



APAC SKB BLE RCU 2017

Product Specification

July 18, 2017

Version: v2.2

URC No: **URC200053-00B00**

Author: Minoh Kim

Revision History

Specification		Sect.	Update Description	By
Rev	Date			
V2.0	7/3/17		Changed ear-jack scenario by SKB Changed IR protocol spec by SKB Changed QS scenario by SKB Finalized the BLE connection parameters	Minoh
V2.1	7/6/17	9.1.1 9.3.2 9.4 9.6	Changed the Backlight operation condition (work when battery is over v2.4 Changed <<HOME>> Key IR spec (Add BREAK code back for this key only) Add scenario for Remote Finder Added A2DP scenario	Minoh
V2.2	7/18/17	9.10.1 9.11	Added LED feedback sceanario – LED shall blink when ear-jack connected Changed B/L sceanario – not activated by Find Me feature / change Backlight scenario for audio streaming.	Minoh

Approvals

ID – Sanchit / Rex Xu
EE – David Gonzalez / Frank Kelly
ME – CJJ / Eric Lee
RF – Javid Karbassi / Alex Park
SW – Kim / Realtek and WPG Korea
IV&V – Vijay/ RBhat/Shashi
QA - Enrique

Table of Contents

APAC SKB BLE RCU 2017	1
2 Introduction	6
2.1 Purpose & Description	6
2.2 General Product Information	7
3 Reference Documentation.....	8
3.1 Customer Documentation	8
3.2 UEI Standard Documentation (as applicable)	8
4 Rendering and Key Description	9
4.1 Rendering - SKB RCU Pebble 04	9
4.2 Key Table	11
5 Mechanical Requirements	12
5.1 Mechanical Information	12
5.2 Housing Material and Finish Details.....	13
5.3 Drawings or other ME requirements	13
6 Electrical Requirements.....	14
6.1 Hardware Information	14
6.2 Performance Requirements	15
6.2.1 REALTEK	15
6.2.2 CSR8630	15
6.2.3 IR Range and Angle Requirements.....	16
6.2.4 IR Frequency Support & Tolerance	16
6.2.5 Microphone Spec	16
6.2.6 Battery life -	16
6.3 RF Factory Test Mode	16
6.4 IR Factory Test Mode	16
7 QA Requirements	17
7.1 Quality Information - UEI STANDARD	17
7.1.1 SKB Reliability Test Requirement.....	17
8 Packaging and Marking Requirements	18
9 Software Requirements.....	19
9.1 Embedded Library	19
9.1.1 Default Devices & Settings.....	19
9.1.2 Library Requirements	19
9.1.3 Database Format and Release/Delivery	20
9.1.4 Device Mode Mapping.....	20
9.2 Bluetooth	20
9.2.1 BLE and BT Classic Local Device Configuration	20
9.2.2 Connectivity	21

9.2.3	Service/Profile.....	23
9.3	Key.....	24
9.3.1	Transmission	24
9.3.2	Key Function Table.....	24
9.3.3	Special Key Code	25
9.3.4	Additional Keys for Setup	26
9.3.5	Drag Mode	26
9.3.6	Key Lock	27
9.4	Remote Finder.....	27
9.5	Voice Upstream.....	28
9.6	Audio Downstream	28
9.6.1	Ear-jack Scenario.....	28
9.6.2	Audio Tones	29
9.7	Battery Monitor	29
9.7.1	Low Battery Mode	29
9.7.2	Empty Battery Mode.....	30
9.8	Quickset	31
9.8.1	Quickset Scenario	31
9.9	OTA.....	31
9.9.1	OTA Scenario.....	31
9.9.2	OTA Vendor code.....	31
9.10	Visual Feedback.....	32
9.10.1	LED.....	32
9.11	Backlight.....	32
9.12	Additional Features	33
9.12.1	Manufacturing Reset	33
9.12.2	Local Manual Setup	33
9.12.3	Code Readout	34
10	Appendix.....	35
10.1	QuickSet DB.....	35
10.2	Command Script for Samsung / LG TV Combo Key	36

2 Introduction

2.1 Purpose & Description

This document describes the product requirement from SKB BLE RCU 2017. SKB is the first RCU customer in Korea, UEI was selected as the first RCU vendor of HDR STB, UH600, which will be launched in July 2017. UEI RCU will use Realtek BLE chipset as main SOC to meet the SKB hard requirement – BLE 4.2 compliance and BT 5.0 ready. UEI will design the full custom remote for SKB, but SW development and verification will be done by Realtek.

Features

- BLE 4.2 – RTL8762AK
- IR (UEI Mini-script IRB, P5)
- Universal TV control – Korea, TV only
- QuickSet 3.8.x
- Voice (Tx)
- Audio Streaming (Rx) – Use CSR8630
- OTA
- Back light (White, 8 LEDs) w/ Laser Etching rubber
- Remote Finder (Buzzer)
- Accelerometer
- 2 AA Battery included
- 47 keys (Metal dome only)

Host Information

UEI RCU should support three STB models below and one more new STB with BLE 4.2 support, which STB is not available yet but will be ready by Apr 2017(MP Date)

- **Existing STB (2 Models)**
- **New STB (UHD HDR)**
(4K UHD, HDR, Android N, BLE 4.2)

Model Name	BKO-UH400 BHX-UH400	BKO-UH600 BHX-UH600 Will be launching with this RCU project
STB Type	UHD2 STB	UHD_HDR
Platform	Android (AOSP) 4.4.4	Android N
Chipset	BCM7252S (12K DMIPS)	BCM7268JD
Bluetooth	BT 4.0 Dual Mode (BT3.0 / BLE)	BT 4.2 Dual Mode (BT3.0 / BLE 4.2)
Flash Memory	eMMC 8GB	
DRAM	DDR3 2.5GB	DDR3/4 or LPDDR4 >3GB
UEI RCU	Must Support	Must Support Launch with this STB

2.2 General Product Information

General Information	
Information Description	Standard (Yes) , Custom, No
1) Industrial Rendering Included (Rendering must include Version; Date; dimensions; materials; and colors)	1) Yes 1E, 2016-06-28
2) IC Type(s) , Memory Size and Package Type(s)	2) RTL8762AK (Main SOC) CSR 8630 (for Audio)
3) UEI internal SW number	3) NA – SW is outsourced to Realtek
4) Product Development Type	4) OEM

3 Reference Documentation

3.1 Customer Documentation

- SKB_RCU_BT07_Protocol_Rev0.7



- SKB_RCU_BT07_Protocol_Rev0.7-1 - *This is Korean*

3.2 UEI Standard Documentation (as applicable)

Spec 0003, Rev 19, Mechanical Standard for Design and Testing of Hand-held Remote Control (HRC)

Spec 0005, Rev 3, Environmental Specification – Drop Test

Spec 0004, Rev 4, Silicon Rubber Keypad, Poly-dome, and Metal Dome Specification

Spec 0007, Rev 3, Carbon Key

Spec 0020, Rev C, ESD

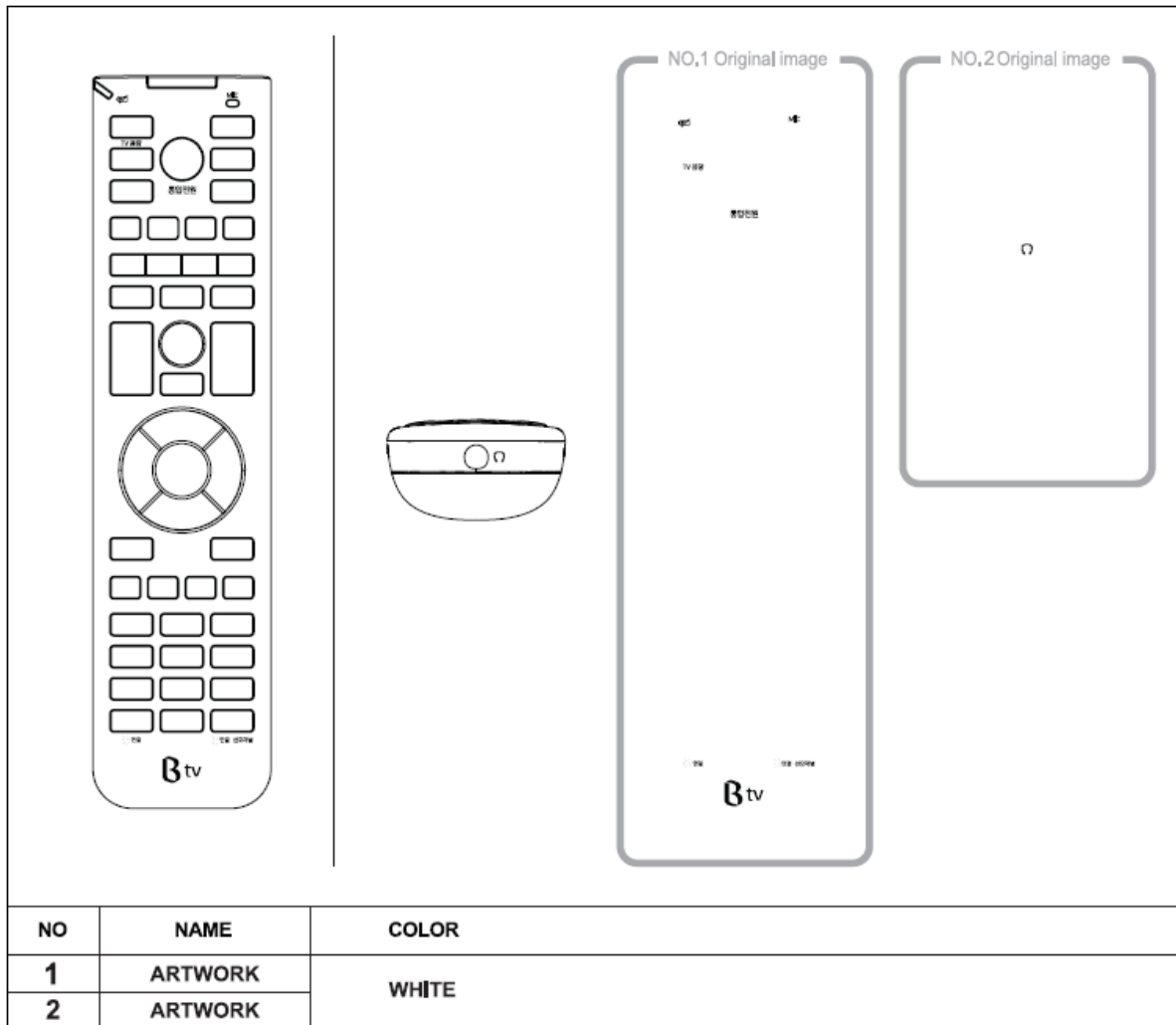
Spec 0010, Rev 3, Marking

4 Rendering and Key Description

4.1 Rendering - SKB RCU Pebble 04



Bottom Silk was added by SKB request on 6/5, 2017



4.2 Key Table

No	Key	Key (English)
	Key name	Key Name (in English)
1	TV 전원	TV Power
2	TV 음량+	TV Vol +
3	TV 음량-	TV Vol -
4	TV 외부입력	TV Input
5	통합전원	All Power
6	B tv 전원	B tv(STB) Power
7	조용히	Mute
8	전체메뉴	All Menu
9	영화	Movie
10	TV 다시보기	TV Replay
11	쇼핑	Shopping
12	◀◀(되감기)/ R	Rewind / Red
13	■(멈춤)/ G	Stop / Green
14	▶/ II (재생/일시정지)/ Y	Play/Pause / Yellow
15	▶▶(빨리감기)/ B	Fast Forward / Blue
16	I ◀◀뒤건너뛰기	Skip Reverse
17	마이크	Mic
18	▶▶ I (앞건너뛰기)	Skip Forward
19	음량+	Vol+
20	음량-	Vol-
21	홈	Home
22	멀티뷰	Multi View
23	채널▲	Channel▲
24	채널▼	Channel▼
25	▲(상)	Up
26	▼(하)	Down
27	◀(좌)	Left
28	▶(우)	Right
29	OK	OK
30	나가기	Exit
31	이전	Previous
32	옵션	Option
33	검색	Search
34	★(찜)	★(Favorite)
35	편성표	Guide
36	1	1
37	2	2
38	3	3
39	4	4
40	5	5
41	6	6
42	7	7
43	8	8
44	9	9
45	*/문자지움	*/Delete
46	0	0
47	#/문자변환	#/Language



5 Mechanical Requirements

5.1 Mechanical Information

(Update this as per your product)

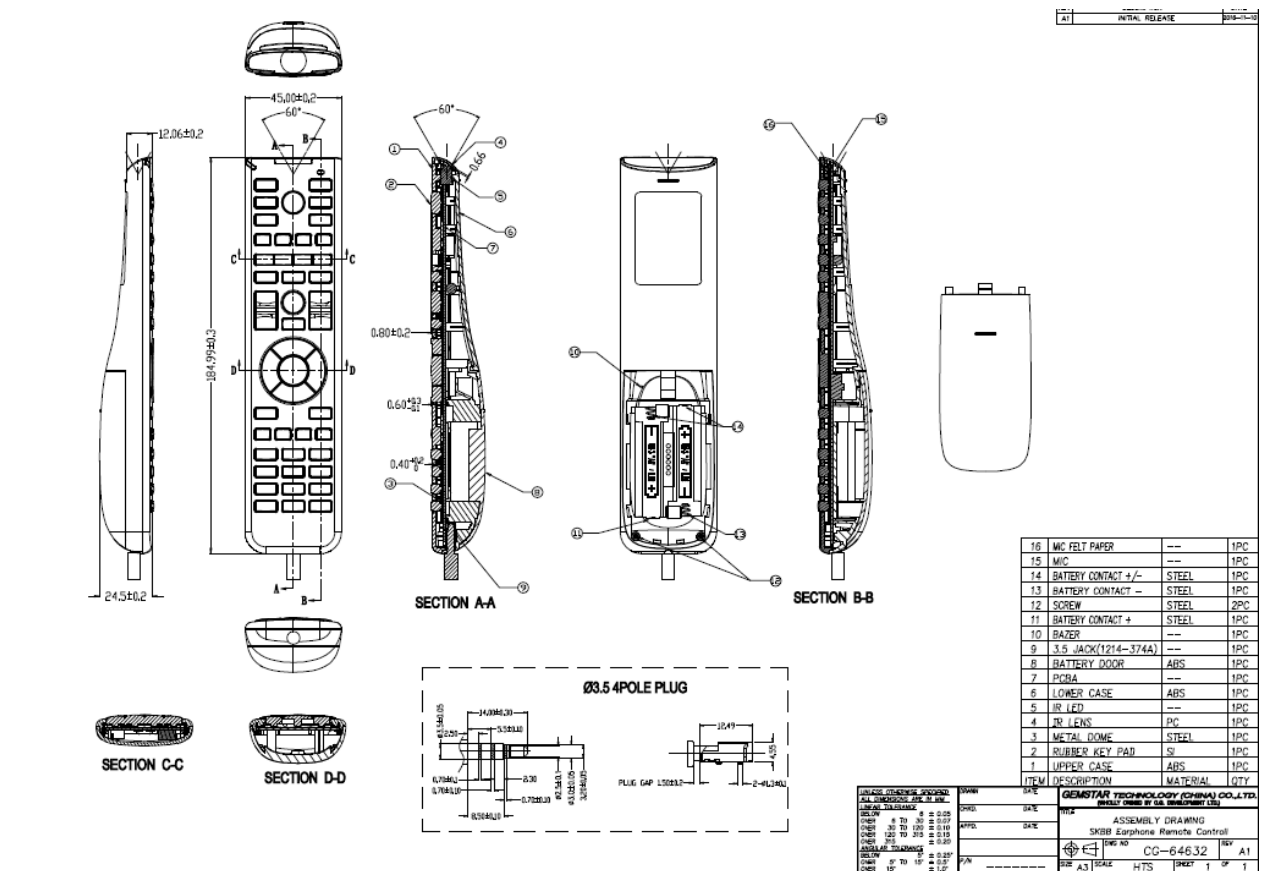
Mechanical Information	
Information Description	Standard (Yes), Custom, No
1) Pro/E Shell Design Responsibility	1) UEI – new design
2) IR Lens	2) Yes
3) IR Lens Color e.g. dark blue; purple; dark red; dark grey; black	3) Dark
4) Overlay e.g. common for older platform projects, the overlay label is typically used to hide extra keys.	4) NA
5) Keypad Definition (Force versus Travel)	5) Standard
6) Keypad Printing/Coating (check with ME whether this is for painting or coating)	6) PU coating on Keypad
7) Hard Cap Keys a. Type (Hard Epoxy, Soft Epoxy, ABS Cap) b. Hard cap key Coating	7) No a. Hard Epoxy b. NA
8) Backlight Diffuser Type and material i.e. Diffuser Plate – PC, LGF	8) LGF
9) Metal Domes / Poly domes a. Number and Location b. If yes, then specify dome diameter size	9) All Metal Domes a. 47 b.
10) Programming/Debugging Opening On Plastics (Required on all designs unless customer requests not to have them)	10) Yes
11) Battery Door Type (Specify – latch, sliding, push button, etc.)	11) Latch
12) Painted Plastics a. Top Case, Bottom Case, Door, Whole unit	12) No a.
13) Rubberized Coating a. Top Case, Bottom Case, Door, Whole Unit	13) No a) NA
14) TPE a) Top Case, Bottom Case, Door, Whole Unit	14) NA a. NA
15) Special Finishes: NCMV, IML/IMD, metal parts	15) NA
16) Patent Numbers (Printed / Embossed)	16) NA
17) Country of Origin Marking (Required for all products being shipped into USA) a. (Printed, Embossed)	17) NA
18) Tooling Inserts	18) NA
19) Compliance Marking Requirements (WEEE, CE, FCC, UL, etc.) a. Location (e.g. Battery area, bottom case)	19) Required Detailed will be provided by SKB
20) Plastic Inlay / Bezel (is this covered in tooling inserts section?)	20) NA
21) Counter Weight (Certain customers may require this for balancing the remote design) a. Amount	21) No

22) Other (Add any other items not captured by above bullet points)	22) NA
---	--------

5.2 Housing Material and Finish Details

5.3 Drawings or other ME requirements

Refer to the attached SKB RCU Design



6 Electrical Requirements

6.1 Hardware Information

Hardware Information	
Information Description	Standard (Yes) , Custom, No
1) 3, 4.5, or 6 Volt Operation (AAAA, AAA, AA, Coin cell) a. Battery Type (Alkaline or Heavy Duty) b. Included in BOM c. Batteries installed or in Polybag d. Battery Tab	1) (Alkaline AA) a. Alkaline (Duracell) b. Yes c. In Polybag d. No
2) Number of physical keys	2) 47
3) SIO access on PCB e.g. pins, pads, etc.	3) No
4) JTAG/Programming Interface on PCB. a. Type (e.g. pins or pads. If pads are chosen, then a fixture maybe required for programming the boards.)	4) JTAG only for Realtek Chipset a. Pads under Battery b. CSR Interface
5) IR LED a. Quantity (1 or 2) b. Type (W, N, WW) "W=Wide N= Narrow" (3mm, 5mm)	5) Specify a. 2 b. 5mm
6) Low Battery Detection a. Type (External or Internal)	6) Yes a. Internal
7) PCB Details a. Type (Single Sided, Double Sided Silver thru hole, Double Sided Plated thru hole, Double Sided Carbon thru hole) b. Material (XPC, FR1, FR4) c. Fabrication process (Wet film or Dry film) d. Flammability Requirement (If mandated by customer)	7) a. Double Sided Plated thru hole b. FR4 c. Dry film d. NA
8) Dual Footprint (Applicable to IXYS MCUs)	8) NA
9) RAM Retention (Non Flash Product)	9) NA
10) RF Operation a. RF Type (433MHz; 868MHz; RF4CE; Z-Wave; Bluetooth; etc.) b. RF PCB (Integrated on Main board or Module) c. RF PCB Material (if separate PCB) d. Antenna Type (as recommended by EE team)	10) a. BLE 4.2 / BT 3.0 b. Integrated c. NA d. PCB trace
11) Visible LED for user feedback a. Type(SMT/Thru-hole) b. Color (Red, Green, etc)	11) a. SMT b. Green and Red
12) Backlight a. LED Type & Color (i.e. top firing, side firing) b. Number of LEDs	12) a. LED & White b. 10
13) Learning Capability	13) No
14) Mode LEDs a. Color and location	14) NA a. NA

15) Voice a. Microphone type (Analog, Digital) b. Mounting method (Top, bottom)	15) Yes a. Analog b. TOP
16) Audio Streaming a. Chipset b. Profile c. Codec (SBC, MP3, or AAC)	16) Yes CSR8630 AD2P SBC
17) Remote Finder a. Feedback Type (Visual or Audio) b. If Visual, specify the type i.e. LED color, etc. c. If Audio, specify Piezo or Speaker, etc.	17) Yes a. Audio b. NA c. Piezo
18) Accelerometer	18) YES BMA222E(F)

6.2 Performance Requirements

6.2.1 REALTEK

Conducted Transmit Power:

Conducted transmit power, at 7dBm power setting, measured at antenna feed-point:

Parameter	Condition, notes	Min	Typ	Max	Unit
TX Power	According to the data sheet		0	-	dBm

Conducted Receive Sensitivity:

Conducted receive sensitivity, at antenna matching input

Parameter	Condition, Notes	Min	Typ	Max	Unit
RX Sensitivity to meet 1% PER	According to the data sheet		-88	-	dBm

RF Range

30 meter minimum, open field, measured against Target

6.2.2 CSR8630

Conducted Transmit Power:

Conducted transmit power, at 7dBm power setting, measured at antenna feed-point:

Parameter	Condition, notes	Min	Typ	Max	Unit
TX Power	According to the data sheet		4	-	dBm

Conducted Receive Sensitivity:

Conducted receive sensitivity, at antenna matching input

Parameter	Condition, Notes	Min	Typ	Max	Unit
RX Sensitivity to meet 1% PER	According to the data sheet		-86	-	dBm

RF Range

30 meter minimum, open field, measured against Target

Product Specification

6.2.3 IR Range and Angle Requirements

Transmission range depends upon the receive angle and the sensitivity of the receiver.

*Angle and range tests are based on a NEC carrier based code.

Single Wide*:

Head on Range: 50 Feet (in the horizontal plane).

Remote Angle coverage: 25° Up/Down and 25° Left/Right from the Center/Head on target position) @ 20 Feet.

6.2.4 IR Frequency Support & Tolerance

The RCU will support IR protocols with frequencies up to 455 KHz with a tolerance of +/-3%.

6.2.5 Microphone Spec**6.2.5.1 Audio Format Requirement**

- Sampling rate: 16000Hz
- Channel: mono
- Encoding: 16bit PCM (ENCODING_PCM_16BIT)

6.2.5.2 Sound Quality Requirement**6.2.6 Battery life -**

Battery life shall be optimized for the maximum life time using Alkaline AA batteries (Duracell) and based on the following usage profile:

6.3 RF Factory Test Mode

The pairing is cleared when the RCU enters the factory test mode in order to minimize the production line test duration.

*** FACTORY TEST POINTS NEED TO BE EXPOSED***

Please refer to the EATP

6.4 IR Factory Test Mode

- RCU FW shall support UEI standard Factory Test Mode, which spec will be given by UEI separately.
- Press and hold <<HOME>> + <<#>> to enter Factory RF Test Mode.
 - Then, RCU shall be blinking 3 times - short_blink (100ms on and 100ms off)

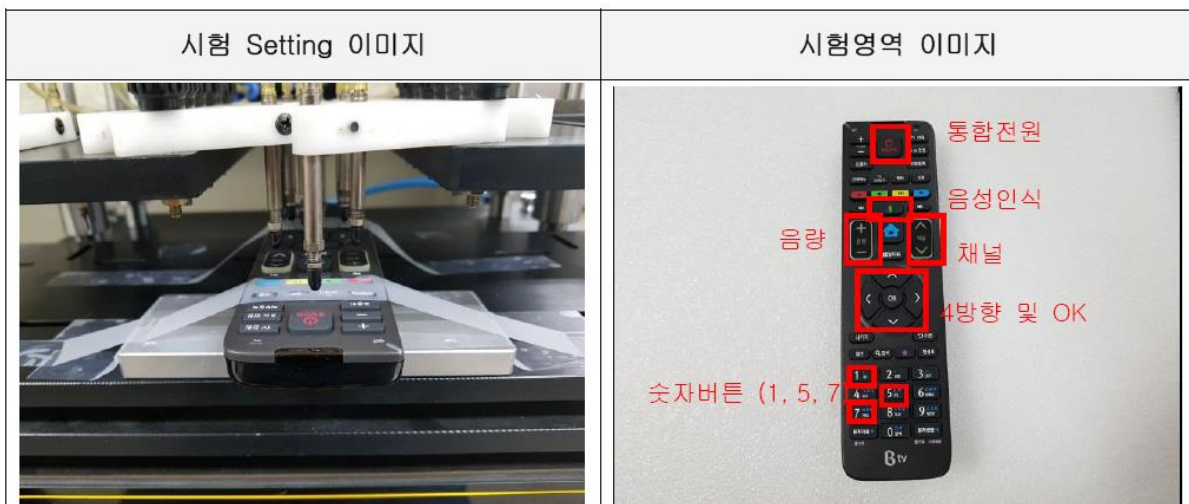
7 QA Requirements

7.1 Quality Information - UEI STANDARD

Quality/Testing Information	
Information Description	Standard (Yes) , Custom, No
1) ESD Protection	1) Yes
2) Environmental Testing	2) Yes
3) FCC or CE Certification Requirements	3) Korea Standard and BT Certification for Korea
4) Bluetooth Certification	4) Yes
5) Reliability Testing	5) Yes
6) SIO Verification	6) No
7) Environmental Requirements a. RoHS Certification type (RoHS, Green, Sony Green, WEEE, REACH, Eup, Erp, Prop 65, etc.)	7) Yes a. RoHS
8) CPSIA (Consumer Product Safety Improvement Act – required by certain customers)	8) (Specify)
9) Special Agency Requirements (i.e. ASTM G1515, G154, 155, UL634, etc.)	9) (Specify)
10) Other (Describe)	10) (Specify)

7.1.1 SKB Reliability Test Requirement

- UEI Standard 0003 can cover this entire requirement for reliability test.
- SKB added a special reliability test requirement on Key Pad
 - o Key Test Report
 - 200K Cycle – WE need to test only the keys in page 6 of Movon's report



Product Specification

8 Packaging and Marking Requirements

Miscellaneous Information	
Information Description	Standard (Yes) , Custom, No
1) URC Part number and Date Code a. Type (Label or Laser etch) b. Location (battery area or bottom case)	1) Yes a. Laser etch b. Bottom case
2) Customer Part number Label	2) NA
3) Device Code label	3) NA
4) Packaging a. Type (Bulk, Blister, Clamshell, Giftbox)	4) Yes a. Bulk
5) Master Carton a. Units per carton	5) Yes a. 100 units
6) Inner Carton a. Units per	6) NA a. NA
7) Packaging bag a. Type (Poly bag, Bubble bag, etc.)	3) Yes a. Poly bag
8) Battery pull-out Tab	4) NA
9) User Manual a. User Manual type (Stapled, Folded Map) b. Dimensions c. Paper Weight and Type (If customer requires certain type, otherwise use standard) d. User Manual Responsibility (Customer or UEI)	5) Yes a. Folded Map b. 25cm*18cm c. 100g/m2, White d. UEI
10) Configurable Product (This is used for platform projects. If the product is configurable, then the URC needs to be defined accordingly)	6) No
11) Spare Part (e.g. battery door, etc) a. Type	7) No a.
12) Other (Describe)	8) (Specify)

9 Software Requirements

The software shall be based on the Realtek RTL8762AK platform. It shall be able to communicate to the following three STB configurations:

- STB with Android KitKat 4.4.x with BT Classic and BLE 4.0.
- STB with Android Lollipop with BT Classic and BLE 4.2.
- STB with Android Marshmallow with BT Classic and BLE 4.2.

The RCU software shall support the following features:

- BLE 4.0 and BLE 4.2 via Realtek RTL8762AK
- BT Classic via CSR8630.
- Voice upstream via BLE 4.2 or BLE 4.0.
- Audio downstream via BT Classic.
- Universal IR for TV for selected keys (TV Power On/Off/Toggle, Volume +/-, Input)
- OTA for upgrading the firmware via BLE. CSR8630 configuration upgrade will not be supported.
- Remote Finder
- Battery Monitor
- UEI Quickset 3.8.x features (OTV, Auto Setup, and control)
- IR assisted pairing

9.1 Embedded Library

9.1.1 Default Devices & Settings

Device	Default Code
STB	BLE Data + IR for Power Key C5443 + C5444(for alternative mode, Mode2)
TV	LG & Samsung combo signal (T2051 & T1860) Send LG signal first and then send Samsung again For Power Toggle, Volume, Input

9.1.2 Library Requirements

9.1.2.1 STB Codesets

- Default STB codeset is C5443 (SKB IR Mode), and C5444 can be set as Mode 2 manually
- Please find the UEI SKB BLE RCU 2017 IR Spec on 9.1.2.2
- Follow UEI Exec. 090
- However, Some keys, like <<All Power>>, <<Home>>, and <<Home>>, use the combo signal to send the SKB-specific IR code(this is handled by RCU FW separately)
- No SKB BREAK code is required.

9.1.2.2 TV Codesets

- RCU shall support Universal TV: T (WW TV brands and Korean Local TV brands)
- SKB Embedded Codeset List
 - (1)Codeset No and, (2) Codeset Sequence, and (3) Group(Brand) Code.
 - "Sequential Setup Method" and "Brand Setup Method"
- UEI RCU shall use the following matching table (in Column M and N) to use UEI IR Binary file matching to each SKB Codeset – Attached file is the matching table.



UEI SKB BLE
RCU 2017 IR Spec

Product Specification

- In summary, UEI RCU shall implement Local Manual Setup (Sequential, Brand(Group), and Direct) based on the SKB Load List and also use UEI-SKB codeset matching table to use UEI binary files resides on Realtek BLE chipset.
- Please refer to 9.12.2 for Local Manual Setup method.

9.1.3 Database Format and Release/Delivery
9.1.3.1 DB Format

- **Encrypted Binary for Samsung P5**
- Same format used for QuickSet - No new tool chain is required for this type of DB format
- Encrypted binaries can only be processed by UEI Mini-script QS IR Blaster (Samsung MCU based UEI Blaster)

9.1.3.2 Delivery Bin files

- UEI Library team generates the individual Bin files for the two STB codesets and 253 TV codesets, as specified in 9.1.2.2 TV Codesets (*No brand/model information will be shared)
- Bin files will be stored in BLE chipset and downloaded to P5 (as per local User programming – limited by FDRA size). *No UEI SW support required for this task.
- Realtek SW team is contracted to fully develop UEI RCU FW for SKB BLE RCU project, including all RCU features. They will make the index and store all the encrypted bin files in the flash, and load the correct bin file based on the matching table (*Please see the attached Doc)
- Realtek allocates 25KB for FDRA for this local DB
- IR Codeset Index Format by Realtek


 IRB codeset DB
 flash format.pdf

9.1.4 Device Mode Mapping

Device	Default Code	Device Type
STB	C	0
Universal TV	T	1

9.2 Bluetooth
9.2.1 BLE and BT Classic Local Device Configuration

Each Bluetooth device contains a unique MAC address called BD address (Bluetooth Device address) which is taken from ranges assigned by IEEE. The below MAC Address is assigned by UEI PM.

MAC Address Range:

Chip	Mac Address Start	Mac Address End
REALTEK	9CAC6D 000000	9CAC6D 07A151
CSR	9CAC6D 07A152	9CAC6D 0F4240

RCU shall have a VID and PID defined from the following:

VID (Vendor ID)	0x06E7
PID (Product ID)	0x8058

9.2.2 Connectivity

9.2.2.1 Advertising / Pairing

- RCU shall support BLE “Just Works” pairing mechanism by setting IO capabilities as No Input/No Output.
- RCU shall start sending BLE advertisement packets if it has no pairing information and the user hold the pairing button(s) defined by PAIR_BUTTONS for PAIR_BUTTON_DURATION.
- RCU shall send BLE advertisement packets with interval defined by PAIR_ADV_INTERVAL for PAIR_ADV_DURATION. RCU will stop sending advertisement packet if it is successfully paired with the host before the PAIR_ADV_DURATION expires.
- RCU shall ignore all key pressed when sending the BLE advertisement packets until PAIR_ADV_DURATION expires.

Parameter	Value	Unit
PAIR_BUTTONS	<<Mic>> or <<*>> + <#>> or Connecting ear-jack	RCU Key(s)
PAIR_BUTTON_DURATION	Once for <<MIC>> 3 for <<*>> + <#>>	Seconds
PAIR_ADV_INTERVAL	50	Milliseconds
PAIR_ADV_DURATION	20	Seconds

- RCU shall send BLE advertisement packet no longer than 31 bytes.
- RCU shall send BLE advertisement packet based on the Advertisement Packet Format.
- RCU is paired and has pairing information but NOT connected to the STB, if user press <<MIC>> button or connecting ear-jack to trigger pairing start, then RCU shall send IR_RCU_NOT_CONN (Refer to 9.3.3 Key Table) to STB, then STB will show pop-up message to the user

Advertisement Packet Format (Realtek):

Data Field	Length	Value	Description
Flag	0x02	0x01, 0x05	Limited Discoverable, No BR/EDR
Appearance	0x03	0x19, 0x0180	Generic Remote Control
Service Length	0x07	0x02, 0x1812, 0x180F, 0x1802	HID, Battery, and Immediate Alert Service
Local Name	0x09	0x09, 0x42, 0x55, 0x45, 0x5f, 0x42, 0x54, 0x30, 0x36	‘BUE_BT07_XXX’ Device Name in ASCII. B: Btv UE: Universal Electronic BT07: UHD_HDR Bluetooth LE RCU XXX : Any three digit of number from MAC_ADDRESS

- RCU shall respond to BLE scan response request from the host based on Scan Response Packet Format.

Scan Response Packet Format.

Data Field	Length	Value	Description
Local Name	0x09	0x09, 0x42, 0x55, 0x45, 0x5f, 0x42, 0x54, 0x30, 0x36	‘BUE_BT07_XXX’ Device Name in ASCII. B: Btv UE: Universal Electronic BT07: UHD_HDR Bluetooth LE RCU XXX : Any three digit of number from MAC_ADDRESS

- RCU shall support the remote finder via BLE FindMe profile using the BLE immediate alert service
- RCU shall advertise device name **BUE_Audio07** for the Bluetooth Classic (CSR8630) used for the Audio Downstream.
- RCU shall advertise Bluetooth Classic only when the headset is detected. This is to save power of the RCU.

9.2.2.2 Connections

- RCU shall store the BLE pairing information when it is successfully paired with the host.
- RCU shall maintain the active connection with connection parameter defined by CONNECTION_INTERVAL, SLAVE_LATENCY, and SUPERVISION_TIMEOUT.

Parameter	Idle / Voice	During OTA	Unit
CONNECTION_INTERVAL	7.5	16.25	Milliseconds
SLAVE_LATENCY	199	0	Number of times
SUPERVISION_TIMEOUT	10	6.5	Seconds

9.2.2.3 Reconnection

- RCU shall start sending BLE directed advertisement packets when it is not connected to the host or detects a key press with prior pairing information.
- RCU shall send high duty direct advertisement packets in RECONNECT_HD_ADV_DURATION time with RECONNECT_HD_ADV_INTERVAL for RECONNECT_HD_ADV_MAX_TIMES, when RCU is not connected and detects a key press with prior pairing information. RCU will stop sending high duty direct advertisement packets if it successfully reconnects with the host before the RECONNECT_HD_ADV_DURATION and RECONNECT_HD_ADV_MAX_TIMES expires.
- RCU shall transmit the key report associated with the key pressed once the connection is re-established.
- RCU shall continuously send low duty direct advertisement packets in RECONNECT_LD_ADV_DURATION time with RECONNECT_LD_ADV_INTERVAL, when it is not connected. RCU will stop sending low duty direct advertisement packets if it successfully reconnects with the host.

Parameter	Value	Unit
RECONNECT_HD_ADV_INTERVAL	1.87	Milliseconds
RECONNECT_HD_ADV_DURATION	1.28	Seconds
RECONNECT_HD_ADV_MAX_TIMES	1	times
RECONNECT_LD_ADV_INTERVAL	1.87(1 cycle)	Milliseconds
RECONNECT_LD_ADV_DURATION	1.5	Seconds

9.2.2.4 Paring / Connection timing information

- BLE and BT chipsets shall be operating with the below timing sequence.
THIS IS TBD and being updated by both Realtek and UEI

9.2.2.5 Un-Pairing

- RCU shall terminate an active link when the user hold the un-pairing button(s) defined by UNPAIR_BUTTONS for UNPAIR_BUTTON_DURATION.
- RCU shall clear the pairing information when the link is terminated. Key press will no longer trigger a reconnection.

Parameter	Value	Unit
UNPAIR_BUTTONS	<<*>> + <<Home>>	RCU Key(s)
UNPAIR_BUTTON_DURATION	3	Seconds

9.2.2.6 Voice

- RCU shall maintain the active connection with connection parameter defined by VOICE_CONNECTION_INTERVAL, VOICE_SLAVE_LATENCY, and VOICE_SUPERVISION_TIMEOUT in voice transmission.

Parameter	Value	Unit
VOICE_CONNECTION_INTERVAL	7.5	Milliseconds
VOICE_SLAVE_LATENCY	199	Number of times
VOICE_SUPERVISION_TIMEOUT	10	Seconds

9.2.3 Service/Profile

9.2.3.1 GAP – Generic Access Profile

- RCU shall support the following characteristics in the GAP Service.

Characteristic	UUID	Value	Description
Device Name	0x2A00	BUE_BT07	RCU BLE Device Name
Appearance	0x2A01	0x0180	Generic Remote Control

9.2.3.2 GATT – Generic Attribute Profile

- RCU shall support the following characteristics in the GATT service.

Characteristic	UUID	Value	Description
System ID	0x2A23	<CAI> 0xFFFE <OUI>	<CAI> is the last 3 bytes of the BLE MAC address. <OUI> is the first 3 bytes of the BLE MAC address.
Model Number	0x2A24	UEISKB0000001	RCU Model Number in ASCII
Serial Number	0x2A25	N bytes	
Firmware Revision	0x2A26	<Major>.<Minor>.<Release>	RCU Bootloader revision in ASCII
Hardware Revision	0x2A27	UEIS-15281	RCU Hardware revision in ASCII
Software Revision	0x2A28	NA	This will be managed by Real tek
Manufacturer Name	0x2A29	“Universal Electronics, Inc.”	RCU Manufacturer Name
PnP ID	0x2A50	0x02 <VID, PID, Product Version>	USB VID, PID, and UEI product version.

9.2.3.3 HOGP – HID Over GATT Profile

- RCU shall support the following characteristics in the HOGP service.

Characteristic	UUID	Value	Description
HID Information	0x2A4A	0x0111, 0x00, 0x01	USB HID version, Country Code, Flags
Report Map	0x2A4B	0x05 0x01 0x09 0x06 0xA1 etc.	HID format information
Protocol Mode	0x2A4E	0x01	Report Protocol Mode

9.2.3.4 Battery

- RCU shall support the following characteristics in the Battery service.

Characteristic	UUID	Value	Description
Battery Level	0x2A19	0-100	RCU Battery Level in percentage

9.2.3.5 Find Me Profile

- RCU shall support the following characteristics in the Immediate Alert Service.

Characteristic	UUID	Value	Description
Alert Level	0x2A06	0-2	RCU Alert Level

9.3 Key

9.3.1 Transmission

- RCU shall send the specific data based on the key function table defined in section 9.3.2.
- RCU shall always transmit keys with IR data independent of the BLE connection status for keys that do not have HID data defined in section 9.3.2.
- RCU shall send the BLE key report when the BLE is paired. Otherwise, it will send the IR data based on the RCU MODE.
- RCU shall send the BLE key report when the key is pressed and BLE is paired.
- RCU shall send the BLE key release report when the key is released or the STUCK_KEY_TIMEOUT has expired and BLE is paired.
- RCU shall transmit the IR data continuously when the key is pressed. It will stop transmitting either when the key is released or the STUCK_KEY_TIMEOUT has expired.
- RCU shall only send either the RF data or the IR data associated with the first button when two buttons are pressed. This includes situation when two buttons are pressed then the first button is released, RCU will not send the RF data or IR data of the second button.

Parameter	Value	Unit	Description
STUCK_KEY_TIMEOUT	120	Seconds	Timeout for transmitting the IR or RF key data

9.3.2 Key Function Table

No	Keys		Device		Code			
					IR		RF(BLE) – HID Standard Key	
	Key name	Key Name (in English)	S T B	T V	MODE1 CUSTOM 0x807F C5443	MODE2 CUSTOM 0xF5A0 C5444	Page	Usage ID
1	TV 전원	TV Power		V	[0x02FD]+[0x08F7]	[0x02FD]+[0x08F7]	These TV keys support LG and Samsung TV combo as a default. When QS (auto-setup) is in use	
2	TV 음량+	TV Vol +		V	[0x07F8]+[0x02FD]	[0x07F8]+[0x02FD]		
3	TV 음량-	TV Vol -		V	[0x0BF4]+[0x03FC]	[0x0BF4]+[0x03FC]		
4	TV 외부입력	TV Input		V	[0x01FE]+[0x0BF4]	[0x01FE]+[0x0BF4]		
5	통합전원	All Power	V	V	BTV Power + TV Power	BTV Power + TV Power	When QS is in use, send BTV Power Only, QS is not available, send BTV Power and TV Power combo signal based on the local TV IR setup states	
6	B TV 전원	STB Power	V		0x01FE	0x01EF	0x07	0x0100
7	조용히	Mute	V		0x45BA	0x45AB	0x07	0x4500
8	전체메뉴	All Menu	V		0x47B8	0x478B	0x07	0x4700
9	영화	Movie	V		0x30CF	0x30FC	0x07	0x3000
10	TV 다시보기	TV Replay	V		0x31CE	0x31EC	0x07	0x3100
11	쇼핑	Shopping	V		0x32CD	0x32DC	0x07	0x3200
12	◀◀(되감기)/ R	Rewind / R	V		0x609F	0x60F9	0x07	0x6000
13	■(멈춤)/ G	Stop / G	V		0x619E	0x61E9	0x07	0x6100
14	▶/ (재생/일시정지) / Y	Play/Pause / Y	V		0x629D	0x62D9	0x07	0x6200
15	▶▶(빨리감기) / B	Fast Forward / B	V		0x639C	0x63C9	0x07	0x6300
16	◀◀뒤꺼내뛰기	Skip Reverse	V		0x649B	0x64B9	0x07	0x6400
17	마이크	Mic	V		0xD12E – No repeat code	0xD1E2 - No repeat code	0x07	0x2300

Product Specification

18	▶▶ I (앞 건너뛰기)	Skip Forward	V		0x659A	0x65A9	0x07	0x6500
19	음량+	Vol+	V		0x43BC	0x43CB	0x07	0x4300
20	음량-	Vol-	V		0x42BD	0x42DB	0x07	0x4200
21	홈	Home	V		0x02FD - No Repeat code (Send out battery info as well)	0x02DF - No Repeat code (Send out battery info as well)	0x07	0x0200
22	멀티뷰	Multi View	V		0x33CC	0x33CC	0x07	0x3300
23	채널Λ	ChannelΛ	V		0x40BF	0x40FB	0x07	0x4000
24	채널V	ChannelV	V		0x41BE	0x41EB	0x07	0x4100
25	▲(상)	Up	V		0x49B6	0x496B	0x07	0x4900
26	▼(하)	Down	V		0x4AB5	0x4A5B	0x07	0x4A00
27	◀(좌)	Left	V		0x4BB4	0x4B4B	0x07	0x4B00
28	▶(우)	Right	V		0x4CB3	0x4C3B	0x07	0x4C00
29	OK	OK	V		0x46B9	0x469B	0x07	0x4600
30	나가기	Exit	V		0x34CB	0x34BC	0x07	0x3400
31	이전	Previous	V		0x4EB1	0x4E1B	0x07	0x4E00
32	옵션	Option	V		0x35CA	0x35AC	0x07	0x3500
33	검색	Search	V		0x4FB0	0x4F0B	0x07	0x4F00
34	★(찜)	★(Favorite)	V		0x53AC	0x51EA	0x07	0x5300
35	편성표	Guide	V		0x6D92	0x6D29	0x07	0x6D00
36	1	1	V		0x21DE	0x21ED	0x07	0x2100
37	2	2	V		0x22DD	0x22DD	0x07	0x2200
38	3	3	V		0x23DC	0x23CD	0x07	0x2300
39	4	4	V		0x24DB	0x24BD	0x07	0x2400
40	5	5	V		0x25DA	0x25AD	0x07	0x2500
41	6	6	V		0x26D9	0x269D	0x07	0x2600
42	7	7	V		0x27D8	0x278D	0x07	0x2700
43	8	8	V		0x28D7	0x287D	0x07	0x2800
44	9	9	V		0x29D6	0x296D	0x07	0x2900
45	*/문자지움	*/Delete	V		0x2AD5	0x2A5D	0x07	0x2A00
46	0	0	V		0x20DF	0x20FD	0x07	0x2000
47	#/문자변환	#/Language	V		0x2BD4	0x2B4D	0x07	0x2B00

- All key should be sent following standard NEC protocol (UEI EXEC 090), but for <<HOME>> key sends the extra BREAK code (0xFF00) defined in the below 9.3.3 Special Key Code table
- Mic Key is used for Paring Start, and should be sent only ONE single frame w/o BREAK code
- Home key is also used for Batter Info update by IR (sending extra IR signal for Battery)
- Send HID Key in RF(BLE) Mode, and IR key in IR mode – for all keys including B tv Power key

9.3.3 Special Key Code

- These keys are supported by UEI STB codeset, except RCU version from #71~#81)
- RCU Version code is NOT following standard IR protocol, but just need to be sent to STB as it is defined - This shall be handled by RCU FW Code using SendIrPattern CMD on P5 Mini-Script FW

51	Normal Battery	Normal Battery	V		0x3AC5	0x3A5C	0x07	0x3A00+0xFFFF
52	Low Battery	Low Battery	V		0x3BC4	0x3B4C	0x07	0x3B00+0xFFFF
53	Empty Battery	Empty Battery	V		0x3CC3	0x3C3C	0x07	0x3C00+0xFFFF
54	EarJack Insert	EarJack Insert	V		0x3DC2	0x3D2C	0x07	0x3D00+0xFFFF
55	Break Data Code This Break code is used only for <<HOME>> Key	Break Data Code	V		0xFF00	0xFF00	0x07	0xFFFF
57	동조 시작	TV Sync Start	V		0x54AB	0x54BA	0x07	0x5400+0xFFFF
58	동조 종료	Sync Stop	V		0x55AA	0x55AA	0x07	0x5500+0xFFFF
59	드래그 모드(상)	Drag Mode – Up	V		0x8778	0x8787	0x07	0x8700+0xFFFF
60	드래그 모드(하)	Drag Mode – Down	V		0x827D	0x82D7	0x07	0x8200+0xFFFF
61	드래그 모드(좌)	Drag Mode – Left	V		0x837C	0x83C7	0x07	0x8300+0xFFFF
62	드래그 모드(우)	Drag Mode - Right	V		0x847B	0x847B	0x07	0x8400+0xFFFF
63	IR_RCU_NOT_CONN	IR_RCU_NOT_CONN	V		0xD22D	0xD2D2	N/A	N/A
71~8	RCU Version for UEI	RCU Version for	V		0xF540 ~ 0xF54A	0xF540 ~ 0xF54A	0x07	0xF540 ~ 0xF54A +

Product Specification

51	Normal Battery	Normal Battery	V		0x3AC5	0x3A5C	0x07	0x3A00+0xFFFF
52	Low Battery	Low Battery	V		0x3BC4	0x3B4C	0x07	0x3B00+0xFFFF
53	Empty Battery	Empty Battery	V		0x3CC3	0x3C3C	0x07	0x3C00+0xFFFF
54	EarJack Insert	EarJack Insert	V		0x3DC2	0x3D2C	0x07	0x3D00+0xFFFF
55	Break Data Code This Break code is used only for <<HOME>> Key	Break Data Code	V		0xFF00	0xFF00	0x07	0xFFFF
57	동조 시작	TV Sync Start	V		0x54AB	0x54BA	0x07	0x5400+0xFFFF
58	동조 종료	Sync Stop	V		0x55AA	0x55AA	0x07	0x5500+0xFFFF
59	드래그 모드(상)	Drag Mode – Up	V		0x8778	0x8787	0x07	0x8700+0xFFFF
60	드래그 모드(하)	Drag Mode – Down	V		0x827D	0x82D7	0x07	0x8200+0xFFFF
61	드래그 모드(좌)	Drag Mode – Left	V		0x837C	0x83C7	0x07	0x8300+0xFFFF
62	드래그 모드(우)	Drag Mode - Right	V		0x847B	0x847B	0x07	0x8400+0xFFFF
63	IR_RCU_NOT_CONN	IR_RCU_NOT_CONN	V		0xD22D	0xD2D2	N/A	N/A
1		UEI						0xFFFF

9.3.4 Additional Keys for Setup

	Key name	Key Name (in English)	Keys	Duration	Remark
1	Un-pairing	Un-pairing	<<*>> + <<Home>>	Press for 3 sec	
2	Re-Pairing	Re-Pairing	<<*>> + <<#>>	Press for 3 sec	
3	TV 동조 (Auto Search)	TV Sync (Auto Search)	<<STB Power>> + <<Input>>	Press for 3 sec	Used for Auto Search and Manual Setup Auto Search: User can search all codesets, which are stored in RCU and ordered by priority. By pressing Ch+ and CH-, user can search the desired codeset (RCU sends Power Toggle signal whenever new codeset is selected)
4	TV 동조 (그룹핑)	TV Sync (Grouping)	Grouping No Key <<1~9>> + <<STB Power>>	Press for 3 sec	Search Brands by CH+/CH- Button Group Search : User may select Brand first by pressing the combo key <<1~9>> + <<STB Power>>, each number represents the specific brands like: 1- Samsung, 2-LG After brand is selected by this number key combination, user can search the desired codeset within that specific brands
5	IR Code 모드 전환	IR Code - Mode change	<<*>> + <<9>>	Press for 3 sec	Toggle either from IR Mode 1 -> IR Mode 2 or IR Mode 2 -> IR Mode 1
6	BT-IR 모드변환 (BT)	BT-IR Mode Change (BT)	<<*>> + <<1>>	Press for 3 sec	Set the RCU mode as BT
7	BT-IR 모드변환 (IR)	BT-IR Change (IR)	<<*>> + <<2>>	Press for 3 sec	Set the RCU mode as IR
8	Factory Default	Factory Default	<<*>> + <<3>>	Press for 3 sec	
9	Buzzer Test	Buzzer Test	<<*>> + <<4>>	Press for 3 sec	Buzzer stop by any key press (Key doesn't work)
10	드래그 모드(상)	Drag Mode(Up)	<<*>> + <<UP>>	On click	Refer to Drag Mode Scenario
11	드래그 모드(하)	Drag Mode(Down)	<<*>> + <<DOWN>>	On click	
12	드래그 모드(좌)	Drag Mode(Left)	<<*>> + <<LEFT>>	On click	
13	드래그 모드(우)	Drag Mode(Right)	<<*>> + <<RIGHT>>	On click	
14	Code Read Out	Code Read Out	<<STB Power>> + <<Input>>	Press for 3 sec	This is used to show the current codeset No Please See the detailed information on 9.11.3

9.3.5 Drag Mode

- The RCU shall provide the special IR key code to support Android Web Browser
- When any key of the two combo keys is released, then RCU shall send BREAK signal

Key Name	Scan code	Android Key code
Drag Mode (Up)	0x136	KEYCODE_BUTTON_L1

Product Specification

Drag Mode (Down)	0x137	KEYCODE_ BUTTON_R1
Drag Mode (Left)	0x138	KEYCODE_ BUTTON_L2
Drag Mode (Right)	0x139	KEYCODE_ BUTTON_R2

9.3.6 Key Lock

9.3.6.1 Lock Mode

- Press <<0>> for 3 secs, then the RCU shall send LOCK Key code + BREAK code (#14 in special code) + BREAK code, and then go into LOCK mode.
- When RCU is in Key Lock mode, all press except the keys (All PWR, STB PWR, TV PWR, TV INPUT) below, shall send LOCK key code instead of its original key code.
 - When pressed, RCU shall send LOCK code, and when released, send BREAK code

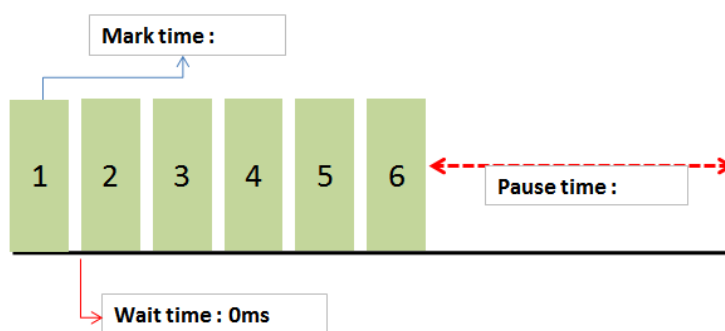
9.3.6.2 Unlock Mode

- Press <<0>> for 3 secs, then the RCU shall send UNLOCK Key code + BREAK code (#15 in special code) + BREAK code, and then go into Normal mode (Unlock)
- When battery is re-inserted, RCU shall resume to the normal mode

9.4 Remote Finder

- RCU shall support the remote finder via BLE FindMe profile using the BLE immediate alert service.
- RCU shall activate the buzzer no more than **3 seconds** when the alert level is set to one and BLE is paired.
- RCU shall de-activate the buzzer when the alert level is set to zero and BLE is paired.
- RCU shall de-activate the buzzer when any key press is detected and the buzzer is activated. IR or RF key will not be transmitted when key press is used to deactivate the buzzer.
- **RCU shall de-activate the buzzer when ear-jack is inserted and the buzzer is activated. Ear-jack insert will trigger the Audio Streaming based on the defined scenario**
- RCU shall activate the buzzer based on the following sequence where each number represents a specific frequency. All frequencies will have DUTY_CYCLE defined by the following table.
- RCU shall repeat the following sequence for 60seconds if key press was not detected.
- RCU shall be able to test the remote finder feature and activate the buzzer sequence by pressing the Buzzer Test buttons defined in the Key Function Table.

Buzzer 1-Frame 출력 파형



Parameter	Value	Unit
Mark Time	100	Milliseconds
Wait Time	0	Milliseconds
Pause Time	1000	Milliseconds
1	1319	Hz
2	1479	Hz
3	1661	Hz
4	1754	Hz

Product Specification

5	1980	Hz
6	2220	Hz
DUTY_CYCLE	50	Percent

- Test Mode
 - Pressing <<*>> + <<4>> for 3 seconds shall activate the buzzer sound test until any key is pressed

9.5 Voice Upstream

- RCU shall send the HID Key report associated with the VOICE_BUTTON and HID key release report when the VOICE_BUTTON is pressed and released. When the host receives the VOICE_BUTTON key report, the host shall send a REQUEST_VOICE packet to the RCU.
- RCU shall start streaming the voice data to the host when it receives the REQUEST_VOICE packet.
- RCU shall stop streaming the voice data when it receives a REQUEST_VOICE_STOP packet from the host even if the VOICE_BUTTON is still pressed. This gives the host the ability to stop the voice upstream when no voice data is detected. The VOICE_BUTTON would need to be depressed and pressed again to initiate the voice stream again.
- RCU shall stop streaming the voice data to the host if it does not receive a REQUEST_VOICE_STOP packet from the host after the VOICE_DURATION.

Parameter	Value	Unit
VOICE_BUTTON	<<Mic>>	RCU Key
VOICE_DURATION	10	Seconds

9.6 Audio Downstream

- RCU shall attempt to establish the BT Classic connect with the last connected host when the headset is detected.
- RCU shall send BT Classic advertisement when headset is detected and it has not previously connected with a host.
- RCU shall send BT Classic advertisement when headset is detected and it cannot connect with the previously connected host.
- RCU shall notify the host either via IR or BLE indicating headset is detected and BT Classic is activated.
- RCU shall disconnect the audio stream when the un-paired button defined in Key Function Table is pressed. User would need to disconnect the headset and connect the headset again to initiate the audio downstream again.
- When STB is turned off and A2DP was disconnected from STB, RCU shall wait for 35 seconds to reconnect to A2DP, but after 35 seconds, RCU shall not be trying to reconnect to A2DP when STB is turned on again.
 - STB Disconnect A2DP – Audio streaming is stopped
 - If STB is turned on
 - Within 35 seconds – RCU reconnect to A2DP
 - After 35 seconds – RCU shall not reconnect to A2DP

9.6.1 Ear-jack Scenario

- When ear-jack is connected, RCU shall following the below scenario.

When Ear-jack is plugged	RCU is NOT connected		BLE is Paired and Connected	
	RCU has no paired Info	RCU has paired info	BLE Mode by <<*>> + <<1>>	BLE Mode by <<*>> + <<2>>

Product Specification

Battery is Normal	Send [Pairing] IR Key	Send IR Code - #63 (IR_RCU_NOT_CONN)	Earjack insert (BT)	Earjack insert (IR)
Low	No Action	Low Batt. Code (IR)	Low Batt. Code (BT)	Low Batt. Code (IR)
Empty	No Action	Empty Batt. Code (IR)	Empty Batt. Code (BT)	Empty Batt. Code (IR)

9.6.2 Audio Tones

- When "A2DP connected" – A2DP source is connected, CSR shall play the following Tones
 - "Connected 3 beep Rising Tone" – 48ms C6 D6 A6

9.7 Battery Monitor

- RCU shall report battery status via HID standard Battery Service when BLE is connected
- RCU shall notify the host the battery level automatically when a voltage change triggers a battery state change based on the following table.
- RCU shall shutdown the audio streaming, if connected, and notify the host when the battery state changes to Low State.
- RCU shall not enable the audio streaming when the headset is detected during Low Battery State.

Battery State	Battery Voltage (V)
Normal	$2.40 \leq V$
Low	$2.20 \leq V < 2.40$
Empty	$V < 2.20$

- RCU shall report battery level when requested from the host or notification based on the following conversion table:

Battery Level (%)	Battery Voltage (V)
100	$3.0 \leq V$
90	$2.9 \leq V < 3.0$
80	$2.8 \leq V < 2.9$
70	$2.7 \leq V < 2.8$
60	$2.6 \leq V < 2.7$
50	$2.5 \leq V < 2.6$
40	$2.4 \leq V < 2.5$
30	$2.3 \leq V < 2.4$
20	$2.2 \leq V < 2.3$
10	$2.1 \leq V < 2.2$
0	$V < 2.1$

- RCU should send battery information via IR whenever <<Home>> key is released.
- In IR Mode, send IR signal defined in 8.3.2, and in BLE mode use battery service

9.7.1 Low Battery Mode

- RCU shall turn on RED LED
- BT / IR mode is unchanged
- RCU shall stop Audio BT Streaming – But, if Audio streaming is already on going, then RCU keep streaming

Product Specification

- When ear jack is inserted, RCU shall send Low Voltage Battery Level Code via IR when in IR code or BT when in BT mode (* Then, STB will show popup on screen)

9.7.2 Empty Battery Mode

- RCU shall turn on RED LED
- BT / IR mode is unchanged
- RCU shall stop Audio BT Streaming even when user is playing audio
- When ear jack is inserted, RCU shall send Empty Voltage Battery Level Code via IR when in IR code or BT when in BT mode (* Then, STB will show popup on screen)

No Shutdown voltage is defined.

9.8 Quickset

- The RCU shall support UEI Quickset 3.4 features and QS Transfer Protocol described in this document below.

- UEI Mini-Script Specification



UEI Mini-Script
QS IR Blaster Proc

- QuickSet Transfer Protocol



SKB Mini-script
Blaster Remote C

9.8.1 Quickset Scenario

- When RCU receive QS Disable CMD from STB, then RCU shall keep the latest codeset.
- If the previous codeset is
 - Manual 3 digit code – keep the manual code for TV keys – no change
 - QS code – keep the QS for TV keys and change All Power to send both <<B tv Power>> and <<TV Toggle>> * TV toggle should use the toggle key <#1> of the downloaded QuickSet T Codeset

9.9 OTA

- The RCU shall support OTA from the host. CSR8630 configuration and IR library will not be upgradable.
- The RCU shall reboot itself when the OTA transfer is completed.
- The RCU shall validate the new firmware image for any bit flip or transfer error via CRC. It will only boot the new firmware image if it is validated, otherwise, it shall boot the current running image.

9.9.1 OTA Scenario

- When OTA App request to report battery level (BAS), RCU shall send battery level information to STB
 - (STB will activate OTA only when the battery level is above 2.4V)
- When starting OTA, RCU shall turn on Green LED
- After OTA, RCU shall show the OTA result by LED blinks
 - Success: GREEN LED 250ms interval 3 Times
 - Fail: RED LED 250ms interval 3 Times

9.9.2 OTA Vendor code

- To distinguish FW image files by RCU vendor, UEI is requested to add the following 2 byte codes in our Binary code.
 - Add Binary Stamp on 0x28 and 0x29.

	0x28	0x29
Remote Solution	'R'	'M'
Movon	'M'	'M'
UEI	'U'	'E'

○

Product Specification

- For example – in case of Remote Solution, 52 and 4D is added on 0x28 and 0x29

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f	
00000000h:	03	00	52	55	10	00	83	D2	26	5C	7F	FF	E7	82	F9	69	; ..RU.. 24 6\ ??
00000010h:	CB	05	E5	11	BE	F3	E1	26	33	08	F9	25	00	00	00	00	; ?? 3. ?....
00000020h:	00	00	00	00	00	00	00	00	00	52	4D	00	00	02	48	80	47;RV...HG
00000030h:	02	48	00	47	FE	E7	70	47	7D	76	51	00	91	A1	50	00	; .H.G pG}vQ. 3 P.
00000040h:	52	45	53	55	2D	A0	50	00	00	00	00	00	00	00	00	00	; RESU- 3

9.10 Visual Feedback

9.10.1 LED

- RCU shall SHORT_BLINK the LED 2 times when power is first applied.
- RCU shall LONG_BLINK the LED continuously when BLE is transmitting advertisement packets.
- RCU shall SHORT_BLINK the LED 5 times when BLE is paired successfully with the host.
- RCU shall SHORT_BLINK the LED 5 times when BLE is un-pairs successfully with the host.
- RCU shall turn the LED ON when transmitting IR signal triggered by a key press or ear-jack connect. LED will be OFF when the key is released.
- RCU shall SHORT_BLINK the LED 1 time when transmitting BLE signal. (including special key codes specified in 9.3.3)
- RCU shall NORMAL_BLINK the LED 2 times when it is changed to BLE mode by <<*>> + <<1>>
- RCU shall NORMAL_BLINK the LED 4 times when it is changed to IR mode by <<*>> + <<2>>

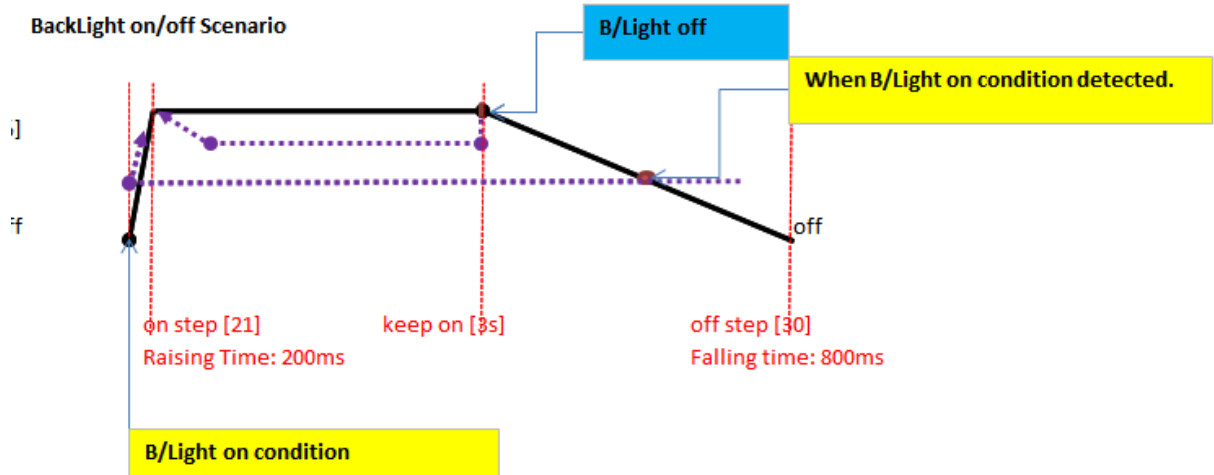
Parameter	On Duration	Off Duration (when blinking more than 1 time)	Units
SHORT_BLINK	150 -> 100	200 -> 100	milliseconds
LONG_BLINK	500 -> 250	500 -> 750	milliseconds
NORMAL_BLINK	250	250	milliseconds

9.11 Backlight

- Operation Condition : Backlight shall work only the battery level is above v2.4
- RCU shall NOT turn on the back light when Find Me feature is activated and turn off once user press any key down.

Parameter	Duration	Units
RAISING_TIME	200	milliseconds
ON_TIME	3000	milliseconds
FALLING_TIME	800	milliseconds

- If RCU detects movement at any time, then raise the duty to the max and start ON_TIME duration again.
- However, when A2DP is connected (Audio Streaming is activated), RCU shall NOT turn on the back light by movement, but by Key Press (On and Off timing is the same)
- Please refer to the below diagram



9.12 Additional Features

9.12.1 Manufacturing Reset

- The RCU shall clear the pairing information when the Factory Default Keys are pressed defined in the Key Function Table.
- The RCU shall clear the device codes when the Factory Default Keys are pressed defined in the Key Function Table.
- The RCU shall unlock the volume feature when the Factory Default Keys are pressed defined in the Key Function Table.
- The RCU shall SHORT_BLINK four times when the manufacture reset is successful, otherwise, LONG_BLINK one time.
-

9.12.2 Local Manual Setup

- RCU shall set up TV codeset manually using the below method
- Once setup the codeset manually, QS macro shouldn't be working and the TV keys (TV Power toggle, Input, TV Volume Up, TV Volume Down) shall be assigned to use the local TV codeset.

9.12.2.1 Sequential Setup

- Turn on TV using physical key on TV or TV RCU
- Press <<Input>> + <STB Power>> for 3 sec, then Green LED shall be turned on
- Press <<Channel up>> and <<Channel Down>> key until TV is off
 - RCU sends Power Toggle signal sequentially (Refer to the SKB Codeset List in 8.1.2.2)
- If TV is turned off, then Press << OK>> Key, then LED will blink 3 times and Setup process is done.

9.12.2.2 Group Setup

- Turn on TV using physical key on TV or TV RCU
- Press <<1 ~ 9>> + <STB Power>> for 3 sec, then Green LED shall be blinking
- Press <<Channel up>> and <<Channel Down>> key until TV is off
 - RCU sends Power Toggle signal sequentially (Refer to the SKB Codeset List in 8.1.2.2)
- If TV is turned off, then Press << OK>> Key, then LED will blink 3 times and Setup process is done.

9.12.2.3 Direct Setup (3 digit Codeset No)

- Turn on TV using physical key on TV or TV RCU
- Press <<Input>> + <STB Power>> for 3 sec, then Green LED shall be blinking
- When LED is on, Press Codeset No as below

Product Specification

- ex) Codeset No "026" -> Press <<0>> + <<2>> + <<6>> + <<OK>>
- LED will blink 3 times and Setup is done.

9.12.2.4 Codeset Reset

- Press <<Input>> + <B tv Power>> for 3 sec, then Green LED shall be is turned on
- Press <<0>> + <<0>> + <<0>>
- Then LED will blink 3 times and Setup is done.

When RCU starts Setup mode, RCU sends TV Sync Start code (0x54)

When RCU finishes Setup mode, RCU sends TV Sync Stop code (0x55)

9.12.3 Code Readout

This is feature is to read the three digit of SKB Local TV codeset number, set by Manual setup in 9.11.2

9.12.3.1 Code Readout

- Press <<Input>> + <B tv Power>> for 3 sec, then Green LED is turned on
- Press <<#8 All Menu>>, then RCU shall send the <<#57 TV Sync Start>> IR Key
- If no key is pressed for READOUT_TIMEOUT, then RCU shall send the <<#58 TV Sync Stop>> IR Key and stop Readout.
- RCU Green LED shall be turned off for one second, and begin to SHORT_BLINK
- RCU shall indicate each digit of codeset by SHORT_BLINK
- RCU shall turn off LED for BLINK_GAP after SHORT_BLINKs of each digit
- E.g. If the setup codeset is 520, then RCU shall
SHORT_BLINK 5 times + BLINK_GAP + SHORT_BLINK 3 times, + BLINK GAP + SHORT_BLINK 10 times
- After blinking for Readout, RCU shall send the <<#58 TV Sync Stop>> IR Key and stop Readout.

Parameter	On Duration	Off Duration (when blinking more than 1 time)	Units
SHORT_BLINK	250ms	250ms	milliseconds

Parameter	Value	Units
BLINK_GAP	1000ms	milliseconds
READOUT_TIMEOUT	15	seconds

10 Appendix

10.1 QuickSet DB

QuickSet Codeset Load List - ** This is only for QuickSet SDK, resides in STB, and different from what we have in RCU as embedded Local DB for SKB Local Manual Setup support



SKB_Korea TV
BSC_08182016.txt

We deleted Videocon TV from the load list

Product Specification
10.2 Command Script for Samsung / LG TV Combo Key

// Wake 00

NOTE: The WakeUp command must be issued to the Blaster prior to sending any other command.

// Download LG TV Codeset - T1860 (0744h)

```
4d 69 6e 69 00 D0 22 00 07 44 00 02 5C 54 08 76 AC E0 5F 14 06 13 53 5D 23 7B 18 17 3E 65
9B E6 CB 3C 2F D1 66 2F 21 8E D6 8D E7 E8 C3 DB B8 F5 8D 07 7C 85 86 E8 51 09 78 02 7B F7
AE D6 7D 4B 0A D0 3D 7C BC 61 1C 45 91 6F 6A 9E AF 38 FB E0 14 76 93 11 4F 78 18 CA 77 78
8D 90 3B 3F 54 E2 58 97 53 84 70 53 91 B3 8E 29 1C DE 25 BC F9 2E DC 50 4F 2C 5B 90 2E 3A
9A 21 ED D7 D1 B3 40 A3 AD D4 83 45 A0 00 77 1C 50 3A 9F EC 93 B0 75 4C F2 BA BF A2 5B 9C
16 1B 1E 34 83 DF 77 E6 61 7D ED E3 F5 09 8B 30 84 B7 AC 68 F9 13 82 40 03 25 EB EB 9C 7C
3C 9C 36 21 26 9C CF 5F 12 FD C7 89 2A D0 7E 5E FE 63 39 D5 AB 3A 2E 15 70 D5 D5 94 F9 BD
32 BD EE 11
```

// Download Samsung TV Codeset - T2051 (0803h)

```
4d 69 6e 69 01 60 22 00 08 03 00 02 6F 82 04 54 F8 8F 6F 80 C3 41 B9 84 1C 50 77 88 F6 AA
1D 75 66 E2 3A C2 9A 96 EB A7 D7 C6 F8 9E BA E8 67 27 F6 39 B3 2A CB 89 52 ED DA 4A 17 6F
D4 AD 8A 2F 5B CE 88 91 45 90 30 F2 55 28 08 FC 51 C5 DB 37 4A 96 E4 8F 84 37 A8 02 86 B6
EF C3 A2 64 5F 80 5C E2 6B E2 BE 77 60 FE 41 D2 28 0E 27 82 3C B6 D2 B5 43 56 88 18 BF 51
72 2B CC 72 C2 4E F5 AA B7 C6 42 C7 AE 50 F1 13 AC 0F F7 29 9F B6 C2 AD D8 EF 13 5D 19 18
35 93 A3 9E D2 20 DB 14 92 4E 94 6C 64 5A 03 A9 E8 39 8A 40 9B C8 64 21 CE 21 58 FE 5C 28
83 EC 9F B5 0C 29 F3 7E 26 43 FC 42 C1 18 25 A8 1E 4B 92 83 09 53 3A 07 DE C0 30 CC 17 60
05 A5 08 B1 0D 59 CE A9 68 3F 1E 4B 92 83 09 53 3A 07 DE C0 30 CC 17 60 05 A5 41 73 B3 F0
46 47 52 EF 12 42 F1 73 FE 00 62 D6 68 2E ED A0 0E 82 F6 65 AA A6 1D 78 61 8E 24 98 05 68
63 6B 62 AC 6E C0 79 4B BE BB D7 9B 03 CE D7 D4 61 E0 1E C4 D7 95 D9 0D 95 5B 82 7A 79 9E
48 15 06 AD EC A8 FD C9 2A C8 11 BD 6E 92 D1 37 A4 1D 5D 18 A5 F4 C8 06 2E 76 1C AC 09 AA
A0 5C 49 14 CA F6 54 E2 C5 DE A9 E5 10 FB 7E 51 44 51 B2 F2 0D 1B C4 2B D5 F0 DD 22
```

// Send key

4D 69 6E 69 00 08 01 00 07 44 01 80 00 00 ==> Send Power in macro mode - LG TV Power
 SYSTEM ID LengthCMDType LG TV PWR Macro Mode

```
4D 69 6E 69 00 08 01 00 07 44 01 80 00 00 - 01 TV Power Toggle
4D 69 6E 69 00 08 01 00 07 44 22 80 00 00 - 22 TV Input
4D 69 6E 69 00 08 01 00 07 44 06 80 00 00 - 06 TV Volume Up
4D 69 6E 69 00 08 01 00 07 44 07 80 00 00 - 07 TV Volume Down
4D 69 6E 69 00 08 01 00 07 44 08 80 00 00 - 08 TV Mute
```