



# **AB156x\_V3/AB157x/AB158x Series Mass Production RACE Application Note**

**\* AB156x is only compatible with SDK v3.1.0 and above \***

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## Document revision history

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Revision	Date	Description
1.0	19 January 2022	Initial release
1.1	04 July 2022	Added relay example for dual chip Fixed incorrect example of get audio channel RACE command Fixed incorrect format of Power OFF RACE command Fixed incorrect NV ID of Enter DUT mode function
1.2	20 October 2022	Added Airoha defined data format for USB interface Added MIC test commands to support multi-MIC/DCHS test purposes Added DUT/DTM mode commands which do not need to reset device
1.3	26 October 2022	Added description for ULL 1.0/ULL 2.0 pairing commands
1.4	10 March 2023	Added a screenshot of Bluetooth address on smart devices
1.5	24 March 2023	Modified description for ULL 2.0/LE Audio pairing commands

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## 1. Introduction

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This application note describes AB156x\_V3/AB157x/AB158x series Mass Production RACE related information. The following topics are included to help users to establish Audio Mass Production environment.

- 1) AB156x\_V3/AB157x/AB158x RACE definition
- 2) UART software flow control
- 3) ANC calibration flow
- 4) ANC RACE commands (ANC RACE commands are used to calibrate ANC.)

Relay RACE commands (Relay RACE commands are used to send RACE to partner for MCSync/dual chip ANC calibration.)

Sub-function RACE commands (Sub-function RACE commands is to support version check, model name check...etc.)

Mic test RACE commands (Mic test RACE commands are used to test mic functionality.)

**\* For AB156x, The content of this application note is only applicable  
in AB156x SDK v3.1.0 and below. \***

## 2. RACE command packet

The Race Command (RCMD) packet is used to send commands to AB156x\_V3/AB157x/AB158x device from the Host (external MCU or PC tool) or receive events (indications or responses) from AB156x\_V3/AB157x/AB158x device. Any AB156x\_V3/AB157x/AB158x device can accept an RCMD with up to 1000 bytes of data excluding the RCMD header and length field. Each RCMD command is assigned two types of transported fields that are used to uniquely identify different format of commands. These two fields are called “Transported by H4” and “Transported by H5”.

### 2.1. RCMD Packet Format

#### 2.1.1. RCMD Command Format (sent to AB156x\_V3/AB157x/AB158x)

Command				
Channel	Type	Length	ID	Payload
1 byte	1 byte	2 bytes	2 bytes	Varied
0x05	0x5A or 0x5C	#1	RACE Command ID	#2

*Table 2-1.RACE command format*

#1 ID + Payload

#2 Command parameters

#3 Little Endian used for multi-bytes area

#### 2.1.2. RCMD Receive Format (received from AB156x\_V3/AB157x/AB158x)

Response				
Channel	Type	Length	ID	Payload
1 byte	1 byte	2 bytes	2 bytes	Varied
0x05	0x5B or 0x5D	#1	RACE Command ID	#2

*Table 2-2.RACE receive format*

The host sends RCMD Commands to AB156x\_V3/AB157x/AB158x via UART. AB156x\_V3/AB157x/AB158x responds with the individual ‘ID’ which represents the ID of the responding command.

### 2.2. Type List

Type ID	Description
0x5A	Command needs a response
0x5B	Response
0x5C	Command does not need a response
0x5D	Notification

*Table 2-3.RACE type list*

### 3. UART flow control

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AB156x\_V3/AB157x/AB158x implements the UART software flow control which uses 0x11 and 0x13 as the control bytes. Encode/decode data according to the following tables if you are sending RACE via UART.

Sending raw data	Encoded data
0x11	0x77 0xEE
0x13	0x77 0xEC
0x77	0x77 0x88

**Table 3-1. UART flow control encoding table**

Receiving raw data	Decoded data
0x77 0xEE	0x11
0x77 0xEC	0x13
0x77 0x88	0x77

**Table 3-2. UART flow control decoding table**



## 4. USB data format

---

AB156x\_V3/AB157x/AB158x supports the USB interface for sending RACE commands for MP/tuning purposes.

Byte 0	Byte 1	Byte 2	Byte 3-61
Report ID - 0x06: Out - 0x07: In	Length - Valid length of Data	Target Device - 0x00: Local - 0x80: Remote	Data - Race command

**Table 4-1. USB data format**

- Byte 0: Report ID

In HID specification, the first byte must be the report ID

**Out Report ID: 0x06; IN Report ID: 0x07**

- Byte 1: **Valid** length of data

The data of HID packet is padded to the maximum size by zero data of each HID report.

The USB module can know according to this byte how many bytes is valid and send the appropriate data to the race module.

- Byte 2: Target device

0x00: The local device

0x80: The remote device which is connected to the local device

- Byte 3~61: Data

Race command

## 5. ANC RACE command

### Payload ID

All ANC commands use the RACE command ID **0x0E06** and Payload ID in the payload. Table 5-1 shows the definitions for the Payload IDs.

Payload ID	
Description	ID
ANC On	0x0A
ANC Off	0x0B
Set ANC Gain	0x0C
Read ANC gain from NvKey	0x0D
Write ANC gain to NvKey	0x0E
Get ANC hybrid capability	0x16

*Table 5-1.ANC RACE payload ID*

### ANC gain index mapping

Table 5-2 shows the Gain Index and the Gain Values for ANC.

Gain Index	Gain Value (dB)
0x0258(600)	6
...	..
0x0000	0
0xFFFF(-1)	-0.01
0xFFFE(-2)	-0.02
...	Gain value = Gain index/100
0xFF9C(-100)	-1
...	...
0xFA24(-1500)	-15
...	...
0xDCD8(-9000)	-90

*Table 5-2.ANC gain index mapping*

## 5.1. ANC On

Command (0x055A)								
Length		ID		Payload				
2 bytes		2 bytes		5 bytes				
				Status	ID	Filter coefficient index	ANC mode	Sync mode
0x07	0x00	0x06	0x0E	0x00	0x0A	XX	00:Hybrid 01:FF only 02:FB only 04:AiroThru	00: Turn on agent ANC only 01: Turn on both agent and partner ANC

Response (0x055B)									
Length		ID		Payload					
2 bytes		2 bytes		6 bytes					
				Status	ID	Filter coefficient index	ANC mode	Sync mode	reserved
0x08	0x00	0x06	0x0E	0x00: success Else: fail	0x0A	XX	00:Hybrid 01:FF only 02:FB only 04:AiroThru	00 or 01	XX

Filter coefficient index: ANC: 0x01 ~ 0x04

AiroThru: 0x09 ~ 0x0B

## 5.2. ANC Off

Command (0x055A)						
Length		ID		Payload		
2 bytes		2 bytes		3 bytes		
0x05	0x00	0x06	0x0E	Status	ID	Sync mode
				0x00	0x0B	00: Turn off agent ANC only 01: Turn off both agent and partner ANC

Response (0x055B)						
Length		ID		Payload		
2 bytes		2 bytes		6 bytes		
0x08	0x00	0x06	0x0E	Status	ID	Sync mode
				0x00: success Else: fail	0x0B	00 or 01

## 5.3. Set ANC Gain

Command (0x055A)						
Length		ID		Payload		
2 bytes		2 bytes		10 bytes		
0x0C	0x00	0x06	0x0E	Status	ID	Gain FF L
				0x00	0x0C	XX XX

Response (0x055B)						
Length		ID		Payload		
2 bytes		2 bytes		10 bytes		
0x0C	0x00	0x06	0x0E	Status	ID	Gain FF L
				0x00:success Else: fail	0x0C	XX XX

## 5.4. Read ANC gain from NvKey

Command (0x055A)						
Length		ID		Payload		
2 bytes		2 bytes		2 bytes		
0x04	0x00	0x06	0x0E	Status	ID	
				0x00	0x0D	

Response (0x055B)						
Length		ID		Payload		
2 bytes		2 bytes		10 bytes		
0x0C	0x00	0x06	0x0E	Status	ID	Gain FF L
				0x00: success	0x0D	XX XX

				Else: fail									
--	--	--	--	------------	--	--	--	--	--	--	--	--	--

## 5.5. Write ANC gain to NvKey

Command (0x055A)													
Length		ID		Payload									
2 bytes		2 bytes		10 bytes									
0x0C	0x00	0x06	0x0E	Status	ID	Gain FF L		Gain FB L		Gain FF R		Gain FB R	
				0x00	0x0E	XX	XX	XX	XX	XX	XX	XX	XX

Response (0x055B)													
Length		ID		Payload									
2 bytes		2 bytes		10 bytes									
0x0C	0x00	0x06	0x0E	Status	ID	Gain FF L		Gain FB L		Gain FF R		Gain FB R	
				0x00: success Else: fail	0x0E	xx	xx	xx	xx	xx	xx	xx	xx

## 5.6. Get ANC hybrid capability

Command (0x055A)													
Length		ID		Payload									
2 bytes		2 bytes		2 bytes									
0x04	0x00	0x06	0x0E	Status					ID				
				0x00					0x16				

Response (0x055B)													
Length		ID		Payload									
2 bytes		2 bytes		3 bytes									
0x05	0x00	0x06	0x0E	Status		ID	Hybrid capability						
				0x00: success Else: fail		0x16	0x01: support hybrid						

## 5.7. Enter ANC MP Mode

Command (0x055A)													
Length		ID		Payload									
2 bytes		2 bytes		2 bytes									
0x04	0x00	0x06	0x0E	Status					ID				
				0x00					0x10				

Response (0x055B)													
Length		ID		Payload									
2 bytes		2 bytes		2 bytes									
0x04	0x00	0x06	0x0E	Status		ID							
				0x00: success Else: fail		0x10							

## 5.8. Leave ANC MP Mode

Command (0x055A)					
Length		ID		Payload	
2 bytes		2 bytes		2 bytes	
0x04	0x00	0x06	0x0E	Status	ID
				0x00	0x11

Response (0x055B)					
Length		ID		Payload	
2 bytes		2 bytes		2 bytes	
0x04	0x00	0x06	0x0E	Status	ID
				0x00: success Else: fail	0x11

## 6. Relay RACE command (For MCSync and Dual Chip)

### 6.1. Get Available Destination

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		N/A
0x02	0x00	0x00	0x0D	N/A

Response (0x055B)				
Length		ID		Payload
2 bytes		2 bytes		N bytes
XX	0x00	0x00	0x0D	Destination list
				Pairs of [dst type:1 byte][dst id: 1 byte] For example: 0x01020506 (type USB and type AWS peer)

\* dst type: 0 uart, 1 usb, 2 airapp, 5 AWS peer

### 6.2. Relay command to partner

Command (0x055A)					
Length		ID		Payload	
2 bytes		2 bytes		N bytes	
XX	XX	0x01	0x0D	Dst type	Dst ID
				0x05	%AWS_peer_ID

Response (0x055C)					
Length		ID		Payload	
2 bytes		2 bytes		N bytes	
XX	XX	0x01	0x0D	Status	Dst type
				0x00: success Else: fail	0x05

\* %AWS\_peer\_ID is queried by Get Available Destination command. Type is 0x05 (AWS\_peer).

Relay example: (for MCSync)

Step 1: Get the AWS peer destination ID.

055A0200000D

055B0400000D0506 => get AWS peer ID: 06

Step 2: Use AWS peer destination ID to send ANC OFF command to partner.

Relay the ANC OFF command to partner.

055A0D00010D0506 055A0500060E000B00

Get ANC OFF Response from partner

055D1000010D0506 055B0800060E000B00000000

**Relay example: (for Dual Chip)**

Step 1: Get the UART destination ID.

055A0200000D

**055B0400000D0506** => UART ID: **0D**

Step 2: Use the UART destination ID to send the ANC OFF command to the Dual chip partner.

Relay the **ANC OFF** command to partner.

**055A0D00010D000D 055A0500060E000B00**

Get the **ANC OFF Response** from partner.

**055D1000010D000D 055B0800060E000B00000000**



## 7. ANC calibration flow

### 7.1. AB156x\_V3/AB157x/AB158x Series Hybrid ANC diagram

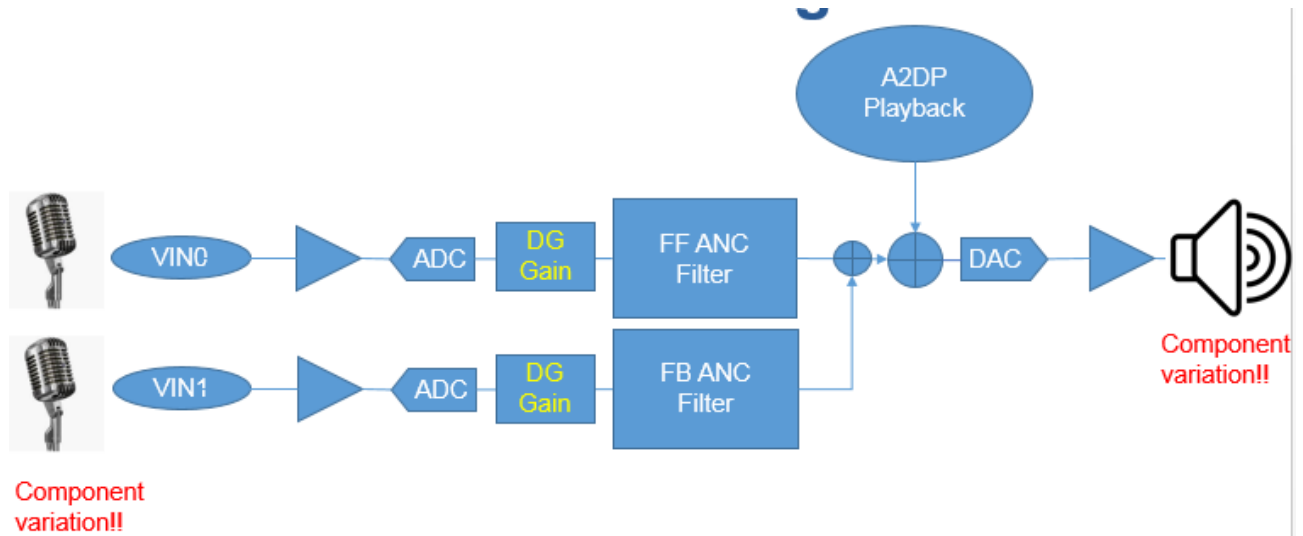


Figure 7-1. AB156x\_V3/AB157x/AB158x Series Hybrid ANC diagram

### 7.2. FB/FF ANC gains

There are two gains to be calibrated during the ANC test.

- 1) FB DG gain: The FB gain must be calibrated in the first stage under ANC FB mode.
- 2) FF DG gain: After FB gain is calibrated, the FF gain must be calibrated under ANC hybrid mode.

### 7.3. ANC calibration flow chart

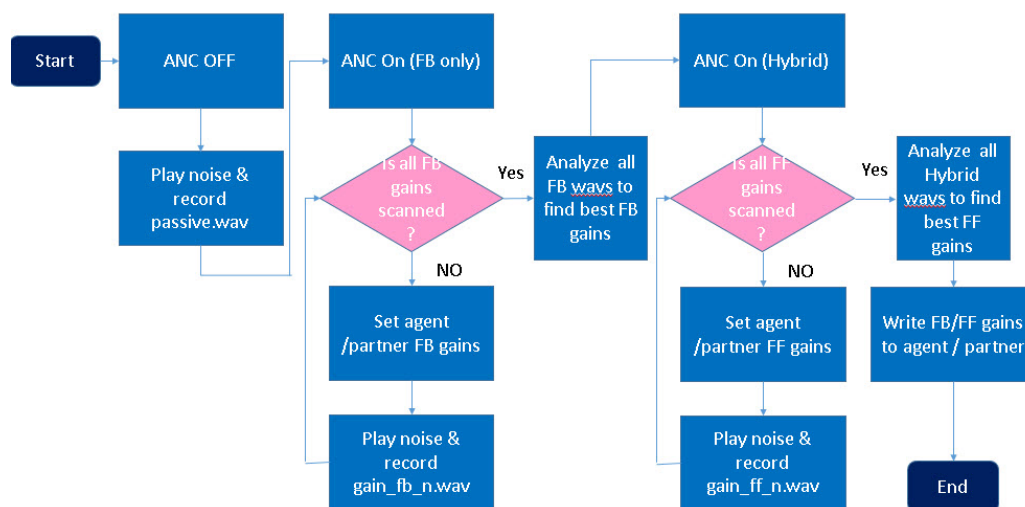


Figure 7-2. ANC calibration flow chart

## 8. Sub Function RACE command

### 8.1. Read NV key

Command (0x055A)							
Length		ID		Payload			
2 bytes		2 bytes		4 bytes			
0x06	0x00	0x00	0x0A	NV_ID_B0	NV_ID_B1	Length_B0	Length_B1
				XX	XX	XX	XX

Command (0x055B)						
Length		ID		Payload		
2 bytes		2 bytes		N bytes		
XX	XX	0x00	0x0A	Length_B0	Length_B1	NV value (N-2 bytes)
				XX	XX	XX

For example:

Read NV ID = 0xF500, Length = 0x0028

055A0600000A00F52800

Response, Length = 0x0028, NV value = 0x5941595500 .....

[illegible]

## 8.2. Write NV key

Command (0x055A)						
Length		ID		Payload		
2 bytes		2 bytes		N bytes		
0xXX	0xXX	0x01	0x0A	NV_ID_B0	NV_ID_B1	Payload
				XX	XX	NV values

Command (0x055B)					
Length		ID		Payload	
2 bytes		2 bytes		1 byte	
03	00	0x01	0x0A	Status	
				0x00: success	
				Else: fail	

For example:

Write NV ID = 0x3A00, Value = 0x00

055A0500010A003A00

Response, Status = 00

055B0300010A00

## 8.3. Get version

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		Role: 1 byte
0x03	0x00	0x07	0x1C	Agent: 0x00

Notification (0x055D)							
Length		ID		Payload			
2 bytes		2 bytes		N bytes			
XX	XX	0x07	0x1C	Status	Role (1 byte)	Length (1 byte)	version (N-3 bytes) in ASCII
				0x00: success Else: fail	0x00: agent	XX	XX

For example:

055A0300071C00

Notification, Length = 0x06, NV value = 0x76312E302E30

055D0B00071C00000676312E302E30

0x76312E302E30 in ASCII is "v1.0.0".

## 8.4. Set PEQ index

Command (0x055A)						
Length		ID		Payload		
2 bytes		2 bytes		Module (2 bytes)	PEQ index (1 byte)	
0x05	0x00	0x00	0x09	0x00	0x00	index

Notification (0x055D)							
Length		ID		Payload			
2 bytes		2 bytes		N bytes			
0x05	0x00	0x00	0x09	Module (2 bytes)		Status	
				0x00	0x00	0x00: success Else: fail	

## 8.5. Power OFF

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x11	0x11	0x01

Response (0x055B)				
Length		ID		Payload
2 bytes		2 bytes		1 bytes
0x03	0x00	0x11	0x11	Status

				0x00: success Else: fail
--	--	--	--	-----------------------------

## 8.6. Get battery level

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		Role (1 byte)
0x03	0x00	0xD6	0x0C	Agent: 0x00

Notification (0x055D)						
Length		ID		Payload		
2 bytes		2 bytes		N bytes		
0x05	0x00	0xD6	0x0C	Status	Role (1 byte)	Battery level (1 byte)
				0x00: success Else: fail	0x00: agent	Unit: percentage

For example:

055A0300D60C00

**055D0500D60C000050** Battery level is **80%**.

## 8.7. Get BD address

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		Role: 1 byte
0x03	0x00	0xD5	0x0C	Agent: 0x00

Response (0x055B)						
Length		ID		Payload		
2 bytes		2 bytes		N bytes		
0x05	0x00	0xD5	0x0C	Status	Role (1 byte)	BD address (6 bytes)
				0x00: success Else: fail	0x00: agent	

For example:

055A0300D50C00

**055B0A00D50C0000665544332211** BD address is 0x112233445566.

055A0300D50C00

**055B0A00D50C00007CE0E56ADB4D** BD address is 0x4DDB6AE5E07C.

The MAC address is shown as the Bluetooth address on smart devices.

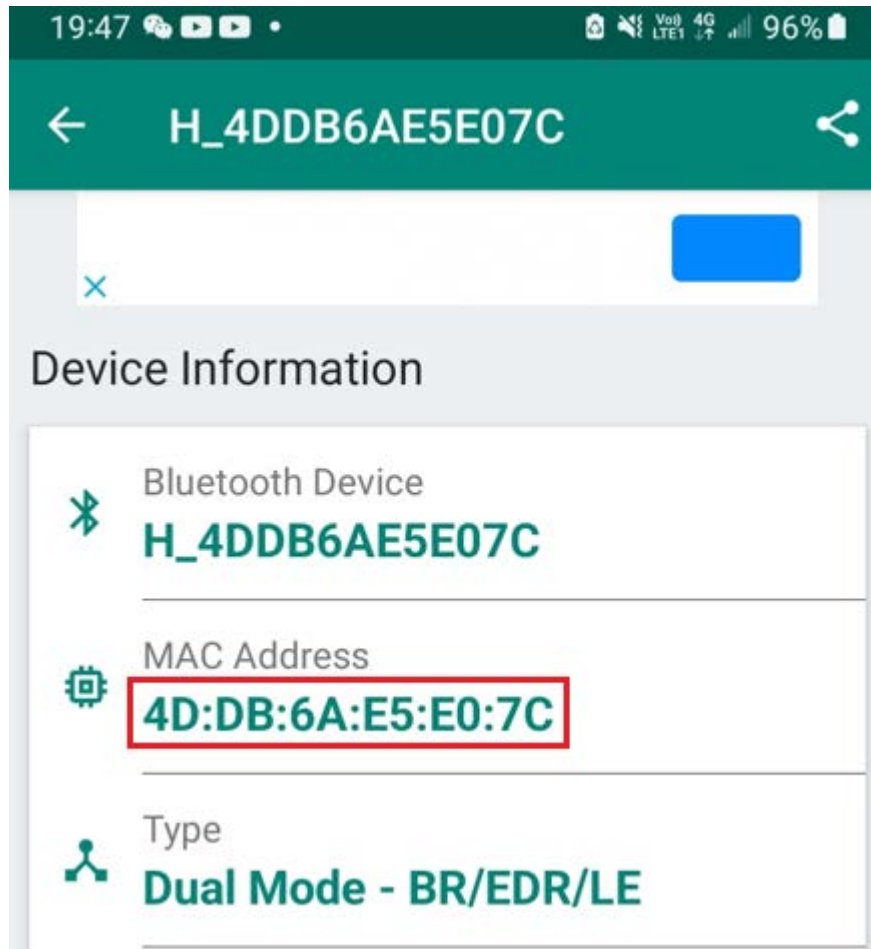


Figure 8-1. Bluetooth address on smart devices.

## 8.8. Write MCSync information

NV key 0x183D saves the MCSync setting. Use the Write NV RACE command to write it.

For example:

Agent BD address: 0x112233445566

Partner BD address: 0x998877665544

MCSync key: 0x01020304050607080910111213141516

Write to agent (0x40)

055A3400010A 3D18 40 0000 445566778899 FF 665544332211

[illegible]

Write to partner (0x20)

055A3400010A 3D18 20 0000 665544332211 FF 445566778899

```
01010203040506070809101112131415160000000000000000000000000000
```

**Note:** To keep values of other fields, read the NV back, replace the agent BDA, partner BDA, role, and MCSync key, and then write it back.

Note: Agent and partner must have the same MCSync key in one group but the different agent partner group must use a different MCSync key.

## 8.9. Read/Write device name

The device name is saved in the NV key 0xF203 in ASCII format. Use Read/Write NV RACE commands to access it.

## 8.10. Get model name

Model name is saved in the 21<sup>st</sup> to 40<sup>th</sup> bytes of NV key 0xF50C in ASCII format. Use Read NV RACE command to get it.

## 8.11. Get audio channel

Audio channel setting is saved in the 2<sup>nd</sup> byte of NV key 0xE0F1. Use Read NV RACE command to get it.

Value = {  
    1: Left channel  
    2: Right channel  
}

For example:

055A060000AF1E0E803

Response, Length = 0x0009, NV value = 0x0001010214, Left channel

055B090000A05000001010214

## 8.12. Enable/Disable DUT mode

DUT mode control is saved in the NV key 0x183A. Use Write NV RACE command to enable/disable it.

For example:

Write NV ID = 0x183A, Value = 0x01 (0x00 for disable, 0x01 for enable)

055A0500010A3A1801

Response, Status = 00

055B0300010A00

### 8.13. RF test commands for entering 3.0 DUT mode/4.0 DTM

There are three commands for entering 3.0 DUT mode and 4.0 DTM.

- 1) standby command
- 2) enter 3.0 DUT mode command
- 3) enter 4.0 DTM command

Send A then B for entering 3.0 DUT mode.

Send A then C for entering 4.0 DTM.

#### A. standby

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		22 bytes
0x18	0x00	0x92	0x0F	0x41 54 2B 42 54 43 4D 49 54 3D 42 54 5F 53 54 41 4E 44 42 59 0D 0A

#### B. enter 3.0 DUT mode

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		23 bytes
0x19	0x00	0x92	0x0F	0x41 54 2B 45 42 54 45 52 3D 53 45 54 5F 44 55 54 5F 4F 4E 4C 59 0D 0A

#### C. enter 4.0 DTM

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		12 bytes
0x0E	0x00	0x92	0x0F	0x41 54 2B 45 42 54 45 52 3D 30 0D 0A

### 8.14. Factory Reset

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		2 byte
0x04	0x00	0x01	0x11	0x9500

Response (0x055B)				
-------------------	--	--	--	--

Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x01	0x11	0x00: success Else: fail

### 8.15. Write ULL1.0 dongle & headset pairing information

ULL1.0 dongle & headset pairing is saved by NV key 0xF318. Use the Write NV RACE command to write it.

For example:

Dongle BD address: 0x112233445566

Headset BD address: 0x998877665544

Write to Dongle

055A0A00010A 18F3 445566778899

Write to Headset

055A0A00010A 18F3 665544332211

### 8.16. Write ULL1.0 dongle & MCSync pairing information

Flow:

Step 1. MCSync setting is saved by NV key 0x183D. Use the Write NV RACE command to write it.

Refer to 8.8 for more information.

Step 2. ULL1.0 dongle & MCSync pairing is saved by NV key 0xF318. Use the Write NV RACE command to write it.

For example:

Dongle BD address: 0x112233445566

MCSync Agent BD address: 0x998877665544

Write to Dongle

055A0A00010A 18F3 445566778899

Write to MCSync (earbuds)

055A0A00010A 18F3 665544332211

### 8.17. Write ULL2.0/LE dongle & MCSync/Headset SIRQ key

To write the SIRQ key:

Step 1. MCSync setting is saved by NV key 0x183D. Use the Write NV RACE command to write it. Refer to Section 8.8 for more details.

Step 2. ULL2.0/LE dongle & MCSync/Headset SIRQ key is saved by NV key 0x1900. Make sure that the dongle and earbuds/headset have the same SIRQ key. Use the Read NV RACE command to read NV back, replace the SIRQ key, and then use the Write NV RACE command to write it back.

For example:

ULL2.0/LE Dongle, MCSync(earbuds), Headset:

Read NV ID = 0x1900, Length = 0x0012





Write to MCSync (earbuds)  
055A0A00010A 18F3 000000000000

3. Use command: Factory Reset (refer to [Factory Reset](#) for more information).

## 8.21. Unpairing: Write ULL2.0/LE dongle & MCSync/Headset SIRK key

To unpair:

Step 1. Un Pairing MCSync setting is saved by NV key 0x183D. Use the Write NV RACE command to write it. Refer to Section 8.18 for more details.

Step 2. Un Pairing ULL2.0/LE dongle & MCSync/Headset, SIRK key is saved by NV key 0x1900. Use the Read NV RACE command to read NV back, replace SIRK key so that each device has a different SIRK key, and then use the Write NV RACE command to write it back.

For example:

Original SIRK Key: 0x01010101010101010101010101010101

ULL2.0/LE Dongle, MCSync(earbuds), Headset:

Read NV ID = 0x1900, Length = 0x0012

055A0600000A00191200

Response, Length = 0x0012, NV value = 0x01010101010101010101010101010101XXXX

055B1600000A1200 01010101010101010101010101010101 XXXX (XXXX: Do not Change.)

Original SIRK Key: 0x01010101010101010101010101010101

Write NV ID = 0x1900, New SIRK Key = 0x02020202020202020202020202020202 (SIRK: 16bytes random num.)

Make **each device write a different SIRK key**. Keep others fields unchanged.

055A1600010A0019020202020202020202020202020202XXXX (XXXX: Don't Change.)

Note: Let the LE dongle and earbuds/headset have a different SIRK key.

Step 3. Use command: Factory Reset (refer to Section 8.14 for more information).

## 9. Mic test RACE Command

### 9.1. MIC Swap

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x0C	0x0E	MIC0 (0x00) MIC1 (0x01) MIC2 (0x02) MIC3 (0x03) MIC4 (0x04) MIC5 (0x05) Not Used (0xFF)

Response (0x055B)				
Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x0C	0x0E	0x00: success Else: fail

### 9.2. AECNR on/off

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x0D	0x0E	0x00 (Off) 0x01 (On)

Response (0x055B)				
Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x0D	0x0E	0x00: success Else: fail

### 9.3. RACE\_DSP\_REALTIME\_OPEN\_ALL\_MIC\_EXTEND

Command (0x055A)									
Length		ID		Payload					
2 bytes		2 bytes		6 bytes					
0x08	0x00	0x20	0x0E	MIC0 index	MIC1 index	MIC2 index	MIC3 index	MIC4 index	MIC5 index
The values of MIC indexes are listed in Table 9-1.									

Response (0x055B)									
Length		ID		Payload					
2 bytes		2 bytes		1 byte					
0x03	0x00	0x20	0x0E	0x00: success Else: fail					

Use this command to enable microphones if some microphones are not use for speech process.

Input Device	Index	Input Device	Index	Input Device	Index	Input Device	Index	Input Device	Index
AMIC_0_L	0x00	DMIC_0_L	0x08	I2S_M_0_L	0x10	I2S_S_0	0x80		
AMIC_0_R	0x01	DMIC_0_R	0x09	I2S_M_0_R	0x20	I2S_S_0	0x90		
AMIC_1_L	0x02	DMIC_1_L	0x0A	I2S_M_1_L	0x30	I2S_S_1	0xA0	Not_Use	0xFF
AMIC_1_R	0x03	DMIC_1_R	0x0B	I2S_M_1_R	0x40	I2S_S_1	0xB0		
AMIC_2_L	0x04	DMIC_2_L	0x0C	I2S_M_2_L	0x50	I2S_S_2	0xC0		
AMIC_2_R	0x05	DMIC_2_R	0x0F	I2S_M_2_R	0x60	I2S_S_2	0xD0		

Table 9-1. Indexes of all types of microphones

After configuring microphones by this command, send MIC swap command to enable MIC0, MIC1, MIC2 ... or MIC5.

For example:

Step 1. Enable AMIC\_0\_R/AMIC\_0\_L/DMIC\_1\_L/DMIC\_1\_R/I2S\_M\_2\_R/ Not Use

055A 0800 200E 01 00 0A 0B 60 FF

055B 0300 200E 00

Step 2. Switch to MIC1 for AMIC\_0\_L test

055A 0300 0C0E 01

055B 0300 0C0E 00

Step 3. Switch to MIC2 for **DMIC\_1\_L** test

**055A 0300 0C0E 02**

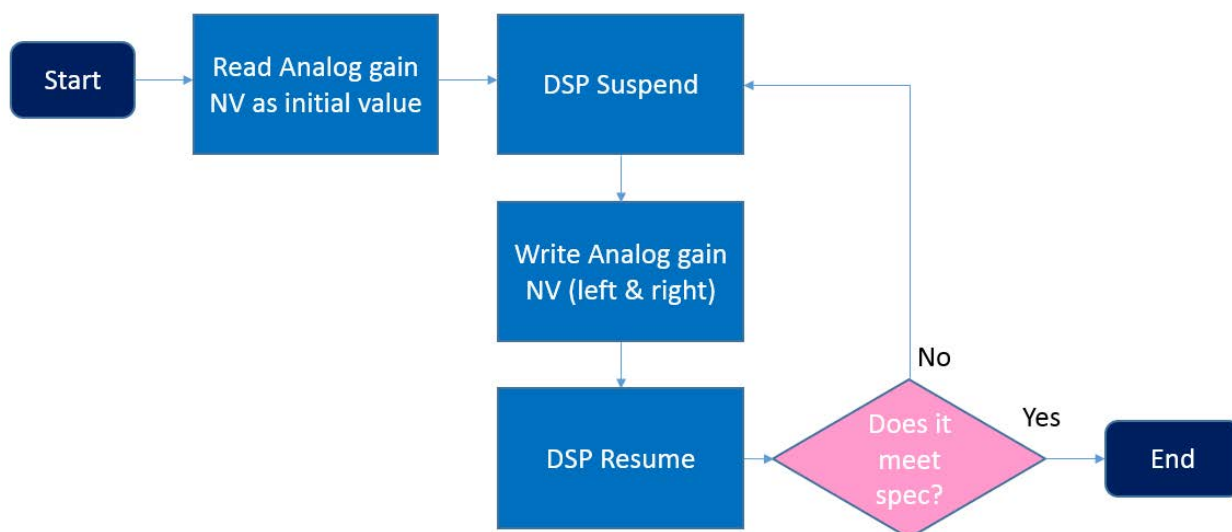
055B 0300 0C0E 00

Step 4. Switch to MIC0 for **AMIC\_0\_R** test

**055A 0300 0C0E 00**

055B 0300 0C0E 00

## 10. Analog Gain calibration flow



**Figure 10-1. Analog gain calibration flow chart**

### 10.1. Read/Write Analog Gain

The analog gain setting is saved by NV key 0xE00A. Use the Read/Write NV RACE command to access it.

In NV key 0xE00A, the 3<sup>rd</sup> and 4<sup>th</sup> bytes composes left analog gain and the 7<sup>th</sup> and 8<sup>th</sup> bytes composes right analog gain in unit of 0.01 db.

For example:

Analog gain left: 0x0190 (400 in decimal. i.e. 4db)

Analog gain right: 0xFF38 (-200 in decimal. i.e. -2db)

Write NV ID = **0xE00A**, Value = 0x00009001.....

055A3C00010AAE00009001900138FF08070807B004B00408070807000000000000000000  
00000807080708070807080708070807080708070807

Response, Status = 00

055B0300010A00

## 10.2. DSP Suspend RACE command

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		0 byte
0x02	0x00	0x01	0x0E	

Command (0x055B)				
Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x01	0x0E	Status
				00: success
				Else: fail

For example:  
055A0200010E  
**055B0300010E00**

## 10.3. DSP Resume RACE command

Command (0x055A)				
Length		ID		Payload
2 bytes		2 bytes		0 byte
0x02	0x00	0x02	0x0E	

Command (0x055B)				
Length		ID		Payload
2 bytes		2 bytes		1 byte
0x03	0x00	0x02	0x0E	Status
				00: success
				Else: fail

For example:  
055A0200020E  
**055B0300020E00**