



**CM002X1**

**Xear Audio Technology  
Authentication User Guide**

(For Win10 / Win11)

**Rev. 1.0**  
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**Release notes**

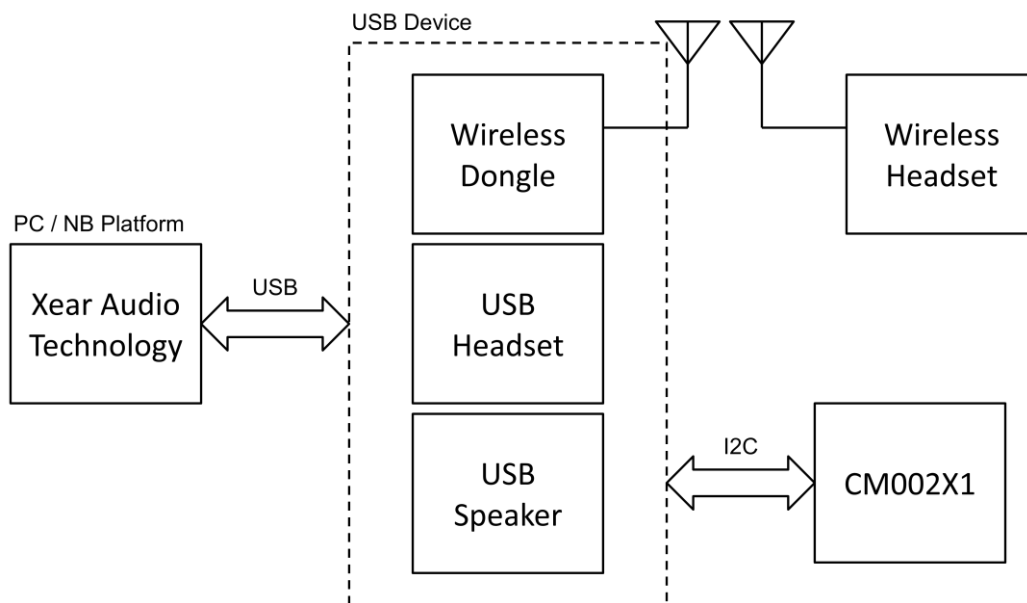
Revision	Date	Description
1.0	2023/07/28	First release

## 1 Description and overview

The CM002X1 is a coprocessor embedded data encryption algorithm, the purpose is returning the certification data to Xear Audio Technology with enabling. The CM002X1 is only accessed via I2C interface which is in slave mode. The user guide is standing on USB device to illustrate authentication flow between HID and I2C protocol, it can help the developer how to program CM002X1 and feedback final result to Xear Audio Technology.

## 2 Application Scenario

Xear audio technology supports the Windows 10 and 11 with USB audio application, see the scenario as below.



CM002X1 Application Scenario

### 3 Xear Audio Technology Authentication

#### 3.1 Available List

Before user starts to implement Xear Audio Technology authentication, the available of relating support which means you may need to claim firstly. For each item is shown as below.

No.	Item	Description
1	Xear Audio Technology	1. Cmedia software driver/APO 2. Require to add VID/PID of USB device into Xear if needed 3. WHQL certification
2	CM002X1 Datasheet	The content including : 1. I2C data format and timing definition 2. The reference of typical application circuit
3	CM002X1 Engineering Sample	Seek for the help from Cmedia distributor
4	User Guide	Guide USB device to interact between host (Xear) and CM002X1

Table 3-1. The Preparation for Xear Audio Technology authentication

#### 3.2 HID Write and Read Command

Xear Audio Technology authentication based on data encryption algorithm, and it has to access (over 10 times of write and read) the external CM002X1 and finally get return of certification data. If the certification data is valid, Xear Audio Technology is enabled automatically. Otherwise, it is still disabled that can't be visited. The access commands are classified WRITE and READ command, standing on USB device, the device will receive the commands of "0x11", "0x12" and return data with "0x13" via HID protocol, the device has to decode the HID format and automatically set the corresponding I2C WRITE and READ to/from CM002X1, the definition is shown as table 3-2.

User can also refer section 3.3 and 3.4 to implement USB device firmware code.

HID Command		Direction	USB Device Action
Write	0x11	Host → Device	I2C write data to CM002X1
Read	0x12	Host → Device	I2C read data from CM002X1
	0x13	Device → Host	return "read data" to host (Xear)

Table 3-2. HID Write and Read Command

### 3.3 HID and I2C Write

Xear generates data (cipher) and sends the write command via HID “0x11”, and USB device needs to follow HID information (address, length, data) and executes I2C write to CM002X1 as shown on figure 3-1. I2C write needs to support 16 bytes data length at least.

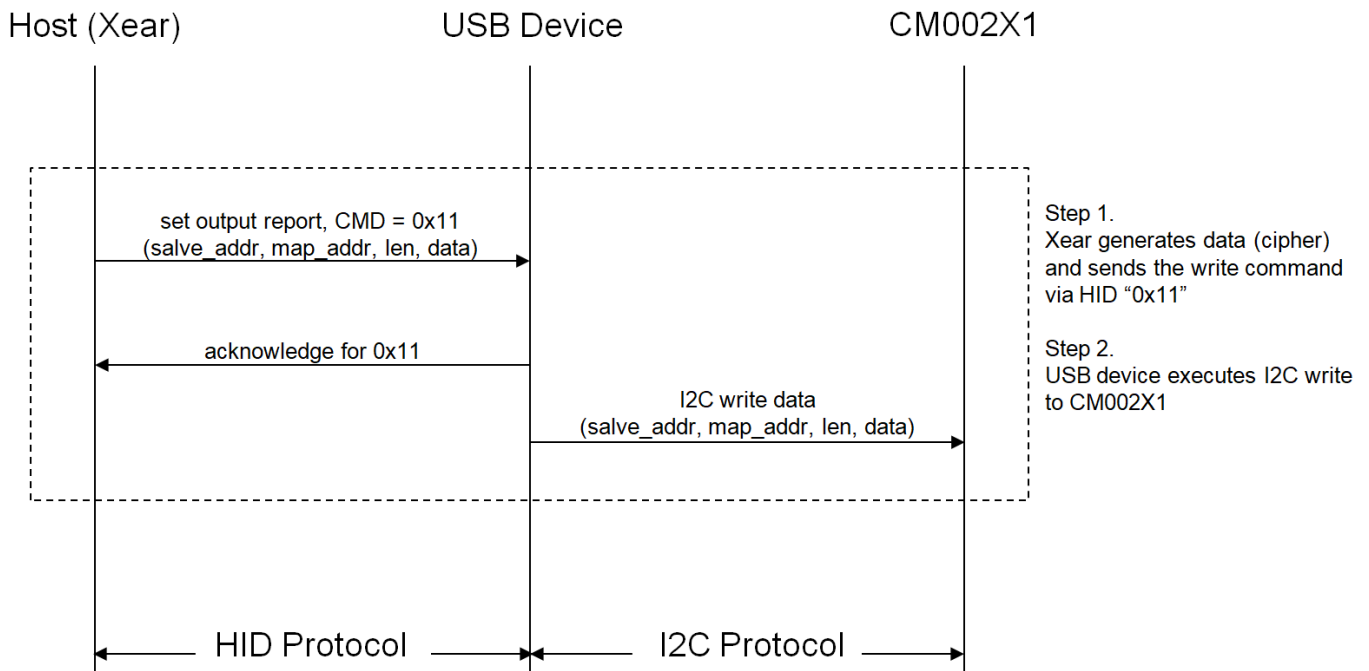


Figure 3-1. HID and I2C Write Flow

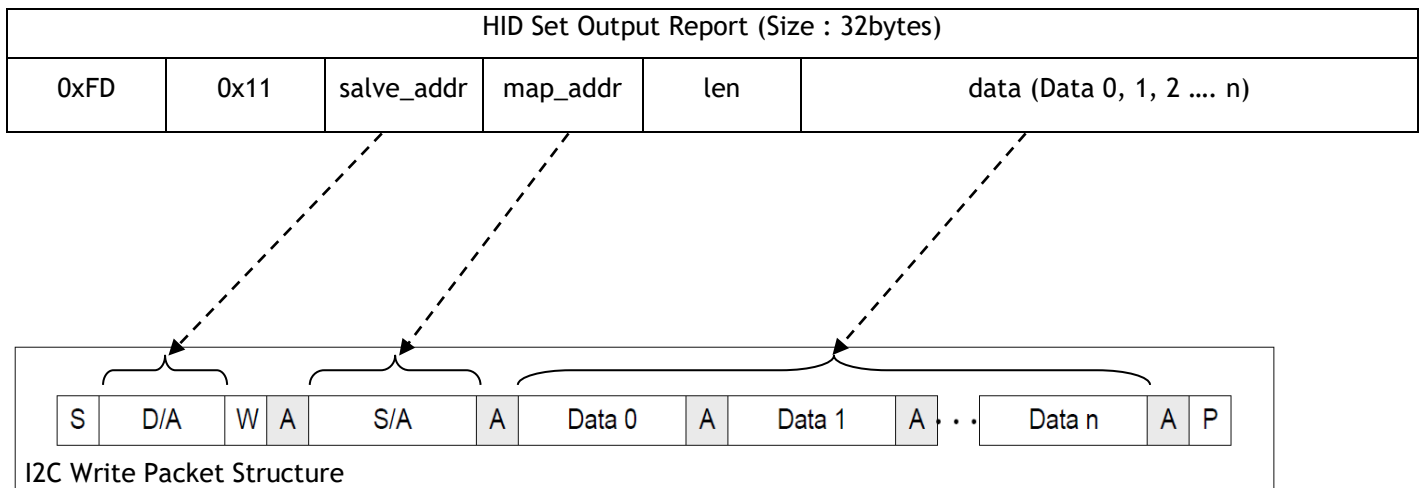


Figure 3-2. HID and I2C Write Format

**Note:**

1. 0xFD (1 byte size) : defined report ID
2. 0x11 (1 byte size) : defined write command
3. salve\_addr (1 byte size) : CM002X1 salve address (device ID) is fixed on “0x7A”, only 7 bit is required
4. map\_addr (1 byte size) : CM002X1 sub address (data address)
5. len (1 byte size) : length of write data (byte), len ≤ 16
6. data (27 byte size) : Data 0 ~ n ≤ 16 bytes

Transfer	F	Control	ADDR	ENDP	D	Tr	R	bRequest	wValue	wIndex	wLength	Bytes Transferred	Time Stamp		
41	S	SET	27	0	H->D	C	I	0x09	0x02FD	0x0003	32	32	8 . 003 720 466		
Transaction	F	SETUP	ADDR	ENDP	T	D	Tr	R	bRequest	wValue	wIndex	wLength	ACK	Time	Time Stamp
5734	S	0xB4	27	0	0	H->D	C	I	0x09	0x02FD	0x0003	32	0x4B	166.000 us	8 . 003 720 466
Transaction	F	OUT	ADDR	ENDP	T	Data							ACK	Time	Time Stamp
5738	S	0x87	27	0	1	FD 11 7A EF 10 FF A2 B2 74 68 5A C9 9E 2D DF 51							0x4B	204.116 us	8 . 003 886 466
Transaction	F	OUT	ADDR	ENDP	T	Data							ACK	Time	Time Stamp
5743	S	0x87	27	0	0	61 3A 02 00 0F 00 00 00 00 00 00 00 00 00 00 00							0x4B	890.368 us	8 . 004 090 582
Transaction	F	IN	ADDR	ENDP	T	Data	ACK	Time	Time Stamp						
5772	S	0x96	27	0	1		0x4B	12.403 ms	8 . 004 980 950						

Figure 3-3. The Example of 0x11 Bus Protocol

### 3.4 HID and I2C Read

When Xear sends the read command via HID “0x12” to claim certification data from CM002X1 and USB device needs to execute I2C read from CM002X1 and gets data ready in device buffer (reserve 16 bytes). Until host (Xear) sending “get input report” to device which means device has to return data to host (Xear) with HID “0x13” for the authentication.

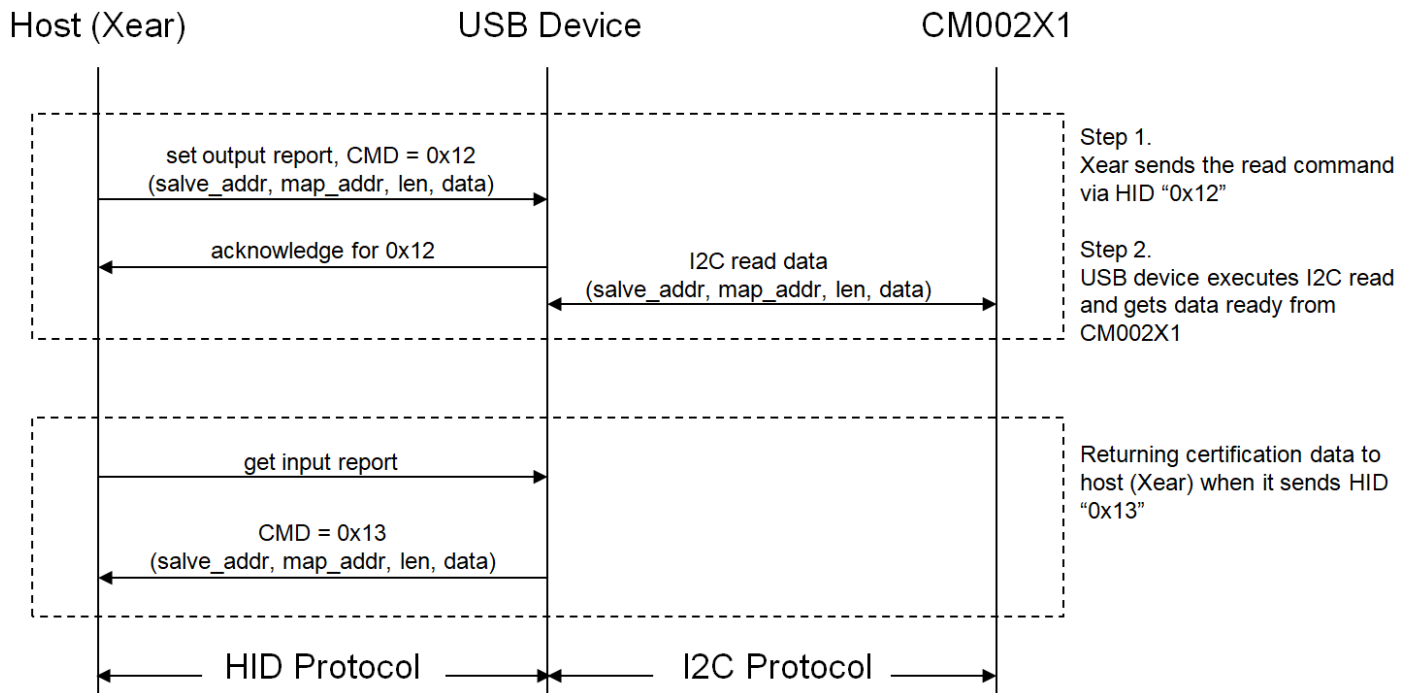


Figure 3-4. HID and I2C Read Flow



HID Get Input Report (Size : 32bytes)					
0xFD	0x13	salve_addr	map_addr	len	data (Data 0, 1, 2 .... n)

Figure 3-7. "0x13" Return Data to Host

Note :

1. 0xFD (1 byte size) : defined report ID
2. 0x13 (1 byte size) : defined read command (return data to host)
3. salve\_addr (1 byte size) : the content is the same with 0x12
4. map\_addr (1 byte size) : the content is the same with 0x12
5. len (1 byte size) : the content is the same with 0x12
6. data (27 byte size) : Data 0 ~ n, n = len - 1

Transfer	F	Control	ADDR	ENDP	D	TP	R	bRequest	wValue	wIndex	wLength	Bytes Transferred	Time Stamp		
43	S	GET	27	0	D→H	C	I	0x01	0x01FD	0x0003	32	32	8 . 030 462 750		
Transaction	F	SETUP	ADDR	ENDP	T	D	TP	R	bRequest	wValue	wIndex	wLength	ACK	Time	Time Stamp
6194	S	0xB4	27	0	0	D→H	C	I	0x01	0x01FD	0x0003	32	0x4B	466.166 us	8 . 030 462 750
Transaction	F	IN	ADDR	ENDP	T	Data						ACK	Time	Time Stamp	
6210	S	0x96	27	0	1	FD 13 7A EF 10 F4 1F 83 B3 0D 19 16 42 00 B1 28						0x4B	256.984 us	8 . 030 928 916	
Transaction	F	IN	ADDR	ENDP	T	Data						ACK	Time	Time Stamp	
6219	S	0x96	27	0	0	06 37 54 39 C1 00 00 00 00 00 00 00 00 00 00 00						0x4B	19.166 us	8 . 031 185 900	
Transaction	F	OUT	ADDR	ENDP	T	Data	ACK	Time Stamp							
6220	S	0x87	27	0	1		0x4B	8 . 031 205 066							

Figure 3-8. The Example of 0x13 Bus Protocol

## 4 HID Report Descriptor (Report ID 0xFD)

For report ID 0xFD, the firmware implementation is also needed to add HID report descriptor which is shown as below:

db 05H, 0CH	::Usage Page(Consumer)
db 09H, 01H	::Usage(Consumer Control)
db 0A1H, 01H	::Collection(Application)
db 06H, 02H, 0FFH	::Usage Page, Vendor Defined(0xFF02)
db 09H, 01H	::Usage(0x01)
db 085H, 0FDH	::Report ID(FD)
db 75H, 08H	::Report Size(8)
db 095H, 1FH	::Report Count(31)
db 09H, 10H	::Usage(vendor, 0x10)
db 081H,02H	::Input(0x02)
db 75H, 08H	::Report Size(8)
db 095H, 1FH	::Report Count(31)
db 09H, 10H	::Usage(vendor, 0x10)
db 091H, 02H	::Output(Data, Variable, Absolute)
db 0C0H	::End Collection

## 5 FAQ

1. Be aware of “Repeated Start (Non-Stop)” of I2C read, the format must be followed, it can be referred from CM002X1 datasheet

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