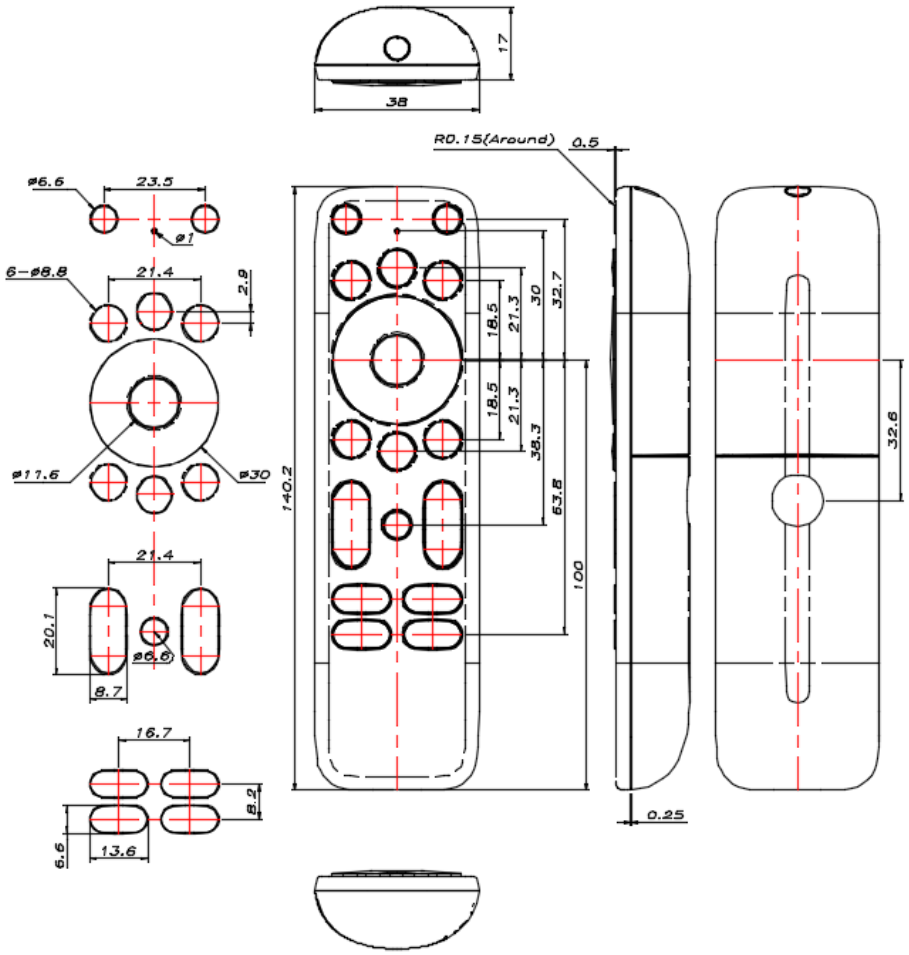
APPENDIX H

: USER'S MANUAL

1 - Mechanical

1.1 - Pictures

1.2 - Dimensions

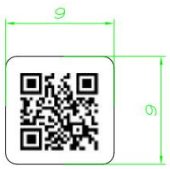


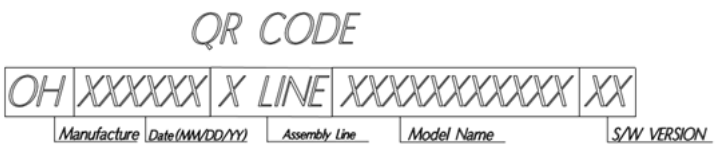
1.3 - Materials & colours

PART NAME	DESCRIPTION	SPECIFICATION	
TOP/BOTTOM CASE	MATERIAL	ABS(ROCK CANDY)	
BATTERY COVER	MATERIAL	ABS(ROCK CANDY)	
NAVI KNOB	MATERIAL	ABS(MARBLE GRAY)	
OK KNOB	MATERIAL	ABS(ROCK CANDY)	
WINDOW FILTER	MATERIAL	PC	
RUBBER BUTTON	MATERIAL	SILICONE RUBBER(경도 80 도)	
	EXCEPT FOR DESIGNATED FORMING COLOR	P.T 5315C(ROCK CANDY)	
	EXCEPT FOR DESIGNATED PRINT COLOR	P.T COOL GRAY 3C (CEMENT GRAY)	
	PRINT COLOR (ASSISTANT/HOME)	P.T 5315C(ROCK CANDY)	
	FORMING COLOR (ASSISTANT/HOME)	P.T COOL GRAY 3C (CEMENT GRAY)	
	YOU TUBE	1	P.T 1795 C (RED)
	hulu	2	P.T 361M (GREEN)
	NETFLIX	3	P.T116M(YELLOW)
	DISNEY +	4	P.T 2925M (BLUE)
	SUFACE TREAMENT	SILICON COATING	

1.4 - QR code label

It is attached to the PCB and it can be seen into the battery compartment after removing the battery cover.



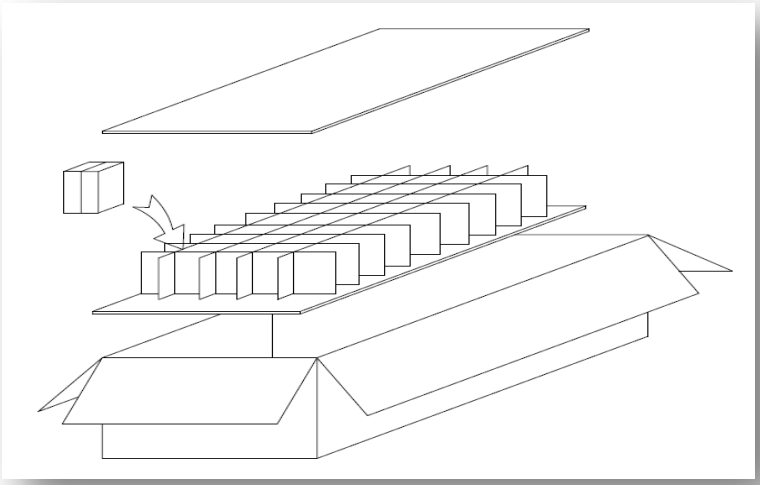


1.5 - Packing

1.5.1 - Remote Control

- PE bag dimensions : 80 x 250mm (LDPE 0.05t)
- Weight: 60g (without battery)

1.5.2 - Carton box



- Box dimensions : W 600 x D 400 x H 200 mm
- Quantity: 140pcs
- Box weight: 11.2Kg

- Barcode label attached on each box - Data as follows:

- Customer part number
- Manufacturer name
- Manufacturer part number

- Quantity
- Date code
- Purchase Order number
- Box ID

1.5.3 - Pallet

- Pallet itself dimensions: W 1200 x D 800 x H 140mm
- Overall pallet dimensions: W 1200 x D 800 x H 1340mm
- Quantity per pallet: 2,800pcs (4 boxes / layer - 5 layers)
- Pallet weight: 240Kg
- Label / Packing list with barcode attached on each pallet - Data as follows:

- Manufacturer name
- Manufacturer part number
- Quantity
- Date code
- Purchase Order number
- Pallet ID

2 - Electrical

2.1 - Electrical Characteristic

Parameter		Condition	Spec	Unit
Frequency Range		**Bluetooth Low Energy Specification**	2.402 ~ 2.480	[GHz]
Channel			40	[Num]
RF Power			8	[dBm]
Test channel		**TC-3000 (RF measuring instrument)**	19	[Num]
RF Power	**PAvg**		-20~+10	[dBm]
	PMax		+8	[dBm]
	Pmin		-20	[dBm]
Modulation Characteristics	**Δf1 avg**		225~275	[KHz]
	Δf2 avg		≥ 185	[KHz]
	Δf2/Δf1		0.8	
	Δf2min		≥ 92.5	[KHz]

	Δf2rate		≥ 99	[%]
Carrier Frequency Offset and Drift	**fTx-fn**		≤ 150	[KHz]
	Δf0-fn		≤ 50	[KHz]
	f1-f0		≤ 20	[KHz]
	Δfn-f(n-5)		≤ 20	[KHz]
Operating Voltage		**RF (Bluetooth)**	2.2~3.6	[V]
LVI Voltage		**Low Voltage Indicate**	2.25±0.2V	[V]
Operating current (IR)		**Power: 3V**	≤ 50	[mA]
Operating current (RF KEY)		**Power: 3V Non-directional distance**	≤ 10	[mA]
Operating current (RF+Voice)			≤ 20	[mA]
Leakage current			10	[㎂]
RF range (distance)			≥10	[m]
IR Range		**Direct**	≥12	[m]
		Horizontal	7 (±15°)	[m]
VOICE	**300Hz**	**Voice Inspection JIG**	-30~-14	[dB]
	2KHz		-30~-10	[dB]
	3.8KHz		-30~-14	[dB]

2.2 - Battery Management

a) Remote Control sends the information for battery level using Bluetooth battery service.

b) Level of LVD is 2.1V ±0.1V.

c) If the battery voltage as reached the LVD value, Remote Control cannot enter the pairing mode and the factory reset mode.

d) If the battery voltage is under 2.0V, Remote Control does not operate.

e) When the battery voltage is 2.1V or higher, the REMOTE CONTROL operates again.

3 - Software

3.1 - Bluetooth 5.0 LE identification

a) Device Name: RemoteG10

b) Vender ID: 0x (TBD)

c) Product ID: 0x (TBD)

d) Vendor ID Source : Blutooth SIG

e) Hardware Version : 'T', 'L', ' ', 'V', '0', '1'

3.2 - Pairing mode & Re-pairing mode

a) If user presses the [HOME] + [BACK] keys on the Remote Control for more than 4 seconds, the Remote Control enters pairing mode.

b) The led stays on while pressing and holding the keys.

c) After that, the led starts blinking to indicate that the Remote Control has entered pairing mode.

d) If pairing is successfully made, the led stop blinking and the Remote Control starts working in Bluetooth.

e) If pairing is not successfully made for 2mins(re-pairing) or 10mins(pairing), the led stop blinking. The Remote Control stops pairing and goes back to the previous state.

f) If pin or key missing, the Remote Control send the un-direct advertising data for 90sec in pairing mode after disconnect. (TBD)

3.3 - Advertising

a) The Remote Control shall choose a very aggressive advertising interval, aimed at the best possible reconnection experience.

b) An advertisement interval of 20ms is recommended.

c) This interval may be downgraded after 30s if no connection has been established.

d) Additional Data of Un-direct advertising Data

Item	Data	Detail
Appearance (TBD)	0x80, 0x01	Generic Remote Control
UUID (TBD)	0x12, 0x18,0x0F, 0x18	Human Interface Device
Complete local name	RemoteG10	

3.4 - Scan Response Data

Item	Data	Detail
Complete local name	RemoteG10	

3.5 - Un-Pairing mode

a) Un-pairing from the STB clears Remote Control bonding cache.

b) Remove Device bonding cache (manual approach - Optional):
Press and hold [BACK] key while inserting batteris.

3.6 - Connection Parameter (TBD)

a) Connection Interval Time: ms

b) Connection Slave Latency: (sec)

c) Connection Supervision Time Out: sec

3.7 - Reconnection

a) Upon an unexpected disconnect from the STB, the Remote Control shall automatically attempt to reconnect to the STB.

b) It is recommended that the Remote Control uses an aggressive advertising interval (ex. 20ms) for the first 30-60 seconds after being disconnected. The Remote Control may then switch to a more battery friendly advertising interval if the connection was not re-established after 30~60 seconds. The Remote Control may stop attempting to connect after a 2mins interval if no user intraction (ex. Button press) has been detected.

c) If the Remote Control is not connected and the user initiates the Remote Control wake-up and connection by pressing a button on the Remote Control, the Remote Control shall cache the button press event and forward it to the STB after successfully establishing a connection.

d) If a button event is cached and being held until the connection is established, any further key presses may be discarded until the cached event is successfully passed to the STB.

3.8 - Key codes for STB

a) In Bluetooth mode, HID Profile is used.

b) In IR Mode, NEC format is used

- Structure of the NEC format: Custom Code - Data - Inverse data
- Custom Code : 0x8877
- Code list :

Key Name	Android key code for BT HID code	IR code	HID	
		Costom Code : 0x8877	Usage Page	Usage ID
Power	KEYCODE_POWER	0x21	0x0C	0x0030
Input	KEYCODE_TV_INPUT	0x60	0x0C	0x01BB
Bookmark	KEYCODE_BOOKMARK	0x74	0x0C	0x022A
Assistant	KEYCODE_ASSIST	0x46	0x0C	0x0221
Dashboard	KEYCODE_APP_SWITCH	0x71	0x0C	0x01A2
D-pad Up	KEYCODE_DPAD_UP	0x15	0x0C	0x0042
D-pad Left	KEYCODE_DPAD_LEFT	0x17	0x0C	0x0044
D-pad Center	KEYCODE_DPAD_CENTER	0x19	0x0C	0x0041
D-pad Right	KEYCODE_DPAD_RIGHT	0x18	0x0C	0x0045
D-pad Down	KEYCODE_DPAD_DOWN	0x16	0x0C	0x0043
Back	KEYCODE_BACK	0x48	0x0C	0x0224
Home	KEYCODE_HOME	0x47	0x0C	0x0223
TV(Guide)	KEYCODE_GUIDE	0x32	0x0C	0x008D
Program +	KEYCODE_CHANNEL_UP	0x33	0x0C	0x009C
Volume +	KEYCODE_VOLUME_UP	0x23	0x07	0x0080
Mute	KEYCODE_VOLUME_MUTE	0x25	0x0C	0x00E2
Program -	KEYCODE_CHANNEL_DOWN	0x34	0x0C	0x009D
Volume -	KEYCODE_VOLUME_DOWN	0x24	0x07	0x0081
YOUTUBE	KEYCODE_F18	0x64	0x07	0x006D
NETFLIX	KEYCODE_F17	0x63	0x07	0x006C
DISNEY+	KEYCODE_TV	0x61	0x0C	0x0089

3.9 - ATV Voice service

Type	Short-form	UUID	Properties
ATV Voice Service	ATVV_SERVICE_UUID	AB5E0001-5A21-4F05-BC7D-AF01F617B664	
Write Characteristic	ATVV_CHAR_TX	AB5E0002-5A21-4F05-BC7D-AF01F617B664	Write
Read Characteristic	ATVV_CHAR_RX	AB5E0003-5A21-4F05-BC7D-AF01F617B664	Notify
Control Characteristic	ATVV_CHAR_CTL	AB5E0004-5A21-4F05-BC7D-	Notify

		AF01F617B664	

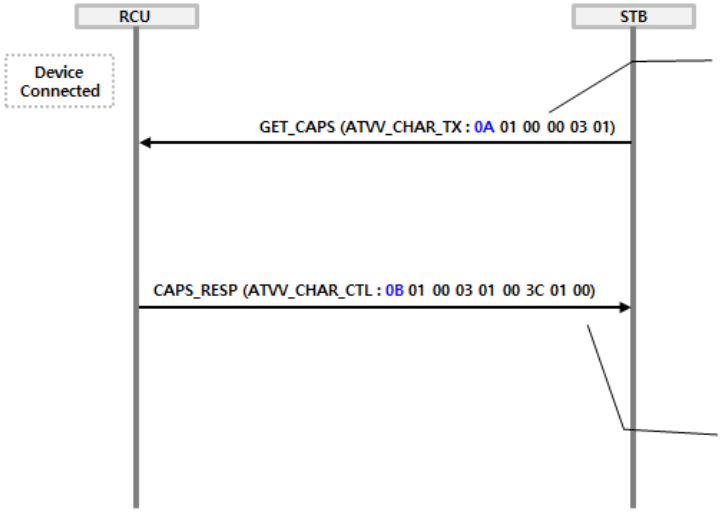
3.10 - ATV Voice initialization (Capability)

a) After the Remote Control device is paired and connected, the STB will send it a command to get capabilities of the Remote Control.

b) This command will be sent via the ATVV_CHAR_TX characteristic.

c) The Remote Control should then respond back with its capabilities using ATVV_CHAR_CTL notification.

d) Flow chart



[Payload(5)]
- 0x0100 : version
  - The highest spec version that Android TV Device supports.
  - **0x0100:** version 1.0
- 0x0003 : legacy_0x0003
  - The legacy constant to comply with spec 0.4e.
  - constant value that is used for compatibility with the previous spec.
- 0x01 : supported assistant interaction models
  - Supported Assistant interaction model. The value of this parameter depends on the platform.
  - **0x00:** only On-request model is supported
  - **0x01:** Press-to-Talk and On-request models are supported
  - **0x03:** Hold-to-Talk, Press-to-Talk and On-request models are supported.

[Payload(8+)]
- 0x0100 : version
  - The spec version that is implemented on the Remote Device.
  - **0x0100:** version 1.0
  - **0x0004:** version 0.4e
- 0x03 : codecs supported
  - Audio codecs that are supported on the Remote Device.
  - **0x01:** ADPCM 8khz/16bit
  - **0x02:** ADPCM 16khz/16bit (recommended)
  - **0x03:** ADPCM 8khz/16bit & 16khz/16bit
    The value should be used if the Remote Device support "Dynamic Bandwidth adjustment"
- 0x01 : assistant interaction model
  - Assistant interaction model that is used by this Remote Device.
  - The returned value should be aligned with "supported assistant interaction models" value provided by the AndroidTV Device.
  - **0x00:** On-request model (should be supported by all remotes)
  - **0x01:** Press-to-Talk model enabled
  - **0x03:** Hold-to-Talk model enabled
- 0x003C : audio frame size
  - The desired audio packet size.
  - The value is used in audio frame counting and usually matches the maximum payload size of a single notification, but can be any arbitrary number.
  - Some examples:
    . 0x0014: 20bytes (default)
    . 0x00A0: 160bytes (recommended for 16kHz audio codec and 20ms connection interval)
- 0x01 : extra configuration
  - If set, host will attempt to enable DLE (and negotiate a new ATT_MTU size) which would allow to transfer an entire audio frame in a single bluetooth packet.
- 0x00 : reserved
  - **0x00:** not used

3.11 - Voice Search initiated by the Remote Control (On-request, legacy)

a) For Voice function, it is recommended to be more than 10 meters from the receiver.

b) Distance between mouth and microphone should be between 5 to 30cm.

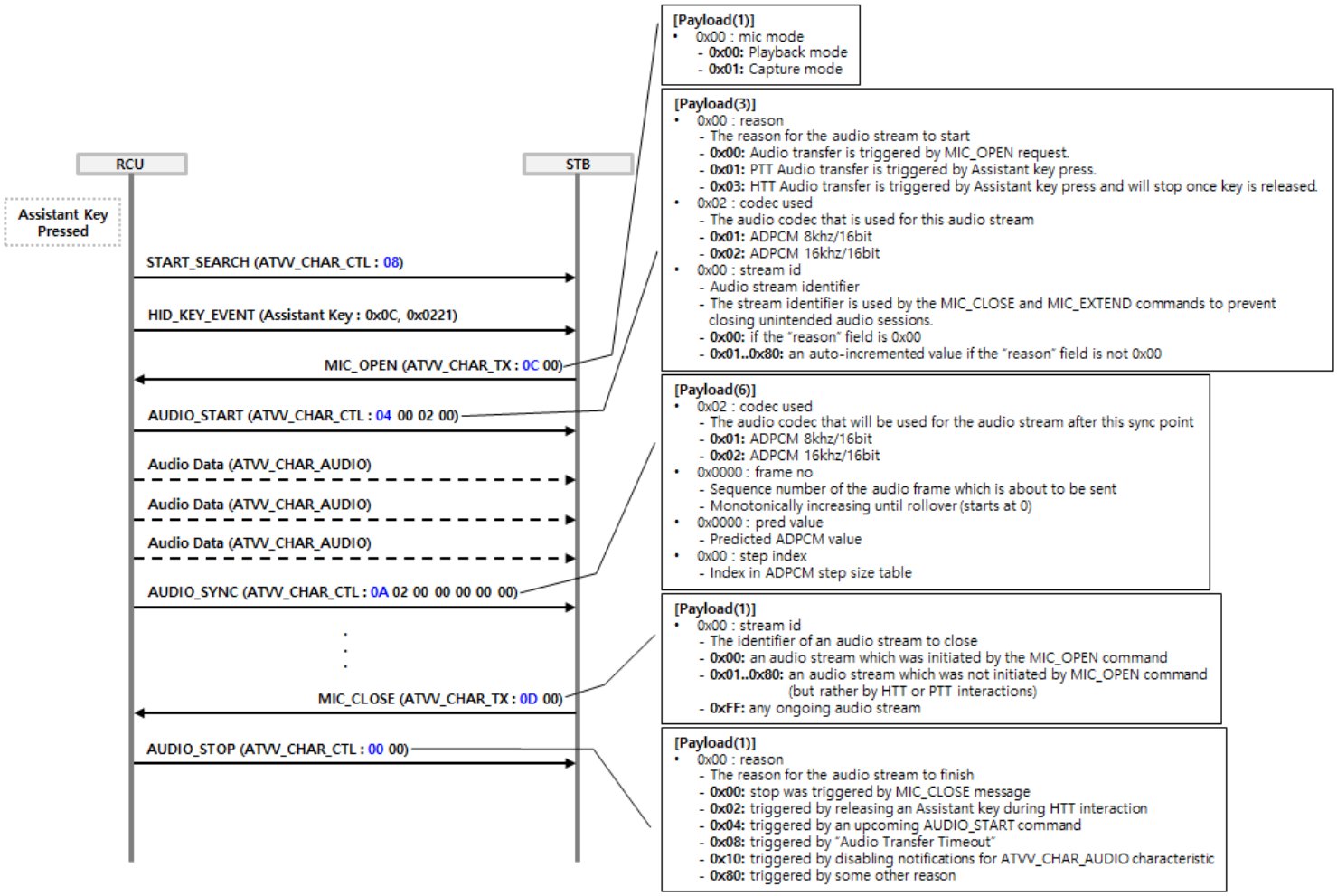
c) If [ASSISTANT] key is pressed, the Remote Control sends the START_SEARCH command first followed by the HID_KEY_EVENT to the STB and the STB sends back the MIC_OPEN command to the Remote Control.

d) The led turns on, the Remote Control sends the AUDIO_START command and

transmits the voice data for 15sec timeout duration.

e) After timeout duration or the Remote Control receives the MIC_CLOSE command from the STB, the Remote Control sends the AUDIO_STOP command to the STB and the led goes off.

f) Flow chart.



Note: The "On-request" assistant interaction model must be supported by all Remote Control and it should be used by default before any other interaction model is negotiated by GET_CAPS , CAPS_RESP messages exchange.

3.12 - Voice Search initiated by the Remote Control (PTT, Press-to-Talk)

a) For Voice function, it is recommended to be more than 10 meters from the receiver.

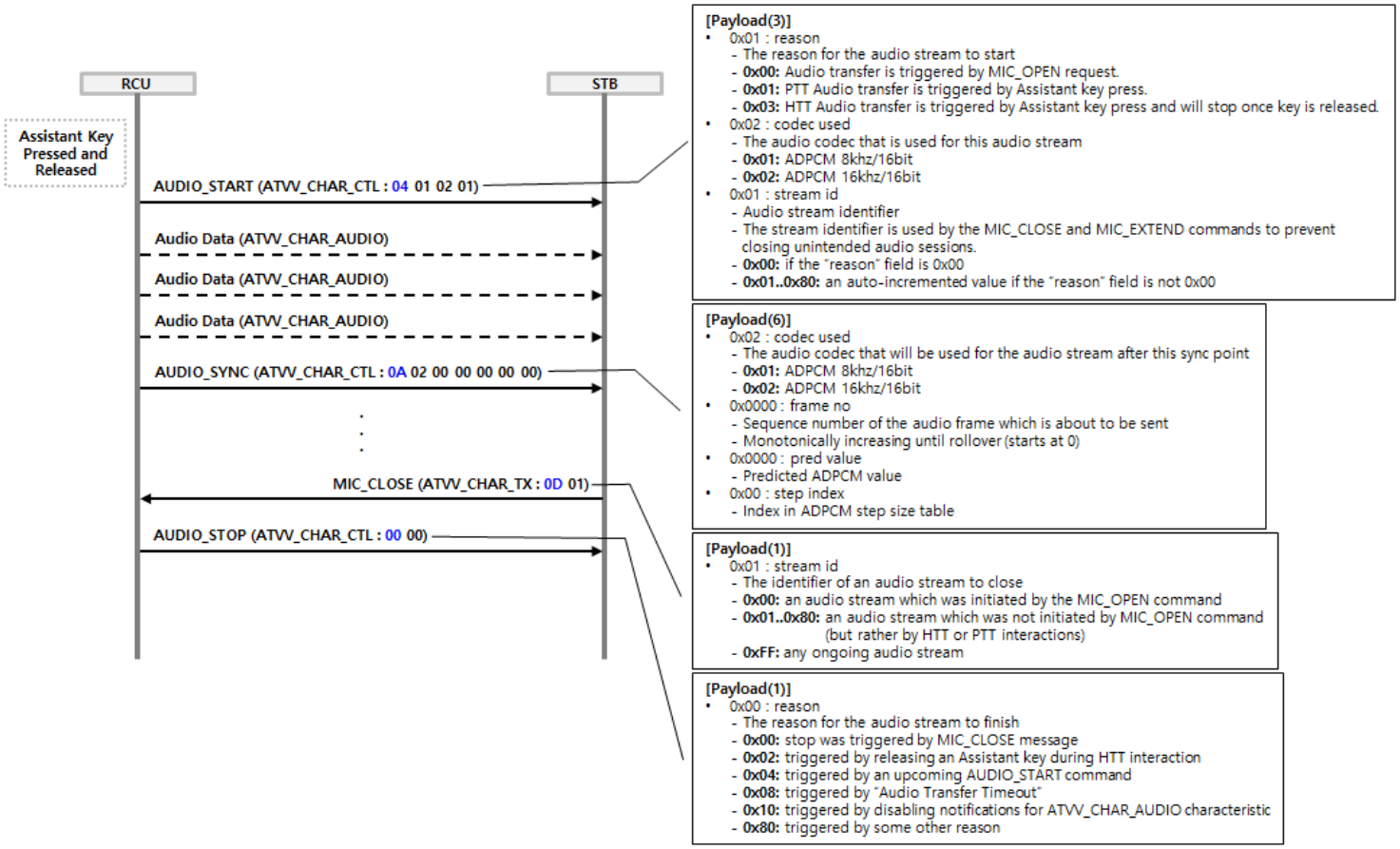
b) Distance between mouth and microphone should be between 5 to 30cm.

c) If [ASSISTANT] key is pressed and released, the led turns on

d) The Remote Control sends the AUDIO_START command and transmits the voice data for 15sec timeout duration.

e) After timeout duration or the Remote Control receives the MIC_CLOSE command from the STB, the Remote Control sends the AUDIO_STOP command to the STB and the led goes off.

f) Flow chart.



3.13 - Voice Search initiated by the Remote Control (HTT, Hold-to-Talk)

a) For Voice function, it is recommended to be more than 10 meters from the receiver.

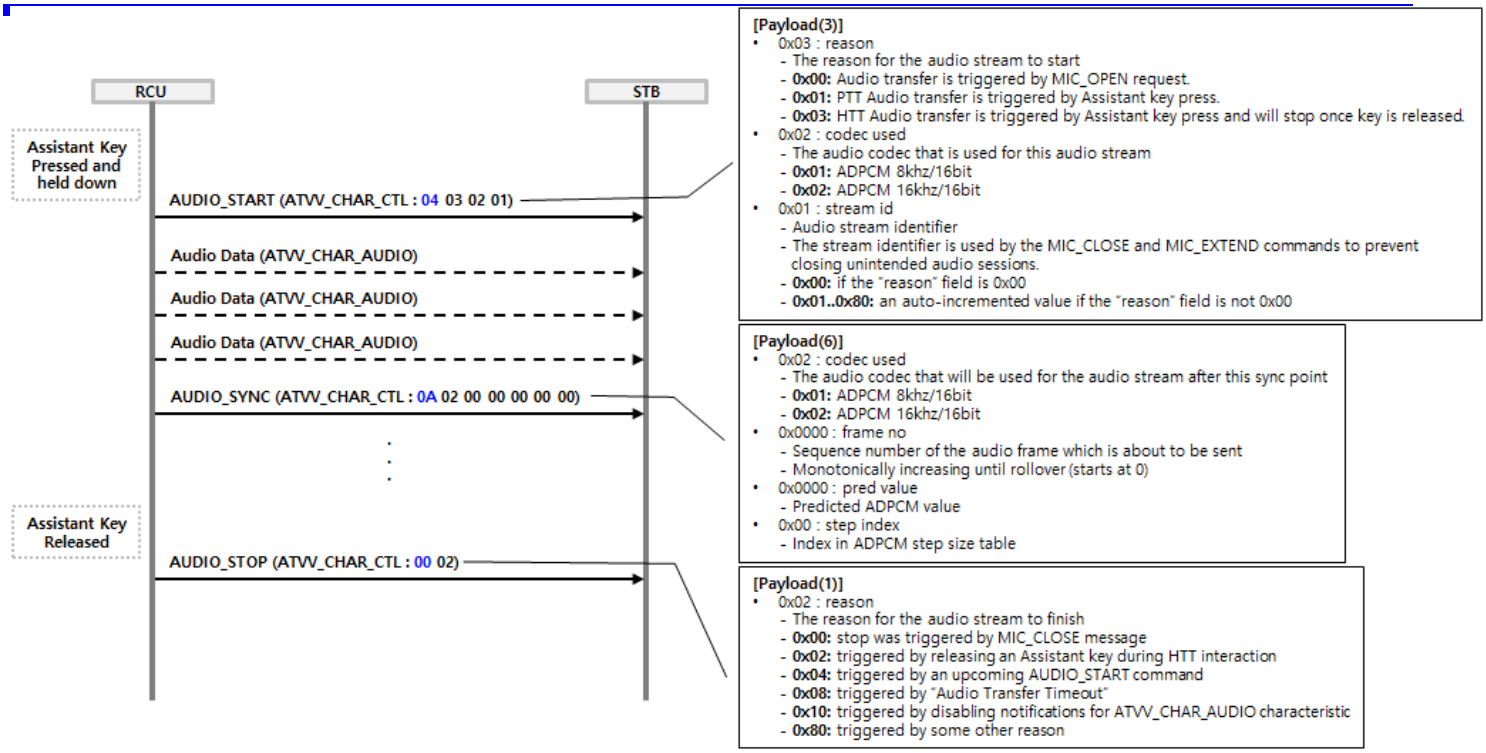
b) Distance between mouth and microphone should be between 5 to 30cm.

c) If [ASSISTANT] key is pressed and held down, the led turns on

d) The Remote Control sends the AUDIO_START command and transmits the voice data.

e) If [ASSISTANT] key is released, the Remote Control sends the AUDIO_STOP command to the STB and the led goes off.

f) Flow chart.



3.14 - Voice Search initiated by the launcher

a) For Voice function, it is recommended to be within 10 meters from the receiver.

b) Distance between mouth and microphone should be between 5 to 30cm.

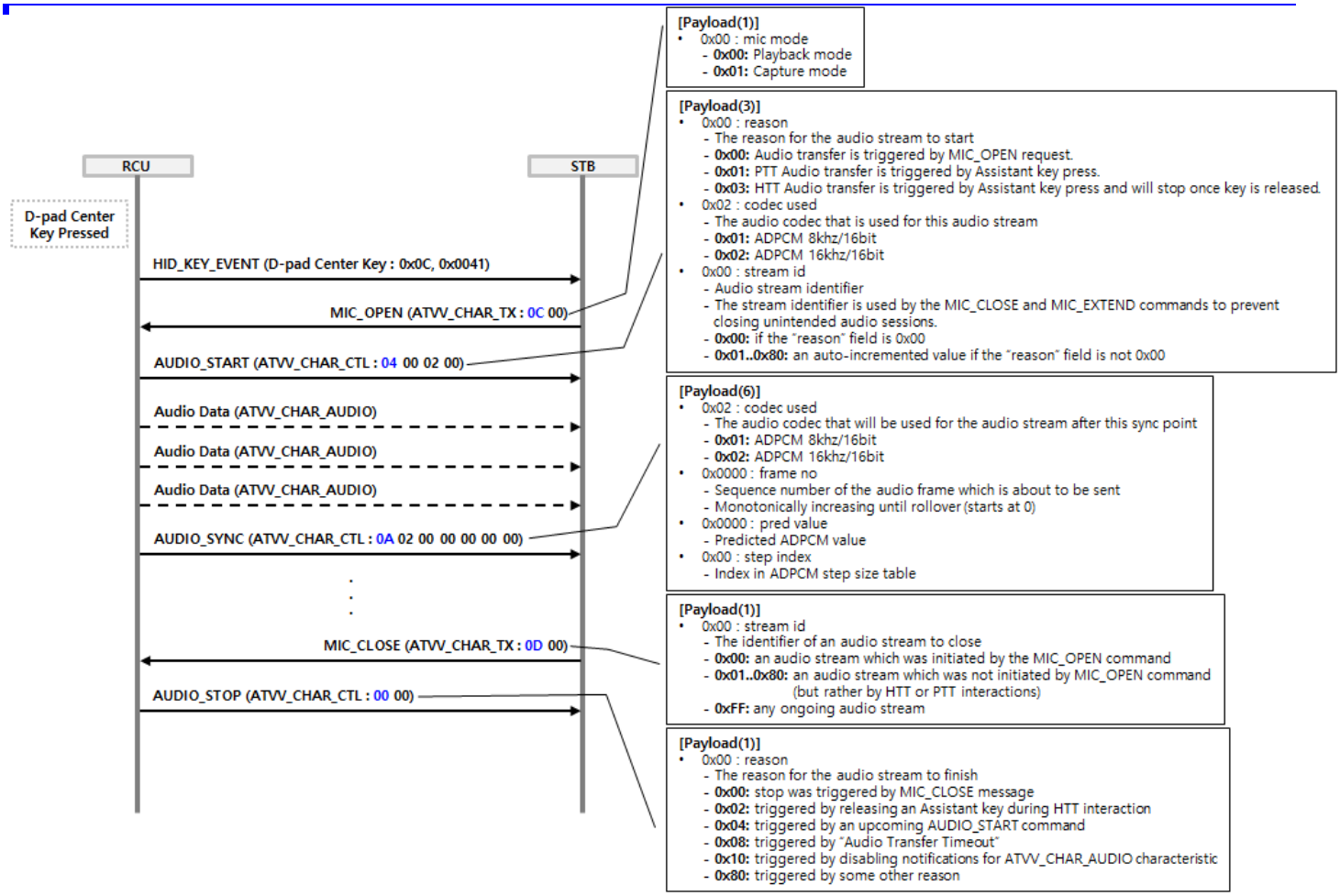
c) User selects and validates the voice search on the launcher by using navigation and [D-PAD CENTER] keys.

d) The Remote Control sends the HID_KEY_EVENT to the STB and the STB sends back the MIC_OPEN command to the Remote Control.

e) The led turns on, the Remote Control sends the AUDIO_START command and transmits the voice data for 15sec timeout duration.

f) After timeout duration or the Remote Control receives the MIC_CLOSE command from the STB, the Remote Control sends the AUDIO_STOP command to the STB and the led goes off.

g) Flow chart



3.15 - Couch mode

a) If a key or multiple keys are pressed continuously for more than 30s, the Remote Control stops transmission in order to protect the battery discharge.

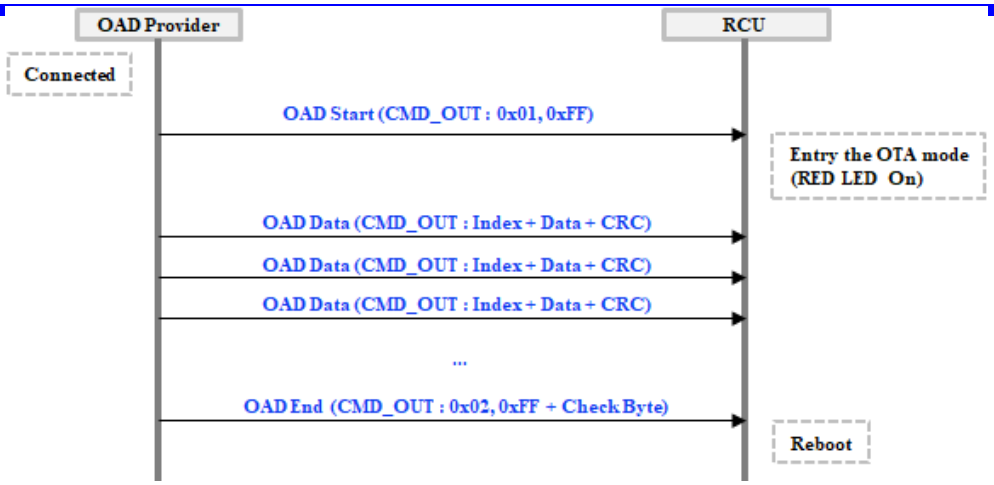
3.16 - OAD mode

a) OAD proceeds according to the Telink specification. (TBD)

b) OAD service (TBD)

Type	Short-form	UUID	Properties
OAD Service	OAD_SERVICE_UUID	00010203-0405-0607-0809-0A0B0C0D1912	
Write Characteristic	OAD_CMD_OUT	00010203-0405-0607-0809-0A0B0C0D2B12	Write

c) Flow chart (TBD)



Note1 : OAD Data = Index(2byte) + Data(16byte) + CRC(2byte)

Note2 : Check Byte is last index and inverse of last index.

Ex) last index = 0x09D7 → Check Byte = 0xD7 0x09 0x28 0xF6

d) OAD time < 30seconds

e) Update should be able to complete without user having to repeat the pairing process

f) Minimal Battery level to support firmware upgrade: 30%

g) Must be able to support successful DFU update with as little as 30% battery capacity

h) Even if the OTA fails, the RCU should still operate normally.

3.17 - Scheduled Silent Upgrade

a) When waking up, the Remote Control sends a message to the STB to trigger the upgrade procedure.

b) In the event the Remote Control would not be able to reconnect with the STB, the Remote Control should try 5 more times increasing the wait time after each attempt to 2, 3, 5, 8 and 13 hours.

3.18 - Bug Report

a) Press the [D-PAD CENTER] + [BACK] keys for over 1sec to get the STB bug report.

b) In IR mode, the sent code data is 0x96.

3.19 - Factory Reset mode

a) Press [ASSISTANT] + [MUTE] keys for longer than 4secs.

b) The Remote Control blinks 3times to confirm that it is deleting the existing pairing table, ir setting value.

c) When the factory reset is completed, the led goes off and the Remote Control operate as ir.

4 - IR over BLE

4.1 - IR service

Type	Short-form	UUID	Properties
IR Service	IR_SERVICE	D343BFC0-5A21-4F05-BC7D-AF01F617B664	
Control Characteristic	IR_PROG_CONTROL	D343BFC1-5A21-4F05-BC7D-AF01F617B664	Write
Key Code Characteristic	IR_KEY_ID	D343BFC2-5A21-4F05-BC7D-AF01F617B664	Write
IR Code Characteristic	IR_CODE	D343BFC3-5A21-4F05-BC7D-AF01F617B664	Write
IR Suppress Characteristic	IR_SUPPRESS	D343BFC4-5A21-4F05-BC7D-AF01F617B664	Write
Key Down Characteristic	IR_KEY_EVENT	D343BFC5-5A21-4F05-BC7D-AF01F617B664	Notify

4.2 - Characteristics and Commands

a) The IR_PROG_CONTROL characteristic is used to START(0x01) and FINISH(0x00) the update process.

b) The IR_KEY_ID characteristic specifies the Remote Control KEY that is currently programmed. (Android keycode: 2bytes)

c) The IR_CODE characteristic is used to send IR codes. (IR Code fragment: variable length payload)

d) The IR_SUPRESS characteristic is used to switch between IR and BLE HID modes. (list of Android keycodes: 2bytes per item)

e) The IR_KEY_EVENT characteristic is used to notify about KEY_UP(0x01, Key Code: 2bytes) and KEY_DOWN(0x00, Key Code: 2bytes) events.

4.3 - IR Programming Operation Sequence

a) ATV writes 0x01 to IR_PROG_CONTROL to START an IR programming session.

This invalidates any previously started session.

b) For each key that ATV wants to program:

1) ATV writes the corresponding key ID to IR_KEY_ID.
The key ID is 2 bytes. Keys are identified by Android key codes and are always written in ascending key code order.
The remote should ignore any key codes that it does not support.

2) ATV writes the corresponding IR code to IR_CODE .
The IR code might be split into multiple consecutive writes. Payloads shall be concatenated in the order of arrival.
The resulting byte sequence shall be interpreted according to IR Code Format .

c) ATV writes 0x00 to IR_PROG_CONTROL to FINISH the IR programming session.
A successful response guarantees that specified keys have been successfully programmed.

Note: Not specified keys shall operate in the BLE HID mode.
Specified keys shall operate in IR mode, unless configured in temporary BLE HID mode.

4.4 - Temporary BLD HID mode

a) IR programmed keys can be temporarily switched back to BLE HID mode by writing the IR_SUPPRESS characteristic.

b) The payload shall be interpreted as a list of 2 bytes Android key codes which identify the keys that should operate in BLE HID mode.

c) All other IR programmed keys shall operate in IR mode.

d) This configuration remains valid until another successful write to IR_SUPPRESS or a disconnection.

4.5 - Key Event Notifications

a) The IR_KEY_EVENT characteristic can be subscribed for notifications about KEY_DOWN and KEY_UP events.

b) Notifications shall be sent only for keys in IR mode.

5 - Certification

5.1 - FCC

Assesment of compliance of the product to the requirements relating to Electromagnetic Compatibility is based on the following standards:

- FCC Part 15 subpart C

7.2 – Manufacturer & Importer

5.2.1 – Manufacturer

- Name: Ohsung Electronics Co., Ltd.
- Address: #181 Gongdan-dong, Gumi, Gyeongbuk Republic of Korea.

5.2.2 – Importer

- Name: Google

Federal Communication Commission
Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one more of the following measures:

❑Reorient or relocate the receiving antenna.

❑Increase the separation between the equipment and receiver.

❑Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

❑Consult the dealer or an experienced radio/TV technician for help.

Warning!

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Note: The manufacturer is not responsible for any Radio or TV interference caused by unauthorized modifications to operate the equipment.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Federal Communication Commissions (FCC)
Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.