Firmware User Guide

kcAudioGateway v6.8 Build 0

Introduction

Our kcAudioGateway firmware is an audio source/transmitter system that operates in one of two modes, which now combines the functionality offered in our previously separate kcAudioAdapter and kcAudioGateway editions. There are no UART commands or SPP data service currently available. All user functions are currently implemented with PIO pins. There are minimal output messages via UART in this edition.

AGHFP mode

AGHFP mode is the default mode, implementing Bluetooth AGHFP profile which is intended to connect to a standard Bluetooth cell phone mono headset. The audio is sampled at 8kHz, and operates two-way communications. The kcAudioGateway does not implement “phone calls” like a phone gateway would, but rather opens the bi-directional audio channel automatically, without the call answer or hang up states.

A2DP mode

A2DP mode implements Bluetooth A2DP Source profile which is intended to connect to standard Bluetooth stereo headsets or speakers. The audio is sampled at 44.1kHz, and transmits stereo audio.

Firmware Editions

Our default kcAudioGateway is released in two editions: our class 1 KC5012 edition, and our class 2 KC6012 edition (also intended for KC6112 modules).

Supported Bluetooth Profiles

Profile	Name	Version	Configured
AGHFP	Audio Gateway Hands Free Profile	1.5	Enabled
A2DP	Advanced Audio Distribution Profile – Source Edition	1.2	Enabled
AVRCP	Audio Video Remote Control Profile – Target Edition	1.0	Enabled

Audio Codec Options

AGHFP mode supports the Bluetooth standard CVSD, aLAW, and uLaw codec formats.

A2DP mdoe supports the Bluetooth standard SBC (Sub-Band Coding) codec format, and a low latency optional codec, FastStream. FastStream is automatically selected whenever the receiver device supports it.

Firmware Change Log

Changes from kcAudioGW v6.7.3 include:

- Added AVRCP output messages, when controls commands are received (Rewind, FastForward, Play, Pause).
- Changes from kcAudioGW v6.7.2 include:
- Fixed LEDs blink pattern when connected.
- Startup Uart message indicates A2DP Mode or HFP Mode.

Multifunctional ENABLE / BTB

The BTB – Bluetooth button is a multi-featured input button. Most of the features are activated differently based on the current operating mode of the device.

The ENABLE pin is a dual purpose pin, and kcAudioGateway firmware can operate both power switch and power button modes.

First, power button mode is supported, where the ENABLE pin is tied to a momentary button (typically supplied directly from a li-ion battery). In this usage model, the ENABLE pin is used as the BTB. A long press of ENABLE will power up the device, and a subsequent very long press will power off the device. When the device is on, this ENABLE pin will provide the same features as the BTB.

Secondly, power switch mode is supported, where an external system power switch is used, typically to supply a DC power source. In this mode the ENABLE pin will be tied to this switched power source, and will simply turn on/off the device. In this mode, since the ENABLE pin is held HIGH when powered on, then BTB features must be operated using the BTB assigned Pio 4.

The device provides both power switch and power button operations by latching the system ENABLE internally, thus allowing the ENABLE pin to turn on/off the device with simple button presses, and additionally triggering all the features of the BTB when subsequently pressed. However, if the system is powered up, and the ENABLE pin remains HIGH for over 10 seconds, then the ENABLE button disables the internal power latch, which will allow the device to power off immediately upon release of the ENABLE pin (LOW).

Push-To-Talk

A special Push-To-Talk feature has been added (since kcAudioGW v6.5.0) that receives a standard Bluetooth cell phone headset button press to toggle the PTT feature in our firmware. This is typically a Voice Activation feature where a phone would open an audio channel in order to receive voice commands. When PTT is toggled OFF, the PTT indicator goes low, and the microphone channel is muted. When toggled ON, the PTT indicator goes HIGH, and the mic channel is unmuted.

AudioLink

The AudioLink feature is similar to Push-To-Talk, but toggles ON/OFF the entire bi-directional audio channel. This feature can provide significant power savings, as the processor can sleep when the audio channel is not operating. The connection remains open in standby mode when the audio channel is closed. When AudioLink toggled OFF, the STREAMING indicator goes low, and the audio channel is dropped completely. When toggled ON, the STREAMING indicator goes HIGH, and the audio channel is opened.

System Messages

Device State

The following messages are output via Uart whenever the device state changes:

Message	Description
-> [State Idle]	No connections.
-> [State Inquiring]	Starting new device discovery.
-> [State Searching]	Searching for profile info on new device.
-> [State Connecting]	Connecting to device.
-> [State Streaming]	Audio is streaming.
-> [State InCall]	A call is active.
-> [State TestMode]	Testmode.

AVRCP Controls

The following messages are output via Uart when Avrcp control signals are received from a remote device:

Message	Description
-> Avrcp Play	Play audio.
-> Avrcp Pause	Pause audio.
-> Avrcp Stop	Stop audio.
-> Avcrp RR Press	Start rewind.
-> Avcrp RR Release	Stop rewind.
-> Avcrp Skip Backward	Previous song/track.
-> Avcrp FF Press	Start fast forward.
-> Avcrp FF Release	Stop fast forward.
-> Avcrp Skip Forward	Next song/track.

A2DP State

The following messages are output via Uart when A2DP state is changed:

Message	Description
-> [A2DP Connected]	Profile connected (no audio channel).
-> [A2DP Disconnecting]	Disconnecting the profile.
-> [A2DP Disconnected]	No current profile connection.
-> [A2DP Paged]	Incoming profile connection request.
-> [A2DP Opening]	Opening an audio channel.
-> [A2DP Open]	Audio channel is open.
-> [A2DP Closing]	Closing an audio channel.
-> [A2DP Starting]	Start streaming audio.
-> [A2DP Streaming]	Audio is streaming.
-> [A2DP Suspending]	Pause audio stream.

AVRCP State

The following messages are output via Uart when AVRCP state is changed:

Message	Description
-> [AVRCP Connected]	Profile connected.
-> [AVRCP Disconnecting]	Disconnecting the profile.
-> [AVRCP Disconnected]	No current profile connection.
-> [AVRCP Paging]	Initiated profile connection.
-> [AVRCP Paged]	Incoming profile connection request.

AGHFP State

The following messages are output via Uart when AGHFP state is changed:

Message	Description
-> [AGHFP Connected]	Profile connected (no audio channel).
-> [AGHFP Disconnecting]	Disconnecting the profile.
-> [AGHFP Disconnected]	No current profile connection.
-> [AGHFP Paged]	Incoming profile connection request.
-> [AGHFP Paging]	Initiated profile connection.
-> [AGHFP AudioOpening]	Opening an audio channel.
-> [AGHFP AudioOpen]	Audio channel is open.
-> [AGHFP AudioClosing]	Closing an audio channel.
-> [AGHFP CallSetup]	Incoming call request.
-> [AGHFP CallActive]	Active call.
-> [AGHFP CallShutdown]	Close call.

Automatic Features

Feature
Reconnect on startup (with previously paired devices)
Search for new headset on startup (if no paired devices)
Reconnect on link loss
Idle shutdown after 30 minutes

Feature Activation

PIO pins are used to activate firmware features. PIO default state is LOW (0V), and activates the assigned feature with a HIGH (3.3V) signal press, and LOW (0V) signal release. The “button presses” are debounced by 4 readings within 15ms. The following timings are configured for a “button press” to activate an assigned feature.

Press	Activation Time		Press	Activation Time
Short	< 1.0 second		Very Long	2.5+ seconds
Double	Within 0.5 seconds		Very Very Long	5.0+ seconds
Long	1.0+ second		Hold	Repeat every 0.25 sec

PIO Assignments

PIN Function	Name	I/O	Feature
ENABLE		Input	Press or Hold Continuously for power up
PIO 2	PTT	Output	HIGH when mic channel is ON
PIO 3		Input	Unused
PIO 4	BTB	Input	Bluetooth Button: Multifunctional See Below
PIO 5	VOLUP	Input	Press: Volume Up; Double: Input Gain Up
PIO 6	VOLDN	Input	Press: Volume Down; Double: Input Gain Down
PIO 7	RR	Input	TestMode with RR + FF
PIO 8	FF / AUDIOLINK	Input	Press: Toggle audio streaming on/off
PIO 9	CONNECTED	Output	HIGH when connected
PIO 10	STREAMING	Output	HIGH when audio is streaming

Button Features

Feature	Button	Press	Condition
System On	ENABLE	Very Long	Only when (firmware) system off
System On	BTB	Very Long	Only when (firmware) system off
System Off	BTB	Very Long	Any
Reconnect	BTB	Short	Only when not connected
Search	BTB	Long	Only when not connected
Volume Up	VOLUP	Short	Any
Volume Down	VOLDN	Short	Any
Input Gain Up	VOLUP	Double	Any
Input Gain Down	VOLDN	Double	Any
Reset Pairing	VOLUP + VOLDN	Very Long	Any
Enter DFU Mode	PIO 2	HIGH	Only during power up
Test Mode	RR + FF	Very Long	Toggle test mode on/off
Set AGHFP mode	VOLUP	Short	Only in test mode
Set A2DP mode	VOLDN	Short	Only in test mode
Audio Loopback	RR	Short	Only in test mode

LED Event and State Indicators

When battery is low, the Red led blinks instead of the Blue led.
When the battery is charging, both Blue and Red blink together.

Event	LED Action	Timing
System On	Blue Flash	1s on
System Off	Red Flash	1s on
Reset Pairing List	Blue+Red Triple Flash	100ms on/off/on/off/on/off
Enter DFU Mode	Blue+Red Triple Flash	100ms on/off/on/off/on/off
State	**LED Action**	**Timing**
Connectable	Blue Blinking	100ms on, 2500ms off
Connected, No Audio	Blue Double Blinking	100ms on/off/on, 1500ms off
Connected, Audio Streaming	Blue Double Blinking	100ms on/off/on, 1500ms off
Searching	Red/Blue Alternate Fast Blinking	100ms on/off
Reconnecting	Blue Fast Blinking	100ms on/off

Output Volume

Default output volume for new connections is Level 14 = 0 dB.

Level	0	1	2	3	4	5	6	7
Gain	-45.0 dB	-39.0 dB	-35.5 dB	-33.0 dB	-29.5 dB	-27.0 dB	-23.5 dB	-21.0 dB
Level	8	9	10	11	12	13	14	15
Gain	-18.0 dB	-15.0 dB	-12.0 dB	-9.0 dB	-6.0 dB	-3.0 dB	0 dB	+3.5 dB

Input Volume

Default input gain is 0 dB.

Contact Information

KC Wirefree Corporation
2640 W Medtronic Way
Tempe, Arizona 85281

Phone	(602) 386-2640
Website	www.kcwirefree.com
Sales Support	info@kcwirefree.com
Technical Support	tech@kcwirefree.com