AB158x Series Headset Reference Design User Guide

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1. Introduction

The man-machine interface (MMI) layer is intended to offer a well-organized interface that makes control profile services such as HFP, A2DP, and AVRCP more intuitive. The MMI layer also provides a robust system environment which protects users from a negative experience (e.g., crash situation).

This guide is written to help users easily and completely understand MMI layer functionality.

1.1. Platform architecture

Figure 1 shows that the software architecture is made up of several components which are divided into three different groups: Airoha Defined Interface component; Bluetooth Defined Component; and Customer Defined Component. MMI is the only component in the Customer Defined component. It is also the topmost layer and is completely controlled by the user. Moreover, MMI coordinates the interface and allows all profiles to operate together.

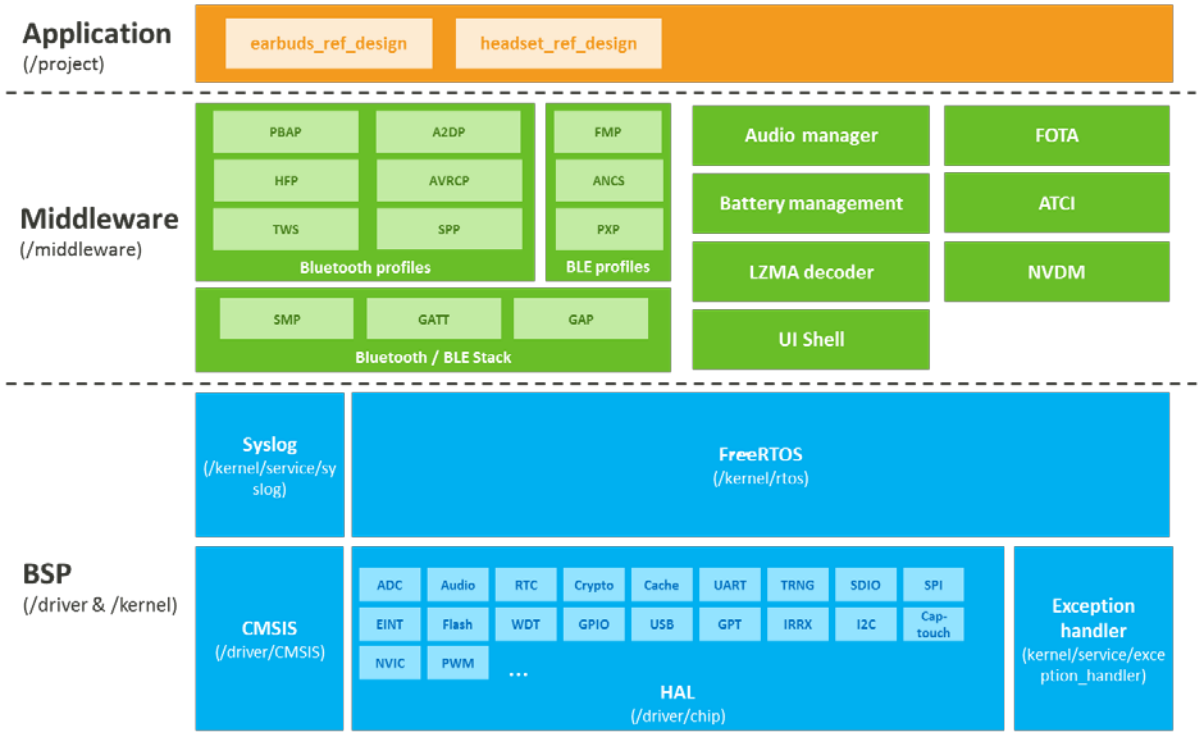

Figure 1. Software architecture

1.2. EVK components

When the user starts making use of the AB158x MMI functionality, there are some signals to which they can refer so that they can verify whether the corresponding function is operating correctly. The user must also use some of the EVK components to make use of the MMI functions. This section introduces the components that are used to trigger MMI or show MMI functionality.

There are three different colors to indicate the different EVK component groups, as shown in Figure 2. EVK components.

1) The components shown in green indicate the buttons on the EVK. From bottom to top, these buttons are EINT_KEY0, EINT_KEY1, EINT_KEY2, and EINT_KEY3. The power key and reset key are above the EINT_KEYs.

2) The EVK components shown in yellow indicate the LEDs. The LEDs (shown from bottom to top) are LED0 and LED1. These LEDs have different colors.

3) The EVK component shown in orange is the earphone jack. The earphone jack is used for listening to the voice prompts that are related to a specific MMI function.

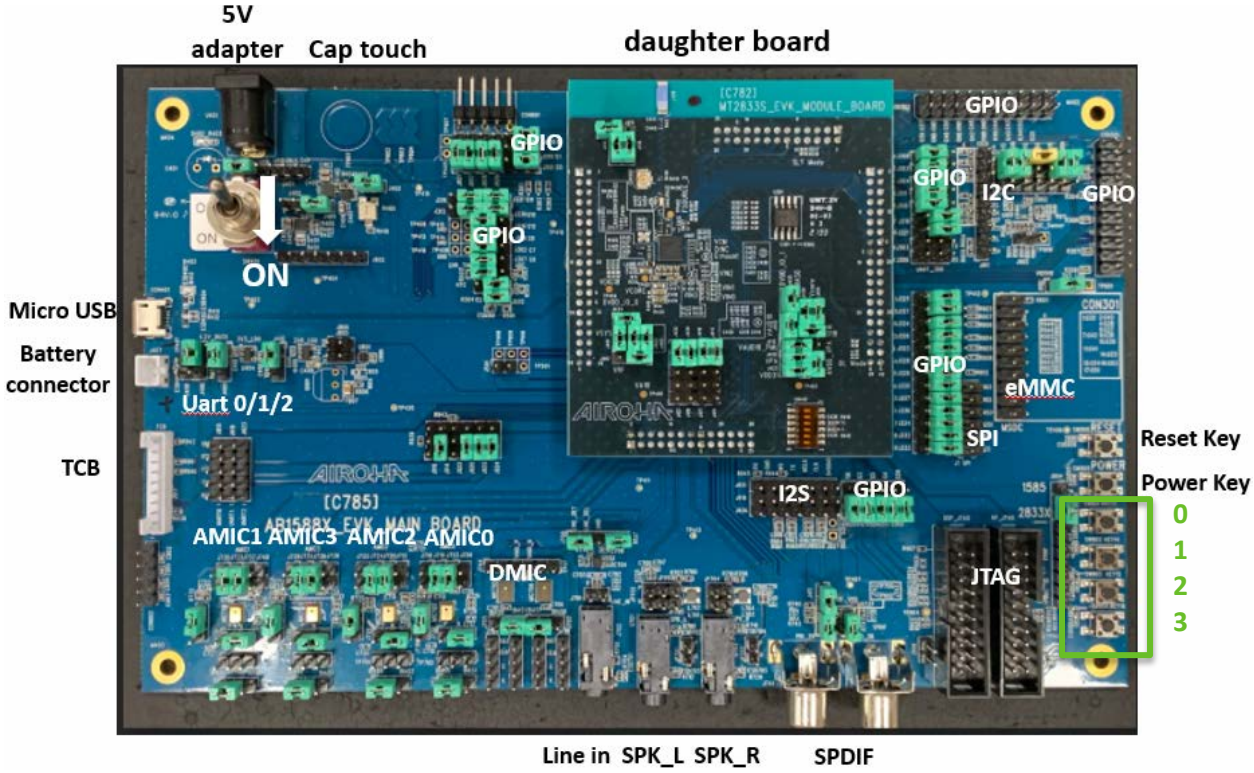

Figure 2. EVK components

2. MMI Functionality

This section shows the MMI layer functionality. Generally speaking, MMI functions can be partitioned into five main fields: system; connection; calling; volume; and music. A more in-depth description of each function field is given in the function field sections.

Furthermore, the actions for the buttons must be defined in advance. The tap action is defined as a press of the button of no more than 500 milliseconds. Pressing the button for more than 500 milliseconds is defined as a “long press”. You can use Config Tool to make changes to the time settings for a tap or long press.

The beep results must also be well defined. The length of the beeps are described as long, median, and short, and the tonality of the beep refers to either rising or falling sounds. Every beep result includes a number which describes the number of times a beep will play.

In the following sections, the components must be used to trigger the functionality. The results indicate that the function is correctly triggered.

2.1. System

Regarding the system function field, the MMI functions related to the functions of the EVK itself are classified in this field, including how to turn the AB158x Series product on and off.

2.1.1. Power

The user can turn the AB158x Series product on and off by pressing the key. BT is turned on when headset powers on and turned off when headset powers off.

Table 1. Power and BT enable

Functionality	Actions	Results	Requirements
Power on	Long press power key for 3 seconds.	Device powers on and BT is enabled.	Power off state.
Power off	Long press power key for 3 seconds.	Device powers off and BT is disabled.	Power on state.

2.2. Connection

This section describes the MMI functionality related to being discoverable by other devices and connecting to other devices.

2.2.1. Entering pairing mode

This functionality is used to make the AB158x series product discoverable by other devices. The user can press a key to enter pairing mode.

Table 2. Enter pairing mode

Functionality	Actions	Results	Requirements
Enter pairing mode	Double-click the power key on headset.	LED0 and LED1 on the headset are on; a voice	The headset does not connect to a smartphone if

Functionality	Actions	Results	Requirements
		prompt says “Pairing” on headset.	AIR_MULTI_POINT_ENABLE is set to “n”. The headset is not playing music or calling if MTK_MULTI_POINT_ENABLE is set to “y”.

2.2.2. Connected

This connecting function occurs when first pairing a device or when automatically reconnecting to a paired device.

Table 3. Connected

Functionality	Actions	Results	Requirements
Connected	Smartphone or other device connects to the headset.	LED0 and LED1 are off and a voice prompt says “Connected”.	NA

2.2.3. Reconnecting automatically

When an AB158x series product powers on or is disconnected, it tries to reconnect to the previously connected device.

Table 4. Reconnect actively

Functionality	Actions	Results	Requirements
Reconnect actively	Automatically reconnect.	NA	Already connected before.

Note: The voice prompt immediately says “Connected” when an AB158X series product successfully connects to the other device.

2.3. Calling

This section shows the MMI functionality related to calling. These functions include how to accept/end/reject/hold a call, cancel an outgoing call, redial the most recently dialed phone number, transfer the sound to a connected device or to the AB158x series product, and manage a three-way call.

2.3.1. Incoming call

The identity of an incoming call.

Table 5. Incoming call

Functionality	Actions	Results	Requirements
Incoming call	There is an incoming call from the smartphone.	LED0 blinks.	Connected.

2.3.2. Accepting a call

The user can accept an incoming call.

Table 6. Accept call

Functionality	Actions	Results	Requirements
Accept call	Press the power key.	NA	An incoming call is active.

Note: When the call is successfully accepted, LED0 is ON.

2.3.3. Ending a call

The user can end an active call.

Table 7. End call

Functionality	Actions	Results	Requirements
End call	Press the power key.	The voice prompt says “Call ended”.	A call is active.

2.3.4. Rejecting a call

The user can reject an incoming call.

Table 8. Reject call

Functionality	Actions	Results	Requirements
Reject call	Double-click the power key.	A voice prompt says “Call rejected”.	A call is incoming.

2.3.5. Holding a call

The user can hold an active call.

Table 9. Hold call

Functionality	Actions	Results	Requirements
Hold call	Double-click the power key.	NA	A call is active.

2.3.6. Three-way calling

This section shows the functions available to the user when two calls are active at the same time.

Note: The calls here are held, incoming, or active.

2.3.6.1. Holding and rejecting

The user can keep the current call and reject a held or incoming call.

Table 10. Hold and reject

Functionality	Actions	Results	Requirements
Hold and reject	Double-click the power key.	A voice prompt says “Call rejected”.	There is an incoming at the same time as an active call.

2.3.6.2. Holding and accepting

The user can hold the current calling and accept an incoming call.

Table 11. Hold and accept

Functionality	Actions	Results	Requirements
Hold and accept	Press the power key.	N/A	There is an incoming at the same time as an active call.

2.3.6.3. Ending an active call and recovering a held call

The user can end the currently active call and recover the held call.

Table 12. End active call and recover held

Functionality	Actions	Results	Requirements
End and recover	Press the power key.	N/A	There is an active call and another held call.

2.3.6.4. Ending a three-way call

The user can end the three-way call.

Table 13. Ending a three-way call

Functionality	Actions	Results	Requirements
End three-way call	Press the power key.	N/A	There is an active three-way active call.

2.4. Volume

This section shows the MMI functions related increasing or decreasing the volume of the speaker and microphone, and how to mute or unmute the microphone.

2.4.1. Changing the volume

The user can adjust the sound level of the speaker.

Table 14. Speaker volume

Functionality	Actions	Results	Requirements
Volume up	Press EINT_KEY_0.	One short beep	In connected, incoming/outgoing, call active states or playing music.
Volume down	Press EINT_KEY_1.	One short beep	In connected, incoming/outgoing, call active states or playing music.

Note: The speaker here is applicable to HFP and A2DP, depending on the scenario.

Note: When the volume reaches the maximum level, the user hears two short beeps and the voice prompt says “Volume maximum” through the earphone.

2.5. Music

This section shows the MMI functionality for controlling music, including the method for playing music, pausing music, and setting music forward or backward.

Note: The music referred to here is for A2DP.

Note: A2DP music cannot exist at the same time of HFP calling.

2.5.1. Playing music

The user can play music.

Table 15. Music play

Functionality	Actions	Results	Requirements
Music play	Press the power key.	NA	In a connected state.

Note: The user can immediately hear the song through the earphones when the music successfully plays.

2.5.2. Pausing music

The user can pause the currently playing music.

Table 16. Music pause

Functionality	Actions	Results	Requirements
Music pause	Press the power key.	NA	In playing music state.

Note: The user immediately hears the music pause when the music successfully pauses.

2.5.3. Skipping forward

This functionality provides the ability to play the next audio file.

Table 17. Music next

Functionality	Actions	Results	Requirements
Music forward	Double-click the power key.	One short beep.	In playing music state.

2.5.4. Skipping back

The user can play the audio file that is stored before the currently playing audio file.

Table 18. Music previous

Functionality	Actions	Results	Requirements
Music back	Triple-click the power key.	One short beep.	In playing music state.

2.5.5. Fast forward and fast rewind

This functionality provides the ability to fast forward and fast rewind.

Table 19. Music previous

Functionality	Actions	Results	Requirements
Music fast forward	Long press EINT_KEY_0 for 1 second to start fast forward and release the key to stop fast forward.	N/A	In playing music state.
Music fast rewind	Long press EINT_KEY_1 for 1 second to start fast rewind and release the key to stop fast rewind.	N/A	In playing music state.

2.6. Line in playback

When the line is plugged in, the audio path will be switched to line in automatically. User can triple click a key to switch audio path between line in and A2DP. When the audio patch is line in, the music functions in section 2.5 couldn't be used.

Table 20. Audio path switch

Functionality	Actions	Results	Requirements
Audio path switch	Triple click EINT_KEY_0.	Switch audio path between line in and A2DP.	N/A

2.7. ANC and pass through

The user can switch ANC and pass through via Airoha UT_APP on the smartphone.

2.8. Voice assistant

The user can press a key to wake up the voice assistant.

2.8.1. Waking up voice assistant

Table 21. Wake up voice assistant

Functionality	Actions	Results	Requirements
Wake up voice assistant	Long press the power key for 1 second and release the key before 3 seconds.	One short beep.	Connected to smartphone.

2.9. Multipoint

This section shows how users can make multilink at the same time.

2.9.1. Connection

When device has connected with one smartphone, users can enter pairing mode again by double-clicking the power key. At this time, the second smartphone can find this device and connect.

When the headset connects to the second smartphone, a voice prompt says “Connected”.

3. MMI Event

This section shows the events that are not triggered by pressing the button, but are instead triggered by other devices or the AB158x series product itself. These events are divided into three types: connection; battery; and time out.

3.1. Connection

This section shows all events related to connections, such as successfully pairing, being connectable, and being connected.

Table 22. Connection event

Event	Results
Connectable	LED0 and LED1 is on.
Connected	LED0 and LED1 is off.

Note: If the AB158x series product is connectable, it can only be connected to but it is not discovered.

Note: The connected event here is for situations in which it is both fully connected and not connected.

3.2. Battery

This section shows the battery events including low battery, charging, and charging full.

Table 23. Battery event

Event	Results
Low battery	LED1 flashes every 0.6 seconds.
Charging	LED1 flashes every 4 seconds.
Charging full	LED1 is always on in 5 seconds.

3.3. Time out

There is a time out mechanism for the AB158x series product: pairing mode time out. This section shows the time out mechanism.

Table 24. Time out event

Event	Results
Pairing mode time out	The timeout of the pairing mode is 2 minutes.
Power off	The AB158x series product powers off if it waits 5 minutes and no other devices are connected.

4. Key Mapping Table

This section shows a mapping table of the keys, actions, LEDs, voice prompts, ring tones and any related comments for a specific function. For example, for the 'Power on' function, search for 'Power on' in the 'Functionality' column in Table 25. Key mapping table. The Key, Action, LED, Voice prompt, Ring tone, and comments that are associated with the 'Power on' function (i.e. Press for three seconds; LED0 rapidly flashes three seconds; Say "Power-On"; and 'In the power off state') are shown in the adjacent cells on the same row.

Table 25. Key mapping table

Key	Functionality	Action	LED	Voice prompt	Comment
Power Key	Accept call	Press	LED0 is ON	NA	An incoming call is active.
	End call	Press	NA	"Call ended"	A call is active.
	Reject	Double-click	NA	"Call Rejected"	An incoming call is active.
	Hold	Double-click	LED0 blinks slowly	NA	During an active call.
	Hold and reject	Double-click	NA	"Call Rejected"	There is incoming call during an active call.
	Hold and accept	Press	NA	NA	There is another incoming when there is an active call or there is an active call and another held call.
	End active and recover held	Press	NA	NA	An activity call and another hold call.
	End three-way call	Press	NA	NA	Three-way call is active.
	Music play	Press	NA	NA	In the connected state.
	Music pause	Press	NA	NA	In playing music state.
	Music forward	Double-click	NA	NA	In playing music state.
	Music backward	Triple-click	NA	NA	In playing music state.
	Power on	Long press for 3 seconds.	LED0 blink quickly; LED1 is OFF	"Power on"	When device is power off.
	Power off	Long press for 3 seconds.	LED0 blinks quickly; LED1 is OFF	"Power off"	When device is power on.

Key	Functionality	Action	LED	Voice prompt	Comment
	Wake up voice assistant	Long press for 1 second and release before 3 seconds	NA	A short beep	When the device is connected to a smartphone.
	Enter pairing mode	Double-click	LED0 and LED1 is on	“Enter pairing mode”	If AIR_MULTI_POINT_ENABLE is set to “n”, the key function works when the device is not connected to a smartphone or not in music playing or HFP status.
	Switch ANC and pass through	Double-click	NA	A short beep	When the device is connected to another side
EINT_KEY_0	Volume up	Press	NA	NA	In the connected, incoming/outgoing call, call active or playing music states.
	Switch audio path	Triple-click	NA	NA	Switch between A2DP and line in.
EINT_KEY_1	Volume down	Press	NA	NA	In the connected, incoming/outgoing call, call active or playing music states.