APPENDIX H

: USER'S MANUAL

1 - Mechanical

1.1 - Pictures

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

1.2 – Dimensions

- Dimensions : Φ 80.25 x15.2mm

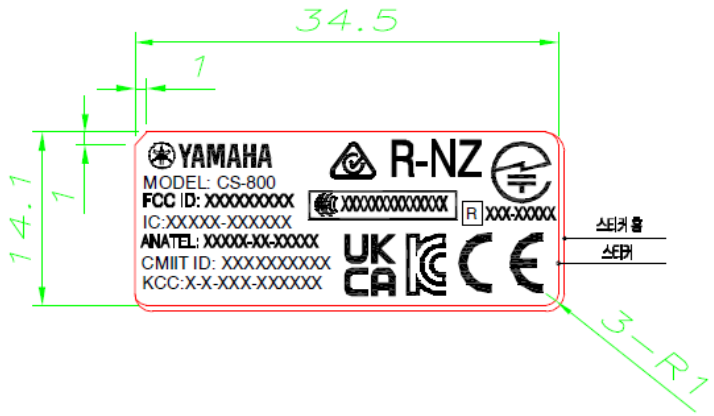
Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

1.3 - Materials & coloyrs

PART NAME	DESCRIPTION	SPECIFICATION
TOP CASE	Material	PC+ABS / TPE (BLACK)
	Spray Color	1Coat' : PRIMER CLEAR 2Coat' : YMB-M-S BLACK
	Print Color	PANTONE Cool Gray 5C
	Except For Designate Print Color	PANTONE Cool Gray 9C
	Surface Treatment	Nihon etching HN21/Semi-Gloss
MIDDLE CASE BATTERY COVER	Material	ABS (BLACK)
	Surface Treatment	Nihon etching HN21/Semi-Gloss
BOTTOM CASE	Material	PC+ABS / TPE(BLACK)
	Spray Color	1Coat' : PRIMER CLEAR 2Coat' : YMB-M-S BLACK
	Surface Treatment	Nihon etching HN21/Semi-Gloss
MIC BUTTON KNOB	Material	PC+ABS / TPE (BLACK)
	Spray Color	1Coat' : PRIMER CLEAR 2Coat' : YMB-M-S BLACK
	Print Color	PANTONE Cool Gray 5C
	Surface Treatment	Nihon etching HN21/Semi-Gloss

1.4 – Label

It is attached to the Middle case and it can be seen compartment after removing the bottom case.



Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

2 - Electrical

2.1 - Electrical Characteristic

Parameter		Condition	Spec	Unit
Frequency Range		Bluetooth Low Energy Specification	2.402 ~ 2.480	[GHz]
Channel			39	[Num]
RF Power			3.5	[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	-	[V]
Operating current (IR)		Power: 3V	-	[mA]
Operating current (RF KEY)		Power: 3V Non-directional distance	≤ 10	[mA]
Operating current (RF+Voice)			-	[mA]
Leakage current			1	[㎂]
RF range (distance)			≥10	[m]
IR Range		Direct	-	[m]
		Horizontal	-	[m]
VOICE	300Hz	Voice Inspection JIG	-	[dB]
	2KHz		-	[dB]
	3.8KHz		-	[dB]

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

3 - Software Specification

3.1 Pairing

3.1.1 Pairing Condition

① RCU can perform pairing with 1 Sound Bar.

3.1.2 Pairing (Re-pairing) Scenario

① Press and hold the BT button on the Sound Bar

② Sound Bar LED will indicate RCU pairing mode, like flashing blue.

③ Press the RCU [Enter OSD Menu] or [Exit OSD Menu] Button for about 3 seconds to start pairing.

i. If the previous pairing information remains.

1. Send un-pairing command to the Sound Bar.
2. Delete the pairing information and start pairing.

ii. After pairing starts, advertise until Advertising Time Out.

1. Advertising Time Out is about 30 seconds.
2. Advertising Interval is about 30 ~ 35ms.

④ When the Sound Bar find the new RCU, deleting the previous pairing information and pairing with the new RCU.

⑤ When pairing is complete, all buttons of the RCU output RF code.

3.1.3 Reconnection (Disconnected State)

① After pairing, when the power of the RCU is re-applied or the BLE connection between the Sound Bar and the RCU is disconnected, it advertises every 5 seconds.

② When the BLE connection is disconnected, Press any RCU button to start direct advertising for 5 seconds to reconnect.

③ When reconnection is completed, all buttons of RCU output RF Code.

3.1.4 Factory Reset

① Press about 5 seconds [Power] + [▼] Button, try the Factory Reset.

② In case of Factory Reset, the BLE connection between the Sound Bar and RCU is disconnected. And the pairing information of the RCU is also deleted.

③ The RCU sends an un-pairing command to the Sound Bar before deleting the pairing information.

④ Sound Bar receives the Un-Pairing Command Code, it deletes the pairing information.

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

3.2 Operation Mode

3.2.1 Normal Operation Mode

① The keys below work.

- **[Power]**
- **[Smart Framing]**
- **[▲, ▼, ◀, ▶]**
- **[Enter OSD Menu]**
- **[Camera Preset 1]**
- **[Camera Preset 2]**
- **[Speaker Volume +, -]**
- **[Zoom +, -]**
- **[Mic Mute]**

3.2.2 OSD Menu Operation Mode

① The keys below work.

- **[Mic Mute]**
- **[Cursor Control ▲, ▼, ◀, ▶]**
- **[Exit OSD Menu]**
- **[Speaker Volume +, -]**

3.3 Enable Full Function

① Press the RCU [Enter OSD Menu] + [Camera Preset 2] Button for about 3 seconds to start to enable full function

② The RCU sends an enable full function command to the Sound Bar

3.4 Couch Mode (Stuck)

① Any Hard Button is pressed for more than 30 seconds, Release Code is output

3.5 OTA: Over the Air (Firmware Update)

3.5.1 OTA Scenario

Provide bin file for RCU OTA.

① Perform RCU OTA by running the App on Sound Bar.

② When the RCU enters the OTA mode, all buttons do not work.

③ When the OTA is complete, the RCU reboots and attempts to reconnect.

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

3.6 Button Code

3.6.1 Button Code Table

RCU Image	Button		Code
	Normal Operation	OSD Menu Operation	
	Power	N/A	0x01
	Smart Framing	N/A	0x02
	Up ▲	Cursor Up ▲	0x03
	Down ▼	Cursor Down ▼	0x04
	Left ◀	Cursor Left ◀	0x05
	Right ▶	Cursor Right ▶	0x06
	Enter OSD Menu	Exit OSD Menu	0x07
	Camera Preset 1	N/A	0x08
	Camera Preset 2	N/A	0x09
	Speaker Volume Up	Speaker Volume Up	0x0A
	Speaker Volume Down	Speaker Volume Down	0x0B
	Zoom Up	N/A	0x0C
	Zoom Down	N/A	0x0D
	Mic Mute	Mic Mute	0x0E
	Un-Pairing	Un-Pairing	0x50
	Enable Full Function	N/A	0x51

Hold operation should be implemented by checking the output of the repeated operation every 100ms in the Sound Bar

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

3.7 Battery Specification

3.7.1 Battery Level

① Sound Bar can read Battery Level of RCU using BLE Battery Service.

② The battery level is evenly divided into 10 steps in the battery voltage range from 2.50V to 3.10V.

1. +/- 0.15% tolerance

③ Percentage (%) Table by Voltage

2. Table

Voltage	Percentage (%)	Battery info
3.10 ~	100%	0x0A
2.98 ~ 3.10	90%	0x09
2.92 ~ 2.98	80%	0x08
2.86 ~ 2.92	70%	0x07
2.80 ~ 2.86	60%	0x06
2.74 ~ 2.80	50%	0x05
2.68 ~ 2.74	40%	0x04
2.62 ~ 2.68	30%	0x03
2.56 ~ 2.62	20%	0x02
2.50 ~ 2.56	10%	0x01
~ 2.50	0%	Cut-Off

Scheduled to be updated upon correction after H/W measurement.

3.7.2 Operating Voltage

① RF Button Code output is possible up to 2.50V.

3.7.3 Cut-Off Scenario

① Cut-off stops the use of the remote control to prevent damage to the circuit due to low voltage.

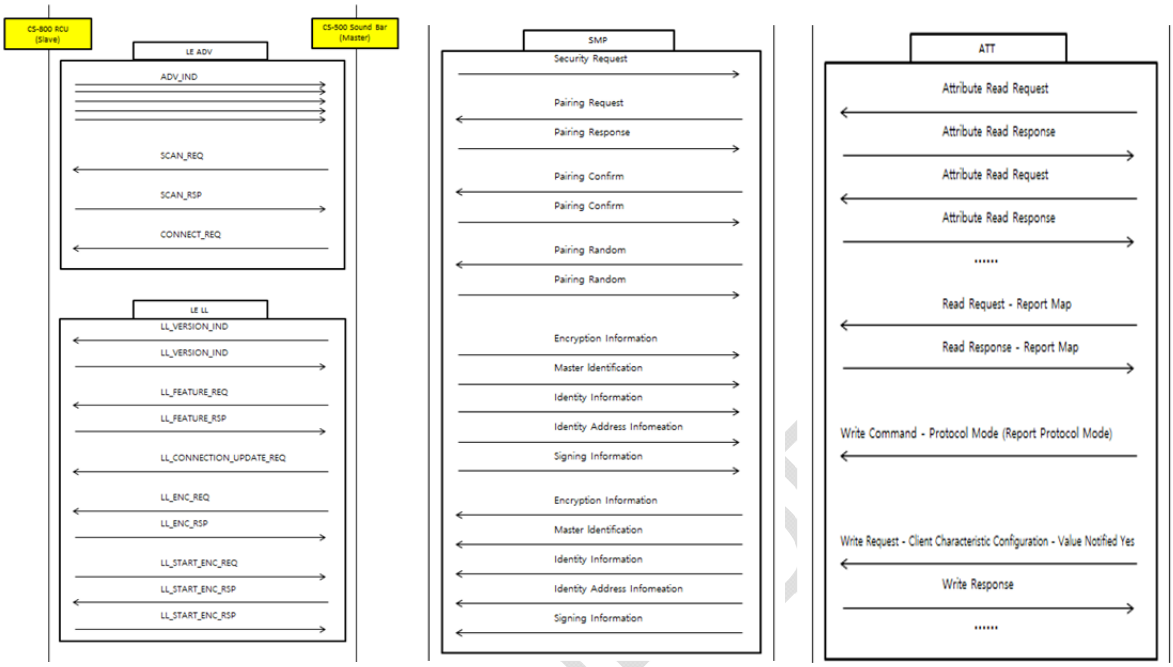
② When the battery level is measured below 2.50V, the RCU operation stops.

③ When a voltage of 2.65V or higher is applied in the cut-off state, the RCU operates

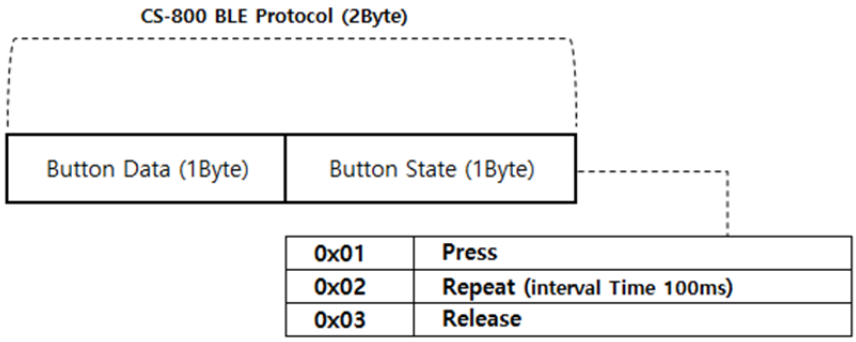
Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

3.8 BLE Protocol

3.8.1 Pairing Scenario



3.8.2 Key Packet Structure



④ CS-800 BLE Protocol consists of a total of 2 bytes..

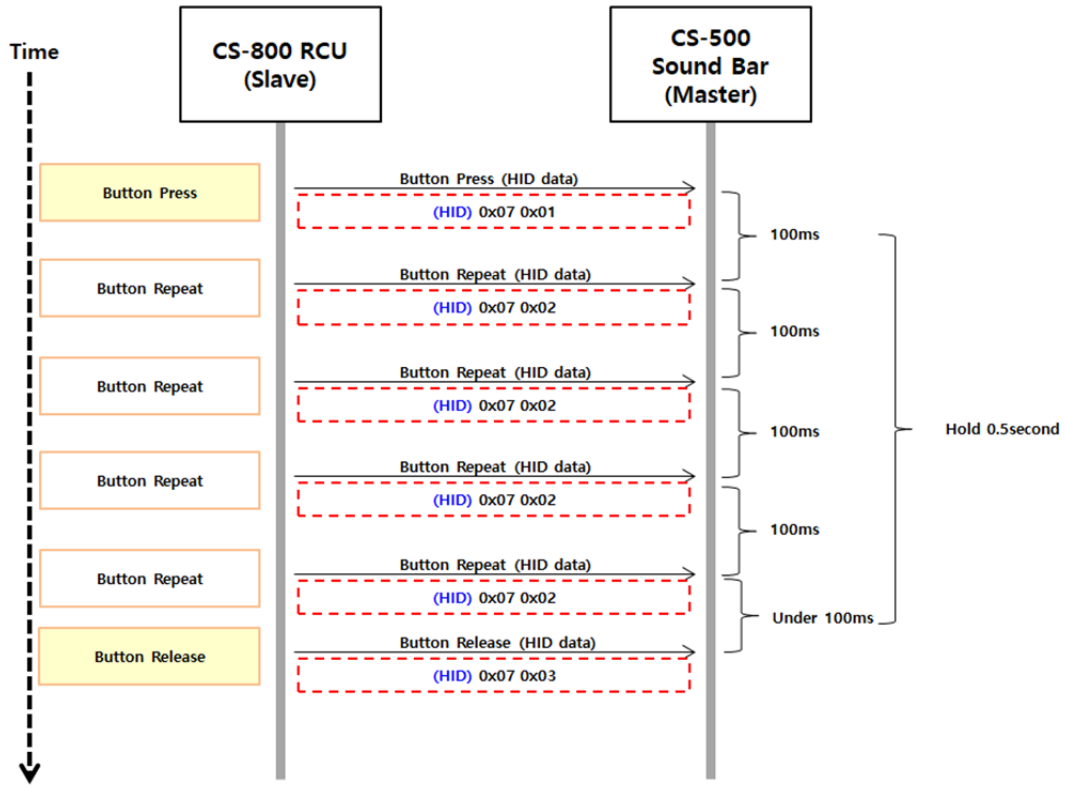
⑤ Button Data is composed of 1 byte and means RCU Button Code.

⑥ Button State is composed of 1 byte and means the pressed state of the RCU Button.

1. The state when the button is first pressed is Press State (0x01).
2. The state of pressing the button is Repeat State (0x02).
   A. If the button is kept pressed, the button state repeats every 100ms and the packet is repeatedly output.
3. When the button is released, the state is Release State (0x03).

3.8.3 Key Packet Example

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com



① When the Camera Home Button is pressed, Key Packet consisting of Button Data (0x07), Button State (Press 0x01), output

② If the button is pressed continuously, only the Button State is changed to Repeat 0x02, output at intervals of 100ms.

③ When the button is released, only the button state is changed to Release 0x03, output.

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

4 - Environmental Tests

4.1 - Temperatures Conditions

- Operating Temperature: 0°C ~ +45°C
- Storage Temperature: -10°C ~ +60°C at 95% Humidity

4.2 - Operating Tests

4.2.1 - Dry Heat Test

- Temperature: +45°C
- Test Time: 72hours
- Test Quantity: 3EA
- Functional Test: Take the measurements after for 1 hour at room temperature.
- Requested level: Remote Control should satisfy electrical and mechanical performances.

4.2.2 - Cold Test

- Temperature: 0°C
- Test Time: 72hours
- Test Quantity: 3EA
- Functional Test: Take the measurements after for 1 hour at room temperature.
- Requested level: Remote Control should satisfy electrical and mechanical performances.

4.3 - Non-Operating Tests

4.3.1 - Dry Heat Test

- Temperature: +60°C
- Test Time: 72hours
- Test Quantity: 3EA
- Functional Test: Take the measurements after keeping for 1 hour at room temperature.
- Requested level: Remote Control should satisfy electrical and mechanical performances.

4.3.2 - Cold Test

- Temperature: -10°C
- Test Time: 72hours
- Test Quantity: 3EA
- Functional Test: Take the measurements after keeping for 1 hour at room temperature.

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

- Requested level: Remote Control should satisfy electrical and mechanical performances.

5 - Certification

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

- FCC Part 15 subpart C 15.247
- EN 62368-1:2020 + A11:2020
- ETSI EN 301 489-1 V2.2.3:2019
- ETSI EN 301 489-17 V3.2.4:2020
- ETSI EN 300 328 V2.2.2:2019
- EN 62479:2010

6 - Manufacturer & Importer

6.1 - Manufacturer

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

6.2 – Importer

- Name: YAMAHA

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

7 - Battery Management

7.1 - Caution

- "Do not ingest battery, Chemical Burn Hazard"
- [The remote control supplied with] This product contains a coin / button cell battery. If the coin / button cell battery is swallowed, it can cause severe internal burns in just 2 hours and can lead to death.
- Keep new and used batteries away from children. If the battery compartment does not close securely, stop using the product and keep it away from children. If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

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

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com

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.

Address: #335-4, SANHO-DAERO, GUMI, GYUNG BUK, KOREA
http://www.ohsungec.com