



RLUSB HPD

UI Specification

4/6/22

Revisions

1. 6/26/2020 – First Draft Created Ryan S
2. 7/21/2020 – Add Tones for Play/Pause/Next/Previous Ryan S
3. 7/22/2020 – Add UI for SAC ANC & Volume Control Ryan S
4. 7/29/2020 – Ryan S
 - a) Removed ANC
 - b) Added SOC on earbud when storing in case
 - c) Added SOC on earbud when turned on
 - d) Updated terminology for Vocal Passthrough
 - e) Updated Auto-Shutoff
5. 8/03/2020 – Ryan S
 - a) Updated Pairing Mode, Removed Discovery Mode
 - b) Added Earbud Capacity Status During Discharge
 - c) Update Low Battery @ 3%
 - d) Updated Single Earbud Functionality
 - e) Update MFB ON/OFF and Pairing Interactions
6. 8/07/2020 – Ryan S
 - a) Updated ON/OFF
 - b) Added UI tone names
7. 8/27/2020 – Added BT features, Enabled & Disabled Ryan S
8. 10/12/2020 – Ryan S
 - a) Added delay to Power ON tone
 - b) 'Press' and 'Press & Release' further defined on MFB
9. 11/02/2020 – Removed single earbud operation Ryan S
10. 11/04/2020 – Adjustments to Pairing and SAC volume settings Ryan S
11. 12/02/2020 – Ryan S
 - a) Removed BT Pair New Device
 - b) Changed SAC Volume Change
12. 12/15/20 – Ryan S
 - a) Change LED on BT connect to single earbud
 - b) Update tones for Passthrough to one tone
13. 12/16/20 Update BT LED to one earbud Ryan S
14. 3/25/21 – Ryan S
 - a) [Low Battery tone](#) changed to 10 minutes before shutdown
 - b) BT [Disconnecting a Paired device](#) Press for 5 seconds
 - c) Added [MFB Interaction Chart](#)
 - d) Changed [Earbud ON/OFF](#) Press to 3 seconds
15. 3/04/21 – Ryan S
 - a) Removed VP on calls
 - b) Removed three volume tones on VP
16. 3/22/21 – Ryan S
 - a) Change MFB button press, [Power ON/OFF](#) to 3 sec
 - b) Removed Disconnecting Paired Device
17. 3/23/21 – Changed Vocal Passthrough volume tone for medium & high Ryan S
18. 6/10/21 – [Auto-off](#), updates based on state of BT Ryan S
19. 6/10/21 – Added [VP volume tones](#) for L/M/H Ryan S
20. 8/24/21 – Updated [LED Peak Wavelength Specs](#) Ryan S
21. 2/18/22 – Added [Manually put Earbuds in BT Pairing Mode](#) Ryan S
22. 2/22/22 – Minor updates/clarifications provided by MKE team Ryan S
23. 2/23/22 – Documented Mode Memory for Volume Setting Ryan S
24. 4/06/22 – Documented [Reject an Incoming Phone Call](#) Ryan S

3. Operation

A. Functions – Earbuds

While Earbuds are Paired with Bluetooth Device:



Play

- Single-press on Right MFB will play audio
- If two Earbuds are out of the case and ON, play in Stereo
- If one Earbud is out of the case and ON, play in Mono
- Play tone plays



Pause

- Single-press on Right MFB will pause audio
- Pause tone plays



Next Track

- Double-press on Right MFB will play next track
- If music is playing, music pauses
- Next Track tone plays
- Next Track plays

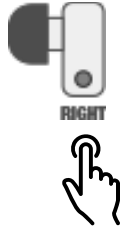


Previous Track

- Triple-press on Right MFB will play previous track
- If music is playing, music pauses
- Previous Track tone plays
- Previous Track plays

3. Operation

A. Functions – Earbuds



While Earbuds are Paired with Bluetooth Device:

Taking an Incoming Phone Call

- Phone Call Ringtone will play in right earbud to notify user of an incoming call
- Single-press on Right MFB to take an incoming call
 - If music is playing, music pauses

End Phone Call

- Single-press on Right MFB to end a call in progress
 - If music was previously playing, music resumes playing from where it left off

Reject an Incoming Phone Call

- Phone Call Ringtone will play in right earbud to notify user of an incoming call
- Press & Hold (1 second) on Right MFB to reject an incoming call

Earbuds can be Paired or Unpaired for the following:



Turn earbud OFF

Long-press (3 seconds) on Left or Right MFB turns that Earbud OFF

- Power OFF tone plays
- Bluetooth turns off
- LED displays the State-of-Charge (Red/Yellow/Green) for 3 seconds
- Earbud turns off



Turn earbud ON

Long-press (3 seconds) on Left or Right MFB turns that Earbud ON

- Power ON tone plays
- Earbud attempts to pair with the last connected device (see Pairing Mode)
- Earbud Battery Indicator LED displays the State-of-Charge (Red/Yellow/Green)

3. Operation

A. Functions – Earbuds



Bluetooth Connectivity

If Bluetooth is OFF:

- Single-press on Right MFB will turn Bluetooth on and pairing tone will play
- Earbuds attempt to pair with the last connected device (see Pairing Mode)

Manually put Earbuds into Pairing Mode

- Manually turn OFF earbuds, Long-press (3 seconds) on Left and Right MFB
 - Press & Hold to turn earbud ON (3 seconds) and continue Holding for an additional 5 seconds on Left and Right MFB
 - Earbuds are in Pairing Mode (see **Pairing Mode**)
-



Low/Dead Battery

- Low Battery Tone plays @ 10 minutes before earbud shutoff due to low charge
- Dead Battery Tone, right before earbud shutoff due to low charge

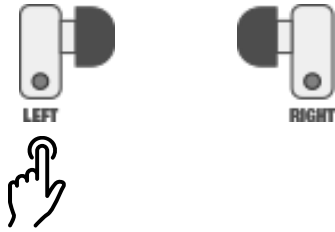


Auto-OFF

- After 30 minutes of non-use Earbuds turn OFF if:
 - Music is not playing
 - Vocal Passthrough is deactivated
 - Not connected to device via BT
 - Earbuds will not turn OFF if:
 - BT is ON and connected to a device, even if music is not playing, there is not an active phone call, and VP is OFF
 - Vocal Passthrough is ON
 - VP reactivation or Bluetooth Pairing resets the 30 minute auto-off
-

3. Operation

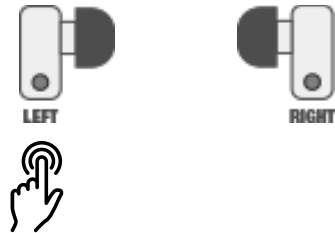
A. Functions – Earbuds



Activation of Vocal Passthrough Feature

Activate Vocal Passthrough

- Single-press & release on Left MFB activates Vocal Passthrough
 - Vocal Passthrough is activated
 - Activation tone plays
- Single-press & release on Left MFB deactivates Vocal Passthrough
 - Vocal Passthrough is deactivated
 - Deactivation tone plays



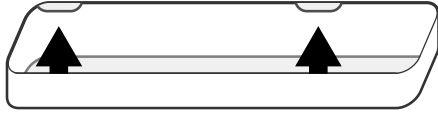
Volume Settings

Change Volume Settings

- Activate Vocal Passthrough (see above)
- Double-Press on Left MFB changes volume
- Volume cycles through: Low > Medium > High & cycles back to Low
- Volume Tone plays: Low > Medium > High & cycles back to Low
- Volume settings will have Mode Memory and will be in the Volume (Low/Medium/High) it was in last, when activated

3. Operation

A. Functions – Earbuds



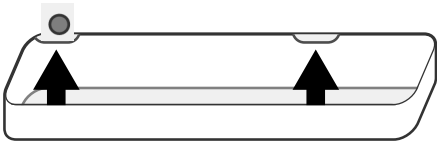
Removing Earbuds from Case

First time use:

- Earbuds turn ON
- Earbuds display SoC for 3 seconds
- Earbuds go into Pairing Mode (see **Pairing Mode**)

After first time use:

- Earbuds turn ON
 - Earbuds display SoC for 3 seconds
 - Earbuds attempt to pair with the last connected device (see **Pairing Mode**)
-



Pairing Mode:

- Earbuds search for Bluetooth device
- Earbuds attempt to pair to device
- Blue LED flashes slowly on one Earbud (1.0Hz)

[Two second delay]

- Power ON Tone plays
- Pairing Tone plays
- If earbuds paired with a device, Successful Pairing tone plays.

If no connection is made after 3 minutes (Unsuccessful Pairing):

- Bluetooth disconnect tone plays
 - Bluetooth turns off
-

Loss of connection with Bluetooth Device:

- Earbuds play disconnect tone
- Earbuds immediately try and reconnect with last connected device

If no connection is made after 3 minutes (Unsuccessful Pairing):

- Bluetooth disconnect tone plays
- Bluetooth turns off

3. Operation

A. Functions – Earbuds

EARBUD CAPACITY STATUS (during discharge)



100% - 50% Battery:

Flashes green three times @ 1.5 hz every 5 minutes



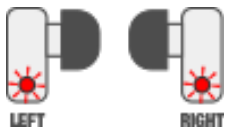
50% - 10% Battery:

- Flashes yellow three times @ 1.5 hz every 5 minutes



10% - 3% Battery:

- Flashes red three times @ 1.5 hz every 60 seconds
- Low Battery tone plays

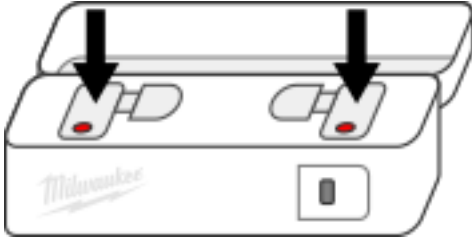


3% - 0% Battery:

- Flashes red @ 1.0 hz constantly
- Low Battery tone plays

3. Operation

A. Functions – Earbuds



Storing Earbuds in the Case

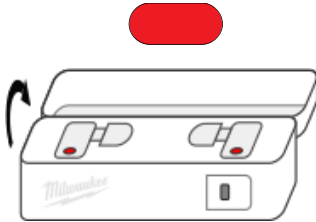
When placing Earbuds in the case:

- Earbud Battery Indicator LED displays the State-of-Charge (Red/Yellow/Green)
- Bluetooth turns off
- Vocal Passthrough turns OFF
- Earbuds turn OFF
- Earbud Battery Indicator LED displays the State-of-Charge (Red/Yellow/Green) for as long as the lid is open
- Earbuds charge
- LEDs turn off when lid is closed

3. Operation

B. LED Indications

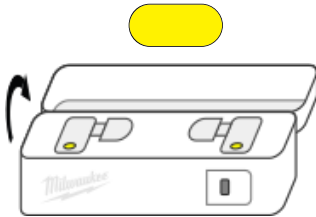
EARBUD CAPACITY STATUS (during charge)



0% - 50% Battery:

Earbud Battery Indicator LED:

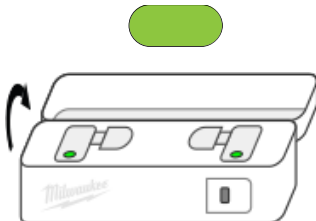
- **Upon Lid Opening:** battery indicator LED for earbud is shown solid red for as long as the lid is open



50% - 99% Battery:

Earbud Battery Indicator LED:

- **Upon Lid Opening:** battery indicator LED for earbud is shown solid yellow for as long as the lid is open



100% Battery:

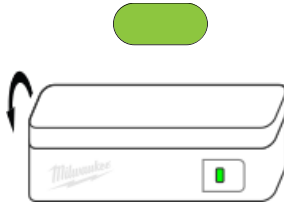
Earbud Battery Indicator LED:

- **Upon Lid Opening:** battery indicator LED for earbud is shown solid green for as long as the lid is open

3. Operation

B. LED Indications

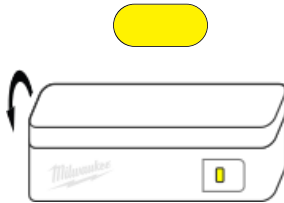
CASE CAPACITY STATUS (during discharge)



100% - 50% Battery:

Case Battery Indicator LED:

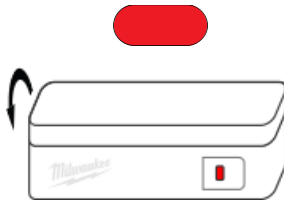
- **Upon Lid Closure:** BATTERY INDICATOR LED is shown solid green for 3 seconds.



50% - 10% Battery:

Case Battery Indicator LED:

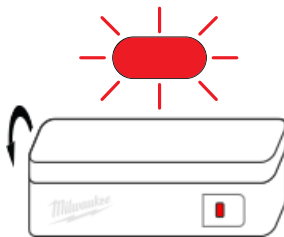
- **Upon Lid Closure:** BATTERY INDICATOR LED is shown solid yellow for 3 seconds.



10% - 3% Battery:

Case Battery Indicator LED:

- **Upon Lid Closure:** BATTERY INDICATOR LED is shown solid red for 3 seconds.



3% - 0% Battery:

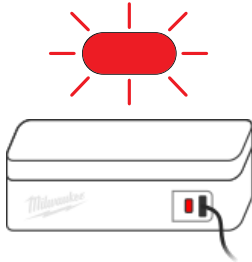
Case Battery Indicator LED:

- **Upon Lid Closure :** BATTERY INDICATOR LED is flashing red (4hz), stops flashing after 3 seconds

3. Operation

B. LED Indications

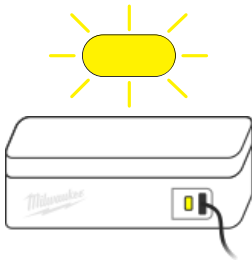
CASE CAPACITY STATUS (during charge)



0%-50% Charged:

Case Battery Indicator LED: slowly 'breathing' red

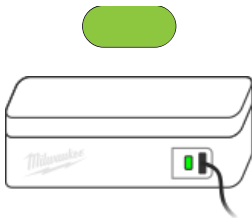
- When disconnected from charger, LED displays SoC for 3 seconds, then turns off



50%-99% Charged:

Case Battery Indicator LED: slowly 'breathing' yellow

- When disconnected from charger, LED displays SoC for 3 seconds, then turns off



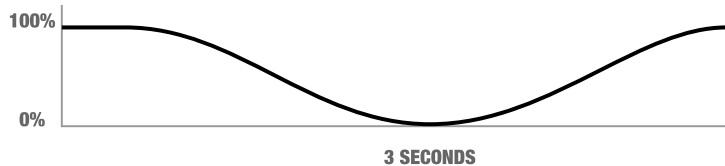
100% Charged:

Case Battery Indicator LED: solid green

- When disconnected from charger, LED displays SoC for 3 seconds, then turns off

Breathing Cycle:

- Solid for .3 seconds
- Fade OFF/ON in 2.7 seconds
- Repeat



3. Operation

B. LED Indications



Errors / Faults:

Case Battery Indicator LED: flashes red to green (2hz)

- Hot
- Cold
- Wet
- Fault
- No battery when charging

Details on Error/Fault are in the protection table of the functional spec.

BATTERY INDICATOR PEAK WAVELENGTHS



Green – 524nm



Yellow – 580nm



Red – 623nm

3. Operation

C. UI Tones

UI	Tone
Power ON	power-on
Power OFF	power-off
Vocal Passthrough Mode ON	vp-on
Vocal Passthrough Mode OFF	vp-off
Volume Setting Low	vol-lo
Volume Setting Medium	vol-med
Volume Setting High	vol-hi
Pairing	bt-pairing
Bluetooth Connected	bt-connected
Bluetooth Disconnected	bt-disconnected
Play	music-control
Pause	music-control
Next Track	music-control
Previous Track	music-control
Answer Incoming Call	call-answer
End Call	call-end
Battery Low	batt-low
Battery Dead	power-off



3. Operation

D. Bluetooth Features

Enabled – Tone Assigned	Enabled – No Tone Needed	Disabled BT Feature
Power ON	Mono Pairing	Reject Call
Power OFF	Mono Power OFF	Cancel Incoming Call
BT Connected		Reject Another Call
BT Disconnected		Pick New Call, Standby Current Call
Vocal Passthrough Mode ON		
Vocal Passthrough Mode OFF		
Vocal Passthrough, Volume Setting Low		
Vocal Passthrough, Volume Setting Medium		
Vocal Passthrough, Volume Setting High		
Pairing		
Bluetooth Connected		
Bluetooth Disconnected		
Play		
Pause		
Next Track		
Previous Track		
Answer Incoming Call		
End Call		
Battery Low		
Battery Dead		

3. Operation

E. MFB User Interactions

MFB Interaction	 LEFT	 RIGHT
SINGLE-PRESS	VP: ON / OFF	Music: Play / Pause Phone Calls: Take Call / End Call BT: (if OFF) Turn BT ON
DOUBLE-PRESS	VP: (if ON) Change Volume Low > Medium > High	Music: Next Track
TRIPLE-PRESS	—	Music: Previous Track
LONG-PRESS (3 SEC)	Earbuds: ON/OFF	Earbuds: ON/OFF

To Manually put Earbuds into Pairing Mode

- Remove earbuds from case
- Manually turn OFF earbuds, Long-press (3 seconds) on Left and Right MFB
- Press & Hold to turn earbud ON (3 seconds) and continue Holding for an additional 5 seconds on Left and Right MFB
- Earbuds are in Pairing Mode (see **Pairing Mode**)

Appendix : Standards

TBD