

## Firmware User Guide

### kcAudioGateway v6.5 Build 2

#### Introduction

Our kcAudioGateway firmware is a two-way mono audio transmitter system intended to connect to a standard Bluetooth cell phone mono headset. 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.

There are no UART commands or SPP service currently available. All user functions are currently implemented with PIO pins.

#### Supported Bluetooth Profiles

Profile	Name	Version	Configured
AGHFP	Audio Gateway Hands Free Profile	1.5	Enabled

#### Audio Codec Options

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

#### Power On/Off

kcAudioGateway uses our PowerSwitch configuration where an external switch will turn the device on/off. The power supplied from the switch should be connected to both VDD and VREGEN. There is no power latch up on the VREGEN pin.

Alternately, a PowerButton configuration is available, where an external momentary button connects power to VREGEN, and a battery or power supply is connected to VDD. The PowerButton will turn the device on/off, and an internal latch up will keep the device on. During device operation, this PowerButton is also assigned as the BTB (and PIO 4 BTB functions are unused).

#### Push-To-Talk Output

A special Push-To-Talk Output feature has been added (since kcAudioGW v6.5.0) that receives a standard HFP Bluetooth cell phone headset button press to toggle the PTT Output. 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. The PTT output can also be configured to operate as a remote, mirrored PIO state, rather than a toggled state.

## AudioLink

The AudioLink feature is similar to Push-To-Talk, but toggles ON/OFF the entire 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.

## Firmware Updates

[http://www.kcwirefree.com/docs/guides/kcFirmware\\_UpgradeGuide.pdf](http://www.kcwirefree.com/docs/guides/kcFirmware_UpgradeGuide.pdf)

Firmware can “easily” be updated using the USB interface. Please see our “Enter DFU Mode” feature in the Button Controls section to place kcAudioGateway into Device Firmware Update mode. Then, refer to our kcFirmware Upgrade Guide for software and procedures. Current and past editions of firmware are posted on our website.

<http://www.kcwirefree.com/downloads.html>

<http://www.kcwirefree.com/archivesfw.html>

## Firmware Source Code

This is the most closely guarded secret at KC Wirefree. It is our secret recipe (source code) that allows KC Wirefree Bluetooth devices to have custom features and perform better than any other Bluetooth module vendor. Additionally, the code is quite complicated and development tools are expensive, so we offer our expert programming services for any changes or additions that you would want. We are a specialty systems programming company who have added many proprietary features and improved many standard features for overall system quality and performance. We have tweaked the Bluetooth and device firmware source code extensively. Sometimes little features and changes can greatly increase the value of your device. For custom features and capabilities, please contact us.

### Firmware Change Log

Changes from kcAudioGW v6.5.0 include:

- PIO assignment of Streaming indicator was changed from PIO 7 to PIO 10. Our BlueDemo Audio Evaluation Boards utilizes PIO 10 for amplifier enable, which corresponds to the Streaming indicator.

Changes from kcAudioGW v6.5.1 include:

- Correcting configuration errors for class 1 (KC-5012) editions of kcAudioGW v6.5.1.

### Document Change Log

## Automatic Features

Feature
Reconnect on startup (with previously paired devices)
Search for new headset on startup (with no paired devices)
Reconnect on link loss
Idle shutdown enabled

## 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
Short	Press < 1.0 sec
Double	Two Presses < 0.5 sec
Long	1.0 sec < Press < 2.5 sec

Press	Activation Time
Very Long	2.5 sec < Press < 5.0 sec
Very Very Long	Press > 5.0 sec
Hold	Repeat every 0.8 sec

## LED Event and State Indicators

When battery is low, the Red led blinks instead of the Blue led.

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 Test Mode	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, 2500ms off
Connected, Audio Streaming	Blue Double Blinking	100ms on/off/on, 1500ms off
Discoverable	Red/Blue Alternate Fast Blinking	100ms on/off
Reconnecting	Blue Fast Blinking	100ms on/off

## PIO Assignments

PIN Function	Name	I/O	Feature
ENABLE		Input	Required for Power Up
PIO 2	PTT	Output	HIGH when mic channel is ON
PIO 3			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			unused
PIO 8	CONNECTED	Output	HIGH when connected
PIO 9	AUDIOLINK	Input	Press: Toggle audio streaming on/off
PIO 10	STREAMING	Output	HIGH when audio is streaming

For optional PowerButton configuration, the ENABLE pin will latch power up, and BTB is reassigned to ENABLE.

## Button Controls

Feature	Button	Press	Condition
System On	BTB	Very Long	Only when (firmware) system off
System Off	BTB	Very Long	Any
Reconnect	BTB	Short	Only when not connected
Search & Connect	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	Long	Any
Enter DFU Mode	PIO 2	HIGH	Only during power up

## Output Volume

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

<b>Level</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Gain</b>	-45.0 dB	-39.0 dB	-35.5 dB	-33.0 dB	-29.5 dB	-27.0 dB	-23.5 dB	-21.0 dB

<b>Level</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>
<b>Gain</b>	-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.



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