



AINA WIRELESS FINLAND OY

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COMMUNICATION PROTOCOL AINA WIRELESS

Enhancing Remote-Speaker-Microphone (RSM) performance over Bluetooth

Version A.18

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1. Scope

This document defines wireless device control protocol. The protocol aims to provide secured control link from wireless device to application with high level acknowledgement, minimal latency and minimal radio air time. The communication includes Classic Bluetooth (BT) for audio transport and Bluetooth Low Energy (BLE) for control link. Optionally button information can also be offered over SPP-link (separate from HFP) over Bluetooth classic, if BLE communication is not available. The control link can be encrypted using BLE provided AES128 encryption and link latency can be optimized by tuning sniff interval parameter down to about 7.5ms maximum response time.

This document is valid on Firmware version FW2251A1 or greater.



2. Features and functionality

The RSM device, when BLE communication is enabled in phone and application, operates as a BLE peripheral device and provides custom *Characteristics* for a phone's application. The application subscribes to receive *Notifications* from the RSM to enable instant message

delivery, such as Push-to-Talk (PTT) keying and writes characteristics in order to control RSM features, such as speaker amplifier and led states.

In addition to BLE control, normal HFP audio link control is available as in any hands free device.

3. SPP Communication

An RSM device acts as an SPP server, and allows one way communication to a compatible phone. Once phone has connected to device, RSM will send messages over SPP when button pressed goes down, and when it comes up. Following messages are defined:

- 1st PTT: "+PTT=P" for button going down and "+PTT=R" for button coming up.
- 2nd PTT: "+PTTS=P" for button going down and "+PTTS=R" for button coming up.
- Emergency button: "+PTTE=P" for button going down and "+PTTE=R" for button coming up.
- Left Soft button (<): "+PTTB1=P" for button going down and "+PTTB1=R" for button coming up.
- Right Soft button (>): "+PTTB2=P" for button going down and "+PTTB2=R" for button coming up.
- Volume Up button: "+VGS=U" when button press is detected.
- Volume Down button: "+VGS=D" when button press is detected.

4. BLE Service and characteristics

BLE connection allows two-way communication with compatible phone. Buttons and other state information is available for phone and phone can set certain features on/off as required. RSM will use a unique generated service identification number.

SERVICE 128b UUID: 127FACE1-CB21-11E5-93D0-0002A5D5C51B

CHARACTERISTICS 16b UUID base: 127Fxxxx-CB21-11E5-93D0-0002A5D5C51B

for example BUTTON Characteristics UUID:

127FBEEF-CB21-11E5-93D0-0002A5D5C51B

4.1. Button mask

This characteristic shows RSM button press status. It is defined as 8bit unsigned integer, with following bit definitions:

bit 0: PTT	(0x01)
bit 1: PTTE	(0x02)
bit 2: PTTS	(0x04)
bit 3: PTTB1	(0x08)
bit 4: PTTB2	(0x10)
bit 5: MFB	(0x20)
bit 6: <i>reserved</i>	(0x40)
bit 7: HEARTBEAT	(0x80)

READ/NOTIFY 16b UUID: 0xBEEF

Button status bits reflect the current pressed state of the buttons. Displaying the button status will not disable its normal operation, pressing PTTB1 will put the device into covert mode regardless what the subscriber will do with the button status information received here. Heartbeat bit will toggle every ~500ms when any button is pressed.

4.2. LED mask

This characteristic allows the control of RSM leds and audio devices. It is an 8bit unsigned integer, with following bit definitions:

bit 0: RED LED ON/OFF	(0x01)
bit 1: GREEN LED ON/OFF	(0x02)
bit 2: BLUE LED ON/OFF	(0x04)
bit 3: LED DISABLE ON/OFF	(0x08)
bit 4: ACTIVE LED DISABLE ON/OFF	(0x10)
bit 5: <i>reserved</i>	(0x20)
bit 6: <i>reserved</i>	(0x40)
bit 7: <i>reserved</i>	(0x80)

READ/WRITE/NOTIFY 16b UUID: 0xDEAD

Led bits only reflect the state set through here. Turning leds on here will set the led on/off and the normal state leds are mixed in. With led disable the normal state patterns are disabled. With active led disable the normal state patterns are reduced to only indicate only *Connectable* and *Pairing* patterns and also low battery warnings.

4.3. CONFIG mask

This characteristic allows the control of various RSM features and states. It is an 8bit unsigned integer, with following bit definitions:

bit 0: POWER ON/OFF*	(0x01)
bit 1: <i>reserved</i>	(0x02)
bit 2: CLASSIC SPP STATE*	(0x04)
bit 3: CLASSIC RECONNECT ATTEMPT*	(0x08)
bit 4: PHONE CONTROLS DISABLE	(0x10)
bit 5: A2DP CONTROLS DISABLE	(0x20)
bit 6: COVERT MODE*	(0x40)
bit 7: <i>reserved</i>	(0x80)

READ/WRITE/NOTIFY 16b UUID: 0xDEAF

***FOR DEVELOPMENT ONLY, NOT FOR PRODUCTION USE!**

All bit statuses will reflect the current state at the device, so when device autonomously enables pairing state, the bit 1 will be set to 1 in the characteristic (and phone notified, if it has subscribed to 0xDEAF).

By setting CLASSIC SPP STATE bit SPP functionality will disabled. By setting CLASSIC RECONNECT APPTTEMPT reconnection attempt will start and end after 5minutes as per normal timeout. When phone controls disable is set it disables answering, reject/end call or last number redial functionality. When A2DP controls disable is set play/pause, next/previous song functionality is disabled. COVERT mode will show and allow to enable/disable the normal covert mode of the RSM device.

4.4. COMMON mask

This characteristic contains the common statuses and configurations of RSM. It is an 8-bit unsigned integer, with following bit definitions:

bit 0: KEEP ALIVE	(0x01)
bit 1: RESERVED	(0x02)
bit 2: <i>reserved</i>	(0x04)
bit 3: <i>reserved</i>	(0x08)
bit 4: SW RESET	(0x10)
bit 5: CLEAR PAIRINGS	(0x20)
bit 6: CRITICAL BAT	(0x40)



bit 7: LOW BATTERY (0x80)
READ/WRITE/NOTIFY 16-bit UUID: 0x57A7

KEEP ALIVE bit is toggled on every 2,5 second to get application notified that we are connected. By setting SW RESET bit RSM resets all settings to default settings and to AINA mode. CLEAR PAIRINGS bit will remove current bonds from RSM and begins open advertisement. CRITICAL BATTERY bit indicates when battery voltage level drops below 3.43 V (1%). LOW BATTERY bit indicates when battery voltage level drops below 3.55 V (25%).

4.7. SW version characteristic

This characteristic will allow to read the RSM internal SW version. The characteristic is hexadecimally encoded ASCII with 6bytes of data in the following format "FWyywwvr" (yy=year, ww=week, v=variant, r=revision)

READ 16b UUID: 0xC0FF

5. Device FW updates

Please refer to AINA firmware update guide.