Name:	Setting_BPM
Definition	A class containing parsed BPM function data.
members	int AUS_HI_infPressure: Highest inflation pressure of AUS mode Valid parameter: 0(not setting), 160, 180, 200, 220, 240 int HI_infPressure: Highest inflation pressure of Auto mode Valid parameter: 0(not setting), 160, 180, 200, 220, 240 int RestTime: Rest time of auto mode Start countdown base on rest time before 1st measurement in auto mode. Available settings are 1, 15,30,60,120, 180,240,300 secs. int IntervalTime: Interval time of auto mode. Start countdown base on interval time before 2nd~6th measurement in auto mode. Available settings are 15,30,60,120, 180,240,300 secs. int AutoMeasureNumber: It' s number of measurements in auto mode. bool SW_AUTO_hide: true: Don't show readings during rest time in auto mode. false: Show readings during rest time in auto mode.

	<p>bool SW_SEL_silent: true: Beeper disabled. false: Beeper enabled</p> <p>bool SW_AUS_Hide: true: Don't show cuff pressure during deflation in AUS mode. false: Show cuff pressure during deflation in AUS mode.</p> <p>bool SW_AVG_no_include_first: true: Average excludes first memory data. false: Average includes first memory data.</p> <p>bool SW_CBP: true: CBP measurement enabled. false: CBP measurement disabled</p> <p>bool SW_AFib: true: AFib measurement enabled. false: AFib measurement disabled</p> <p>AMPM SW_AMPM: A Enum of AMPM, described in 4-2-3.</p> <p>PressureUnit SW_Kpa: A Enum of PressureUnit, described in 4-2-4.</p>
--	---

4-1-5. DeviceID_and_Info Class

Name:	DeviceID_and_Info
Definition	A class containing parsed Device ID and information data.
members	<p>string ID: Device ID string</p> <p>ConnectType ConnectType: A Enum of ConnectType which would be one of the following, described in 4-2-5</p> <p>BothOfUSBAndBT: Device support USB & BT.</p> <p>USBOnly: Device only support USB.</p> <p>int Mea_times: Total number of measurements</p> <p>int[] ErrorCount: The array of the total number of errors is recorded in the order of error1,error2,error3,error5,errorF.</p>

4-1-6. Setting_BPM_Function Class

Name:	Setting_BPM_Function
Definition	A class containing parsed Device ID and information data.
members	<p>bool Fun_SEL_AFib:</p> <p>true: AFIB algorithm ON.</p> <p>false: AFIB algorithm OFF.</p> <p>bool Fun_SEL_CBP_algo:</p> <p>true: CBP algorithm ON.</p> <p>false: CBP algorithm OFF.</p> <p>AMPM Fun_SEL_AMPM: A Enum of AMPM setting, described in 4-2-3.</p> <p>o24: only 24hr</p> <p>o12: select 24hr or 12hr by UI</p> <p>bool Fun_SEL_CBP_CL:</p> <p>true: Enable CBP clinical data transmission.</p>

	<p>false: Disable CBP clinical data transmission.</p> <p>bool Fun_SEL_AutoTest:</p> <p>true: AutoTest ON.</p> <p>false: AutoTest OFF.</p> <p>bool Fun_SEL_Bluetooth:</p> <p>true: Bluetooth function ON.</p> <p>false: Bluetooth function OFF.</p> <p>bool Fun_SEL_UnitKpa:</p> <p>true: select Kpa or mmHg by UI.</p> <p>false: only mmHg.</p> <p>bool Fun_SEL_RS232:</p> <p>true: LabView data transmission ON.</p> <p>false: LabView data transmission OFF.</p>
--	--

4-1-7. Data Class

Name:	Data
Definition	A class containing parsed CBP and CalCBP data.
members	<p>DataFormat Format: A Enum of format, described in 4-2-6</p> <p>List<int> CBPData: A list of CBPData.</p> <p>List<int> CalCBP: A list of CalCBP Data.</p>

4-1-8. Remote_Measurement_Status Class

Name:	Remote_Measurement_Status
Definition	A class containing parsed remote measurement status data.
members	<p>Status Status: A Enum of remote status which would be one of the following, Wait_countdown_for_next_measurement/Start_BP_measurement /Manual_press_IO_to_stop_measurement. described in 4-2-7,</p> <p>int Measurement_Number: Send current measurement number in auto mode.</p> <p>int Measurement_Total: Send total measurement number in auto mode.</p> <p>int Countdown: Send current countdown time in auto mode.</p> <p>int TotalMeasurementTime: Send total measurement time (seconds) in auto mode. Total measurement are count between 1st measurement to last measurement. (exclude rest time)</p>

4-1-9. MData_Measurement Class

Name:	Remote_Measurement_Status
Definition	A class containing parsed remote measurement status data.
members	int History_Measurement_Times: The history measurement times store in

	<p>memory.</p> <p>int Current_Measurement_Times: Send current measurement times to APP.</p> <p>byte[] RawData: Raw Data. From device.</p> <p>Because this class inherits from 4-1-2.MData, the following parameters are the same as MData.</p> <p>int CPP:The value of CPP.</p> <p>int CDIA: The value of CDIA.</p> <p>int CSBP: The value of CSBP</p> <p>bool CBP_Error: Record if this is a CBP error.</p> <p>int PVR_length:The value of PVR length.</p> <p>int Mean_CBP_data:The value of mean CBP data.</p> <p>int MAP:The value of MAP.</p> <p>bool Afib: true : afib detected</p> <p>bool WithPVPWave: true : PVP Wave included in measurement.</p> <p>bool Start_of_a_manual_measurement: true : start of a manual measurement detected</p> <p>bool LowBattery: true : low battery detected(battery contains < 4.75V)</p> <p>DateTimeOffset Time: Record time</p> <p>int Hr: heart rate</p> <p>int DiaStole:The value of diastole</p> <p>int Systole:The value of systole</p> <p> ** If the Condition is EmptyBattery or BPErrror, these three values are 0.</p> <p> ** If Heart rate>=240 or <30, Hr will be 0, and note HI(Heart rate>=240), LO(Heart rate <30) in Code.</p> <p>bool AverageCalculationWhenMeasurement:</p> <p> Send Average calculation when measurement to APP.</p> <p> true : Average is not include first memory data when measurement.</p> <p> false : Average is include first memory data when measurement.</p> <p>Condition Condition: A Enum of Condition, described in 4-2-1.</p> <p>int Index:Data index</p> <p>bool Anti_Artifact: true : anti-artifact detected</p> <p>List<string> Code: List of error codes or special cases, described in 4-3-1</p>
--	---

4-2 Enum

4-2-1 Condition

Condition	
0	BPOnly
1	BPAndCBP
2	EmptyBattery
3	BPErrror

4-2-2 arrhythmiaDisplay

arrhythmiaDisplay	
0	NONE
1	IHB
2	PAD

4-2-3 AMPM

AMPM	
0	o24
1	o12

4-2-4 PressureUnit

PressureUnit	
0	mmHg
1	Kpa

4-2-5 ConnectType

ConnectType	
0x55	USBOnly
0x42	BothOfUSBAndBT

4-2-6 DataFormat

DataFormat		Note
0	No_CBP_Raw_Data	No CBP raw data
1	Low_resolution_CBP_data	low resolution CBP data (sampling rate =16Hz)
3	Full_CBP_raw_data	full CBP raw data (sampling rate=256Hz)
128	Pressure_No_CBP_Raw_Data	send the pressure value out during

		measurement frequently. **Sending the pressure value with Bluetooth is invalid.
129	Pressure_Low_resolution_CBP_data	send the pressure value out during measurement frequently & low resolution CBP data
131	Pressure_Full_CBP_raw_data	send the pressure value out during measurement frequently & full resolution CBP data

4-2-7 Status

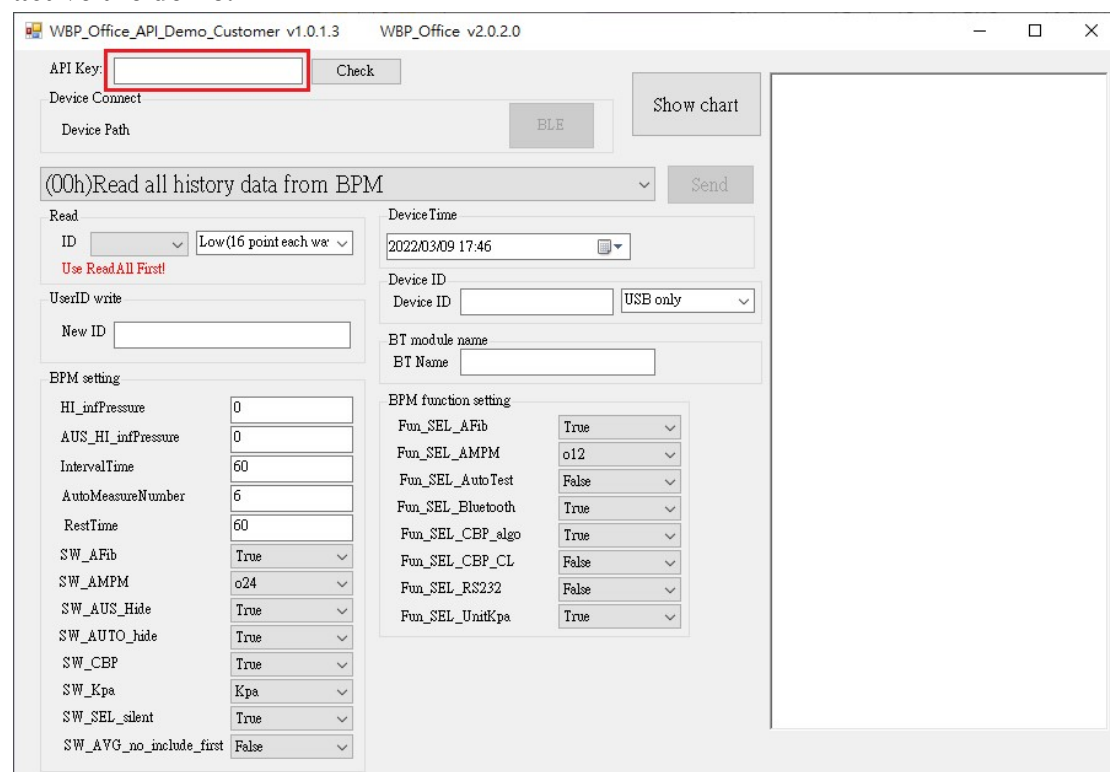
Status		Note
0x01	Wait_countdown_for_next_measurement	Wait countdown for next measurement
0x02	Start_BP_measurement	Start BP measurement
0x04	Manual_press_IO_to_stop_measurement	Manual press IO to stop measurement

4-3 list**4-3-1 Code**

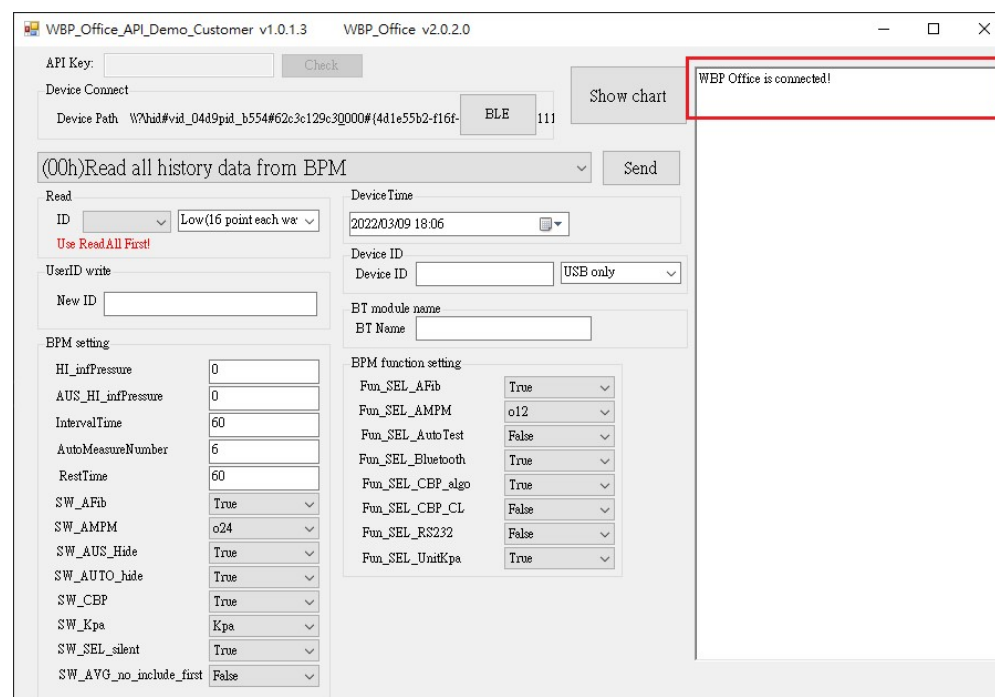
Value	Description	Corresponding Condition
4	Low Battery, the battery contains < 4.75V	0,1,2,3
5	Empty Battery, the battery contains < 4.5V	2
LO	Hr<30	0,1
HI	Hr>=240	0,1
ER 1	Signals is too weak	3
ER 2	Error signal	3
ER 3	No pressure in the cuff	3
ER 5	Abnormal result	3
ER 65	Flash error	3
ER F	reach of maximum 30 min of measurements	3
ER 11	Signal too weak during central blood pressure measurement	1
ER 12	Error signal during central blood pressure measurement	1
ER 13	Cuff pressure errors during central blood pressure measurement	1
ER 15	Abnormal result of central blood pressure reading	1
ER T	Transmission error	3

Chapter 5 Instruction of Demo App

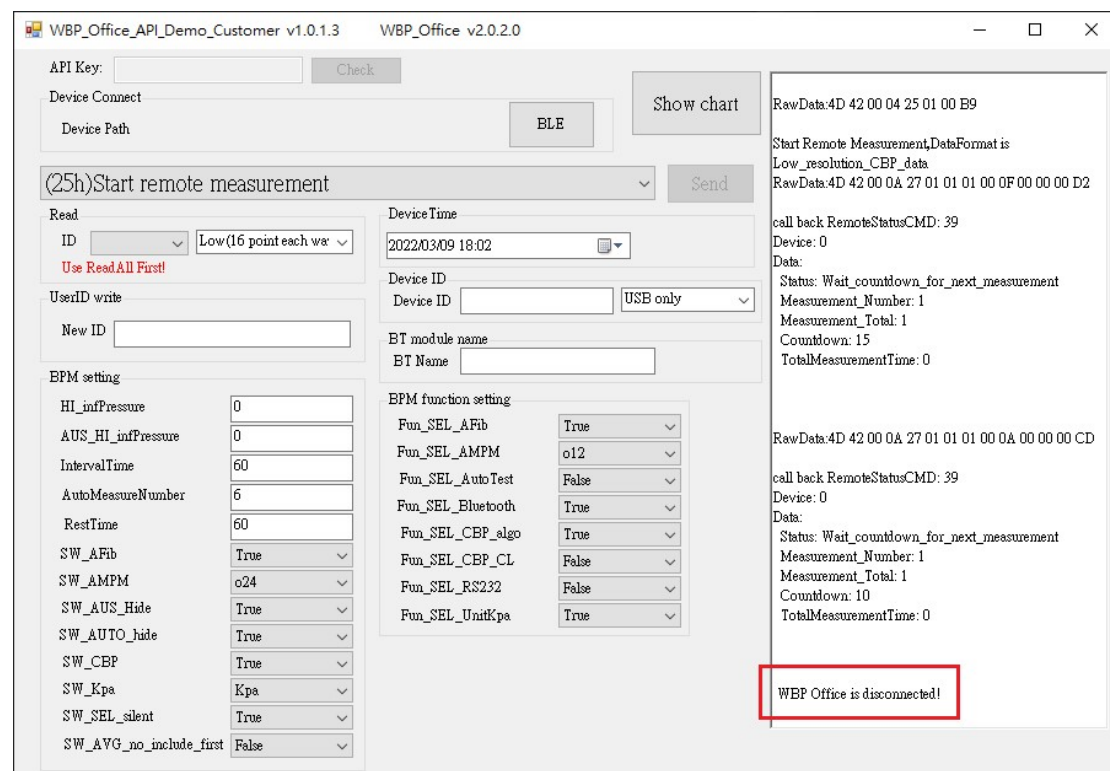
5-1. Input the API Key on the API Key textbox and click “Check” button to active the demo.



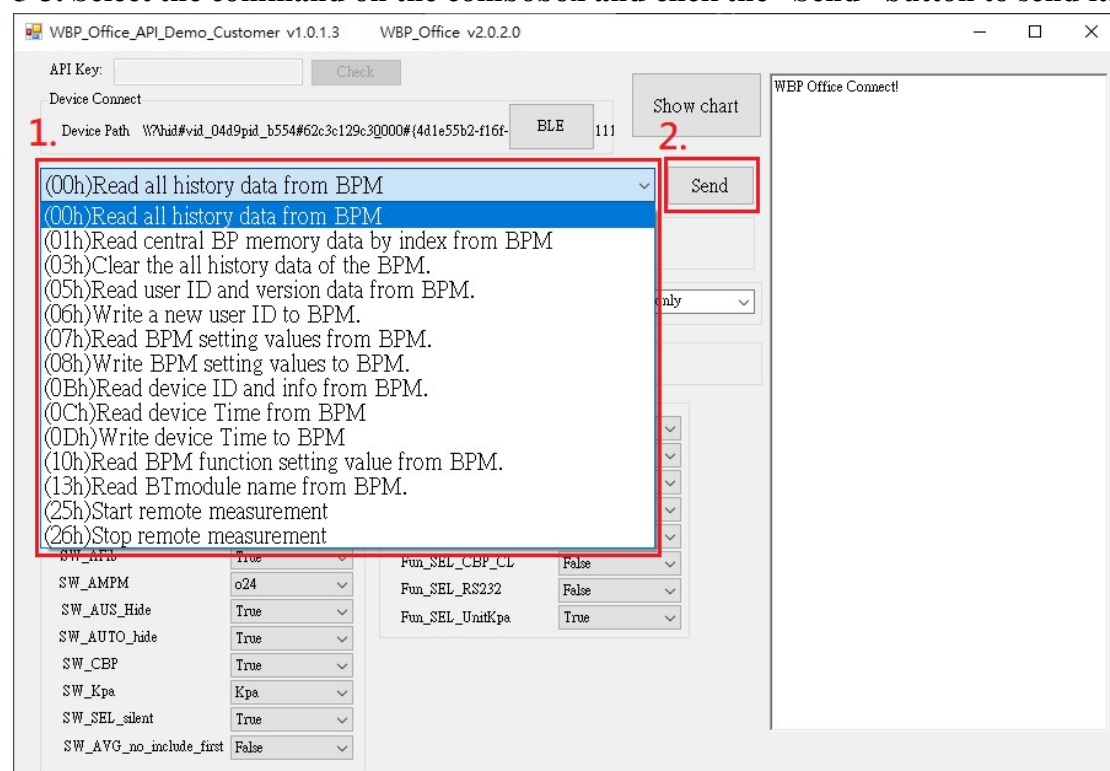
5-2. If the device is connected, “WBP Office is connected!!” will be displayed in the text box on the right



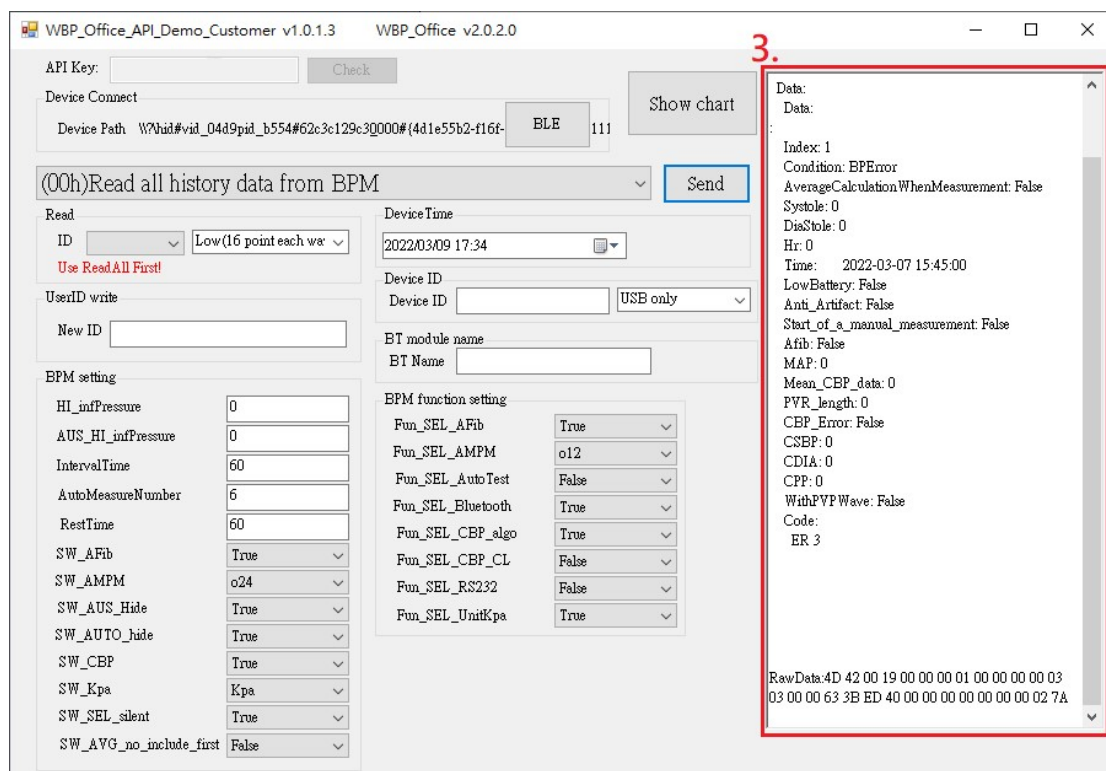
Similarly, if the device is disconnected in anytime, “WBP Office is disconnected!!” will be displayed.



5-3. Select the command on the combobox and click the “Send” button to send it.



The output will be displayed in the textbox on the right



In addition to the data that has been parsed, the original raw data will be displayed in the bottom.

Chapter 6 The description for each command of Demo App

6-1. (00h)Read all history data from BPM

The results of the data received are as follows

Index: 1
 Condition: BPErrors
 AverageCalculationWhenMeasurement: False
 Systole: 0
 DiaStole: 0
 Hr: 0
 Time: 2022-03-09 18:02:00
 LowBattery: False
 Anti_Artifact: False
 Start_of_a_manual_measurement: False
 Afib: False
 MAP: 0
 Mean_CBP_data: 0
 PVR_length: 0
 CBP_Error: False
 CSBP: 0
 CDIA: 0
 CPP: 0
 WithPVPWave: False
 Code:
 ER 3

The description is as follows

(a)Index:

Data index

(b)Condition:

The result could be one of the following.

Condition	Description
0	BPOnly
1	BPAndCBP
2	EmptyBattery
3	BPErrors

(c)AverageCalculationWhenMeasurement: False

Send Average calculation when measurement to APP.

true : Average is not include first memory data when measurement.

false : Average is include first memory data when measurement.

(d)Systole, DiaStole, Hr

Blood pressure and heart rate values

** If the Condition is EmptyBattery or BPErrors, these three values are 0.

** If Heart rate \geq 240 or $<$ 30, Hr will be 0, and note HI(Heart rate \geq 240),

LO(Heart rate $<$ 30) in (p)Code.

(e)Time:

Record time

(f)LowBattery

true : low battery detected

(g)Anti_Artifact

true : anti-artifact detected

(h)Start_of_a_manual_measurement

true : start of a manual measurement detected

(i)Afib

true : afib detected.

(j)MAP

The value of MAP.

(k) Mean_CBP_data

The value of mean cbp data.

(l)PVR_length

The value of pvr length.

(m)CBP_Error

true : cbp error detected

(n)CSBP, CDIA, CPP

The value of CSBP, CDIA, CPP.

(o)WithPVPWave

true : PVP Wave included in measurement.

(p)Code

The results of the Code received are as follows

Code	Description	Corresponding Condition
4	Low Battery	0,1,2,3
5	Empty Battery	2
LO	Hr $<$ 30	0,1
HI	Hr \geq 240	0,1

ER 1	Signals is too weak	3
ER 2	Error signal	3
ER 3	No pressure in the cuff	3
ER 5	Abnormal result	3
ER 65	Flash error	3
ER F	reach of maximum 30 min of measurements	3
ER 11	Signal too weak during central blood pressure measurement	1
ER 12	Error signal during central blood pressure measurement	1
ER 13	Cuff pressure errors during central blood pressure measurement	1
ER 15	Abnormal result of central blood pressure reading	1
ER T	Transmission error	3

6-2. (01h)Read central BP memory data by index from BPM

The results of the data format received are as follows

(a)Format:

The result could be one of the following.

No_CBP_Raw_Data:

Low_resolution_CBP_data: (sampling rate =16Hz)

Full_CBP_raw_data: (sampling rate=256Hz)

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: W\hid#vid_04d9pid_b554#6371af80c10000#{4d1e55b2-f16f- BLE 111

Show chart

(01h)Read central BP memory data by index from BPM

Send

Read

ID: 1 Low (16 point each wa)

Use Read All First!

User ID write

New ID: 2002

BPM setting

HI_inPressure	0
AUS_HI_inPressure	200
IntervalTime	15
AutoMeasureNumber	1
RestTime	15
SW_AFib	False
SW_AMP	o24
SW_AUS_Hide	False
SW_AUTO_hide	False
SW_CBP	True
SW_Kpa	mmHg
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/14 16:40

Device ID

Device ID: USB only

BT module name

BT Name

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMP	o12
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	True

CMD: 1

Device: 0

Data:

Format: Low_resolution_CBP_data

CBPData:

425, 551, 648, 662, 590, 554, 496, 436, 360, 314, 270, 236, 194, 196, 481, 582, 655, 605, 565, 510, 452, 378, 302, 256, 219, 182, 155, 304, 494, 586, 609, 530, 499, 458, 409, 342, 300, 269, 232, 205, 212, 504, 605, 665, 612, 558, 518, 472, 404, 335, 285, 253, 215, 172, 405, 565, 661, 661, 578, 542, 496, 461, 389, 324, 279, 239, 198, 209, 508, 590, 640, 575, 538, 501, 447, 377, 315, 267, 232, 182, 150, 345, 511, 598, 590, 525, 504, 476, 435, 386, 338, 300, 273, 239, 355, 586, 674, 689, 604, 567, 512, 453, 383, 316, 275, 235, 197, 207, 527, 626, 674, 613, 566, 518, 459, 391, 318, 270, 235, 190, 154, 416, 545, 634, 616, 547, 515, 470, 397, 340, 301, 270, 238, 208, 400, 562, 652, 644, 566, 555, 510, 448, 380, 319, 286, 251, 215, 455, 598, 666, 650, 564, 528, 479, 411, 339, 288, 260, 225, 199

CalCBP:

8701, 8685, 8669, 8652, 8628, 8611, 8587, 8570, 8546, 8529, 8505, 8480, 8455, 8439, 8423, 8406, 8398, 8382, 8373, 8357, 8349, 8332, 8316, 8300, 8300, 8308, 8332, 8390, 8464, 8578, 8718, 8890, 9079, 9292, 9505, 9726, 9923, 10104, 10268, 10415, 10546, 10661, 10760, 10858, 10940, 11014, 11071, 11129, 11186, 11227, 11268, 11309, 11350, 11391, 11440, 11481, 11530, 11580, 11637, 11686, 11735, 11785, 11842, 11883, 11924, 11965, 12006, 12039, 12072, 12096, 12121, 12137, 12145, 12154, 12162, 12170, 12178, 12186, 12178, 12170

6-3. (03h)Clear the all history data of the BPM.

The result could be one of the following.

ACK

No call back, Please try again

Memory have clear

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: W\hid#vid_04d9pid_b554#6371af80c10000#{4d1e55b2-f16f- BLE 111

Show chart

(03h)Clear the all history data of the BPM.

Send

Read

ID: 1 Low (16 point each wa)

Use Read All First!

User ID write

New ID:

BPM setting

HI_inPressure	0
AUS_HI_inPressure	0
IntervalTime	60
AutoMeasureNumber	6
RestTime	60
SW_AFib	True
SW_AMP	o24
SW_AUS_Hide	True
SW_AUTO_hide	True
SW_CBP	True
SW_Kpa	Kpa
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/14 16:57

Device ID

Device ID: USB only

BT module name

BT Name

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMP	o12
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	True

Memory have clear!

RawData: 4D 42 00 03 03 00 95

6-4. (05h)Read user ID and version data from BPM.

The results of the data received are as follows

UserID:2002
Protocal ID:V1.0.1
Max memory:6
IHB:False
Firmware version:RP2
Firmware Date: 2019-05-29
CBP:True
Voltage:5.6 V
arrhythmiaDisplay:NONE
AFIB:True

The description is as follows

(a) UserID:

User ID

(b) Protocal ID:

Protocol ID

(c) Max memory:

Maximum of memory data can be saved for every user.

(d) IHB: **Deprecated**

true:IHB Enbale

(e) Firmware version:

The version of firmware.

(f) Firmware Date:

The release date of firmware.

(g) CBP:

true:CBP Enbale.

(h) Voltage:

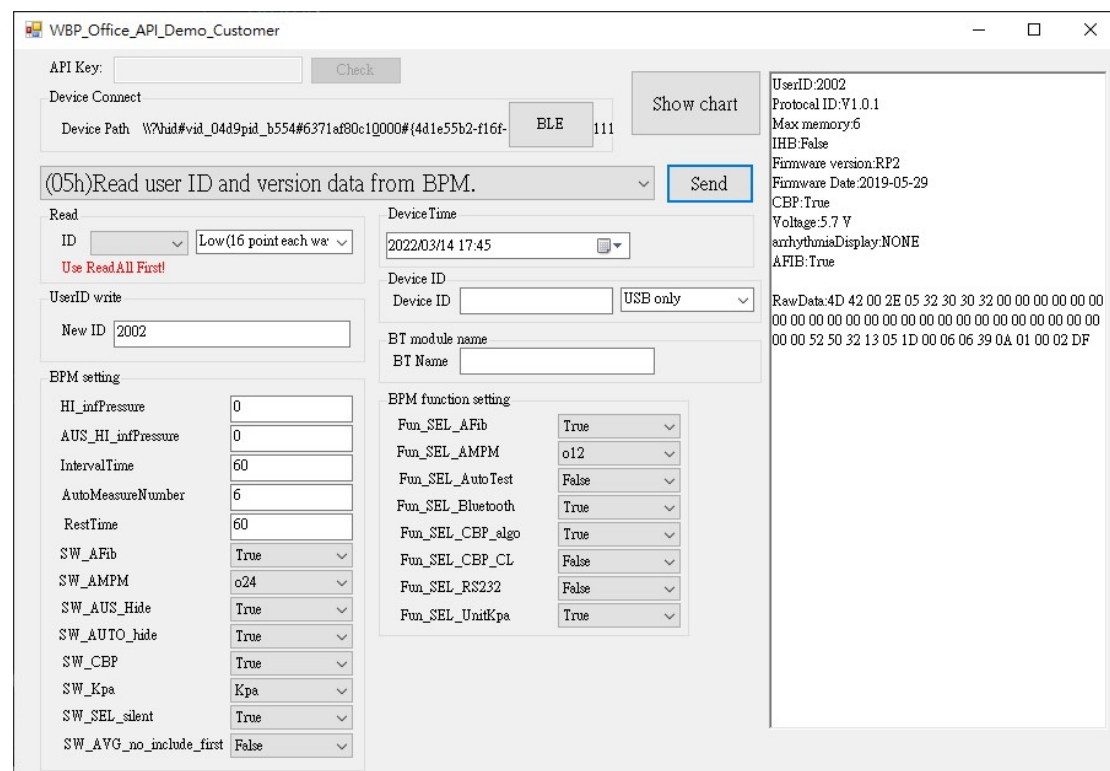
Voltage of the device battery.

(i) arrhythmiaDisplay:

Display arrhythmia name in software. It may be one of NONE, IHB, PAD.

(j) AFIB:

true:AFIB Enbale



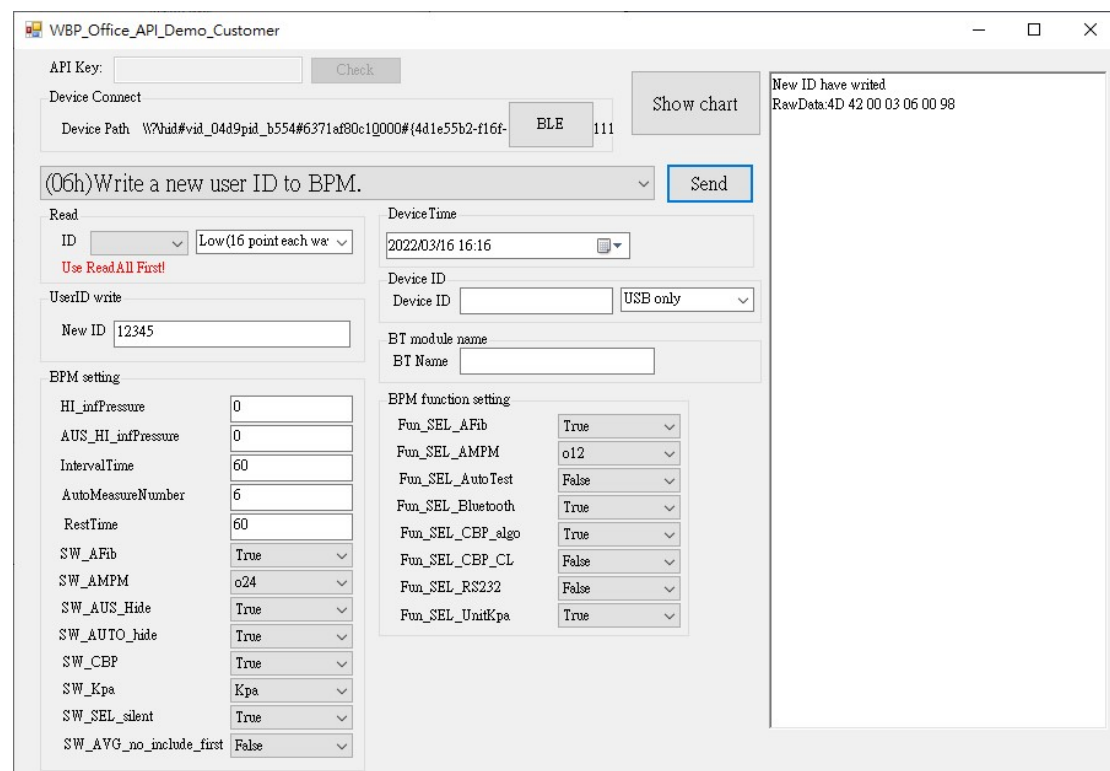
6-5. (06h) Write a new user ID to BPM.

The result could be one of the following.

ACK

No call back,Please try again

New ID have writed



6-6. (07h)Read BPM setting values from BPM.

The results of the data received are as follows

AUS_HI_infPressure: 200
HI_infPressure: 0
RestTime: 15
IntervalTime: 15
AutoMeasureNumber: 1
SW_AUTO_hide: False
SW_SEL_silent: True
SW_AUS_Hide: False
SW_AVG_no_include_first: False
SW_CBP: True
SW_AFib: False
SW_AMPM: 024
SW_Kpa: mmHg

The description is as follows

(a) AUS_HI_infPressure:

Highest inflation pressure of AUS mode

Valid parameter: 0(not setting), 160, 180, 200, 220, 240

(b) HI_infPressure :

Highest inflation pressure of Auto mode

Valid parameter: 0(not setting), 160, 180, 200, 220, 240

(c) RestTime:

Rest time of auto mode

Start countdown base on rest time before 1st measurement in auto mode.

(d) IntervalTime:

Interval time of auto mode

Start countdown base on interval time before 2nd~6th measurement in auto mode.

(e) AutoMeasureNumber:

It's number of measurements in auto mode.

(f) SW_AUTO_hide:

true: Don't show readings during rest time in auto mode.

false: Show readings during rest time in auto mode.

(g) SW_SEL_silent:

true: Beeper disabled

false: Beeper enabled

(h) **SW_AUS_Hide:**

true: Don't show cuff pressure during deflation in AUS mode.

false: Show cuff pressure during deflation in AUS mode.

(i) **SW_AVG_no_include_first:**

true: Average excludes first memory data.

false: Average includes first memory data.

(j) **SW_CBP:**

true: CBP measurement enabled

false: CBP measurement disabled

(k) **SW_AFib:**

true: AFib measurement enabled

false: AFib measurement disabled

(l) **SW_AMPM:**

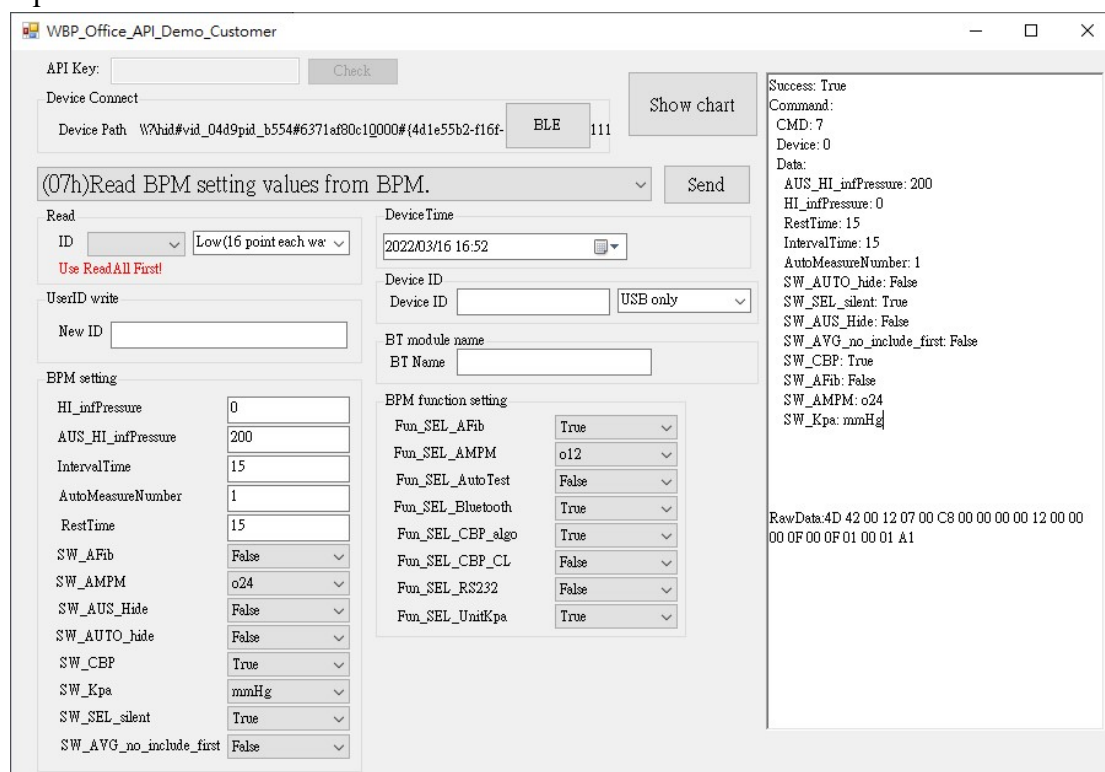
o24: 24-hour clock

o12: 12-hour clock

(m) **SW_Kpa:**

mmHg,

Kpa



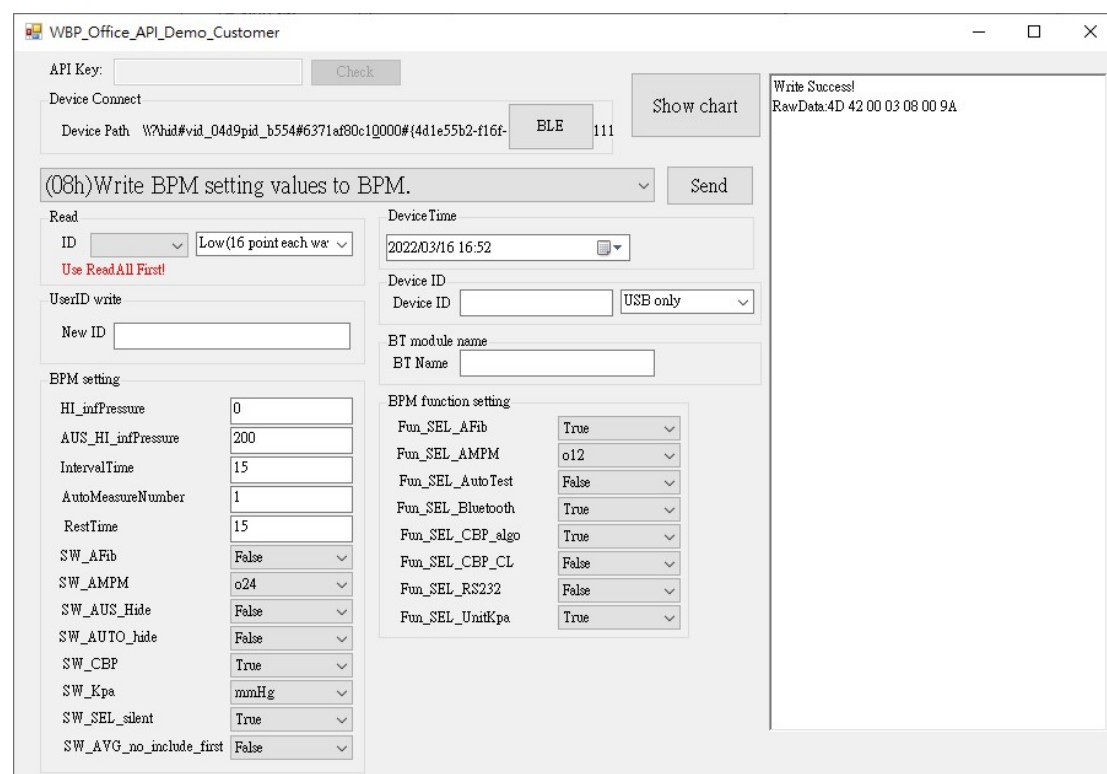
6-7. (08h)Write BPM setting values to BPM.

The result could be one of the following.

NACK

No call back, Please try again

Write Success!



6-8. (0Bh)Read device ID and info from BPM.

The results of the data received are as follows

ID: F2A68B3BE4AE

ConnectType: BothOfUSBAndBT

Mea_times: 45

ErrorCount:

3, 0, 13, 0, 0

The description is as follows

(a) ID:

Device ID string

(b) ConnectType:

BothOfUSBAndBT

USBOnly

(c) Mea_times:

measurement times.

(d) ErrorCount:

The total number of occurrences of error 1, error 2, error 3, error 5, error F.

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: BLE 111 Show chart

(0Bh)Read device ID and info from BPM. Send

Read

ID Low (16 point each wa)

Use Read All First!

User ID write

New ID

BPM setting

HI_infPressure	0
AUS_HI_infPressure	200
IntervalTime	15
AutoMeasureNumber	1
RestTime	15
SW_AFib	False
SW_AMP	024
SW_AUS_Hide	False
SW_AUTO_hide	False
SW_CBP	True
SW_Kpa	mmHg
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/16 16:52

Device ID

Device ID: F2A68B3BE4AE USB and BT both

BT module name

BT Name

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMP	012
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	True

Success: True

Command: 11

Device: 0

Data:

ID: F2A68B3BE4AE

ConnectType: BothOfUSBAndBT

Mea_times: 45

ErrorCount: 3, 0, 13, 0, 0

RawData: 4D 42 00 1E 0B 44 F2 A6 8B 3B E4 AE 42 4D 00 00 2D 01 00 03 02 00 00 03 00 0D 05 00 00 46 00 00 06 09

6-9. (0Ch)Read device Time from BPM

The time of device will be sent back, if no time is set, NACK will be sent back.

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: BLE 111 Show chart

(0Ch)Read device Time from BPM Send

Read

ID Low (16 point each wa)

Use Read All First!

User ID write

New ID

BPM setting

HI_infPressure	0
AUS_HI_infPressure	200
IntervalTime	15
AutoMeasureNumber	1
RestTime	15
SW_AFib	False
SW_AMP	024
SW_AUS_Hide	False
SW_AUTO_hide	False
SW_CBP	True
SW_Kpa	mmHg
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/16 16:52

Device ID

Device ID: F2A68B3BE4AE USB and BT both

BT module name

BT Name

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMP	012
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	True

2022-03-16 16:52:51

RawData: 4D 42 00 0A 0C 01 16 03 10 10 34 33 01 46

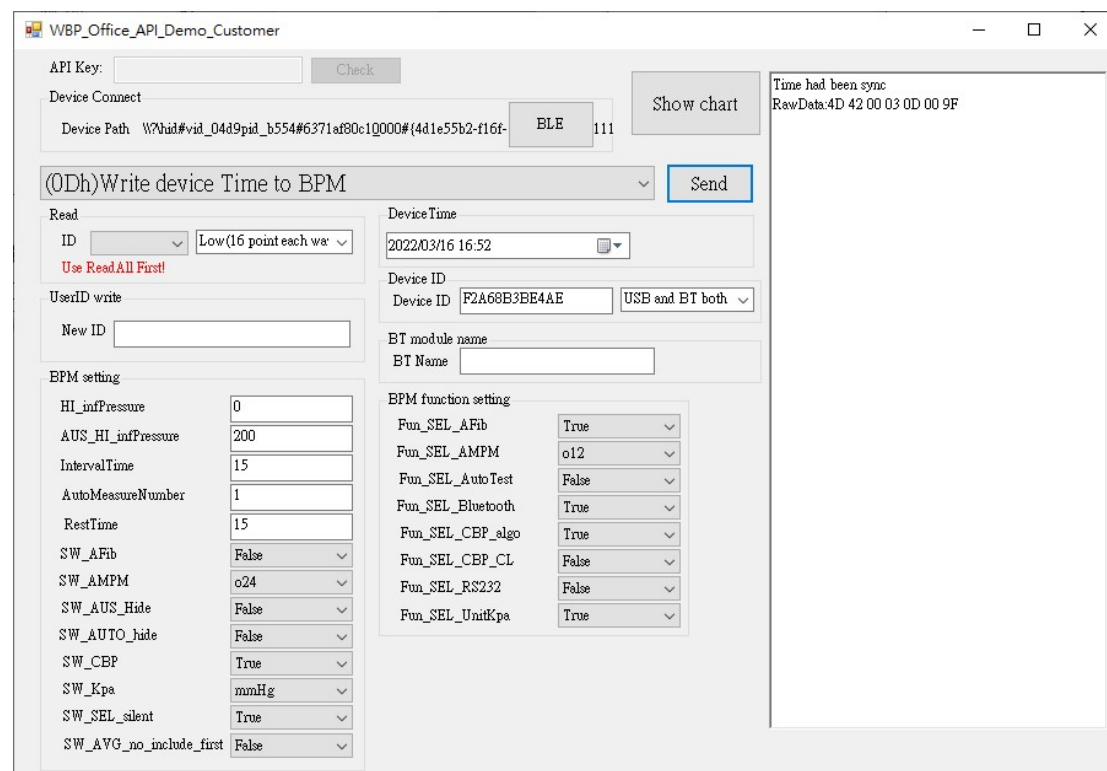
6-10. (0Dh)Write device Time to BPM

The result could be one of the following.

NACK

No call back,Please try again

Time had been sync



6-11. (10h)Read BPM function setting value from BPM.

The results of the data received are as follows

Fun_SEL_AFib: True
 Fun_SEL_CBP_algo: True
 Fun_SEL_AMPM: o24
 Fun_SEL_CBP_CL: False
 Fun_SEL_AutoTest: False
 Fun_SEL_Bluetooth: True
 Fun_SEL_UnitKpa: False
 Fun_SEL_RS232: False

The description is as follows

(a) Fun_SEL_AFib :

true: AFIB algorithm ON.

false: AFIB algorithm OFF.

(b) Fun_SEL_CBP_algo :

true: CBP algorithm ON.

false: CBP algorithm OFF.

(c) Fun_SEL_AMPM:

o24: only 24hr

o12: select 24hr or 12hr by UI

(d) Fun_SEL_CBP_CL:

true: Enable CBP clinical data transmission.

false: Disable CBP clinical data transmission.

(e) Fun_SEL_AutoTest:

true: AutoTest ON.

false: AutoTest OFF.

(f) Fun_SEL_Bluetooth :

true: Bluetooth function ON.

false: Bluetooth function OFF.

(g) Fun_SEL_UnitKpa :

true: select Kpa or mmHg by UI.

false: only mmHg.

(h) Fun_SEL_RS232:

true: LabView data transmission ON.

false: LabView data transmission OFF.

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: W\hid#vid_04d9pid_b554#6371af80c10000#{4d1e55b2-f16f- BLE 111

Show chart

(10h)Read BPM function setting value from BPM. Send

Read

ID Low (16 point each wa

Use Read All First!

User ID write

New ID

BPM setting

HI_infPressure	0
AUS_HI_infPressure	200
IntervalTime	15
AutoMeasureNumber	1
RestTime	15
SW_AFib	False
SW_AMP	o24
SW_AUS_Hide	False
SW_AUTO_hide	False
SW_CBP	True
SW_Kpa	mmHg
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/16 16:52

Device ID

Device ID: F2A68B3BE4AE USB and BT both

BT module name

BT Name

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMP	o24
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	False

Success: True

Command: CMD: 16

Device: 0

Data:

Fun_SEL_AFib: True

Fun_SEL_CBP_algo: True

Fun_SEL_AMP: o24

Fun_SEL_CBP_CL: False

Fun_SEL_AutoTest: False

Fun_SEL_Bluetooth: True

Fun_SEL_UnitKpa: False

Fun_SEL_RS232: False

RawData: 4D 42 00 04 10 23 00 C6

6-12. (13h)Read BTmodule name from BPM.

The results of the data received are as follows

The name of the BT module will be displayed in the BT Name text box.

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: W\hid#vid_04d9pid_b554#6371af80c10000#{4d1e55b2-f16f- BLE 111

Show chart

(13h)Read BTmodule name from BPM. Send

Read

ID Low (16 point each wa

Use Read All First!

User ID write

New ID

BPM setting

HI_infPressure	0
AUS_HI_infPressure	200
IntervalTime	15
AutoMeasureNumber	1
RestTime	15
SW_AFib	False
SW_AMP	o24
SW_AUS_Hide	False
SW_AUTO_hide	False
SW_CBP	True
SW_Kpa	mmHg
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/16 16:52

Device ID

Device ID: F2A68B3BE4AE USB and BT both

BT module name

BT Name: WatchBP Office

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMP	o24
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	False

RawData: 4D 42 00 14 13 57 61 74 63 68 42 50 20 4F 66 66 69 63 65 00 00 00 05 AB

6-13. (25h)Start remote measurement.

The results of the data received are as follows

Start Remote Measurement,DataFormat is Low_resolution_CBP_data

The SDK will receive an update of the current status every five seconds after the start of the measurement.

Status: Wait_countdown_for_next_measurement

Measurement_Number: 1

Measurement_Total: 1

Countdown: 15

TotalMeasurementTime: 0

The description is as follows

(a) Status :

There are three possible status

Wait_countdown_for_next_measurement

Start_BP_measurement

Manual_press_IO_to_stop_measurement

(b) Measurement_Number :

Send current measurement number in auto mode.

(c) Measurement_Total :

Send total measurement number in auto mode.

(d) Countdown :

Send current countdown time in auto mode.

(e) TotalMeasurementTime :

Send total measurement time (seconds) in auto mode. Total measurement are count between 1st measurement to last measurement. (exclude rest time).

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: W:\hid\vid_04d9pid_b554#6371af80c10000#{4d1e55b2-f16f- BLE 111

Show chart

(25h)Start remote measurement

Send

Read

ID: Low (16 point each wa:

Use Read All First!

User ID write

New ID:

BPM setting

HI_inPressure	0
AUS_HI_inPressure	200
IntervalTime	15
AutoMeasureNumber	1
RestTime	15
SW_AFib	False
SW_AMPM	o24
SW_AUS_Hide	False
SW_AUTO_hide	False
SW_CBP	True
SW_Kpa	mmHg
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/16 16:52

Device ID

Device ID: F2A68B3BE4AE USB and BT both

BT module name

BT Name: WatchBP Office

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMPM	o24
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	False

RawData: 4D 42 00 04 25 01 00 B9

Start Remote Measurement, DataFormat is Low_resolution_CBP_data

RawData: 4D 42 00 0A 27 01 01 01 00 0F 00 00 00 D2

call back RemoteStatusCMD: 39

Device: 0

Data:

Status: Wait_countdown_for_next_measurement

Measurement_Number: 1

Measurement_Total: 1

Countdown: 15

TotalMeasurementTime: 0

RawData: 4D 42 00 0A 27 01 01 01 00 0A 00 00 00 CD

call back RemoteStatusCMD: 39

Device: 0

Data:

Status: Wait_countdown_for_next_measurement

Measurement_Number: 1

Measurement_Total: 1

Countdown: 10

TotalMeasurementTime: 0

6-14. (26h)Stop remote measurement.

After successfully stopping the measurement, the SDK will receive “Stop Remote Measurement” event.

WBP_Office_API_Demo_Customer

API Key: Check

Device Connect

Device Path: W:\hid\vid_04d9pid_b554#6371af80c10000#{4d1e55b2-f16f- BLE 111

Show chart

(26h)Stop remote measurement

Send

Read

ID: Low (16 point each wa:

Use Read All First!

User ID write

New ID:

BPM setting

HI_inPressure	0
AUS_HI_inPressure	0
IntervalTime	60
AutoMeasureNumber	6
RestTime	60
SW_AFib	True
SW_AMPM	o24
SW_AUS_Hide	True
SW_AUTO_hide	True
SW_CBP	True
SW_Kpa	Kpa
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2022/03/17 11:23

Device ID

Device ID: USB only

BT module name

BT Name:

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMPM	o12
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	True

RawData: 4D 42 00 03 26 00 B8

Stop Remote Measurement

RawData: 4D 42 00 04 26 91 01 4A

6-15. (28h) Send measurement results for each measurement

After a successful measurement, the SDK will receive the blood pressure data in the same format as the “(00h)Read all history data from BPM”, but with three new parameters.

The new parameters descriptions are as follows

(a) History_Measurement_Times:

The history measurement times store in memory.

(b) Current_Measurement_Times:

Send current measurement times to APP.

(c) RawData:

The original data of the measurement data received by APP this time

The screenshot displays the WBP_Office_API_Demo_Customer application window. It features several sections for configuring the device and viewing data:

- API Key:** A text field with a "Check" button.
- Device Connect:** Includes a "Device Path" field with a long hexadecimal string, a "BLE" checkbox, and a "Show chart" button.
- Measurement Action:** A dropdown menu set to "(25h)Start remote measurement" with a "Send" button.
- Read Section:** Contains a "Read" dropdown, an "ID" dropdown, a "Low(16 point each wa)" dropdown, and a "Use ReadAll First!" checkbox.
- UsedID write:** Includes a "New ID" text field.
- BPM setting:** A list of settings with checkboxes and dropdowns:
 - HI_infPressure: 0
 - AUS_HI_infPressure: 0
 - IntervalTime: 60
 - AutoMeasureNumber: 6
 - RestTime: 60
 - SW_AFib: True
 - SW_AMPM: o24
 - SW_AUS_Hide: True
 - SW_AUTO_hide: True
 - SW_CBP: True
 - SW_Kpa: Kpa
 - SW_SEL_silent: True
 - SW_AVG_no_include_first: False
- Device Time:** A text field showing "2022/04/08 15:28".
- Device ID:** A text field and a "USB only" checkbox.
- BT module name:** A text field for "BT Name".
- BPM function setting:** A list of settings with checkboxes and dropdowns:
 - Fun_SEL_AFib: True
 - Fun_SEL_AMPM: o12
 - Fun_SEL_AutoTest: False
 - Fun_SEL_Bluetooth: True
 - Fun_SEL_CBP_algo: True
 - Fun_SEL_CBP_CL: False
 - Fun_SEL_RS232: False
 - Fun_SEL_UnitKpa: True
- Data Log:** A scrollable area on the right showing the following data:


```
call back MeasurementResultsCMD: 40
Device: 0
Data:
History_Measurement_Times: 1
Current_Measurement_Times: 1
RawData:
4D, 42, 00, 19, 28, 00, 00, 01, 00, 01, 00, 00, 00,
90, 59, 4B, 64, 43, DE, 40, 61, 00, 00, 00, 00, 00,
00, 04, 2C
Index: 0
Condition: BPOnly
AverageCalculationWhenMeasurement: False
Systole: 144
DiaStole: 89
Hr: 75
Time: 2022-04-08 15:30:00
LowBattery: False
Anti_Artifact: False
Start_of_a_manual_measurement: False
Afib: False
MAP: 97
Mean_CBP_data: 0
PVR_length: 0
CBP_Error: False
CSEP: 0
CDIA: 0
CPP: 0
WithPPWave: False
Code:
```

6-16. (0Fh-00) Read serial number from BPM

The results of the data received are as follows

The serial number from BPM will be returned in string format.

The screenshot shows the WBP_Office_API_Demo_Customer application window. The interface includes several sections for configuring and executing a command to read the serial number from a BPM device.

API Key: [Text field] **Check**

Device Connect

Device Path: W\hid#vid_04d9pid_b554#6371af80c20000#{4d1e55b2-f16f- BLE 111

Show chart

(0Fh-00)Read serial number from BPM **Send**

Read

ID [Dropdown] Low(16 point each wa [Dropdown]

Use ReadAll First!

UsedID write

New ID [Text field]

BPM setting

HI_infPressure	0
AUS_HI_infPressure	0
IntervalTime	60
AutoMeasureNumber	6
RestTime	60
SW_AFib	True
SW_AMP	o24
SW_AUS_Hide	True
SW_AUTO_hide	True
SW_CBP	True
SW_Kpa	Kpa
SW_SEL_silent	True
SW_AVG_no_include_first	False

Device Time

2023/09/19 11:30

Device ID

Device ID [Text field] USB only [Dropdown]

BT module name

BT Name [Text field]

BPM function setting

Fun_SEL_AFib	True
Fun_SEL_AMP	o12
Fun_SEL_AutoTest	False
Fun_SEL_Bluetooth	True
Fun_SEL_CBP_algo	True
Fun_SEL_CBP_CL	False
Fun_SEL_RS232	False
Fun_SEL_UnitKpa	True

2022-04-2200001

RawData: 4D 42 00 18 0F 00 32 30 32 32 2D 30 34 2D 32 32 30 30 30 31 00 00 00 00 03 8F