

## **AC-204TR Bluetooth Wireless Operation**

### **Wireless Security**

The HS-1500BT (wireless headset) and the Dongle of the training enabled wired headset (AC-204TR) do not use the BLE (Bluetooth Low Energy) protocol of the Bluetooth standard. Without this support devices such as a Flipper Zero device cannot hack into or sniff the Bluetooth connection.

The dongle of the AC-204TR headset is a master device and is designed to only pair and connect with the HS-1500BT headset product. The AC-204TR headset will not connect with any other device. The HS-1500BT headset is a generic Bluetooth device and is a slave device. The HS-1500BT can connect to other Bluetooth devices that are a master such as those using a specific USB Bluetooth dongle or Bluetooth enabled computer, smartphone, etc.

The connection between the dongle of the training headset and the HS-1500BT utilize standard Bluetooth encryption security with a pairing code. The pairing code is randomly and automatically generated by the headset and the dongle of the training headset. The pairing code is randomly set and is not readable by any other device therefore, without knowing this pairing code, there are no devices that can hack into the Bluetooth connection, including using high-end Bluetooth analyser equipment.

There is not a way for any Bluetooth device to connect to the dongle of the training headset, other than the HS-1500BT, and have access to the audio information of an agent's call.

### **Wireless Density and Interference**

Wireless density refers to the concentration of wireless signals in a given area, often measured by the number of devices transmitting wireless signals within a specific space. When numerous devices are using wireless technologies like Wi-Fi, Bluetooth, or other radio frequencies in close proximity, it can lead to a crowded or dense wireless environment. This density can potentially cause interference, signal degradation, or slower performance for these wireless devices as they compete for bandwidth or experience overlapping signals.

The maximum density for Bluetooth devices in a given area can vary depending on several factors, including the Bluetooth version, the environment, and the specific implementation of the technology. Bluetooth technology has evolved through various versions, with each version introducing improvements in terms of speed, range, and efficiency. Bluetooth 5.2 included in the AC-204TR and HS-1500BT, have enhancements that can support higher device densities compared to older versions. They utilize features like improved frequency hopping and higher data transfer rates, which mitigates interference in crowded environments to some extent.

In ideal conditions, Bluetooth devices can theoretically support hundreds or even thousands of connections within a certain range. However, in real-world scenarios with interference from other wireless signals, physical obstacles (i.e., walls), or signal degradation due to distance, the practical maximum density will be lower. In the environment of a call center where the AC-204TR headsets will be deployed there are a limited number of wireless devices in the environment. With the typical scenario of approximately 10-15 agents per each coach, the number of Bluetooth devices transmitting at the same time is limited. There are several factors that create an optimal environment for the AC-204TR and HS-1500BT training system to operate in a call center environment.

- The AC-204TR will only transmit when activated to connect with the HS-1500BT headset of their coach.
- If another agent activates their AC-204TR headset while the coach is out of range (2-3 meters) or is connected to another agent, the AC-204TR will time out after 1 min when not able to connect and the Bluetooth will automatically turn off.
- The general reliable transmission distance of Bluetooth 5.2 is approximately 30-40 meters line of sight.
- The group configuration of agents and their coach in a typical open floor plan of a call center is ideal in that the number of active Bluetooth devices are spread out over a large area and minimizes any concern of interference with the Bluetooth connection between and agent's AC-204TR and the coach's HS-1500BT.
- In centers where agents are in a room separated from other groups, the scenario improves even more, as the walls of the room absorb much of the Bluetooth transmission and weaken the signal strength.

In an open floor plan call center, if we assume that the density of agents is approximately 5 SQM per agent and there are 1000 agents in a space with a ratio of 10 agents to 1 coach, this would be equivalent to 5000 SQM and there would be 100 HS-1500BT and 1000 AC-204TR headsets operating. The AC-204TR is designed to have the Bluetooth function turned off unless connected with their coach's HS-1500BT headset, therefore only one agent AC-204TR headset will be transmitting at any particular. Assuming all 100 HS-1500BT coach headsets are actively connected with an AC-204TR agent headset in their group of agents, there would be approximately 7-10 active Bluetooth connections that are in range of each other and could potentially interfere with each other before the signal strength of the two furthest apart Bluetooth transmitting devices become too weak to affect the other. It is also important to note that the closer the two Bluetooth connection devices are to each other, the stronger the signal strength and the less affected it is from other transmitting devices in the area. As described above, the latest Bluetooth technology in version 5.2 can support hundreds of connected devices within range of each other. They utilize features like improved frequency hopping, efficiency, and higher data transfer rates, which help mitigate interference in crowded environments. With the typical connection distance between the agent and a coach of less than 4 meters the possibility of an agent and coach having their connection affected by other devices in this environment is very small to non-existent.

## Bluetooth Connection Behavior

When the Bluetooth mode is initiated on the training headset by long pressing the Bluetooth button on the dongle of the training headset more than 2 second, the dongle of the training headset will switch to “Re-connection” mode to try and connect to a previously paired HS-1500BT headset. If there is no previously connected HS-1500BT headset within the effective distance, the internal dongle of the training headset will switch to “Off” mode after 1 minute.

To pair and connect a new HS-1500BT headset for the first-time, press and hold the Bluetooth button while connecting the USB connection into the PC. After connecting to the PC, continue to hold the Bluetooth button for more than 2 seconds until the light is flashing Blue. This will allow the dongle of the training headset to switch to “Pairing” mode to pair and connect with a new HS-1500BT that is in range. The connection is less than 5-10 seconds. If there is no HS-1500BT headset within the effective distance, the internal dongle of the training headset will switch to “Off” mode after 1 minute.

### Connection

- The initial pairing and connection to a new HS-1500BT is set to a distance of 2-3 meters.
- The reconnecting distance cannot be reduced from the normal Bluetooth distance of 20 to 30 meters, but the dongle from the training headset will not connect with any other headset that has not been previously paired.
- The Bluetooth function is turned off on the dongle when not activated with the Bluetooth button. The dongle of the training headset **will not connect with a HS-1500BT unless the Bluetooth button is pressed** as noted above for reconnection to a previously connected HS-1500BT or a newly connected HS-1500BT.

It is recommended that before the headsets are deployed with an agent that the dongle of the training headset be paired with the HS-1500BT headset that the agent’s coach will be using. This will allow for a quick and seamless connection to their coach’s HS-1500BT headset when within 5-10 feet.

If a coach changes to a different group of agents, the AC-204TR headsets used by this new group of agents will need to be pre-paired again with the new HS-1500BT of the coach before the coach’s HS-1500BT headset will be able to connect with the AC-204TR headsets of this new group of agents. Any previous HS-1500BT paired with the agent’s AC-204TR headsets will be forgotten and only the newly paired HS-1500BT of the coach will connect to the agent’s AC-204TR headset. This functionality is designed to keep the connection between the agent and coach headsets secure and other Bluetooth devices cannot connect to the agent AC-204TR headset.