1 Introduction

WASP-B is a standalone unit providing a bridge for ANT+ devices to communicate wirelessly through Wi-Fi networks, to other devices on the local network or over the Internet. Utilizing an 8-channel ANT+ receiver, on-board memory, power management circuitry and rechargeable Li-Ion battery, WASP-B provides a data gateway for monitoring, recording and analyzing ANT+ data remotely.

WASP-B connects ANT+ devices to wireless networks for monitoring and data collection purposes. For example ANT+ home scales, pulse-oximeter monitors, and blood glucose monitors as well as heart rate monitors and all other ANT enabled devices are all able to use this bridge module to communicate their data to central monitoring stations via the Wi-Fi network.

WASP-B is capable of receiving data wirelessly, from all certified ANT+ devices in the local area that share the same ANT frequency. ANT+ device state is encapsulated as standard UDP messages, allowing it to be routed through local networks, through the Internet or directly to any Wi-Fi connected device. WASP-B can be configured directly over the network with a configuration utility or a web browser. WASP-B is also capable of sending data to any ANT radio in range that is capable of receiving data packets.

An Application Programmers Interface is available to OEM partners, allowing WASP-B integration into custom applications needing wireless connectivity to ANT enabled devices at ranges which exceed the typical ANT radio reach. WASP-B Wi-Fi is able to join existing networks with common security protocols, or create it's own access point allowing WASPs and application end point devices (smart phones, tablet computers, Personal Computers, etc.) to join and share information locally. WASP-B will run for up to six hours on its internal Li-Ion battery when hosting it's own network as the network manager or up to 18 hours when joining an existing network. Battery life is dependent on the amount of ANT traffic local to the WASP-B. For fixed installation environments, WASP-B can be powered from a USB power source.

In addition to the periodic streaming protocols, WASP-B supports ANT-FS sessions when coupled with a Wi-Fi application or web host to manage the authentication, and file transfer requests. When WASP-B is configured in ANT-FS mode, it searches for ANT-FS beacons. When a beacon is found, it commands the device sending the beacon to change frequencies and await the authenticate command. The Wi-Fi endpoint application or web host is then notified of the connection and control is passed off to the host device to manage the data transfer. WASP-B monitors the transactions assisting in connection management during the transfer process. Once the transfer is complete (the connection is either closed or lost), it resumes searching for other ANT-FS devices.

WASP-B can also be used as a bridge between multiple ANT+ nodes in distributed ANT+ network topologies. Since ANT+ is a personal area network, it has a typical range of approximately 10 to 20 meters. If the ANT+ network is used as a mesh or hub and spoke topology, WASP-B can join networks together that would normally not be able to communicate with each other because of range limitations.

WASP-B is ANT+ certified and complies with all ANT+ device profiles.
2 Scope

This document provides a general introduction to using WASP-B. It includes information on button operations, LED indicators, powering/charging the device, and Wi-Fi configuration.

3 What's New

Here are the updates for the latest release and previous releases.

Release 2.2.7
1. Added section on WASP Operating Ratings.

Release 2.2.6
1. Added regulatory section.
2. Added unit safety section.
3. Removed deprecated sections on WPS and Reset to Initial Configuration.

Release 2.2.5
1. Default operation for button press or cold boot selected by new "Infrastructure Enabled" flag.
2. Cold boot or SW Reset from SET_CONFIG or web pages now goes directly into operation.
3. Charger connect always starts WASP-B if not already in operational mode.

Release 2.1.23
1. Changed default provisioning mode from AdHoc to Limited AP.
2. WASP-B can now join non-broadcasting networks.
4. Multiple bug fixes.

Release 2.1.9
1. Added AdHoc Web provisioning mode and ability to switch between AdHoc Web and AP Web.
2. Made AdHoc Web the default provisioning mode.
3. Multiple bug fixes.

Release 2.1.0
1. ANTFS application specific disconnect parameter added.

Release 2.0.17
1. ANTFS functionality added to download and forward files from ANTFS enabled devices.
2. Packet Saver mode added to concatenate multiple ANT packets into a single UDP packet to
reduce Wi-Fi network traffic.

3. Infrastructure Mode no longer uses a channel setting. It instead scans all channels for the preconfigured network name.

4. WPS Mode added.

5. WASP-B now available with SPI mode ANT radios for higher throughput.

6. Updates for more intuitive usage and user feedback.

7. Multiple bug fixes.

**Release 1.6.1**

1. Functional packet protocol change from point to point packet routing to local area UDP multicast packets greatly increasing the number of Wi-Fi endpoints capable of receiving data from a WASP-B while at the same time reducing the number of transactions required to supply the data.

2. Support for both TCP and UDP type connections.

3. Enabled TCP connection for managing WASP-B configuration/control operations to a single endpoint instead of UDP control from multiple endpoints requesting control.

4. Singular IP routing entry for supporting connection to web services outside the local Wi-Fi network.

5. Improved user interface (button/LED) operation

6. Configured network persistence improvements which allow the WASP-B to reacquire the network if the connection is lost.

7. Stage 1 implementation of onboard data storage of ANT data.
4 Quick Start Guide

The Quick Start Guide leads you through beginning to use the WASP-B. It is simple to use, yet provides all the ANT, ANT+, and ANT-FS functionality you need to work with the ANT enabled devices.

4.1 Getting Started

Out of the box, the WASP-B is configured to join a default Wi-Fi network (WASP-B). Follow the directions below to configure the WASP-B to either join your local Wi-Fi network, or create its own network. The WASP-B needs to be configured in order to connect it to an existing Wi-Fi network other than the default. This guide walks the user through the process of setting up the WASP-B for a specific operating environment.

Turning WASP-B on/off or changing operating modes is performed using the button on the front panel of the device. This button is a membrane switch so feedback on button presses is provided by the green and red LEDs above the button. The red LED is on the left side of the label and the green LED is on the right side. The green LED is primarily used to indicate the WASP-B is powered on and shows its operational state. With a repeated single blink once every two seconds, the WASP-B is hosting its own limited AP network. With a repeated double blink every two seconds, the WASP-B has joined an existing network. Refer to Modes of Operation for additional details on the operating modes.

The red LED is used to provide change of state feedback, indicate the state of the internal battery charger and to indicate progress when joining Wi-Fi networks. Refer to Status Indicators section under WASP-B Startup for details on the operating modes of the red LED.

The mini-USB connector on the back of the WASP-B or the micro-USB connector on the side of the
WASP-B is used to charge the internal Lithium Ion battery using either a USB connection on a computer, or a stand-alone wall charger. It can also be used to configure the WASP-B via an application running on a computer connected to the USB cable.

### 4.1.1 WASP Startup

#### Turning On the WASP-B

Pressing the black button on the WASP-B turns the green LED on immediately. Continue to hold the button until the red LED turns on then release the button immediately. After you release the button you will notice the green LED continues to flash. This indicates that the WASP-B has entered operational mode.

The WASP-B actually has a couple of different modes of operation. The green LED indicates which mode it is in.

1. A double flash signals the WASP-B is joining an existing Wi-Fi network.

   **Note:** While the WASP-B is joining the network, the red LED flashes fast. While it is flashing a tap of the black button causes the WASP-B to stop joining the network and proceed to create its own network.

2. A single flash indicates a limited AP Wi-Fi network has been created.

#### Limited AP Mode

Limited AP mode can be entered by two different methods.

The primary method is to have the WASP-B enter Limited AP mode when it is attempting to join the configured infrastructure network. While the Red LED is flashing fast when it is powered on, tap the button. This causes the WASP-B to halt the join process and proceed into Limited AP/AdHoc mode. This mode is indicated by a single flash on the Green LED once a second.

An alternative method of entering Limited AP/AdHoc mode is to disable the infrastructure mode in the WASP-B configuration. When infrastructure is disabled, the WASP-B enters Limited AP/AdHoc mode immediately after power up. This setup is useful if it is known the WASP-B will not be joining an infrastructure network.

In this mode the WASP-B creates either an AdHoc or a Limited AP infrastructure network with the same name as its serial number. PCs, laptops, and smart phones can connect to this network and will be assigned an IP address in the range 192.168.240.10 to 192.168.240.18. All WASP-B functionality is fully available in Limited AP Mode. In addition, a webpage is accessible at 192.168.240.1 for AdHoc Mode, and "config.WASP-B.local" in Limited AP mode for configuring the Infrastructure Mode settings.

The choice between AdHoc and Limited AP mode is set in the WASP-B configuration. The factory default mode is Limited AP mode. AdHoc mode is useful for maintaining the cellular data connection when connected to an iOS product with cellular data capability. Since AdHoc devices typically do not provide internet access, the iOS device continues to route data requests other
than WASP-B traffic to the cellular modem. Some devices are not capable of communicating in
AdHoc Mode, so Limited AP mode should be chosen for these devices.

Note: The battery will drain faster in AdHoc/Limited AP since hosting a network consumes more
power for Wi-Fi operations.

**Infrastructure Mode**

From power off, hold the button for one second and release after the Red LED activates. If the
WASP-B is configured to join an infrastructure network, the Red LED flashes fast while it is
attempting to join the network. The rapid blink on the red LED is used to indicate that the module
is searching for the network, attempting to join, authenticating, or negotiating an IP address. This
is called the Network Join indicator. Once the network association process is complete, the red
LED turns off or switches to the Charging Indicator if the USB cable is connected. The Network
Join Indicator will come back any time network connectivity is lost. All WASP-B functionality is
fully available in Infrastructure Mode. The configuration webpage is not available in
Infrastructure Mode.

**Status Indicators on the Red LED**

These status indicators are provided in Limited AP and Infrastructure Modes only. They are in
priority order. Indicators earlier in the list override indicators lower down.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| Network Join Indicator| Rapid blink on red LED. Provided in Infrastructure Mode only. Occurs while
                         searching for or negotiating a network connection. If the LED is rapidly
                         flashing for a WASP-B that was previously connected in Infrastructure Mode,
                         that's a sign network connectivity was lost.                      |
| Charging Indicator    | Provided if USB cable is connected. Slow blink indicates battery is charging. |
|                       | Solid indicators battery is fully charged.                                  |
| Battery Indicator     | One to four blinks indicating battery level. One blink is the lowest level.   |
|                       | Four blinks is the highest. Battery indication is provided by pressing and
                       releasing the button within 1 second while in Limited AP, Infrastructure,
                       or WPS Mode. Battery Indication is not provided if the Charging or
                       Network Join Indicator is active.                                |

**4.1.2 WASP Configuration**

**Configuration of Network Settings for Infrastructure Mode**

Out of the box Infrastructure Mode is setup to join a network with the name "WASP-B". This
network likely does not exist in most environments, so the network settings for Infrastructure
Mode will need to be updated. The WASP-B allows three different methods for setting the
network settings.

**Webpage Update**

The WASP-B can be started into the Limited AP Mode by pressing the button from the powered
off state and releasing after the green LED comes on and one flash occurs on the red LED. The
WASP-B will create an infrastructure network with the same SSID as its serial number. This network can be joined by any PC, laptop, or smart phone. Open a web browser and navigate to "config.WASP-B.local". The WASP-B will perform a scan of all networks in the area and present a webpage allowing you to select from this list. Once you select a network, you are asked to enter a network password and any advanced IP settings. Click "Next", then click "Save and Apply". The WASP-B then updates the network settings for Infrastructure Mode. Note that the WASP-B is still in Limited AP Mode at this point. You must power off and power back on into Infrastructure Mode.

**WASP-B Configuration Utility**

The WASP-B allows configuration of several settings in addition to the network settings for Infrastructure Mode. A complete list of these settings, along with their default values, can be found in Configurable Hardware Settings. The WASP-B is configured using the configuration utility, which runs on either an iOS device or a Windows PC. The device performing the configuration must be on the same Wi-Fi network as the WASP-B that is being configured. Configuration can be performed in either Infrastructure or Limited AP Mode. If configuration is being performed from an iOS device for a WASP-B in Limited AP Mode, the network created by the WASP-B must be joined manually. This needs to be performed using the Settings application of the iPhone, iPad. If using the Windows config application, the network is selected from within the application.

The configuration application lists all of the WASPs found on the network. Select one of the WASPs to configure and select the option to connect to the WASP-B. Only one device is allowed to open a connection to a WASP-B. If another device attempts to open a connection the WASP-B checks with the currently connected device to find out if it is still connected and if it is willing to release the configuration connect. If it is no longer on the network or it is willing to release the connection the new device is granted access to the configuration interface. Otherwise it is sent a message indicating the configuration interface is not currently available.

If the configuration connection is established the application then has access to the configuration settings. A description of the settings is available in the Configurable Hardware Settings section of this document. The default settings are found in Default Settings.

After the new settings are selected in the user interface, the changes are applied to the WASP-B by choosing to apply the settings. When the WASP-B receives the command to apply the settings, the internal configuration table stored in non-volatile FLASH memory is updated and the WASP-B resets itself and attempts to join the preferred network using the new settings.

### 4.1.3 ANT+ Data

Once the WASP-B has established a network connection, it opens a UDP multicast socket at address 239.78.80.1. It then starts forwarding any ANT messages it receives from any ANT transmitter configured to send on ANT RF channel 57 to the multicast address. If configured, the WASP-B opens a unicast UDP socket and forwards ANT messages on that connection as well. The Multicast Address and Port Number destination, the Unicast Address and Port Number destination, and the ANT RF channel to monitor are all configurable using the WASP-B Configuration Utility. See the settings in Configurable Hardware Settings.
The WASP-B allows two modes for forwarding ANT traffic. With Packet Saver mode turned off, each ANT message received as packed and forwarded as an individual UDP packet. With Packet Saver mode turned on, ANT messages are concatenated and sent together every 250ms (or quicker if there is a lot of ANT traffic and packets are becoming too large). Each Wi-Fi packet is sent twice in Packet Saver mode to help guarantee delivery, although the network traffic overall should be lower. Packet Saver mode should be used if there is a lot of ANT traffic. Packet Saver mode should be turned off if latency is a concern.

Packet Saver mode is enabled by default.

4.1.4 ANTFS Data

In addition to forwarding regular ANT traffic, the WASP-B can also listen for beacons from ANTFS devices, if ANTFS mode is enabled (see Configurable Hardware Settings). Once an ANTFS beacon is seen, the WASP-B will send a message to the ANTFS device informing it to switch its channel and RF frequency. The WASP-B will reset its own ANT radio to these settings and then connect with the ANTFS device. The only authentication mode allowed at this point is Passthru. Once connected, the WASP-B downloads all files and forwards them to a preconfigured destination IP address and port number. Files are sent using TCP for guaranteed delivery.

The Configurable Settings contain a few options to control which files can be downloaded and forwarded. The Ignore Archive bit allows files to be downloaded and forwarded, even if they have previously already been downloaded. This is normally disabled. In addition, the ANTFS whitelists and blacklists allow for selecting or excluding specific file indexes and ANTFS device types. These settings are described in further detail in Configurable Hardware Settings.

Once an ANTFS session is complete, a Disconnect command is sent to the ANTFS device with a specific timeout. This timeout prevents the ANTFS device from going immediately back into beacon mode, in which case the WASP-B would immediately connect again. The disconnect timeout is configurable in Configurable Hardware Settings.

ANTFS mode is disabled by default.

4.2 Charging

WASP-B provides a mini-USB port to connect to a powered USB port on a computer or using a USB (5V) wall transformer. This USB port is connected to the integrated Li-ion battery charger, which monitors the status of the battery and controls the charge state. Once the battery reaches a full charge, the charger stops the charging process and maintains a full charge level without overcharging the battery so the WASP-B can remain connected to power indefinitely.

The red LED is used to provide feedback on the charging state of the WASP-B, both in the OFF and ON states. When the WASP-B is attempting to join a Wi-Fi network in Infrastructure Mode, the red LED is used to provide feedback on the progress of the connection process and does not provide the feedback for battery charging.

When the red LED is flashing slowly the battery is charging. If the LED is a solid red, the battery is fully charged.
4.2.1 Battery Indicator

When the WASP-B plugged into USB power, the red LED provides the feedback of the battery charging

- A solid red LED shows a fully charged battery.
- A flashing red LED shows the battery is currently charging.

When the WASP-B is unplugged and in operational mode, tapping the black button will cause the red LED to display the battery level

- flashes, fully charged
- 3 flashes
- 2 flashes
- 1 flash, plug in to continue operation

5 Configurable Hardware Settings

There are a number of hardware settings that modify the operation of the WASP-B. The network settings, described elsewhere in this document, the configured static IP, and DHCP settings all affect WASP-B operation. See WASP-B Configuration for instructions on how to access and modify these settings. See Default Settings for a full list of configurable settings, descriptions, and their default options.

5.1 Default Settings

<table>
<thead>
<tr>
<th>User Setting</th>
<th>Factory Default Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WASP-B Name</td>
<td>17 character MAC Address of the WASP-B</td>
<td>The WASP-B name is a 32 character field used to provide an ASCII name to identify the WASP-B. This can be changed using the WASP-B Configuration Utility. Changing the WASP-B Name does not affect the network name created in Limited AP Mode. It does affect how the WASP-B identifies itself to any WASP-B specific programs and utilities connected to the same network.</td>
</tr>
<tr>
<td>Infrastructure Mode</td>
<td>WASP</td>
<td>The network name used to identify the Wi-Fi network the WASP-B attempts to join when in Infrastructure Mode. The network name has a maximum of 31 characters.</td>
</tr>
<tr>
<td>Network Security</td>
<td>None</td>
<td>The security type used for joining an encrypted network. Options include WEP, WPA, WPA2 or None.</td>
</tr>
<tr>
<td>Configurable Hardware Settings</td>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>---</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Infrastructure Mode Network PassPhrase</td>
<td>(Blank)</td>
<td>The network security key used when connecting to a network in Infrastructure Mode. This may be a WEP Key hex string if security is set to WEP, or a passphrase if security is set to WPA/WPA2. A WPA passphrase has a minimum length of 8 characters and a maximum length of 64 characters.</td>
</tr>
<tr>
<td>Infrastructure Mode DHCP</td>
<td>ON</td>
<td>The DHCP selection determines if the WASP-B will attempt to get an address from a DHCP server when it joins the Infrastructure Mode network or use a static IP configuration. If DHCP is turned off, the IP configuration is given by the IP Address, Subnet Mask, and Gateway IP settings outlined below.</td>
</tr>
<tr>
<td>Infrastructure Mode IP Address</td>
<td>192.168.89.10</td>
<td>IP address to be used in Infrastructure Mode if DHCP is off. Not used if DHCP is on.</td>
</tr>
<tr>
<td>Infrastructure Mode Subnet Mask</td>
<td>255.255.255.0</td>
<td>Subnet mask to be used in Infrastructure Mode if DHCP is off. Not used if DHCP is on.</td>
</tr>
<tr>
<td>Infrastructure Mode Gateway IP</td>
<td>192.168.89.1</td>
<td>Gateway IP address to be used in Infrastructure Mode if DHCP is off. Not used if DHCP is on.</td>
</tr>
<tr>
<td>Packet Saver Enabled</td>
<td>ON</td>
<td>With Packet Saver mode turned off, each ANT message received is packed and forwarded as an individual UDP packet. With Packet Saver mode turned on, ANT messages are concatenated and sent together every 250ms (or quicker if there is a lot of ANT traffic and packets are becoming too large). Each Wi-Fi packet is sent twice in Packet Saver mode to help guarantee delivery, although the network traffic overall should be lower. Packet Saver mode should be used if there is a lot of ANT traffic. Packet Saver mode should be turned off if latency is a concern.</td>
</tr>
<tr>
<td>RSSI Enabled</td>
<td>OFF</td>
<td>Not yet implemented.</td>
</tr>
<tr>
<td>Archive Ignore Enabled</td>
<td>OFF</td>
<td>In ANTFS mode, when downloading files from an ANTFS device, the WASP-B normally ignores files with the Archive bit set (files</td>
</tr>
<tr>
<td>Feature</td>
<td>Setting</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ANT-FS Enabled</td>
<td>OFF</td>
<td>Allows connecting to ANTFS enabled devices, downloading files, and forwarding them to a preconfigured TCP server. See ANTFS Data for a more complete description.</td>
</tr>
<tr>
<td>Created Network Type</td>
<td>Limited AP</td>
<td>The WASP-B can create either an AdHoc network or Limited AP network when creating a network.</td>
</tr>
<tr>
<td>Direct UDP Routing Destination IP Address</td>
<td>0.0.0.0</td>
<td>This specifies a single destination to forward all ANT traffic. Since this need not be a multicast address, it allows ANT traffic to be sent to a remote network. Only one unicast destination address may be specified for ANT traffic.</td>
</tr>
<tr>
<td>Direct UDP Routing Destination Port Number</td>
<td>0</td>
<td>Used in conjunction with the Direct UDP Routing Destination IP Address.</td>
</tr>
<tr>
<td>Multicast UDP Routing Destination IP Address</td>
<td>239.78.80.1</td>
<td>This specifies a multicast group address that allows multiple devices to receive ANT traffic forwarded by this WASP-B. Although multiple devices can subscribe to the multicast group address, multicast transfers are usually limited to the local network subnet.</td>
</tr>
<tr>
<td>Multicast UDP Routing Destination Port Number</td>
<td>51113</td>
<td>Used in conjunction with the Multicast UDP Routing Destination IP Address.</td>
</tr>
<tr>
<td>Operational Mode</td>
<td>Streaming</td>
<td>Operational modes supported are Streaming, Proximity, and Access Point. The proximity mode also has a range setting that adjusts the distance a device is detectable from the WASP-B.</td>
</tr>
<tr>
<td>ANT Network Key Selection</td>
<td>ANT+ Network Key</td>
<td>The default eight byte Network Key can be selected to be either Public, ANT+, ANT-FS, or Custom. If Custom, the Custom ANT Network Key is used.</td>
</tr>
<tr>
<td>Custom ANT Network Key</td>
<td>12-34-56-78-90-AB-CD-EF</td>
<td>The custom network key is used when ANT Network Key Selection is set to Custom.</td>
</tr>
<tr>
<td>Setting</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>ANT Channel</strong></td>
<td>57</td>
<td>ANT radio beacon frequency to listen for ANT and ANTFS traffic.</td>
</tr>
</tbody>
</table>
| **ANT-FS Destination IP Address**   | 192.168.240.10 | Address of TCP server that ANTFS files should be sent to during ANTFS file download and forward operation.  
Note: The default value is the same as the IP address assigned to the first connected device in Limited AP Mode. This is useful for testing. |
| **ANT-FS Destination Port Number**  | 55555   | Used in conjunction with ANT-FS Destination IP Address.                     |
| **ANT-FS Device Type White List**   | All 0s  | A list of Device Type, Device ID pairs that can be used to whitelist specific ANTFS devices. Device IDs can be wildcarded with a zero value for a specific Device Type. The list holds up to eight entries. Note that bit 7 (the pairing bit) of the Device Type is masked out when comparing to the whitelist. An empty list means the whitelist is not used. |
| **ANT-FS Device Type Black List**   | All 0s  | A list of Device Type, Device ID pairs that can be used to blacklist specific ANTFS devices. Device IDs can be wildcarded with a zero value for a specific Device Type. The list holds up to eight entries. Note that bit 7 (the pairing bit) of the Device Type is masked out when comparing to the blacklist. An empty list means the blacklist is not used.  
An entry in the Device Type Black List will override any entries in the Device Type White List. |
| **ANT-FS File Index White List**    | All 0s  | A list of ANT-FS File Indexes to be whitelisted. Any file indexes not in the white list are excluded from download. An empty list means the whitelist is not used. |
| **ANT-FS File Index Black List**    | All 0s  | A list of ANT-FS File Indexes to be blacklisted. Any file index specified by the black list is excluded from download. An empty list means the blacklist is not used.  
An entry in the File Index Black List will override any entries in the File Index White List. |
### Modes of Operation

The WASP-B has operational modes which are selectable via the membrane button located on the front panel of the device. The button area is defined by the black circle just below the red and green LEDs. See WASP-B Startup for how to transition between different modes and brief descriptions. Detailed descriptions are provided in this section.

- Limited AP Mode
- Infrastructure Mode
- Sleep Mode
- Charging State

#### Limited AP Mode

In AdHoc/Limited AP Mode the WASP-B acts as its own Access Point. The WASP-B creates either an AdHoc or Infrastructure network with the same SSID as its serial number (i.e. "WA032105B4D"). The WASP-B can serve up to 8 IP addresses with a simple DHCP server. Note that the simple DHCP server does not maintain a lease table. This means that any device that requests an address and loses the connection may receive a different address when it attempts to reconnect. Also, if the WASP-B creating the network is power cycled, it will restart the DHCP IP address assignments from the initial IP address. This means devices that join the network can receive the same address as other devices that had joined the network before the WASP-B was power cycled.

AdHoc/Limited AP Mode also provides a configuration webpage for the network settings used in Infrastructure Mode. To access this webpage, first connect to the network being hosted by the WASP-B with any PC, laptop, or mobile device. Then navigate to the URL 192.168.240.1 for AdHoc, and "config.wasp.local" for Limited AP using any web browser. The WASP-B will perform a scan of all networks in the area and then provide a list for selection within the webpage. There are also options to set the security settings and IP configuration. If the browser is having trouble connecting to "config.WASP-B.local" first make sure that your laptop is maintaining connection to

<table>
<thead>
<tr>
<th>App Specific Disconnect</th>
<th>0</th>
<th>Byte sent for the application specific disconnect field when the ANT-FS session issues the disconnect command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disconnect Time Duration</td>
<td>1 = 30 seconds</td>
<td>Disconnect time duration to specify to ANTFS enabled devices. The time duration is sent as part of the disconnect command after file download/transfer is complete. It is the length of time the device should wait before resuming listening for ANTFS beacons. This prevents the WASP-B from immediately reconnecting. The disconnect time duration is specifiable in increments of 30 seconds.</td>
</tr>
</tbody>
</table>
the WASP-B’s network. If there is still a problem, your OS may be attempting to perform an MDNS lookup on the URL only, and not a DNS lookup. Try entering "192.168.240.1" into the address bar instead of "config.wasp.local". This problem has been observed occasionally with Mac OS X.

To enter Limited AP Mode, see WASP-B Startup for details.

All ANT operations are available in AdHoc/Limited AP Mode.

**Note:** The battery will drain faster in AdHoc/Limited AP since hosting a network consumes more power for Wi-Fi operations than simply maintaining a connection.

### 6.2 Infrastructure Mode

In Infrastructure Mode the WASP-B joins a preconfigured network. The network settings are stored in non-volatile flash and can be updated using three different methods. See WASP-B Configuration for details. The default network settings are to join a network named "wasp", security is none, and a blank passphrase.

Infrastructure Mode always attempts to maintain connection with the pre-configured network. When the WASP-B is either searching for the network, associating, authenticating, or negotiating an IP address, the Network Join Indicator will be shown. This is a continuous rapid flashing on the red LED. If this indicator occurs during normal operation, it means network connectivity was lost.

To enter Infrastructure Mode, see WASP-B Startup for details.

All ANT operations are available in Infrastructure Mode.

### 6.3 Sleep Mode

The WASP-B is in the Sleep Mode when both LEDs are off. In this state both the Wi-Fi and ANT radios are powered off and the WASP-B consumes a minimal amount of power. To enter Sleep Mode from any Operational Mode (Limited AP, Infrastructure, or WPS), press and hold the button until three slow blinks occur simultaneously on both LEDs.

When the WASP-B is off, it is waiting for either a button press or USB charging connection. If the button is pressed and held for at least three quarters of a second, the WASP-B will wake up and enter the WASP-B Startup sequence.

If a USB cable is connected, the WASP-B will enter the Charging State but will remain off as far as any ANT and Wi-Fi operations are concerned. USB Charging Sleep Mode is functionally equivalent to Sleep Mode as far as button operations are concerned. A button press will wake up the WASP-B and it will enter the startup sequence, but it will continue to charge from the USB port.

### 6.4 Charging State

When a USB cable is connected, the WASP-B is in the Charging State. It is in the Charging State regardless of which mode it is in. Charging state is indicated during the Limited AP, Normal, and Sleep Modes using the red LED. A slow blink indicates the battery is charging, and a solid on LED indicates the battery is fully charged. The WASP-B can remain plugged in, at all times, to maintain the battery in the maximum charge state. At times, the solid red will transition to blinking red indicating the battery voltage has dropped to the point where the battery supervisor needs to perform a maintenance charge cycle.
Notes:
The Network Join Indicator in Infrastructure Mode overrides the Charging Indicator.
In both Limited AP and Infrastructure Modes, the Battery Indication will not be provided if the USB Cable is connected and the battery is charging. The Charging Indicator overrides it.
Being in the Charging State while in Sleep Mode does not affect push button operations. Any user documentation that refers to a powered off state or Sleep Mode refers also to this state.

7 WASP Hardware

The major components of the WASP-B include an 802.11 b/g/n Wi-Fi radio, ANT protocol radio, user controls and internal, rechargeable Li-ion battery. The WASP-B can be ordered without the Li-ion battery.

Key features of each of these components are detailed in this section.

7.1 WASP Operating Ratings

General WASP-B Ratings
• RoHS compliant

Battery Operation
WASP-B Maximum Ratings when equipped with an internal Li-ion battery.

Operating Temperature
• Battery Operation: -20°C to +60°C
• Battery Charging: 0°C to +45°C

No Battery Operation
WASP-B Maximum Ratings when no internal battery installed.
Operating Temperature: 0°C to +70°C

7.2 Wi-Fi Key Features

• FCC/IC/Wi-Fi Certified
• Compliant to 2.4 GHz IEEE 802.11 b Radio (compatible with 802.11 g/n networks - requires 802.11b enabled on network)
• Dual ARM7 Processors for application and networking
• Security: WEP128, WPA-PSK and WPA2-PSK (TKIP / AES)
• 5 Volt USB power
• Splash Resistant Case
• Internal antenna
7.3 **ANT Key Features**

- 2.4GHz worldwide ISM band
- 78 selectable RF channels (2403 to 2480MHz)
- Ultra low power operation
- Integrated antenna
- Broadcast, acknowledged, or burst data transmissions
- ANT channel combined message rate up to 190Hz (8byte data payload)
- Minimum message rate per ANT channel 0.5Hz
- Burst transfer rate up to 20Kbps (true data throughput)
- Up to 8 ANT channels
- Up to 3 public, managed and/or private network keys
- 1 Mbps RF data rate, GFSK modulation
- Radio regulatory approval for major markets

**Specific Radio Features**

- Background scanning
- Continuous scanning mode
- High density node support
- Improved channel search
- Channel ID management
- Improved transmission power control
- Frequency agility
- Proximity acquisition

The complete description of ANT message protocol is found in the document “ANT Message Protocol and Usage”. This document is available on www.thisisant.com.

7.4 **WASP User Interface**

The WASP-B has an integrated membrane switch which includes a button, a green LED, a red LED built into the graphics overlay. See Modes of Operation for more information.

7.5 **Power**

The WASP-B provides a USB port for connection to a powered USB port on a computer or a USB (5V) wall transformer. The USB port is used to power the WASP-B and in the versions delivered with an internal Li-ion battery, to charge the battery.
The red LED is used by the WASP-B-N to indicate different charging modes. See the section in this manual on charging.

8 WASP Protocol

Refer to the WASP-B Packet Protocol Specification for a detailed description of the communications protocol used to interface with the WASP-B.

9 Definitions

- **WASP-B Client Device** is defined as the programming interface the WASP-B Packet Protocol communicates with and would be running in the application device.

- **WASP-B Protocol Commands** are defined as the protocol packets with the specific command code in byte 2 of the packet. There are parts of the packet that are defined common across all the protocol commands. Also, there is specific packet sections defined for each protocol command.

- **WASP-B API Packet Commands** are defined as the packet commands being received by the Wi-Fi-Basic code from the application device.

- **WASP-B Asynchronous Packet Commands** are defined as the packet commands being created by the Wi-Fi-Basic code asynchronously and sent to the application device.

- **WASP-B Response Packet Commands** are defined as the packet commands returned directly by the Wi-Fi-Basic code after receiving one of the WASP-B API packet commands.

- **Packet Type identifier** is defined as bytes 0 and 1 of each WASP-B Packet and are defined as ASCII characters “A” followed by “N”.

- **Packet Command ID** is defined as an incrementing count generated by the initiator of the packet, and returned in byte three of the response packet commands.

- **MAC address** is defined as the MAC of either the application device or the WASP-B device depending on who is the sending device.


10 Regulatory Approvals

The WASP-B has received regulatory approvals in the United States (FCC) and Canada (IC). The end user must comply with all of the instructions provided by the Grantee, which includes installation and/or operating conditions necessary for compliance.

10.1 United States

The equipment device 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.
Changes or modifications not expressly approved by North Pole Engineering, Inc. could void the user’s authority to operate the equipment. Manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment.

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

This equipment complies with the FCC/IC radiation exposure limits set fourth for portable transmitting devices operation in a controlled environment. End users must follow the specific operating instructions to satisfy RF exposure compliance. The equipment should only be used where there is normally at least 20 cm separation between the antenna and all person/user. This transmitter must not be co-located or operation in conjunction with any other antenna or transmitter.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.

### 10.2 Canada

This device complies with Industry Canada license-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.

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.

Class B digital device notice / “CAN ICES-3 (B)/NMB-3(B)”.

### 11 Operational Safety

The WASP-B has the following safety precautions that must be followed by the user.
11.1 Hazardous Materials

The WASP-B contains hazardous materials and must be disposed of properly.

11.2 Radio Transmissions

The WASP-B is not intended to be worn by the user. The unit should be operated no less than 20cm from the body.

11.3 Moisture

The WASP-B is not waterproof. Protect the micro-USB connector contacts from moisture.