

Document Number:	Document Title: <b>Krill Operational Guide</b>	Revision Level: <b>A</b>
Original Issue Date: 8/26/2022		Date Effective:
Original Created By: M Harkins	Revised By: M Harkins	ECO:

## 1. Scope

This document outlines the firmware operation for the Krill audio system.

## 2. Overview

The Krill audio system is a rechargeable battery powered Bluetooth Audio system. The unit is charged with a custom 19VDC power adapter

## 3. Firmware:

The three firmware blocks used to program the P1.8 samples are:

## 4. Device Name:

When first looking to connect to the device with your phone, you will see Krill. Just select and connect it.

## 5. User Interface:

The following is a description of how to operate the P1.8 units. Buttons have been reordered to match the new layout shown below:



### 5.1. Turn On

Pressing and releasing the power button initiates the Power Up LED sequence. During the power on Sequence the unit will play its custom power On sound.

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### 5.1.1. Power On LED Sequence

When the Power/Play/Pause button is first pressed in the off state, the Power On LED sequence starts with lighting the Play/Pause button, it remains lit as a half second later the Concert Mode and Next buttons light up. They all remain lit as a half second later the Volume Up and Volume Down buttons light up. They remain on for a half second then they all turn off. After the Turn On sequence is completed, there is a delay until the BT module indicates it has booted and is ready. All LEDs are off during this time. Upon the BT module indicating it is ready, the unit automatically enters Pairing Mode.

### 5.1.2. Known Issues

Turn On prompt timing is not always quite correct and volume level is too high (IMO).

## 5.2. Pairing Mode

Upon completion of the Power On sequence and the BT Module indicating it is ready, the unit automatically enters Pairing Mode. If the unit was already paired to a device, and that device is present, this may be an extremely short period of time.

Additionally, pressing and holding the Power Button for ~ 0.5 seconds then releasing causes the unit to enter pairing mode. This operation is only required when connected to a phone and wishing to disconnect and enter Pairing mode. This operation has been only partially implemented at this time.

### 5.2.1. Pairing LED Indication

Pairing is indicated by all Button LEDs blinking at a rate of half second on, half second off. This continues until either a connection is made, or registration times out. **NOTE:** *In P1.8 the micro received no notice of time out, or module shut down. This will be fixed going forward.*

### 5.2.2. Known Issues

There is no means to “Cancel” pairing mode or to disconnect from a current connection to enter pairing mode in the P1.8 Firmware build. We need the “Disconnect” command implemented in the module to allow the unit to force disconnection to existing connection prior to entering Pairing mode.

## 5.3. Play/Pause

After powering up and connecting to a device, the unit enters the Pause mode. Pressing and releasing the Play/Pause button will toggle the operation between paused and streaming. (See Charging and Fault sections for expected LED color).

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### 5.3.1. Pause LED indication

Pause is indicated by the Play button continuously turning on then off at a half second rate.

### 5.3.2. Play LED indication

The play LED indication is the Play button being lit.

### 5.3.3. Known Issues

Occasional disconnect for unit LED indication and phone operation (showing paused while actually playing).

## 5.4. Volume Up/Dwn

Pressing and releasing either the Volume Up or Volume Down buttons while actively streaming music from a connected phone, will adjust the output volume up or down.

## 5.5. Next Button

The Next button will cause the unit to send a message to a connected phone to advance to the next Song.

## 5.6. Mode Button (DSP Toggle)

On power up, the unit initializes to the DSP setting that it was in previously. The DSP Toggle function will toggle between On Vehicle and In Home DSP settings.

### 5.6.1. Mode Button Indication

The Mode button will be illuminated depending upon which DSP setting is selected. In the P1.8 build the illumination is backwards from what it needs to be and will be addressed going forward. Currently the button is “Off” in the On Vehicle mode or “Ride Mode” and lit in the Off Vehicle mode.

When the button is first pressed, all other buttons will turn off their illumination, and the “Mode” button will flash “On” and “Off” at a half second rate. The audio will be muted while the DSP amplifier is reprogrammed. Upon completion of the mode change, the other button illumination will return to their previous states, and the Mode button will be either lit, or off depending upon which mode it is in.

**NOTE:** *Currently the unit will power up in the previous mode that was selected and will remember its current mode when entering shut down. Is this the operation desired or should the units always power up on a default mode?*

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### 5.7. Concert Mode

Concert mode is initiated by pressing the Vol+ and Vol- simultaneously for ~ 0.5 seconds.

**Master Mode:** To initiate Concert mode, first have the unit that is to be the master Powered up and connected to a phone. Press and release the Concert mode button to initiate the master operation.

**Slave Mode:** The slave unit(s) must be powered up and displaying Pairing mode (All LEDs blinking). If the unit is connected to a phone, go to the phone and disconnect the unit so it reverts to pairing operation. Once in this mode, initiate Concert mode as above. The unit will initiate the broadcast stream in 5 to 10 seconds.

#### 5.7.1. Concert Mode LED indication

Concert mode will be indicated by both the Vol- and Vol+ buttons indicated by initially blinking on-off-on at a half second then remaining on. This is the same whether Master or Slave concert mode operation is used. The master will also have its Play button indicating the current Play/Pause state, while the Play button will be “Off” in the slave mode.

**NOTE:** *During Concert mode, there is no means for which the master to communicate to the slave devices which Operational Mode (On Vehicle or Off) it is operating in, so currently each slave will remain in which ever Operational Mode it was in upon entering concert mode. Going forwards, it was requested to have all units (Master and Slave) to default into Off Vehicle Mode. We still need to determine upon Exiting Concert mode if the slave units revert to their previous Operational Mode or not. We will also need to know whether the mode button is to be disabled in Concert mode or is the user able to change Modes while in Concert Mode operation.*

#### 5.7.2. Known Issues

Currently to exit concert mode the unit must be shut down and restarted. This should be fixed in next firmware release.

There is no local volume control while in Concert mode Slave mode. This should be fixed in next firmware release.

Slave unit gets no indication when Concert Mode stream is started or ended. This should be fixed in next firmware release.

Save unit does not give proper indication of DSP Mode if toggled (always off). This should be fixed in next firmware release.

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If the Master is powered down while in Concert Mode, the Slave units will play the masters power down Prompt along with the master. This should be fixed in next firmware release.

### **5.8. Charging Operation**

Plugging in the charger will cause the hardware to enter charging operation and will be indicated by the Blue LED indicator on the On/Off/Play/Pause button.

### **5.9. Charge Level Indication**

The Play Pause button back light changes color depending upon the current level of the battery charge state. Indications are:

1. Charging: Blue Solid.
2. Charge Complete: Blue Blinking. Not fully implemented.
3. Battery Low/Fault: Red Solid
4. Critical Level, Shut down Red Blinking followed by shut down.

#### **5.9.1. Known Issues**

Battery Low and Critical levels are not optimally set yet. Need to implement some hysteresis because notice occasional bouncing between Battery OK and Battery Low

### **5.10. Turn Off**

Press and hold the power button until the Power Down LED sequence starts.

#### **5.10.1. Power OFF LED Sequence**

The Power Off LED sequence starts with all button LEDs on for a half second. This is followed by the Volume Up and Dwn buttons turning off. A half second later the Concert mode and Next buttons turn off. Lastly, the Power/Play/Pause button turns off.

#### **5.10.2. Known Issues**

I've noticed that occasionally the when the unit completes it power off sequence, it appears to revert to on mode. The BT is not operational. Starting the Off sequence again will cause the unit to turn Off.

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### **5.11. Audible Prompts**

Not all the audible prompts have been implemented. The ones that have need to have more work done on them. Current issues are getting the prompt to enunciate at the proper volume. With some of the prompts getting proper timing to the LED indications has been an issue. These should be resolved in the P3 build.

#### **5.11.1. Power On**

Custom Sound #1 Volume 30%: Unit plays sound, but at incorrect volume.

#### **5.11.2. Power Off**

Custom Sound #2 Volume at 30%: Plays sound, but at incorrect volume.

#### **5.11.3. Maximum Volume**

Long Beep at volume level: Not implemented yet

#### **5.11.4. Minimum Volume**

Long beep Volume at 20%: Not implemented yet

#### **5.11.5. Pairing Mode**

Custom Standard Pairing Sound Volume at 30%: Not implemented yet

#### **5.11.6. Concert Mode Init**

Custom Concert Mode Volume 30%: Not implemented yet

#### **5.11.7. Concert Mode Successful**

Custom Concert Confirmation Sound Volume at 30%: Not implemented yet

#### **5.11.8. DSP Tuning**

Fading and transition sound: *It is not possible to produce sound while reprogramming the amplifier Chip. The unit is muted during this action. We can play a sound prior to starting, or upon completion, but not during.*

To assure continued compliance, any changes or modifications not expressly approved by the party. Responsible for compliance could void the user's authority to operate this equipment.

#### FCC Statement

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: 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 or 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.

#### FCC Radiation Exposure Statement:

The device has been evaluated to meet general RF exposure requirement.

The device can be used in the portable exposure condition without restriction.

This device complies with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

- French:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device has been evaluated to meet general RF exposure requirement.

The device can be used in portable exposure condition without restriction.

le dispositif a été évalué à satisfaire l'exigence générale de l'exposition aux rf.

l'appareil peut être utilisé dans des conditions d'exposition portatif sans restriction.

- **Resolution 680 statement, below, must be placed in an easily visible place in the product, or in the user manual:**
  - *Regulamento Anatel sobre equipamentos de Radiocomunicação de Radiação Restrita (Resolução n° 680): "Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados – Para maiores informações, consulte o site da Anatel – <https://www.gov.br/anatel/pt-br/>"*