TELEGRID
Technologies, Inc.

DRAFT

WZRDnet™
Handheld Device Model WHD-310(V)1

USER MANUAL
Document Number: USM310(V)1-100922

10/01/2010

DRAFT

TABLE OF CONTENTS

TELEGRID
Technologies, Inc.

TELEGRID
Technologies, Inc.

SECTION 1: GENERAL INFORMATION

1. Introduction

This document forms the user manual for the WZRDnet handheld device Model WHD-310(V)1. As such it presents a detailed equipment description including the physical characteristics and operational instructions for the device.

2. Features

The WHD-310(V)1 is a portable handheld wireless communication device that is a key element of the WZRDnet low-power wireless ad-hoc mesh network. The mesh architecture of the network facilitates wireless communication between handheld devices without infrastructure (e.g. satellites, cell towers, etc.). Every device in the network acts as both a router and a data/ voice terminal. This design creates a robust network without distance limitations or expensive maintenance. The devices automatically associate themselves with a network and are assigned a dynamic network address and ID. This self-forming, ad-hoc configuration eliminates the need for additional overhead or external monitoring.   A device that is part of a network is referred to as a node. Nodes can send voice or data messages to other specific nodes or talk groups.

The innovative voice and data communication methods of the WHD-310(V)1 feature the following capabilities:

WZRDtalk™ allows peer-to-peer and talk group voice communications. The handset also allows communications with users on the WZDRnet network and stations on external Wide Area Networks (WANs).

WZRDtext™ allows users to transmit text messages of unlimited length including files to other users or to multiple users. A message archive maintains sent and received messages on the device until deleted by the user.

WZRDchat™ uses a USB connection to provide a user-friendly PC interface for text messaging and network monitoring. WZRDchat also allows uploading of GPS coordinates and modification of node settings. The WZRDchat application serves as a gateway to a local Personal Computer (PC) and the Internet where available.

WZRDalert™ broadcasts text alerts/ notifications to all users on the network.

TELEGRID
Technologies, Inc.

SECTION 2: EQUIPMENT DESCRIPTION

1. Device Characteristics

Physical Characteristics
- Dimensions:
  - Device: 4.97 x 2.66 x 1.21 inch
  - Antenna length: 1.95 inch
- Weight: 0.53 lbs including batteries

Internal Components
- 1.5 inch Color LCD Screen
- 2.4 GHz Radio Transceiver
- GPS Receiver
- Two 1800mAhr Rechargeable Lithium Polymer Battery
- Real-Time Clock
- Integrated Speakerphone
- Microphone
- 5-Button Navigation Tool
- Illuminated Keypad
- Mini-USB Port
- 2.5mm Audio Output Jack

External Components
- Mini-USB to USB Cable
- Headset with Push-to-Talk button and microphone
- 110VAC Wall Adapter.

Additional Software
- USB to Serial Driver
- X-CTU Network Management
- WZRDChat PC Instant Messaging

TELEGRID
Technologies, Inc.

Figure 2.1 WHD-310(V)1 Handset

SECTION 3: DEVICE POWER

1.   Device Power

Main power to the WHD-310(V)1 is provided by two internal rechargeable 1800mAhr Lithium Polymer batteries or by an external power source connected to the Device's USB port such as a wall charger or PC. The internal batteries are constantly monitored and protected by an embedded battery gauge circuit. They are recharged whenever an external power source is connected to the USB port. An internal charger circuit determines whether the power is being supplied by the batteries or through an external power source.

The Device's on-board voltage regulator provides three separate outputs of 3.3VDC each. One output powers the microcontroller, and the other two power the peripherals and the DC-DC converter for the Liquid Crystal Display (LCD) backlight.

1.1   Battery Charging

The batteries are recharged via the USB port. This can be done by connecting to the USB port of a PC or to a 5VDC 500mA to 1A wall charger. The Device will automatically determine which charging method is being used and configure itself accordingly.

1.2   Battery Gauge

The current state of the Device's batteries is displayed with a battery icon on the LCD screen.   The user can monitor the voltage and be alerted when the battery is low. When the battery voltage drops below a predetermined level, the device will shut down automatically to save power.

SECTION 4: MODES OF OPERATION

1. Start-up Mode

The Device enters the Start-up Mode when the batteries are charged and the center button of the keypad is pressed. It can also enter this mode automatically through a Real-Time Clock alarm. In the absence of charged batteries, the Device enters the Start-up Mode when an external power source, i.e., a PC or a wall charger is connected to the USB port.

When Start-up Mode is entered, the microcontroller first checks the condition of the battery supply to determine if it should proceed to Power-on Mode.

2. Power-on Mode

The Device is in Power-on Mode when the user is interacting with the device and the device is running at maximum clock frequency with all the peripherals fully functional. Because this mode consumes the most power, the device will go into either Idle Mode or Power-off Mode to preserve battery life as soon as conditions permit.

3. Idle Mode

The Device enters Idle Mode when the user is inactive for a predetermined amount of time and the USB port is not connected to an external power source, i.e., a PC or a wall charger. In Idle Mode the LCD screen is disabled and the microprocessor runs at minimal clock frequency of 500Hz in order to preserve power.

In Idle Mode, the RF transceiver remains active as a repeater in order to interchange messages inside the mesh network. If the transceiver receives a message for the Device, then the Device transitions to Power-on Mode and the microprocessor resumes running at the higher clock frequency, while the LCD remains off, in order to analyze the received message. If the received message packet is not for the Device, then the Device returns to Idle Mode.

4. No LCD Mode

The Device enters the No LCD Mode when the user is inactive for a predetermined amount of time and the USB port is connected to an external power source, i.e., a PC or a wall charger. Note that the Device does not go into a complete Idle Mode in order to allow the USB to continue charging the batteries. The LCD will turn back on when any button is pressed or upon message receipt.

5. Power-off Mode

The Device enters the Power-off Mode by a controlled powering off sequence or by an uncontrolled power off sequence. Both sequences will cause the main regulator to be disabled as the voltage supply disappears, thus the Device would remain off.

5.1 Controlled Power-off

The WHD-310(V)1 can be powered off by pressing the center button of the keypad for 1 second.

5.2 Uncontrolled Power-off

The Device is powered off automatically if the battery voltage falls below a predetermined threshold or if the battery is removed from the Device. The Device is also powered off when the battery gauge disconnects the battery due to over temperature, over voltage, or under voltage.

Return to the Power-on Mode occurs when an external power source, i.e., a PC or a wall charger is connected to the USB port or a charged battery is inserted.

6. No Supply Mode

The Device enters this mode if the battery is completely depleted and the voltage level falls below the undervoltage threshold.

Return to the Power-on Mode occurs when an external power source, i.e., a PC or a wall charger is connected to the USB port or a charged battery is inserted.

SECTION 5: NETWORK COMMUNICATIONS

1. **Overview**

   The networking technology employed by WZRDnet is based on the IEEE 802.15.4 protocol. Each Wireless Mesh Network (WMN) and is defined with a unique WMN Identifier (WMN ID).

2. **Mesh Networking**

   WZRDnet supports mesh routing, allowing data packets to traverse multiple nodes in order to reach the destination node. This allows nodes to be spread out over a large region, and still support communications among all devices in the network.

3. **Network Device Types**

   The following two device types exist in the network:

   3.1 Coordinator

   A Coordinator selects a channel and WMN ID at the formation of a network. After starting the network a Coordinator behaves like a router except that it maintains the capability of updating network encryption keys.

   3.2 Router

   A Router must join a WMN before it can transmit, receive, or route data. After joining, it can allow other Routers to join the network.   It assists in routing data and therefore its RF section must remain fully-powered.

4. **Ad-Hoc Network**

   WZRDnet is an ad-hoc network that is a comprised of self-configuring devices. These devices either form a new network or join the nearest available network. The ad-hoc architecture allows new devices to automatically join a network without manual configuration. This encourages large-scale networks with minimal infrastructure support required.

   4.1 Network Formation

   The Coordinator is responsible for initiating a network. Networks are formed when a coordinator selects a channel and WMN ID.   To start a WMN, the coordinator performs an energy scan in order to discover RF activity on different channels as well as a WMN scan to identify nearby operating WMNs.

   4.1.1 Energy Scan

   When a Coordinator powers up for the first time, it performs an energy scan on multiple channels (frequencies) to detect energy levels on each channel. Channels with excessive detected energy levels are removed from its list of potential channels. When the energy scan is complete, the Coordinator scans the remaining quiet channels for existing WMNs.

TELEGRID
Technologies, Inc.

4.1.2 WMN Scan

A WMN Scan allows the Coordinator to detect nearby WMN IDs in order to avoid duplication. The Coordinator sends a broadcast information request and all nearby Coordinators and Routers respond with information about their specific WMNs including WMN ID, and whether or not joining is allowed. Once the Coordinator has completed the scans, it parses all received responses and creates a WMN with an unused WMN ID on a channel with minimal traffic.

4.2 Joining a WMN

Routers must discover and join a WMN in order to be part of a network. They first issue a WMN scan and receive a list of responses from nearby nodes. They then parse this list to find valid candidate networks. Routers can be configured to join any WMN, or to only join a WMN with a specific WMN ID. However, they must always find a Coordinator or Router that allows joining. When they discover a device operating on a valid network that also allows joining, they attempt to join the WMN by sending an association request to that device.

4.3 Allowing Joining

The Coordinator and Routers can allow or not allow new Routers to join the network. The number of Routers that can join is only restricted by the number of network addresses.

5. Network Addressing

The 802.15.4 protocol specifies two address types:

- 16-bit network address
- 64-bit MAC address

A Node Identifier String can also be specified which will route to the underlying address.

5.1 16-bit Network Address

A 16-bit network address is assigned to a node when it joins a network. The network address is unique to each node in the network. However, network addresses are not static and can change. The 16-bit address must be discovered before transmitting data to a node.

5.2 64-bit MAC Address

Each node contains a unique IEEE defined 64-bit MAC address. The 64-bit address uniquely identifies a node and is static.

TELEGRID
Technologies, Inc.

5.3 Node Identifier String (NI)

A node can also be assigned a character based Node ID. This Node ID can be used to identify the node in order to route messages. The node ID will then be linked to the corresponding network address for packet transmission.

6. Broadcast Transmission

Broadcast transmissions are intended to be propagated throughout the entire network such that all nodes receive the transmission. This is useful for emergency alerts or network notifications. Each WHD-310(V)1 comes with the ability to broadcast text messages as a standard feature.

7. Node Discovery

A node discovery mechanism can be used to discover all modules that have joined a network. A node discovery sends a broadcast discovery transmission throughout the network. All devices that receive the command will send a response that includes the device's addressing information, Node Identifier String, and other relevant information.

8. Node Search

The WHD-310(V)1 provides the ability to search for a specific node based on the assigned Node Identifier String.

SECTION 6: WZRDnet COMMUNICATION UTILITIES

1. WZRDtalk Voice Communication

WZRDtalk is the voice communication utility of the WHD-310(V)1 which allows users to send and receive voice quickly and seamlessly. Voice messages are played out loud through an integrated speaker or through a Push-To-Talk (PTT) headset for private conversations. The WHD-310(V)1's speaker should never be held against a user's head.

1.1 Call Initiation

The call originator selects a destination and initiates a call to that destination. After a call is initiated by pressing and holding the PTT button, an invitation is sent to the destination.

1.2 Call Invitation

The call invitation determines the operating status of the destination. The destination hears an audible alert that an invitation was received. The system then automatically responds whether the user is ready to accept calls or is busy.

1.3 Call Establishment

The call originator receives an audible alert if a response to the invitation was received and the destination is ready to accept the call. The response is received approximately 1-3 second after the call was initiated depending on the location of the destination and the status of the routing path. If the user is out of range and no response is received, a message will be displayed informing the user that the call has failed.

1.4 Call Communication

After a call is established the call originator will continue to hold the PTT button and begin talking.

1.5 Call Disconnect

A call disconnect is sent automatically when the user is finished speaking and the PTT button is released.

1.6 Call Reply

The call remains active for 15 seconds after each communication. The active status will allow the call originator and destination to communicate with each other by simply pushing the PTT button.

After 15 seconds the call status will become inactive. The originator and destination will then have to go through the call initiation process. Alternatively it is possible to connect via the Speed Dial feature described below.

TELEGRID
Technologies, Inc.
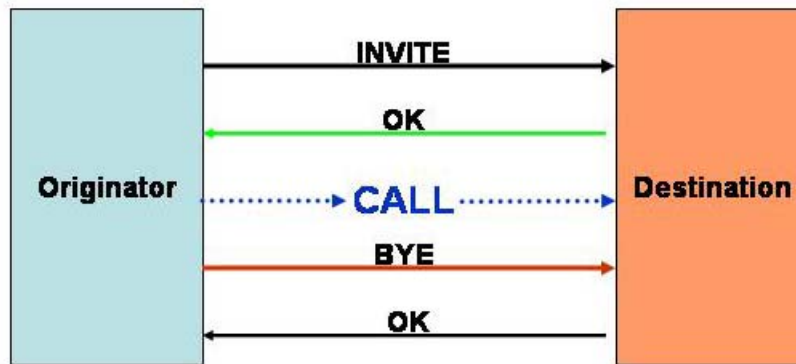
Figure 6.1 WZRDtalk Process

2. External Network Dialing

WZRDnet allows any device to communicate with external Wide Area Networks (WANs) by providing a mechanism to transfer voice or data to the following external networks and utilities:

Public Switched Telephone Network (PSTN)
- Provides analog voice communication via landline or mobile telephones.

Session Initiation Protocol (SIP) Phone
- SIP is a signaling protocol that is used to control voice communication over Internet Protocol (IP). A SIP phone is a hardware-based or software-based SIP user agent, that provides call functions such as dial, answer, reject, hold/unhold, and call transfer.

Instant Messaging (IM) Client
- An IM client is a service that is based on either of the following real-time communication protocols developed by the Internet Engineering Task Force (IETF):
  - o SIMPLE - Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions.
  - o XMPP - Extensible Messaging and Presence Protocol (XMPP) which is an open source XML-based protocol.

TELEGRID
Technologies, Inc.
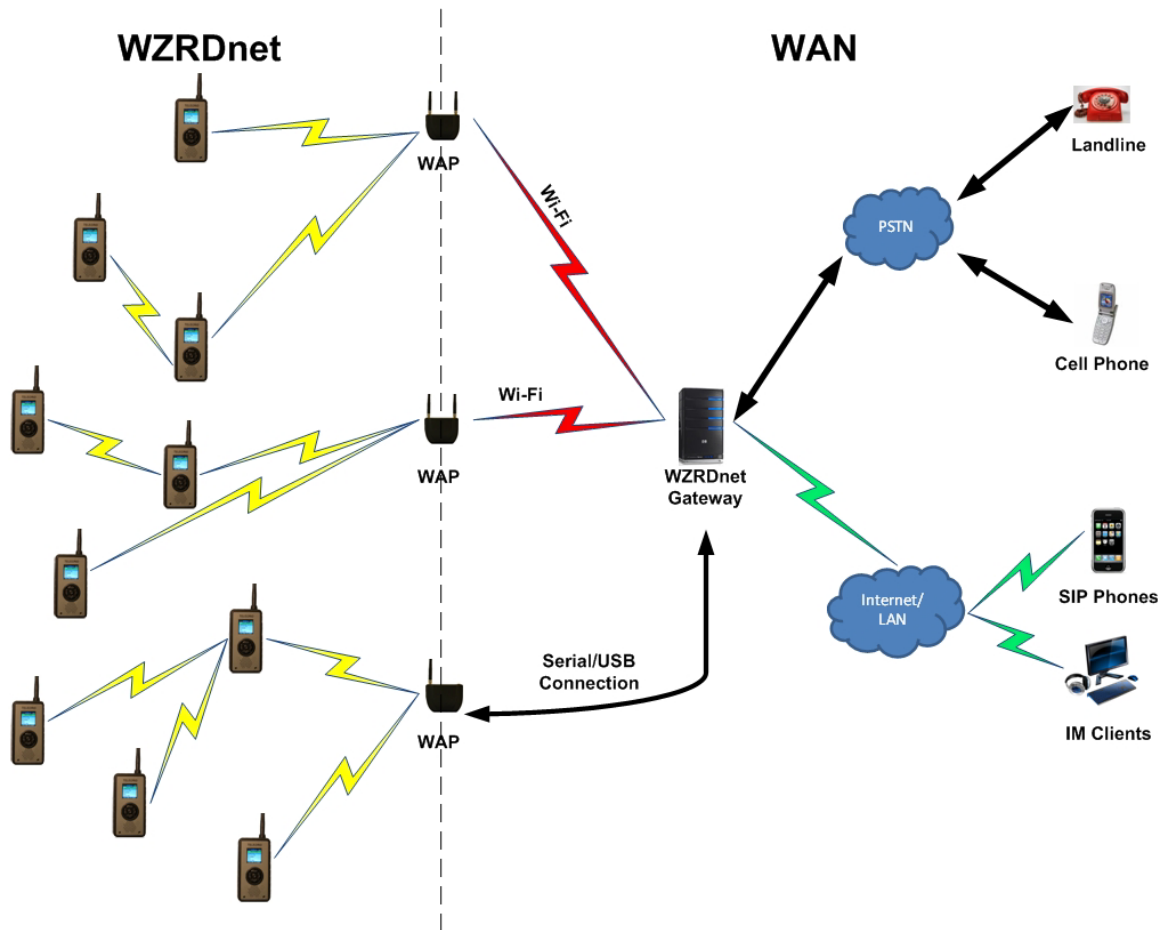
Figure 6.2 Sample External Dialing Network Design

2.1 External Dialing Elements

The key WZRDnet element which supports the external dialing feature is the WZRDgate™. This element consists of a hardware unit and internal supporting software. The key components of the WZRDgate are described in the following:

2.1.1 WZRDnet Access Point

The WZRDnet Access Point (WAP) can be either embedded in the WZRDgate or act as a standalone piece of equipment. It provides a wireless link between the WZRDnet network and the WAN realm and performs the adaptation of a WZRDnet packet to a WAN format.

A single WAP can process multiple calls simultaneously. In operation, a WHD-310(V)1 desiring to send a voice segment to a WAN destination will identify the WAP in closest proximity to it. The voice segment, defined as the time between pressing and releasing the PTT button, will be

processed through the same WAP. The WAP can change over the course of a "call" but not within a single voice segment.

2.1.2 Gateway
The Gateway resides in the WZRDgate and consists of software that receives packets and sends them to a SIP server for processing. The Gateway also converts inbound messages back into the WZRDnet packet format for transmission to a WHD-310(V)1 handset.

2.1.3 Connectivity
The WAP is able to transfer packets between the WZRDnet and the WAN via Wi-Fi, Ethernet or Serial transmission.

2.1.4 Device Registration
WHD-310(V)1 devices and WAP register automatically with the Gateway. The Gateway maintains a constant list of all devices in the network including their MAC addresses and other identifying information.

2.1.5 WHD-310(V)1 Location Identification
Each WHD-310(V)1 sends a registration message to the Gateway at a pre-determined interval.   The Gateway uses this information to identify the nearest WAP to the WHD-310(V)1.   This information is used to route inbound calls to a WHD-310(V)1 and provides the highest chance of a successful connection.

2.1.6 Hosting
The SIP server can be hosted locally or remotely depending on the user's needs.

3.   WZRDgroup™ Talk Group Communications
WZRDGroup provides communication with multiple users simultaneously. Users can establish "talk groups" without the need of a group administrator. A user can add or remove themselves from a talk group directly from the handset. This approach allows the group to remain dynamic and eliminates the need for a group administrator to maintain the list of members.   An alert will be forwarded to the existing members of the group declaring the arrival or removal of a new member. While this design allows large scale talk groups, call quality deteriorates when talk groups reach more than 5 users. A user can be a member of up to 10 different talk groups.

4.   WZRDtext Text Messaging
The WZRDtext feature allows devices to send and receive text messages rapidly and effectively. The user selects a destination based on the Node Identifier String.   The messaging component includes utilities to bolster network communication.

TELEGRID
Technologies, Inc.

4.1 Acknowledgments

Upon receipt of a new message, the Device will automatically send an acknowledgement to the sender. The sender will then be able to determine if the message reached its destination.

4.2 Long-Term Message Storage

The Device will store up to 30 sent messages and 30 received messages. A new message will automatically override the oldest message eliminating the need for message maintenance. The messages can be deleted or replied to at any time.

5. WZRDchat PC Instant Messaging

WZRDchat is a java-based PC application that can be used to send instant messages to other nodes on the network. A node is attached to a PC using a USB connector cable. The user can then monitor the network and send instant messages to other nodes from the PC keyboard.

6. WZRDalert Network-Wide Notification

The WZRDalert feature broadcasts a text message to all users on the network for emergency alerts or notifications.

SECTION 7: SECURE COMMUNICATIONS

1. Encryption

The WZRDnet system can be set for secure or non-secure communication. If security is enabled, the network employs 128-bit AES encryption with both a network security key and link key. Only devices that have the same security keys can communicate on the WMN. Routers that join a secure WMN must obtain the correct security keys.

1.1 Link Key

The link key is pre-defined and installed on each Router that wishes to join a secure network. The link key is used to encrypt the network key which is sent to devices upon joining the network.

1.2 Network Key

The Coordinator distributes a network security key when forming the network and periodically based on the Key Update Interval. Routers obtain the key when they join the network. The network key is encrypted with the preinstalled link key and is transmitted securely to joining routers by the Coordinator. The network security key is used to apply 128-bit AES encryption to all network level transmissions. Network layer security is applied on a hop-by-hop basis. As each node along a route receives an encrypted packet, it decrypts and authenticates the packet before processing it. When forwarding the packet to the next hop, the node re-encrypts the packet.

1.3 Key Update Interval

The administrator sets a periodic interval for the Coordinator to update the Network Key. The Key Update Interval can be a specific number of days or hours. The Network Key is generated randomly by the system.

TELEGRID
Technologies, Inc.

SECTION 8: Global Positioning System (GPS)

1. GPS Locator

The WHD-310(V)1 includes an embedded GPS locator which provides the local GPS latitude and longitude position.

2. GPS Clock Sync

The WHD-310(V)1 allows syncing of the time to the GPS clock. GPS time is reported in Greenwich Mean Time (GMT). The user has the ability to maintain a local time offset that will automatically recalculate the time to the local time before syncing.

3. GPS Tracking

The WHD-310(V)1 allows local storage of GPS coordinates along with a description. The coordinates, user description and timestamp can be uploaded to a PC via the WZRDchat software. These coordinates can then be displayed on a map.

4. GPS Mapping

A file of captured GPS coordinates can be uploaded to a PC for visual display on a map.   The file of GPS coordinates will be stored in a formatted .CSV file for upload into any internet GPS mapping software.

SECTION 9: OPERATING INSTRUCTIONS

1.   Network Activation

1.1   Forming a Network

Turn on the Coordinator device. The Coordinator will perform an RF Energy and WMN scan and then automatically form the network.

1.2   Assigning Network IDs

1.2.1   PC Serial Port Connection

In order to assign Node Identifier String to devices a USB to serial port connection must be established on the PC. A driver will need to be installed on the PC is order to communicate with the device through the PC USB port.

Follow the steps below:
1) Insert WZRDnet CD into CD-ROM of a PC
2) Double-Click USBSerialDriver File
3) Follow instructions to install driver

1.2.2   Assigning a Node Identifier String

In order to communicate the device must be assigned a character based Node Identifier String which can not exceed 20 characters. Assigning the ID can begin after the USB to Serial driver has been installed.

Follow the steps below:
1) Power on the device
2) Attach device to a PC via the mini-USB to USB cable
3) Insert WZRDnet CD into CD-ROM of a PC
4) Open X-CTU

TELEGRID
Technologies, Inc.
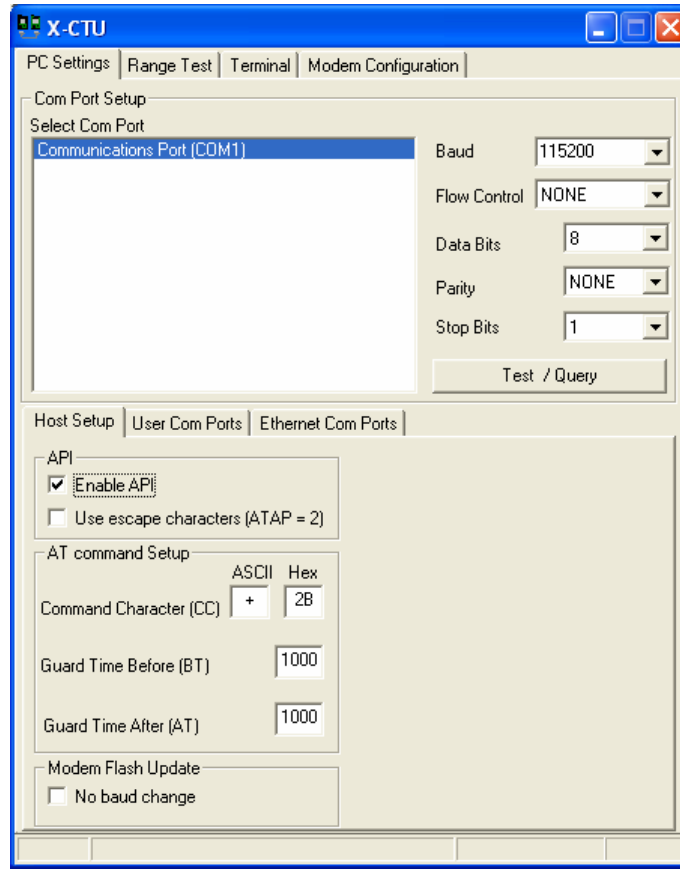
5) Highlight the COM port that device is connected on (not COM1).
6) Set Baud to 115200
7) Click API Enable Box
8) Go to the Modem Configuration Tab
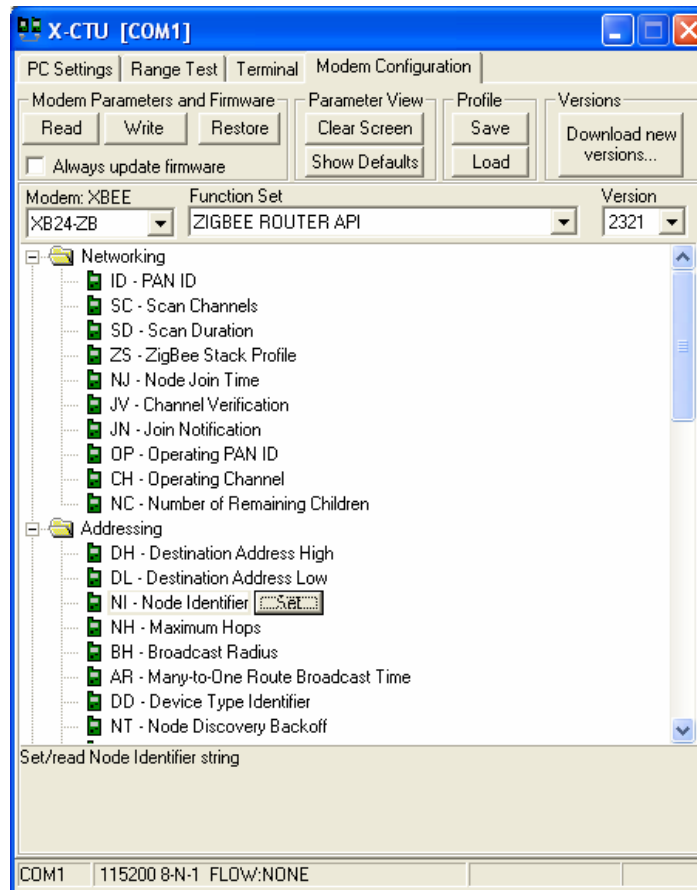
9) Press Read Button
10) Update NI – Node Identifier Value with desired Network ID
11) Press Write Button
12) DONE

2. Getting Started

2.1 Buttons and Connectors

2.2 Battery Voltage Indicator

The battery voltage indicator is located in the upper right hand corner of the screen. The number of bars signifies the amount of voltage in the battery with three bars indicating full voltage. Low voltage will result in zero bars and the battery voltage indicator flashing. The handset will power off when the voltage drops below the minimum required threshold.
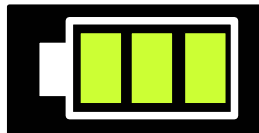
2.3 Charging the Battery

Charging the battery of the handset can be performed using a USB port or AC wall adapter. Handset operation is permitted while charging. The battery

TELEGRID Technologies, Inc.

indicator will cycle through the bars to indicate charging is in progress. Use only approved chargers with the WHD-310(V)1.

2.3.1 USB Charging

1. Attach the USB cable to the mini-USB cable on the bottom of the device.
2. Attach the USB cable to the USB port of a PC.

2.3.2 AC Wall Adapter Charging

1. Attach the AC wall adapter to the mini-USB cable on the bottom of the device.
2. Attach the AC wall adapter to a wall outlet.

2.4 Turning ON/OFF

To turn the device on and off simply press and hold the center button shown below.

2.5 Navigation Tool

The WHD-310(V)1 is a menu driven device. A 5-button lighted navigation tool is used to maneuver through the provided menus.   The navigation tool includes an up button, down button, left button, right button and center button as shown below:

In most instances the left button can be used to go back to the previous menu.

2.6 IDLE mode

To save power the device will automatically go into an idle mode state when no function of the device has been used for a certain period of time. Press any button to deactivate IDLE mode and return to the last screen.

3. Using the Menu

The device offers an extensive range of functionality that is grouped in a series of color menus. The main menu is shown below:

3.1 Scrolling

To access available menu items simply scroll using the up and down button. The left button will return to the previous menu.

3.2 List of Menu Functions

- **MAIN MENU**
  - o Contacts
    - Contact List
    - Add Contact
    - Add Group
  - o Messaging
    - New Message
    - Inbox (# in Inbox)
    - Outbox (# in Outbox)
  - o Network
    - Network Info
    - Find Network
    - Node Search
    - Change Channel
  - o GPS
    - View Position
    - Save Position
    - Upload
    - Enable/Disable GPS
  - o Settings
    - Clock Settings
      - Set Date & Time
      - Sync to GPS
      - Local Offset
    - Sound Control
- **MESSAGE DETAILS**
  - o Main Menu
  - o Reply
  - o Delete
- **NODE LIST**

TELEGRID
Technologies, Inc.

- o Send Txt Msg
- o Add Contact
- o Main Menu
- **CONTACT LIST**
- o Send Txt Msg
- o Remove Contact
- o Main Menu

4. Menu Functions

4.1 User Settings

User settings can be accessed by performing the following steps:

Main Menu → Settings

4.1.1 Clock Settings

4.1.1.1 Set Date & Time

The device contains a real-time clock that will maintain the correct date and time when the device is off or the battery is depleted. The real time clock uses a back-up battery in absence of the main battery supply. The date and time are displayed on the main menu screen. The user can set the clock manually by performing the following steps:

Main Menu → Settings → Clock Settings → Set Date and Time
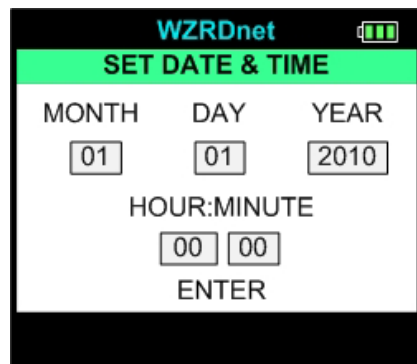
Use the up button to move through the numbers. Use the right button to go to the next section. Press the center button to store the new date and time settings.

4.1.1.2 Sync to GPS Clock

Sync the time to the GPS clock by performing the following steps:

Main Menu → Settings → Clock Settings →Sync to GPS

4.1.1.3 Local Offset

GPS time is transmitted in Greenwich Mean Time (GMT). The user can create a local time offset by doing the following:

Main Menu → Settings → Clock Settings →Local Offset

4.1.2 Sound Control

The device contains a volume control feature that the user can set from the interface by performing the following steps:

Main Menu → Settings → Sound Control

The current volume is displayed on the bottom of the screen. Use the up and down button to adjust the volume. Press the center button to save the volume setting.

4.1.3 Encryption Key Update Interval

If security is enabled the Network Key will be updated periodically by the Coordinator as described above. In order to establish the Key Update Interval, the Coordinator will access a screen on the handset that allows setting a specified number of hours or days.

4.2 Network Management

The network management tools can be accessed by performing the following steps:

Main Menu → Network

4.2.1 Network Info
The Network Info screen displays the devices network information including the following:

- Node Identifier String
- 64 bit IEEE MAC Address
- 16 bit Network Address
- Channel
- 64 bit PAN ID

4.2.2 Find Network
The WHD-310(V)1 is capable of sending out a node discovery request to update the list of available nodes. The number of node responding will be displayed in real time. Upon completion of the node search the screen will display a list of nodes found.

4.2.3 Node List
When all available nodes have been found the node list will be displayed. To add a node scroll through the list and highlight the desired node. Press the center button and select Add Contact from the pop-up menu. The pop-menu features the following options:

- Send a text message
- Add to contacts
- Return to Main menu.

After adding a contact press the left button to return to the node list. To begin a call with a node in the node list, highlight the desired node and press the PTT button.

4.2.4 Node Search
The Node Search function allows the user to search for a specific node based on the Node Identifier String. The system will display a virtual keyboard to enter the ID. The system will check locally for the node using

a node discovery. If the node is not found, the system will then query the Gateway for the node information. The system will then display if the node was found. If the node was found the system will provide the following pop-menu featuring the following options:

- Send a text message
- Add to contacts
- Return to Main menu.

To begin a call with the node, press the PTT button.

4.2.5 Change Channel

If a channel becomes crowded it is possible for the network coordinator to switch to a new channel. Turn off the handset and wait for the network coordinator to establish the network on a new channel. Each handset must change channel one at a time. While changing channel no handset on the old channel can be powered on. When notified by the network coordinator, turn the handset back on and perform the following steps:

Main Menu → Network → Change Channel

4.3 Contacts

The user can maintain a list of personal contacts in the device. The contacts are a subset of the network node list.   The contacts can be accessed by performing the following steps:

Main Menu → Contacts

4.3.1 Contact List

An alphabetical list of contacts can be accessed as follows:

Main Menu → Contacts → Contact List

4.3.2 Adding Contacts

Nodes can be added to the contact list directly from the node list by performing either of the following steps:

Main Menu → Contacts → Add Contact
Main Menu → Network → Find Network

A node discovery will be performed and the user can add a contact per the instructions above. Pressing the left button will return the user to the node list.

4.3.3 Navigation
The user can scroll through the list using the up and down buttons. Pressing the center button will allow the user to create a text message. Pressing the PTT button will send a call invitation.

4.3.4 Removing Contacts
Contacts can be removed from the list by performing the following steps:

Main Menu → Contacts → Contact List

Highlight the contact the desired contact and press the center button. Select Remove Contact from the pop-up menu and press the center button.

5. WZRDtalk

5.1 Call Initiation

5.1.1 WHD-310(V)1 to WHD-310(V)1
A call begins by selecting a node from the contact list or the node list by performing the following steps:

Main Menu → Contacts
or
Main Menu → Network → Find Network.

Highlight the desired recipient and simply **press and hold** the PTT button on the side of the device. The selected recipients ID will appear in **RED** on the screen.

5.1.2 External Network Calling

5.1.2.1 Dial-Pad
The handset includes an external call feature for Wide Area Network access. The user can access the numeric keypad by performing the following steps:

Main Menu → Contacts → External Dial

TELEGRID
Technologies, Inc.

Upon selecting the external call option a numeric dial pad will appear on the LCD screen. Enter a phone number manually using the 5-button navigation tool. After the number has been entered simply **press and hold** the PTT button on the side of the device. The entered phone number will appear in **RED** on the screen.

5.1.2.2 Contact List

External phone numbers can be stored in the contact list for later use. To add an External Network contact, enter the number and select SAVE from the dial pad. An alphanumeric keypad will appear to enter a contact description. The name will appear in **BLACK** in the contact list in order to distinguish it from WZRDnet contacts.

5.2 Call Invitation

After a call is initiated an invitation is sent to the recipient to check their status and alert them to the inbound call. If available the recipient will see the following:
- The caller's ID will appear in **RED** and then **BLUE** on the LCD
- A single audible beep will be sounded.

5.3 Call Establishment

The system will make 2 attempts to connect to the recipient within the local network. If the device is unavailable locally it will try to contact to a remote WZRDnet network through theWZRDgate. If the recipient is available the caller will the following:
- The recipient's ID will turn to **BLUE** on the LCD
- A double audible beep will be sounded.

The caller can then begin speaking.

5.4 Call Termination

A call is terminated by releasing the PTT button. Upon termination the caller's LCD will display the recipient's IDs in **BLACK** and the recipient's LCD will display the caller's IDs in **BLACK.**

TELEGRID
Technologies, Inc.

32

If no call activity occurs within 15 seconds the system will return to the main menu.

5.5   Speed Dial

WZRDtalk provides a quick mechanism to redial the last caller. The system retains the address information of the most recent caller/ recipient.

This address can be called quickly by simply pressing and holding the PTT button. The most recent caller/ recipient is also retained through a power cycle.

6.   WZRDgroup

6.1   Group Establishment

Talk Groups are defined and established by individual users in the system. Users will define a name for the new group and add it to their handsets. Users can be added or removed as often as necessary. An alert will be forwarded to the existing members of the group declaring the arrival of a new member or the removal of a member.

6.2   Group Maintenance

Talk groups are maintained in the handset and do not require a third party group administrator. The user is allowed to add, remove and view talk groups from the handset.

6.2.1   Group List Display

Talk Groups are displayed in red and uppercase in the Contact List.

6.2.2   Add Group

To add a group perform the following:

Main Menu → Contacts → Add Group

A virtual keyboard will be displayed to enter the new talk group name. When the new name is entered press the save button. A message indicating that the new group was added will be displayed. A message will then be forwarded to the existing members of the group declaring the new member. The following alert will notify members of the new member and the associated talk group:

NEW MEMBER
PRO13
GRP1

6.2.3 Remove Group

A member can remove themselves from the group by selecting the Talk Group from the contact list. A sub-menu will pop-up and the user will select remove. A message indicating the group was removed will be displayed. A message will then be forwarded to the existing members of the group declaring the member has been removed. The following alert will notify members of the group the name of the member that was removed and the associated talk group:

<div align="center">

MEMBER LEFT
PRO13
GRP1

</div>

6.3 Call Establishment

Talk group calls are initiated the same way as a unicast calls. The group is highlighted in the Contact List and the PTT button is pressed. The speed dial feature will maintain a talk group if it was the most recent caller/ recipient.

6.4 Call Display

Talk Group calls alert the user in the same mechanism as unicast calls. The user will see the name of the node who is speaking as well as the name of the Talk Group. The name of the Talk Group will appear in red above the name of the node who is speaking. Pressing the PTT button will call back the entire group not the last node speaking.

7. WZRDtext

7.1 Message Creation

A new text message can be created in the following ways:

> **Main Menu → Contacts**.
> **Main Menu → Find Network**
> **Main Menu → Messaging → New Message**.

Highlight the desired node and press the center button. Select **NEW TXT MSG** from the pop-up menu and a virtual keyboard will be displayed.

7.1.1 Virtual Keyboard

WZRDtext contains a full on-screen QWERTY keyboard.   The keys can be maneuvered using the up, down, left and right button buttons. When the desired key is highlighted, press the center button and it will be added to the message.

TELEGRID
Technologies, Inc.

7.2 Message Received Status

The destination will send an ACK to confirm the message has been received. The Outbox will display messages in **RED** that were not received while messages displayed in **GREEN** were received.

7.3 Incoming Message Alert

Upon receipt of the message the system will do the following:
- A new message pop-up will appear on the display
- A single audible beep will be sounded.

7.4 Reading a Message

When a message is received, the full message details will be displayed by pressing the center button. Pressing the left button will remove the pop-up and return the user to the prior screen.

7.4.1 Message Details

The message will contain the following details:

- Senders Node ID
- Full Message Text
- Local Received Timestamp

7.4.2 Message Options

When reading a messing the following options will be displayed by pressing center button:

- Main Menu
- Reply
- Delete

7.5 Replying to a Message

By selecting reply the virtual keyboard will be displayed with the recipient's Node Identifier String displayed at the top.

TELEGRID
Technologies, Inc.

7.6 Deleting a Message

By selecting delete the message is removed from the system.

7.7 Message Archive

The device will maintain the 30 most recently received messages and 30 most recently sent messages. All messages will be automatically saved until the user selects them for deletion.

To view received messages to the following:

Main Menu → Messaging → Inbox (# of messages)

To view sent messages to the following:

Main Menu → Messaging → Outbox (# of messages)

Scroll through the list of messages using the up and down buttons. To see the full message screen highlight a message and press the center button.

8. WZRDchat

WZRDchat is the PC application used to send and receive text messages through an attached node. The main screen of the WZRDchat application is shown below:
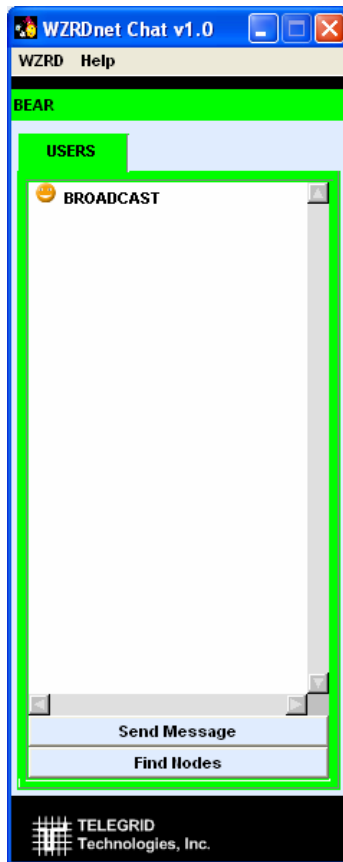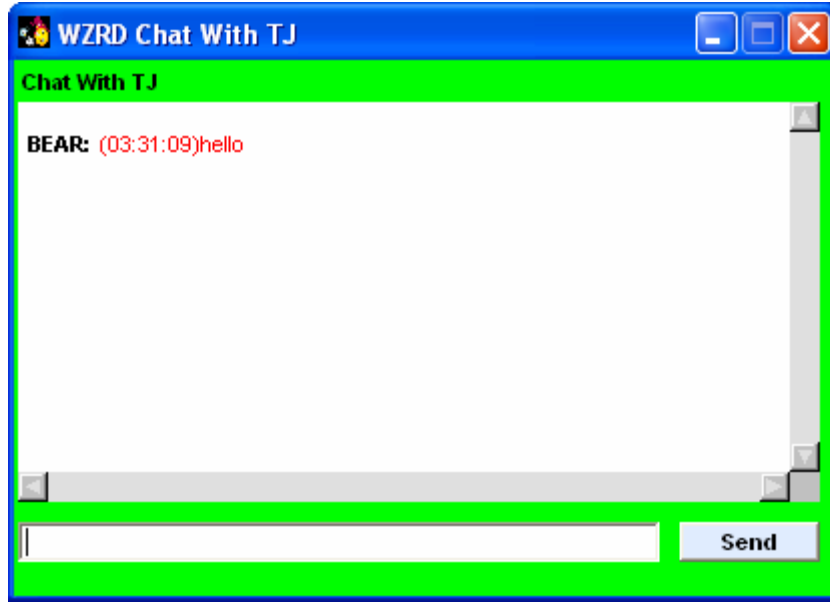
8.1 Node Discovery

A node discovery can be performed by selecting **Find Nodes**. The list of available nodes will update as responses are received.

8.2 New Message

To create a new message, highlight the desired node, and select **Send Message**. A new chat window will appear.

The new chat window will also appear by double-clicking on the node ID. Type a message and press send to transmit. The message and all responses including the timestamp will appear in the section above.

9. WZRDalert

WZRDalert broadcasts a text message to all users on the network. To send a broadcast message perform the following steps:

Main Menu → Messaging →Broadcast

The virtual keyboard will be displayed.

10. GPS

The device contains a GPS receiver to allow viewing and saving coordinates. The GPS menu can be accessed by performing the following steps:

Main Menu → GPS

10.1 View Position

The user can view their GPS location by performing the following steps:

Main Menu → GPS →View Position

The screen will display Searching for Signal followed by the handset's latitude and longitude.

10.2 Save Position

To save a location with a description perform the following steps:

Main Menu → GPS →Save Position

Enter a description using the keypad and the location will then be saved in the system for future upload.

10.3 Upload GPS Coordinates

In order to upload saved GPS coordinates the user will perform the following steps:

1) Plug USB connector into device and then connect to a PC.
2) Open WZRDChat application
3) Go to **Main Menu → GPS →Upload**
4) WZRDChat will alert the user that a file is ready for upload and prompt for a location to save the file.
5) WZRDChat will alert the user when the upload is complete.

10.4 Enable/Disable GPS

The GPS feature can be disabled or enabled by performing the following steps:

Main Menu → GPS →Disable GPS/ Enable GPS

SECTION 10: PRODUCT AND SAFETY INFORMATION

1. Safety Information

1.1 WHD-310(V)1 Information

Do not disassemble, crush, open, bend, deform, microwave or puncture device.
Avoid dropping device.
Avoid excessive pressure on device.
Do not expose to extreme temperatures, liquid, moisture, or high humidity.
Device contains small parts risk which may present a choking hazard.
Keep metal objects away from connectors and battery terminals.
Do not expose to open flames.
Do not dispose of device in fire or water. Recycle or dispose of device according to local regulations.
Do not use harsh chemicals, aerosol cleaners or solvents to clean the device
Avoid dramatic shifts in temp as will cause moisture. Allow sufficient time for moisture to evaporate before using the device.
Avoid pushing objects into the device as this action might cause a short circuit, a fire, or electric shock. Never force a connector into a port
Do not disassemble device or accessories.
Do not repair or service the device yourself.
Turn your device OFF where posted notices so require.
Failure to observe all safety instructions will void Warranty.

1.2 Battery Information

The WHD-310(V)1 contains rechargeable Lithium Ion batteries. Lithium Ion batteries pose a risk of fire, explosion, leakage, or other hazard. Replace only with approved batteries. Recycle or dispose of used batteries according to local regulations.

Use only approved batteries and chargers. Use of an unapproved battery or charger may present a risk of fire, explosion, leakage, or other hazard.
Do not disassemble, crush, open, bend, deform, microwave or puncture battery.
Avoid dropping battery.

TELEGRID
Technologies, Inc.

Keep metal objects away from battery terminals.

Do not expose battery to extreme temperatures, fire, direct sunlight, liquid, moisture, or high humidity.

Do not use batteries that appear damaged, deformed, discolored, rust or emits foul odor.

In the event the battery leaks and the fluid gets into one's eye, do not rub the eye. Rinse well with water and immediately seek medical care. If left untreated, the battery fluid could cause damage to the eye.

Do not use charger if the power cord or plug has become frayed or damaged; The charger is exposed to rain, liquid, or excessive moisture; The charger has become damaged.

1.3   Antenna

Use only approved replacement antennas. Unauthorized antennas or modifications could damage your device or result in a violation of FCC regulations.

Do not use any device that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

1.4   Health and General Use

Loud speaker can cause hearing loss. Keep device away from head and set volume to a safe level. When using the earpiece set volume to a safe level. Use of earpiece at high volume can lead to hearing loss.

Avoid repetitive motion and take frequent breaks when using the device.

Avoid use on Aircraft. RF Interference might disrupt instrumentation, communication and performance; Might disrupt the network; Might be illegal. Turn your device OFF before boarding an aircraft. Always request and obtain prior consent and approval of an authorized airline representative before using your device aboard an aircraft. Always follow the instructions of the airline representative whenever using your device aboard an aircraft, to prevent any possible interference with airborne electronic equipment

Do not place the device in the area over an air bag or in the air bag deployment area. Air bags inflate with great force. If a device is placed in the air bag deployment area and the air bag inflates, the device may be propelled with great force and cause serious injury to occupants of the vehicle.

Do not use in explosive atmosphere in presence of explosive fumes, explosive dust, or other explosive chemicals. Sparks could cause fire or explosion resulting in serious injury or death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fueling areas such as gasoline or petrol stations; below deck on boats; fuel or chemical transfer or storage facilities; vehicles

TELEGRID
Technologies, Inc.

using liquefied petroleum gas (such as propane or butane); areas where the air contains chemicals or particles, such as grain, dust, or metal powders; and any other area where you would normally be advised to turn off your vehicle engine.

Blasting areas: To avoid interfering with blasting operations, turn off all wireless connections on the BlackBerry device when in a "blasting area" or in areas posted: "Turn off two-way radio". Obey all signs and instructions.

Use of device when driving, riding or walking is not recommended and is illegal in some areas. Comply with local laws and regulations regarding use of wireless devices when driving, riding or walking.

Pacemakers: The Advanced Medical Technology Association (AdvaMed) recommends that a minimum separation of 6 inches (15 centimeters) be maintained between a handheld wireless device and a pacemaker.

These recommendations are consistent with those of the U.S. Food and Drug Administration.

Persons with pacemakers should:

- ALWAYS keep the device more than 6 inches (15 centimeters) from their pacemaker when the device is turned ON.
- Not carry the device in the breast pocket.
- Use the ear opposite the pacemaker to minimize the potential for interference.
- Turn the device OFF immediately if you have any reason to suspect that interference is taking place.

Hearing Aids: Some digital wireless radios may interfere with some hearing aids. In the event of such interference, you may want to consult your hearing aid manufacturer to discuss alternatives.

This device may cause RF Interference with other personal medical equipment. Consult manufacturer of medical device to determine if it is adequately shielded

Do not rely on this phone during emergencies. All wireless devices operate using radio signals which cannot guarantee a connection at all times due to network availability or environmental interference.

2. Certifications

FCC ID: XAYWHD310V1
IC ID: 9251A-WHD310V1

2.1 FCC Notice

This 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.

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 instruction manual, 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:

- Re-orient 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.

Warning: Changes or modifications not expressly approved by TELEGRID Technologies, Inc. could void the user's authority to operate the equipment.

2.2 Industry Canada (IC)

This device complies with the Class B limits for radio noise emissions as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICE-003 of Industry Canada. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada. This Category II radiocommunication device complies with Industry Canada Standard RSS-310. Ce dispositif de radiocommunication de catégorie II respecte la norme CNR-310 d'Industrie Canada. This device complies with RSS 210 of Industry Canada under certification number 9251A-WHD310V1.

3.   Legal Notices

3.1 Copyright

3.2 Software Copyright Notice

TELEGRID Technologies, Inc. products may include copyrighted TELEGRID Technologies, Inc. and third-party software stored in semiconductor memories or other media. Laws in the United States and other countries preserve for TELEGRID Technologies, Inc. and third-party software providers certain exclusive rights for copyrighted software, such as the exclusive rights to distribute or reproduce the copyrighted software. Accordingly, any copyrighted software contained in TELEGRID Technologies, Inc. products may not be modified, reverse-engineered, distributed, or reproduced in any manner to the extent allowed by law. Furthermore, the purchase of TELEGRID Technologies, Inc. products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents, or patent applications of TELEGRID Technologies, Inc. or any third-party software provider, except for the normal, non-exclusive, royalty-free license to use that arises by operation of law in the sale of a product.

Java is a trademark of Sun Microsystems, Inc.

3.3 Jurisdiction

This Customer's rights and obligations shall be governed and construed pursuant to the laws of the State of New Jersey; (b) Any lawsuit concerning this product shall be brought in a court of competent jurisdiction in Essex County, New Jersey; (c) Customer consents to be subject to the jurisdiction of the state or federal courts located in Essex County, New Jersey; (d) Customer may not assign this Agreement except with TELEGRID's prior written approval; (e) No action may be brought by the Customer more than one year after the cause of action has occurred;