

OP-735 Bluetooth Optical Probe User Manual

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1 How to use the device

1.1 Bluetooth Optical Probe

The OP-735 is a device that facilitates communication between measurement devices that comply with IEC62056-21 (mode C, E), IEC62056-31, and DLMS standards for optical ports, such as electricity meters and gas correctors, and computers, handheld devices, tablets, and other Bluetooth-enabled devices. The Bluetooth of OP-735 supports both Classic and BLE (Bluetooth Low

Energy) modes, and it is also possible to communicate in transparent mode. All steps involved in using the optical port, including pairing, connecting to the meter, and checking the battery charge, can be easily monitored through the device's LEDs.

The Lithium Polymer battery has a capacity of 470mAh and provides up to 14 hours of working time per charge. The device can be charged using either the adapter or a USB Type C cable connected to a PC.

Table 1 contains descriptions of the Bluetooth commands that can be used to change configurations in OP-735, such as Bluetooth name, Optical port frame and baud rate, and mode.

1.2 Electrical Specifications

- IEC 62056-21 standard for optical port
- Bluetooth version 4.1 standard, Classic and BLE modes
- Communication with measurement devices according to IEC62056-21 (Mode C, E), IEC62056-31, DLMS standards and TRANSPARENT mode for other standards such as MODBUS
- 10m unobstructed Bluetooth connection range
- Communication speed (baud rate) from 300 to 19200 bps
- 3-colored LEDs for displaying battery charge
- Pairing status, Sending and receiving data LED indicator
- Lithium Polymer 3.7V, 470mAh battery
- On/off switch
- USB Type C port for charging

1.3 Mechanical Specification

- Weight: 50 gr
- Dimension: 32x43mm
- Magnet power: more than 15 Newtons
- Body Material: ABS
- Ambient light filter



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1.3.1 USB Connector

The battery can be charged using the embedded USB C connector. After connecting the USB cable, the Bluetooth and data transfer LEDs will flash three times. The corresponding LED will then start blinking, indicating the amount of charge:

- Blinking Red: charge rate 0-33% •
- Blinking Orange: charge rate 34-66% •
- Blinking Green: charge rate 67-100%
- Green: complete charge

Battery Indicator LEDs (Charge) 1.3.2

These LEDs represent the amount of battery charge as follows:

- Blinking Red: Battery charge is less than 10% •
- Red: Battery charge is 10-33%
- Orange: Battery charge is 34-66% •
- Green: Battery charge is 67-100%

STATUS Indicator LED 1.3.3

The green LED indicates the status of data transfer on the optical interface. It blinks during data transfer via the optical interface.

Bluetooth Status Indicator LED 1.3.4

The blue LED indicates the status of the Bluetooth connection. It remains illuminated when the device is connected to another Bluetooth device and blinks when data is being transferred via Bluetooth.

1.3.5 POWER Button

The purpose of this button is to power the OP-735 on and off. Press and hold for 2 seconds to turn on, and press and hold again to turn off.

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•= OP-735 BLUETOOTH OPTICAL PROBE 47













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1.4 Software Specifications

1.4.1 Working Modes

The OP-735 is capable of connecting with all devices in IEC62056-21 standards.

OP-735 can work on two Transparent and IEC modes. The functionality is as follows:

IEC

In this mode, the optical port can automatically change baud rate during communication according to the IEC62056-21 standard. It can also communicate with meters that support direct DLMS at 9600 baud rate and IEC62056-31 standard at 1200 baud rate without requiring any additional settings.

Transparent

In this mode, the optical port can automatically change baud rate during communication according to the IEC62056-21 standard. It can also communicate with meters that support direct DLMS at 9600 baud rate and IEC62056-31 standard at 1200 baud rate without requiring any additional settings.

Note. At this mode optical probe cannot do any changes in the communication frame with the meter and will only transfer the received data from one side to another.

1.4.2 Settings

To send the settings or upgrade firmware, you can use any program that is capable of sending commands using Bluetooth. You can also use windows/android application (see <u>4. Application for setting OP-735</u>).

1.4.2.1 Using Commands

The following table shows the commands associated with each configuration that must be sent to optical probe.

Command Type	Possible options	Command	Answer
Read Serial	10 bytes digits or letters	AT+AD Serial? <cr><lf></lf></cr>	Serial Number=OP-
			735 <cr><lf></lf></cr>
Read Bluetooth Name	10 bytes digits or letters	AT+AD Name? <cr><lf></lf></cr>	Name=OP-735 <cr><lf></lf></cr>
Set Bluetooth Name	10 bytes digits or letters	AT+AD Name=OP-	Name=OP-735 <cr><lf></lf></cr>
	, 2	735 <cr><lf></lf></cr>	
Read Optical Probe	OP-735, OP-745	AT+AD Model? <cr><lf></lf></cr>	Model = OP-
Model			735 <cr><lf></lf></cr>
Read Software Version		AT+AD Software	Version:01.01.01 <cr></cr>
		Version? <cr><lf></lf></cr>	<lf></lf>
Read Automatic Power	1 to 9	AT+AD	AutoPowerOff=5 <cr><l< th=""></l<></cr>
Off Time (Minute)		AutoPowerOff? <cr><lf></lf></cr>	E>
Set Automatic Power	1 to 9	AT+AD	AutoPowerOff=3 <cr><l< th=""></l<></cr>
Off Time (Minute)		AutoPowerOff=3 <cr><lf></lf></cr>	E>
Read Working Mode	TRANSPARENT, IEC	AT+AD Mode? <cr><lf></lf></cr>	CommunicationMode=IE
5			C <cr><lf></lf></cr>
Set Working Mode	TRANSPARENT, IEC	AT+AD Mode=IEC <cr><lf></lf></cr>	CommunicationMode=IE
J J			C <cr><lf></lf></cr>
Read Optical Port Frame	Note*	AT+AD Frame? <cr><lf></lf></cr>	Frame=300,7,E,1 <cr><</cr>
			LF>
Set Optical Port Frame	Note*	AT+AD	Frame=300,7,E,1 <cr><</cr>
	1	Frame=300.7.E.1 <cr><lf></lf></cr>	LF>

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Note*:

Set up and collection of the optical port communication frame is as follows:

• Baud rate, Number of Bit, Parity, Stop bit

The values for each parameter are as follows:

- Baud rate: 300, 1200, 2400, 4800, 9600, 19200
- Number of Bit: 7, 8
- Parity: N (none), E (even), O (odd)

According to the above description, if we want to connect with the meter with baud rate: 4800 and number of bits: eight and parity: E with the last 1 bit, the command format will be as follows:

```
AT+AD Frame =4800,8,N,1<CR><LF>
```

Note*:

Generally, for meters that comply with IEC 62056-21 standard, the command should be:

AT+AD Frame =300,7,E,1<CR><LF>

Note*:

In case any command other than the mentioned commands are sent to the optical probe, "Invalid Command!" will be returned and if parameters are not set correct, "Invalid Parameters!" will be returned.

1.4.2.2Upgrading Firmware

The firmware can be upgraded in two ways:

- Send the file through the windows/android application (see <u>4. Application for setting OP-735</u>).
- Send the file through any program via Bluetooth that can send commands.

Upgrading via other applications

To send the file through other programs, each line of the file must be sent separately to the device. For each line, an ACK (06H) must be received from the device before sending the next line. If a NACK byte (15H) is received instead of an ACK, the line must be resent. Receiving a NACK indicates an error in the sent line format.

Sample sent file:

Send From PC:	AT+AD BOOT
Receive From PC:	06
Send From PC:	:02000040800F2
Receive From PC:	06
Send From PC:	:10480000000E00208D4900086DB700089DB4000817
Receive From PC:	06
Send From PC:	:104810000000000000000000000000000000000
Receive From PC:	06
Send From PC:	:10482000000000000000000000000000039B800088F

2 How to pair with devices

2.1 How to pair with Android device

To connect the OP-735 to your Android device, first enable Bluetooth on your device. Then, turn on the OP-735 and navigate to the Bluetooth settings on your Android device to pair the two devices.

After pairing, there is no need to re-pair (even after turning device on and off).

These pictures show all steps of pairing OP-735 with android:

Bluetooth	Bluetooth	Bluetooth	Bluetooth O
Device name Redmi Note 8 Pro. >	Device name Redmi Note 8 Pro >	Device name Redmi Note 8 Pro >	Device name Redmi Note 8 Pro >
A AWEI MUSIC	AWEI MUSIC	AWEI MUSIC	A AWEI MUSIC
BT PIONEER M.6 PLUS Saved	BT PIONEER M.6 PLUS	BT PIONEER M.6 PLUS	BT PIONEER M.6 PLUS Saved
∩ TP-LINK_Music →	∩ TP-LINK_Music →	Pair with OP-735? Bluetooth pairing code	A OP-735 Saved
AVAILABLE DEVICES O	AVAILABLE DEVICES O	Allow access to your contacts and call history	TP-LINK_Music
OP-735	OP-735 Pairing	Block	Sureu
BLUETOOTH SETTINGS	·	Cancel	AVAILABLE DEVICES O
Additional settings	BLUETOOTH SETTINGS Additional settings	Pair	BLUETOCTH SETTINGS

2.2 How to pair with IOS device

Turn on the OP-735 and follow steps below:

Step 1: On your IOS device, go to Settings > Bluetooth and turn on Bluetooth. Stay on this screen until you see the OP-735.

Step 2: Tap on OP-735.

9:41	
Settings	Bluetooth
Bluetooth	
Now discoverable	as "John's iPhone".
MY DEVICES	
Headphones	Not Connected ()

Step 3: You might need to enter the PIN. The OP-735 pin code is "0" (zero).

After pairing, there is no need to re-pair (even after turning device on and off).

BLE Communication Guide 2.3

OP-735 BLE mode has 3 options which are set via

AT+AD Command:at+ab config var60=[0-2]<CR><LF>

as follows:

- 0: Demo, battery service used to exchange data in transparent mode.
- 1: Modem, Custom Service is used to exchange data in transparent mode.
- 2: Profile, transparent mode not allowed.

Note: Default mode is "modem mode".

1. Demo

The Demo mode is battery service-based data exchange in transparent mode. A BLE connection is used to transfer data between any BLE compatible software and the module. Also, writing to the battery state of the module will result in a notification from the module by the software.

Service UUID = 26CC3FC0-6241-F5B4-5347-63A3097F6764

2. Modem mode (default mode)

Using transparent mode, the first characteristic of customer service can be written to the module and notifications can be received from the module through the software.

- 1st characteristics UUID: bf8796f1-64f7-70b5-1e41-09bb46d79100 Readable, Writeable, Writeable Without Response, Notify
- 2nd characteristics UUID: bf8796f1-64f7-70b5-1e41-09bb46d79101 Readable, Writeable
- 3th characteristics UUID: bf8796f1-64f7-70b5-1e41-09bb46d79102 Readable, Writeable
- 4th characteristics UUID: bf8796f1-64f7-70b5-1e41-09bb46d79103 Readable, Writeable

3. Profile mode

If the module is in profile mode, it will not go into transparent mode after the connection is made. Each characteristic of customer service can be read and written in the module and the module can send notifications using AT commands to get and set characteristics locally.

Note: if it's necessary being in Profile mode, some changes must be implemented in OP-735 by German metering.

Example: Connecting OP-735 and LightBlue software:

- Connect the module to the PC or iPad.
- Establish BLE connection between the iOS device and the OP

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Data Exchange:

Select the 1st characteristic of customer service.



Click "Write", fill in the desired data in the "Write ASCII" window (\leq 20 bytes), and then click "Send".

	Ils Services	Characteristics
hxhx	UUID: 180F	> DAR 2799/1-6477-2000-0241-08004627918 >
BC188848C678 Local Name: helix	Detection and Plan and Assessment (and tecchical and Plan and Assessment)	CARFECTARY 44F7-2086-1Ext-048844073101
Service: Garery TX: Power Level: 0	_	04910991-047-200-061-0604020102
Bt53		DuBF079871-6477-7080-1041-098848079100
191466F8- DHE1-2077-4481-26800770E37F	>	UR BENE-WEIGHT- MARKEN Papers for the
Service: Battery TX Power Level: 0		
	_	
	Write Hex	
	White Hex	
	Write Hex.	
	Write Hex wwww ASCII: wwww Select to Write	
	Write Hox wwww ASCII: wwww Select to Write	
	Unite Hox wwwwi ASCII: wwww Select to White	
0	Inter Has wwwwi ASCII: wwww Select to White	
	When Hax www ASCIE wwww Select to Whe	

Optical probe will receive the data.

If the data needs to be sent to an iPad, first click "Start Notify" on the demo, which will change to "Stop Notify".

Hex	0x			
Decimal				
Date	2015/04/21 11:	49:43:340		
	Read	Write	Stop Notify	

The other side will receive data one byte by one byte.

- Disconnect by iOS device
 - Click "Disconnect" to close the BLE connection.

2.4 How to connect in Windows 10

The OP-735 is Bluetooth-enabled, and other device should be Bluetooth-enabled too. To connect OP-735 to your Computer/Laptop follow steps below:

Step 1: Make sure your device Bluetooth is on and click on "Add Bluetooth or other device" in the Bluetooth settings in Settings Menu:

Settings		– 🗆 X
வ் Home	Bluetooth & other devices	
Find a setting	Add Bluetooth or other device	Turn on Bluetooth even faster
Devices	+ Bluetooth	To turn on Bluetooth without opening Settings, open action center, and then select the Bluetooth icon. Do the same to turn it off when you want.
Bluetooth & other devices	On On	Get more info about Bluetooth
	Now discoverable as "PC61"	
CD Printers & scanners		Related settings
() Mouse	Mouse, keyboard, & pen	Devices and printers
I Typing	USB Keyboard	Sound settings
	Usb Mouse	Display settings
(P) AutoPlay	0	More Bluetooth options
🖞 USB	Audio	Send or receive files via Bluetooth

Step 2: In New form click on "Bluetooth":

A	dd a device X	
A	Add a device	
C C	hoose the kind of device you want to add.	
*	Bluetooth Mice, keyboards, pens, or audio and other kinds of Bluetooth devices	
Ģ	Wireless display or dock Wireless monitors, TVs, or PCs that use Miracast, or wireless docks	
	Everything else Xbox controllers with Wireless Adapter, DLNA, and more	

Step 3: Click on found OP-735 with audio type and click "Connect":



Step 4: Click "done" after connection is complete.



Step 5: After connecting, a COM port for the OP-735 is created on the computer, to know its port number, scroll down to the end of the form and click on "More Bluetooth options":



Click on "COM Ports" tab and find your OP-735 serial number with outgoing direction.

8 Bluetooth	Settings		×
ор СОМ	Ports Hardwar	e	
This PC is us whether you with your Blo	ing the COM (s need a COM p uetooth device.	serial) ports listed below. To ort, read the documentatio	determine n that came
Port	Direction	Name	
	Incoming	OP-735	
COM9	Outgoing	OP-735 'AMP-SPP'	
		Add	Remove
		OK Cance	Apply

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2.5 How to connect in Linux

To connect OP-735 with your Linux device flow steps below:

Step 1: Install BlueZ packages by using any of the following commands that matches your Linux distribution:



This installation provides the *bluetoothctl* utility.

Step 2: You need to add your account to the lp group if you wish to connect to a bluetooth tether:

sudo usermod -aG lp \$USER
newgrp lp

Step 3: Start and enable the Bluetooth:

\$ systemctl is-enabled bluetooth.service
enabled

Use this command to check it out:

\$ systemctl status bluetooth.service

Step 4: Ensure Bluetooth is not disabled:

\$ I	rfkill			
ID	ТҮРЕ	DEVICE	SOFT	HARD
0	bluetooth	<pre>tpacpi_bluetooth_sw</pre>	blocked	unblocked
1	wlan	phy0	unblocked	unblocked

If it is blocked, unblock it by using the command below: \$ rfkill unblock bluetooth

Confirm it is unblocked:

\$ rfkill				
ID TYPE	DEVICE	SOFT	HARD	
0 bluetooth	<pre>tpacpi_bluetooth_sw</pre>	unblocked	unblocked	
1 wlan	phy0	unblocked	unblocked	
2 bluetooth	hci0	unblocked	unblocked	

Step 5: Use bluetoothctl to connect to OP-735. Start the bluetoothctl interactive command:

\$ bluetoothctl
Agent registered

Use this command to check it out:

\$ bluetoothctl show

Step 6: Turn on your bluetooth adapter:

[bluetooth]# agent KeyboardOnly
Agent is already registered
[bluetooth]# default-agent
Default agent request successful
[bluetooth]# power on

Changing power on succeeded

Step 7: Turn OP-735 on and do a scan to detect it:

```
# scan on
Discovery started
[CHG] Controller 20:79:18:5E:4B:64 Discovering: yes
[NEW] Device 5C:FB:7C:A4:17:C6 OP-735
```

To stop scanning use this command:

scan off

Step 8: To pair with OP-735 use command "*pair <Bluetooth address>"*. You may need to confirm it.

```
[bluetooth]# pair 5C:FB:7C:A4:13:C6
Attempting to pair with 5C:FB:7C:A4:17:C6
[CHG] Device 5C:FB:7C:A4:13:C6 Connected: yes
Pairing successful
```

trust 5C:FB:7C:A4:17:C6

[CHG] Device 5C:FB:7C:A4:17:C6 Trusted: yes Changing 5C:FB:7C:A4:17:C6 trust succeeded

Use this command to check it out:

paired-devices
Device 5C:FB:7C:A4:17:C6 OP-735

devices
Device 5C:FB:7C:A4:17:C6 0P-735

Step 9: Connect to OP-735 after pairing:

```
[bluetooth]# connect 5C:FB:7C:A4:17:C6
Attempting to connect to 5C:FB:7C:A4:17:C6
[CHG] Device 5C:FB:7C:A4:17:C6 Connected: yes
Connection successful
```

Use this command to check it out:

```
[OP-735]# info
Device 5C:FB:7C:A4:17:C6 (public)
Name: OP-735
Alias: OP-735
```

3 Preparing for reading meter

Turn on OP-735 and put it on the optical port of the meter. After OP is turned on and before connecting with other Bluetooth device, LED will turn orange. First pair your tablet or laptop with the optical probe. After pairing with tablet or laptop, the LED on OP will turn green.

If you are using pc for connecting with OP, first choose the Com port corresponding to the optical port in the software used correctly and then start transferring data.

If you are using the meter reading application from German Metering, after pairing with tablet or phone, in Digital collection window, choose the serial number of the optical probe and then collect data from meter.

4 Application for setting OP-735

4.1 Using Windows Configuration Application

Open "Bluetooth Optical port tools" and choose the corresponding COM port to the optical probe. On the "Settings" section, choose the desired "commands" and click "Read" to collect data and "Write" to configure. If the selected command has the configuration capability, the parameters can be chosen in the "Params" section according to the configuration type.

For example, the parameters for optical port communication frame in transparent mode. The collected value will be displayed in front of "Value" after collection.

Port COM9 V	
ing	
Commands Device Model ~	Read 🕡
Params	Write
Value Model = OP-735	
File	Select Boot File

Firmware Upgrade using windows-based application

In order to upgrade OP-735 using "Bluetooth Optical port tools", first choose the associated file in "File" section by clicking on the "Select Boot File" and then press the "load boot file" button.

4.2 Using Android Configuration Application

To config your OP-735 with android application flow steps below:

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Step 1: Select your paired OP-735 from list and click on "CONNECT":

14.06 🕥 🕛		🗟 💷 82% 🖬
≡ Home		
Select B	luetooth Serial I	lumber
2 -	• OP-735 •	G
3 -	CONNECT	
)
1		
1 Connection	← Commands	Firmware

To disconnect your OP-735 click on "DISCONNECT":

14:18 🔶 🖻 🕄		କ୍ଲି al 82% 🖬
≡ Home		
Select B	luetooth Serial	Number
	0P-735	C
	DISCONNECT	
	1	
Connection	← Commands	Firmware
		N

Step 2: To send READ/WRITE commands click on "Commands" and choose desired command:



> Device Serial Number: Click on "READ" and get device serial number:

> Device Name: Click on "READ" to get device name and click on "WRITE" to set desired name:

14:19 1		Stall OZ 70
	Command	
	Choose Command	
		ne 🔹
Name	Device Response e=0P735	
	Write Command	
	5 🔶 WRITE	

> Software Version: Click on "READ" and get device software version:



> Auto Power Off: Click on "READ" to get and "WRITE" to set auto power off time:

14:19 ₪ 🖝	● mmand	ିବ୍କାଣ 81% 🖬
	Choose Command	
	1 📫 Auto Power	Off 👻
	2 📫 READ	
AutoPow	Device Response erOff=9 43	
	Write Command	
	4 🔿	1 🔹
	5 📫 WRITE	
)

> Device Mode: Click on "READ" to get and "WRITE" to set device mode:

14:19 🖪 🚖 🕥	🗟 .il 81% 🖬	14:19) 🖻 单 🕥	🖘 ill 81% 🖬
≡ Command		=	Command	
Choose Command			Choose Command	
1 📫 Device N	1ode 👻		Device N	lode 👻
2 📥 READ			READ	
Device Response			Device Response	
CommunicationMode=Transpare	nt 4 3	Cor	mmunicationMode=Transpare	nt
Write Command			Write Command	
	ENT -		TRANSPARE	ENT -
5 🗭 WRITE				
)			

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Data Transfer Frame: Click on "READ" to get and "WRITE" to set data transfer frame. Click on "SELECT FRAME" (4) to select Baudrate, Data Bit, Parity and Stop Bit:



Click on each of Baudrate, Data Bit, Parity or Stop Bit to select desired value:



> Device Model: Click on "READ" and get device model:



> Custom Command: Enter desired command in "Write Command" section and click on "WRITE" to send command and receive device response:

14:20) 🖪 🎃 🕢	S. al 81% 💼
=	Command	
	Choose Command	
	1 📫 Custom Command	•
	Device Response	
	4	
	Write Command	
	4 2	
	3 📫 write	

Use following commands:

Command Type	Possible options	Command	Answer
Read Serial	10 bytes digits or letters	Serial?	Serial Number=OP-735
Read Bluetooth Name	10 bytes digits or letters	Name?	Name=OP-735
Set Bluetooth Name	10 bytes digits or letters	Name=OP-735	Name=OP-735
Read Optical Probe Model	OP-735, OP-745	Model?	Model = OP-735
Read Software Version		Software Version?	Version:01.01.01
Read Automatic Power Off	1 to 9	AutoPowerOff?	AutoPowerOff=5
Time (Minute)			
Set Automatic Power Off	1 to 9	AutoPowerOff=3	AutoPowerOff=3
Time (Minute)			
Read Working Mode	TRANSPARENT, IEC	Mode?	CommunicationMode=IEC
Set Working Mode	TRANSPARENT, IEC	Mode=IEC	CommunicationMode=IEC
Read Optical Port Frame	Note*	Frame?	Frame=300,7,E,1
Set Optical Port Frame	Note*	Frame=300,7,E,1	Frame=300,7,E,1

Note*:

Set up and collection of the optical port communication frame is as follows:

Baud rate, Number of Bit, Parity, Stop bit •

- The values for each parameter are as follows:
 - Baud rate: 300, 1200, 2400, 4800, 9600, 19200
 - Number of Bit: 7, 8 •
 - Parity: N (none), E (even), O (odd) •

According to the above description, if we want to connect with the meter with baud rate: 4800 and number of bits: eight and parity: E with the last 1 bit, the command format will be as follows:

```
Frame =4800,8,N,1
```

Note*:

Generally, for meters that comply with IEC 62056-21 standard, the command should be:

Frame =300,7,E,1

Note*:

In case any command other than the mentioned commands are sent to the optical probe, "Invalid Command!" will be returned and if parameters are not set correct, "Invalid Parameters!" will be returned.

Step 3: To upgrade firmware, click on "Firmware" and choose file to send to device:

