MindWave Dongle Communication Protocol

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NeuroSky
Brain-Computer Interface Technologies

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Contents

Introduction

This specification describes the command bytes and the dongle status packets required for developers to understand to connect/disconnect to a headset when connecting to the serial port directly. For those developers that are developing for Mac and PC does not have to use this, since the MindWave Manager and the ThinkGear Connector (assisted by the MindWave driver) manage this part.

Definitions

- **Global Headset ID**: A 2-byte unique ID that is programmed in each headset module. This allows for 65536 unique Global Headset IDs, which reduces the chance that any two headsets used at the same time at a given location will have the same ID.

Prerequisites

- The respective driver has to be installed on the computer.

(Note: The current driver is only supported on PC and Mac)

Functional States

This section explains the various states the dongle can be in.

1. Idle/Disconnected state
In this state, the dongle is in standby mode and the solid red LED represents this state. This state can also be verified by the dongle status packet. The dongle status packet sent by the dongle during this state is specified in the dongle status packet section in this document.

This state is also what the dongle will go in right after it disconnects from the headset. Right after it stops streaming the headset data, it will send out the headset disconnected packet, which is specified in the dongle status packet in this document.

2. Searching state
In this state, the dongle is searching for a specific headset or a random headset (This depends on the command that was sent to the module). The dongle status packet sent by the dongle during this state is specified in the dongle status packet section in this document.

3. Connected state
In this state, the headset will be sending headset data. Right before it starts streaming the headset data, the dongle will send out a dongle status packet that indicates which headset it was connected to. The dongle status packet sent by the dongle right before it starts streaming the headset data is specified in the dongle status packet section in this document.

Command Bytes and Dongle Status Packets

Command Bytes Supported by the Dongle

Since these command bytes are sent directly to the dongle via PC USB, the communication channel is expected to be reliable. Thus, the commands will not require sync bytes or a checksum.

1. Request "Connect"
When the dongle receives this command from the application, the dongle will attempt to connect to the headset with the requested Global Headset ID. If the dongle is already connected to a headset, this command will be denied.

```
Packet Format: (Headset Connect Command Byte) (2-byte Global Headset ID)
Example Command Bytes: 0xC0 0x00 0x01
The command above will request connection to a global headset ID of 0x0001.
```

2. Request "Disconnect"
When the dongle receives this command from the application, the dongle will disconnect from whichever headset(s) it is connected to (if any).

```
Packet Format: (Headset Disconnect Command Byte)
Example Command Bytes: 0xC1
The command above will request disconnection from any/all headsets that is connected to the dongle.
```

3. Request "Auto-connect"
When the dongle receives this command from the application, the dongle will switch into auto-connect mode and connect to any headsets it can find. The dongle will search for headsets for 10 seconds.

```
Packet Format: (Headset Auto-Connect Command Byte)
Command Byte: 0xC2
The command above will connect to any headsets it can find within 10 seconds.
```

Dongle Status Packets

These responses are sent by the RF dongle back to the application to indicate the results of command requests. These Status Packets are formatted according to the ThinkGear Packet format (described in the ThinkGear Communication Protocol), so that the responses can be properly parsed by applications that are already designed to parse ThinkGear Packets.

1. Headset Found and Connected
This packet is sent in response to Connect and Connect All requests to inform the application of each headset ID that the dongle managed to connect to.

```
DataRow Format:  (Headset Connect Success Code) (Data Length) (2 byte Global Headset ID)
Example Packet:  0xAA 0xAA 0x04 0xD0 0x02 0x05 0x05 0x23 means that
                 the dongle found a headset with Global Headset ID 0x0505 and
                 connected to it.
```

2. Headset Not Found
This packet is sent in response to Connect requests to inform the application that the requested headset couldn't be found within the 10-second connection period.

```
DataRow Format:  (Headset Not Found Code) (Data Length) (2 byte Global Headset ID)
Example Packet:  0xAA 0xAA 0x04 0xD1 0x02 0x05 0x05 0xF2 means that
                 Headset ID 0x0505 could not be found.
```

This packet is also sent in response to Connect All requests to inform the application that no headset could be found during the 10-second connection period.

```
DataRow Format:  (Headset Not Found Code) (Data Length 0)
Example Packet:  0xAA 0xAA 0x02 0xD1 0x00 0xD9 means no headset could
                 be found during Connect All.
```

3. Headset Disconnected
This packet is sent by the dongle to the application whenever the dongle disconnects from a headset.

```
DataRow Format:  (Headset Disconnected Code) (Data Length) (2 byte Global Headset ID)
Example Packet:  0xAA 0xAA 0x04 0xD2 0x02 0x05 0x05 0x21 means that
                 the dongle disconnected from headset with Global
                 Headset ID 0x0505.
```

4. Request Denied
This packet is sent by the dongle when the dongle does not accept the last command request from the PC. This response will be sent when you ask for more than one headset to be connected or there is no headset to be disconnected.

```
DataRow Format:  (Request Denied Code) (Data Length 0)
Example Packet:  0xAA 0xAA 0x02 0xD3 0x00 0x2C means that the last
                 command request was denied.
```

5. Dongle in Standby Mode
This packet is sent every 1 seconds by the dongle when the dongle is in Standby Mode. This response is to notify the PC that the dongle is alive during standby mode.

```
DataRow Format:  (Standby/Scan Mode Code) (Data Length 1) (0x00)
Example Packet:  0xAA 0xAA 0x03 0xD4 0x01 0x00 0x2A means that the headset is in standby mode
awaiting for a command.
```

6. Dongle is Trying to find a headset

This packet is sent every 1 seconds by the dongle when the dongle is trying to connect with a headset. This response is to notify the PC that the dongle is alive during headset searching mode.

```
DataRow Format: (Standby/Scan Mode Code) (Data Length 1) (0x01)
Example Packet: 0xAA 0xAA 0x03 0xD4 0x01 0x01 0x29 means that the headset is trying to establish a
connection with a headset.
```

ThinkGear Code	Byte Length	Value Definition
0xD0	3	Headset Connect Success
0xD1	2	Headset Not Found
0xD2	3	Headset Disconnected
0xD3	0	Request Denied
0xD4	1	Standby/Scan Mode

Continued Reading

After the connection is established and headset data is streaming, please reference the MindSet Communication Protocol, which explains all the data types that the headset sends out.