WhereWand II

With VSS 3.1 (or later)

User's Guide

Configuration Utilities For

WhereTags, WherePorts, and Location Sensors

WhereNet

Typographical Conventions

Warnings call attention to a procedure or practice that could result in personal injury if not correctly performed. Do not proceed until you fully understand and meet the required conditions.

Cautions call attention to an operation procedure or practice that could damage the product, or degrade performance if not correctly performed. Do not proceed until understanding and meeting these required conditions.

Note

Notes provide information that can be helpful in understanding the operation of the product.

Document Revision History

Revision	Description of Changes	Date	Approved
A	Release WhereWand User's Guide		D. Olsen

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D1258 rev A

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1   NOTICES AND REQUIREMENTS

1.1   FCC Requirements

This device complies with Part 15 of FCC (Federal Communication Commission) rules. See FCC registration label, located on the bottom of the equipment for the FCC registration. 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.

This equipment has been tested and found to comply with the limits of Class B devices, pursuant to Part 15 of the FCC Rules.

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numerique de la class B est conforme a la norme NMB-003 du Canada.

Radio Equipment Authorization: FCC ID: NSQWND-2100-00AA

                                                                IC: 3586B-WND2100

1.2 RF Notice

The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Any changes or modifications to WhereNet Corporation equipment not expressly approved by WhereNet Corporation could void the user's authority to operate the equipment.

2 SYSTEM OVERVIEW

2.1 WhereNet RLTS System

The WhereNet real time location system (RTLS) is designed to permit users to determine the position of tagged assets in both indoor and outdoor applications. Each WhereTag autonomously emits a 2.4 GHz direct sequence spread spectrum (DSSS) radio signal at predetermined blink intervals, in response to switch events, and/or in response to WherePort devices. The signal transmitted by the WhereTag is received by the WhereNet infrastructure which decodes that tag's transmission, extracts the data, and determines the tag's location using several different algorithms.

The WhereNet RLTS consists of WhereTag/WhereCall tags, WherePorts, WhereWands, Location Sensors, and the server based Visibility Suite software.

WherePorts generate a magnetic field in a localized area. WherePort devices can be used in places where the user wants to know immediately that the tagged asset has entered the zone covered by the WherePort field. The WhereTag devices can be configured to blink rapidly several times when they enter a WherePort field. When the tag blinks in response to entering a WherePort field, the ID of the WherePort is included in the tag transmission.

WhereWands are used to configure WhereTags, WhereCalls, WherePorts, and Location Sensors. This document will detail the operation and use of the WhereWand.

Location Sensors receive DSSS blinks from the tags and demodulate the signal, time stamp the blink, and send the tag ID and any associated data included in the blink to the server over the LAN.

2.2   WhereWand Hand Held Programmer

Note

All references to the WhereWand product in this document assume VSS 3.0 (or greater) Tag Utilities are loaded on the WhereWand; prior versions of the Tag Utilities do not support all features listed in this document.

The WhereWand Hand Held Programmer consists of Handheld Computer with an external WhereWand adapter with an integral antenna assembly. The WhereWand is capable of two-way wireless communication with WhereTag and WhereCall tag devices. The WhereWand is also capable of wired communication with WherePort devices. The third capability of the WhereWand is wireless communications with the Location Sensor in the WhereNet G2 infrastructure.

The WhereWand communicates with WhereTag II/III/IV devices by sending magnetic FSK data to the tag and receiving on-off keyed / frequency shift keyed (OOK/FSK) RF data from the tag. The WhereWand communicates with WhereCall and WhereTag I devices by transmitting and receiving OOK/FSK RF data to and from the tag. Communication with the WhereTag and WhereCall allow the user to set tag configuration parameters such as DSSS blink intervals and tag responses to such stimuli as WherePorts and/or switch/telemetry inputs. It also allows the user to read back configuration and other data from the tag. The WhereWand will automatically select the proper communication protocol scheme based on the tag's unique identification number

- Tag IDs between 0 and 16,777,215 are WhereCall or WhereTag I
- Tag IDs between 16,777,216 and 17,099,999 are WhereTag II V2.0
- Tag IDs between 17,100,000 and 17,999,999 are WhereTag II V2.1
- Tag IDs greater than 18,000,000 are WhereTag III or IV devices

The WhereWand communicates with WherePort II or III devices using the configuration cable included with the WhereWand. This bi-directional interface

allows the user to configure WherePort devices and read back the configuration. WherePort configuration parameters include WherePort ID, power level, phase setting, and tag response.

The WhereWand communicates with the Location Sensor by transmitting DSSS messages containing the desired configuration data or test mode. This is a transmit only operation and the Location Sensor will not transmit anything back to the WhereWand, but the Location Sensor will flash its LEDs to indicate communications are in progress.

2.3   Power Management

The WhereWand II's power management is handled by the application software installed on the handheld computer. The WhereWand II Adapter PCBA itself will shut off the on-board high frequency RF clock while it is not transmitting to further reduce current consumption. The WhereWand II Adapter ships with rechargeable Lithium batteries.

Any time the WhereWand Programmer is not in use, it should be placed into its battery charger cradle. Refer to the terminal's Original Equipment Manufacturer documentation included with the product.

2.4 Software Requirements

WhereNet Corporation has developed and installed the software to ensure that the WhereNet Adapter unit is recognized by the handheld computer, that the appropriate I/O and memory resources are allocated, and the user application software will operate.

2.5 Package Contents

WhereWand II Programmer Handheld Computer

Handheld serial port adapter

Docking Station / Battery Charger

Power Supply for docking station

Serial cable for downloading software to the handheld computer

WhereWand II Adapter unit

Connection cable from handheld to WhereWand II Adapter unit/battery pack

Configuration cable for WhereWand II to WherePort II/III communications

Carrying Case for WhereWand II Adapter and battery pack

Software installation diskette

3 OPERATION

3.1 Configuration and Setup

The WhereWand II Programmer does not require any special configuration or setup to operate with the application software loaded on the handheld computer. The software is stored in non-volatile memory in the WhereWand. If the WhereWand is left off for long periods of time without being placed in the battery charging cradle, it is possible that the backup battery used to keep the memory may completely discharge. If this does happen, the software can be reloaded using the WhereTools PDT Installer included with VSS. This program is run on a laptop or desktop computer connected to the battery charging dock with the serial cable.

The PDT Installer can be launched through the Microsoft Windows start menu by:

At Windows desktop, click   **Start >>**
                                            Programs >>
                                                   WhereNet Visibility Server Software >>
                                                         WhereTools >>
                                                               PDT Install.
Then select **WhereWand Utilities** and then click the **Next** button and follow the

on screen instructions as shown in Appendix A.

3.2   Starting the WhereWand Application

The WhereWand Programmer application software should automatically run on

power up of the handheld computer. Typing "HH" from the DOS C:\ prompt will

also start the application software. As the program is loading, the screen shown in

figure 1 is displayed. Once the program is loaded, the welcome screen shown in

figure 2 will be displayed.

Figure 1: Loading Screen

Figure 2: Welcome Screen

The user presses the <Enter> key on the handheld to bring up the WhereWand utilities main menu. The main menu is shown in figure 3.
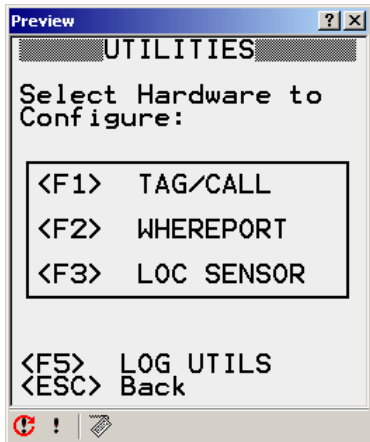
Figure 3: Main Utilities Menu Screen

4   WHERETAG/WHERECALL UTILITIES

The user enters the WhereTag / WhereCall utilities by pressing <F1> from the main utilities screen. The WhereTag / WhereCall utilities allow the user to configure and read tags. The tag utilities screen is shown in figure 4.
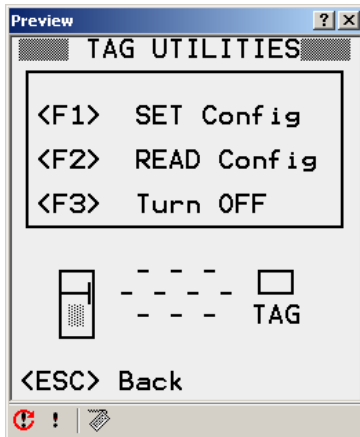
Figure 4: Tag Utilities

Pressing <F1> puts the user into the set configuration mode. The user can select from one of the default configuration tag types or set up a custom configuration. Figure 5 shows the set configuration options. The WhereWand will automatically determine the correct protocol for communicating with the WhereTag or WhereCall based on the tag's unique identification on the bar code label.

Figure 5: Set Tag Configuration

4.1   Default Configurations

Selecting one of the default configurations options <F1> through <F4> from SET CONFIG screen will bring up the appropriate tag ID entry screen. The user can either scan the tag bar code with the laser scanner on the WhereWand, or manually type the tag ID using the WhereWand keypad and then hitting <Enter>. The WhereWand will then open the tag communications link and send the default configuration. Once the tag has been successfully configured, the WhereWand will indicate the status of the communications. Figure 6 shows the default configuration tag ID entry screens. Figure 7 shows the communications success screen. To see what the default configuration settings are, the user can configure a tag and then read the configuration back.
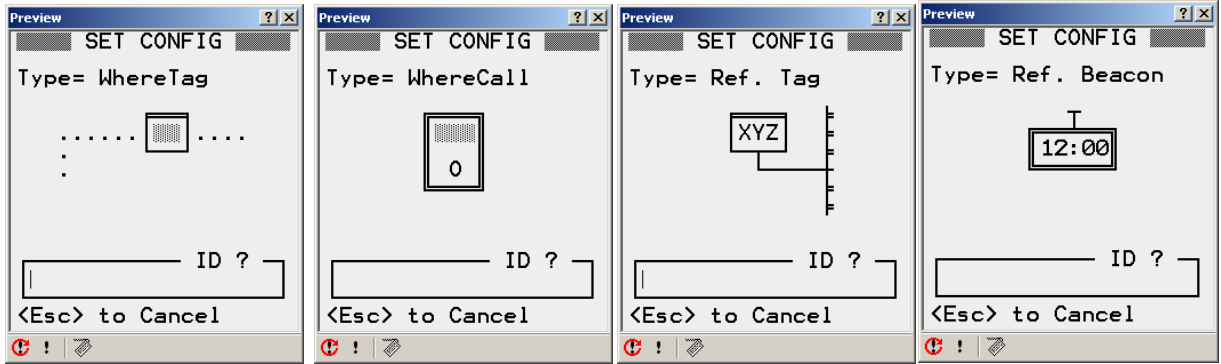
Figure 6: WhereTag Default Config ID Entry Screen
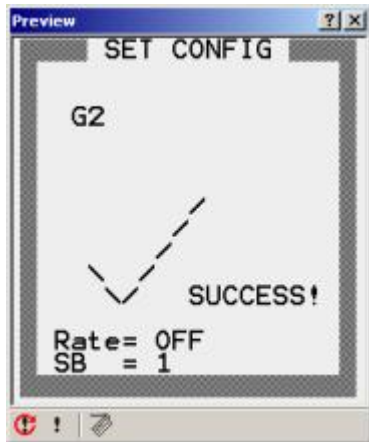
Figure 7: Configuration Success

4.2   Custom Configuration

Select Custom <F5> from the SET CONFIG screen will allow the user to configure all of the available tag parameters to meet unique application requirements. Table 1 describes each of the configurable parameters that the user can access through the screens shown in figures 8 and 9. Figure 10 shows the tag ID entry screen. The user can move between screens shown in figures 8 through 10 using <Enter> and <Esc>. Once the user has changed the desired parameter and presses <Enter> the WhereWand will bring up the tag ID entry screen. The user can either scan the tag bar code with the laser scanner on the WhereWand, or manually type the tag ID using the WhereWand keypad and then hitting <Enter>. The WhereWand will then open the tag communications link and send the custom configuration. Once the tag has been successfully configured, the WhereWand will indicate the status of the communications.


```
Preview                  [?][X]
░░░░░  SET CONFIG  ░░░░░

A> Rate=            OFF

B> WP Count=          0
C> WP Interval=    0.5
D> WP Retriggr=    1sL

E> Sw Count=          0
F> Sw Interval=    0.5
G> Sw Retriggr= 0.5s


<Enter> Next
<Esc> Back
<S> Set Defaults

C  !  |
```

Figure 8: Custom Config Screen 1

Figure 9: Custom Config Screen 2
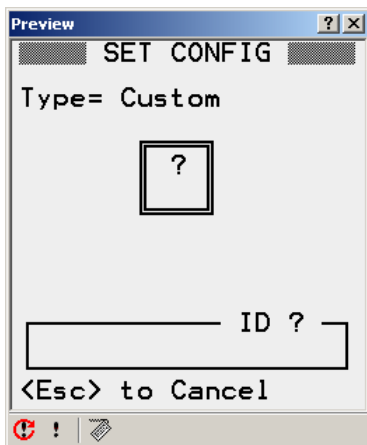
Figure 10: Custom Config Tag ID Entry

Table 1: Custom Configuration Parameters

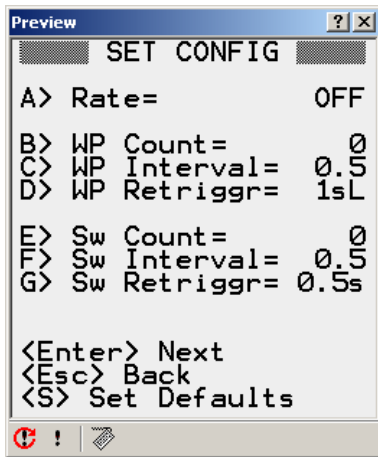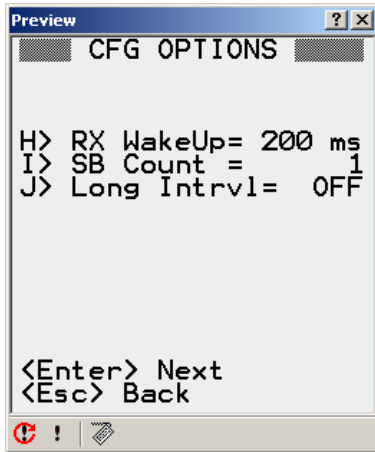| Key	Parameter	Description
<A>	Rate	The interval between tag's normal keep alive blinks. -> Range is from OFF to 5 seconds to 1 Hour
<B>	WP Count	The number of blinks the tag transmits in response to receiving a valid WherePort message. -> Range is from 0 to 15 blinks
<C>	WP Interval	The time between each of the WherePort blinks. -> Range is 5 seconds to 1 minute.
<D>	WP Retrigger	Set the time after blinking in response to a WherePort that the same WherePort ID is ignored and will not cause more tag blinks. -> Range is 1 second to 2 minutes, with 3 different modes.
<E>	Sw Count	The number of blinks the tag transmits in response to a level change on one of its switch or telemetry inputs. -> Range is from 0 to 15 blinks.
<F>	Sw Interval	The time between each of the switch event blinks -> Range is 5 seconds to 1 minute.
<G>	Sw Retrigger	The time after blinking in response to a switch event that the same event will be ignored and will not cause more tag blinks ->Range is ½ second to 1 minute.
<H>	RX Wakeup	Select between 200 msec and 500 msec receiver on interval
<I>	SB Count	Set the number of sub-blinks the tag sends in every blink -> Range is 1 to 8 sub-blinks.
<J>	Long Intrvl	Allows the tag to periodically send normal mode blinks with 12 bytes of data appended to the blink -> Settings are never, every 8th or 64th blink, or with every blink

More detail on the settings for each parameter is given in the following sections.

4.2.1 Custom Configuration Blink Rate

Selecting <A> Rate from the custom configuration screen 1 will allow the user to set the interval between normal keep alive blinks that the tag transmits and the infrastructure receives for locating the tag and collecting data from the tag. The normal keep alive blinks can be turned off by selecting <F1> OFF. The interval can range from 5 seconds up to over 2 hours (depending on tag type). As soon as the user selects one of the available intervals, the WhereWand application will return to custom configuration screen 1 to allow another parameter to be selected and modified. The user can press <Enter> to move between rate pages, or <ESC> to return to the previous menu. Figure 11 shows the blink interval settings available to the user.
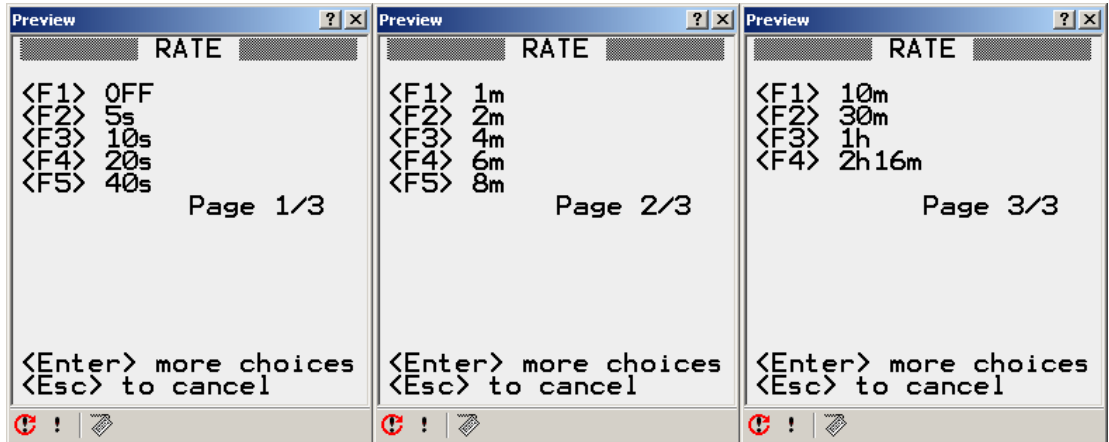
Figure 11: Custom Config Blink Rate

4.2.2   Custom Configuration WherePort Blink Count

Selecting <B> WP Count from the custom configuration screen 1 will allow the user to set the number of blinks the tag will send in response to receiving a valid WherePort message. These blinks will include the WherePort ID the tag received in the message. WherePort blinks can be disabled by selecting <F1> 0. The tag can send up to 15 blinks in response to a WherePort message. As soon as the user selects one of the available blink counts, the WhereWand application will return to custom configuration screen 1 to allow another parameter to be selected and modified. The user can press <Enter> to move between blink count pages, or <ESC> to return to the previous menu. Figure 12 shows the available blink counts. This configuration parameter applies only to tags with ID greater than 17,000,000.

Figure 12: Custom Config WP Blink Count

4.2.3 Custom Configuration WherePort Blink Interval

Selecting <C> WP Interval from the custom configuration screen 1 will allow the user to set the interval between each blink the tag sends in response to receiving a valid WherePort message. These blinks will include the WherePort ID the tag received in the message. The interval can range from 5 seconds to 1 minute. As soon as the user selects one of the available intervals, the WhereWand application will return to custom configuration screen 1 to allow another parameter to be selected and modified. The user can press <ESC> to return to the previous menu. Figure 13 shows the available intervals. This configuration parameter applies only to tags with ID greater than 17,000,000.
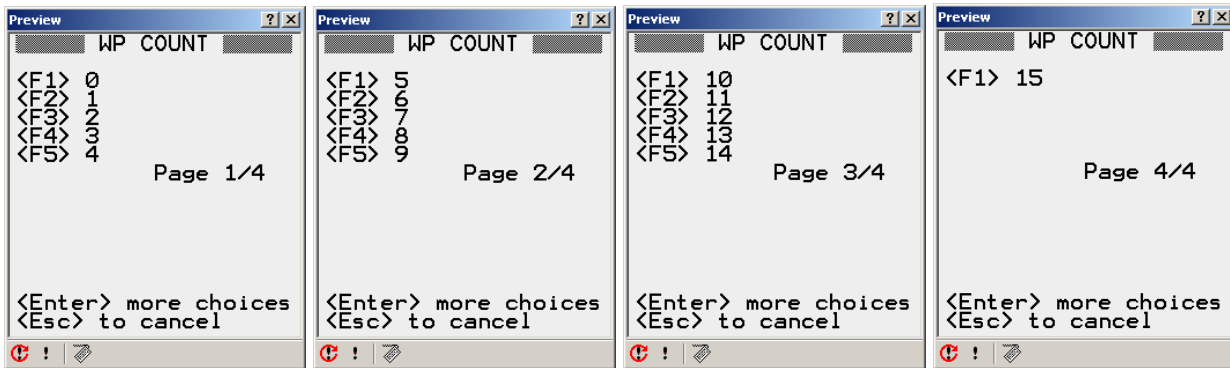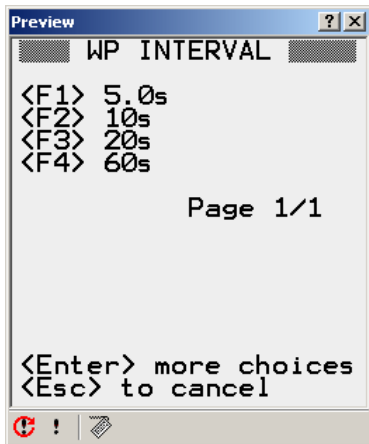

Figure 13: Custom Configuration WP Interval

4.2.4   Custom Configuration WherePort Retrigger

Selecting <D> WP Retrigger from the custom configuration screen 1 will allow the user to set the WherePort retrigger timeout and mode. The same WherePort ID will be ignored after causing tag blinks until the retrigger timeout expires. The mode selects the event that starts the timer. In retrigger mode 1 (values with 'L' added to the time in seconds) the retrigger timer starts after the tag sends its last WherePort blink from the previously received valid WherePort message. In retrigger mode 2 (values with 'E' added to the time in seconds) the retrigger timer will not start until the sends its last WherePort blink AND the tag has left the WherePort field. If the same WherePort message is received before the timer expires, the time is reloaded and the retrigger timeout starts over. In retrigger mode 3 (values with 'EF' added to the time in seconds) the retrigger timer operates the same as in mode 2, only when the timer does expire, the tag will send another set of WherePort blinks – with the "LEFT WP FIELD" bit set. The retrigger times can range from 1 second to 2 minutes. As soon as the user selects one of the available timeouts, the WhereWand application will return to custom configuration screen 1 to allow another parameter to be selected and modified. The user can press <Enter> to move to between the WherePort retrigger pages, or <ESC> to return to the previous menu. Anytime the tag enters the field of a different WherePort, the blinks and retrigger from the previous WherePort are aborted and the process begins for the new WherePort. Figure 14 shows the flow diagram of the blinks and retrigger for one WherePort. Figure 15 shows the available retrigger times. This configuration parameter applies only to tags with ID greater than 17,000,000.

WhereNet

```
┌─────────────────┐
│ Tag Enters      │
│ WherePort Field │
└─────────────────┘
         │
┌─────────────────┐
│ Tag transmits   │
│ WherePort blink │
└─────────────────┘
         │
┌─────────────────┐
│ Wait for WP Blink│
│ interval         │
└─────────────────┘
         │
    Are all required
No   WP blinks      Yes
     transmitted?

       Mode 2 or 3?
No, Mode 1            Yes

     Tag in same WP
No     Field?        Yes

┌─────────────────┐
│ Start Retrigger Time │
└─────────────────┘

     Has Retrigger
No   timer expired?  Yes

       Mode 2 or 3?
No, Mode 1            Yes

     Has tag re-
No   entered the same  Yes
     WP field?

              Mode 1 or 2
          No             Yes

     ┌─────────────────┐
     │ Tag sends WP Blink  │
     │ with most significant│
     │ bit set          │
     └─────────────────┘

     ┌─────────────────┐
     │ Wait for WP Blink │
     │ interval          │
     └─────────────────┘

          All blinks
     No   transmitted?  Yes

                    ┌──────┐
                    │ Done │
                    └──────┘
```
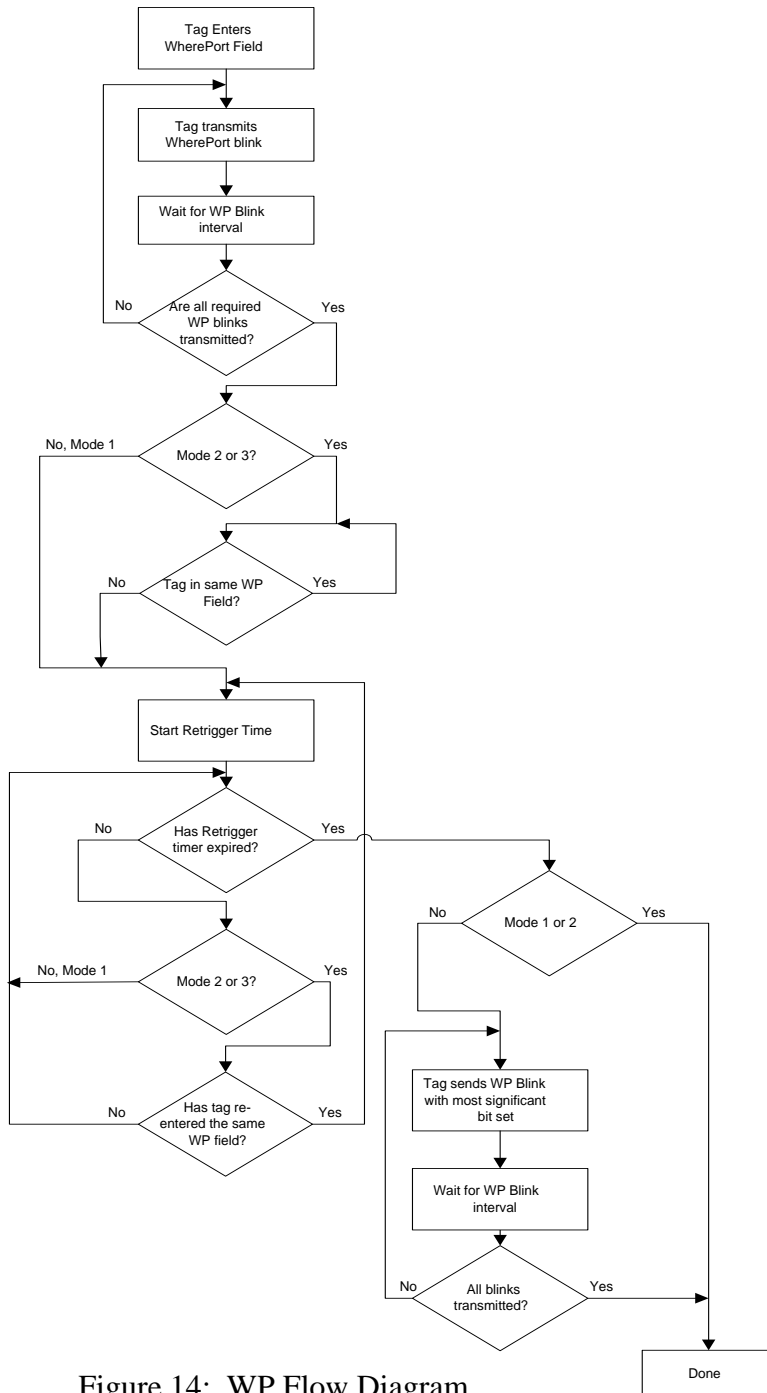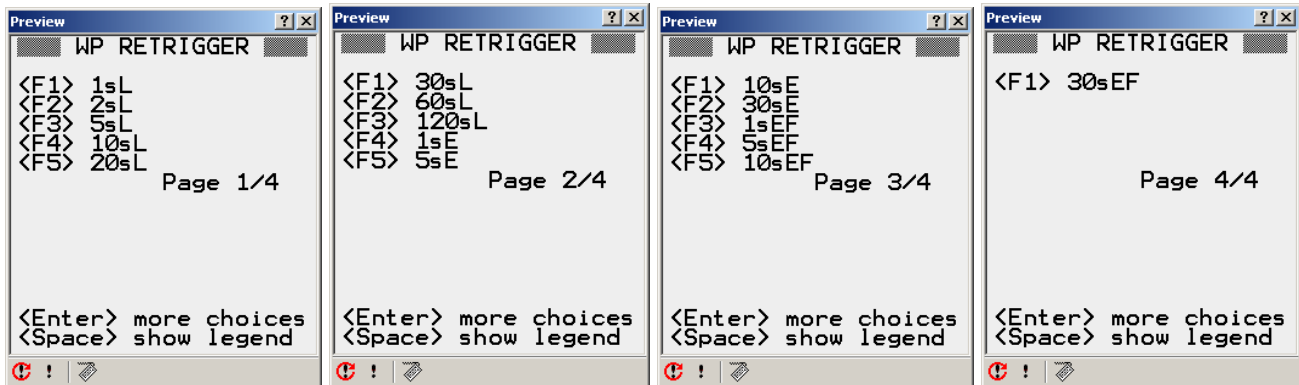
Figure 14: WP Flow Diagram

Figure 15: Custom Configuration WP Retrigger

4.2.5 Custom Configuration Switch Blink Count

Selecting <E> Sw Count from the custom configuration screen 1 will allow the user to set the number of blinks the tag sends in response to a level change on one of its switch or telemetry inputs. Switch event blinks can be disabled by selected <F1> 0. The tag can send up to 15 blinks in response to a switch event message. As soon as the user selects a blink count, the WhereWand application will return to custom configuration screen 2 to allow another parameter to be selected and modified. The user can press <Enter> to go between the blink count pages, or <ESC> to return to the previous menu. Figure 16 shows the available counts. This configuration parameter applies only to tags with ID greater than 17,000,000.
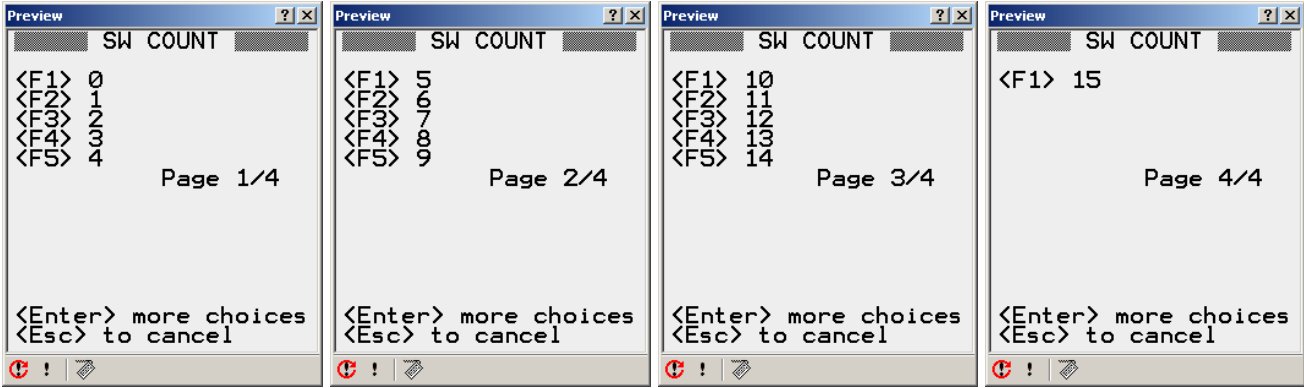
WhereNet

Figure 16: Custom Config Switch Blinks

4.2.6   Custom Configuration Switch Blink Interval

Selecting <F> Sw Interval from the custom configuration screen 1 will allow the user to set the interval between switch event blinks. As soon as the user selects an interval, the WhereWand application will return to custom configuration screen 2 to allow another parameter to be selected and modified. The user can press <ESC> to return to the previous menu. Figure 17 shows the available intervals. This configuration parameter applies only to tags with ID greater than 17,000,000.
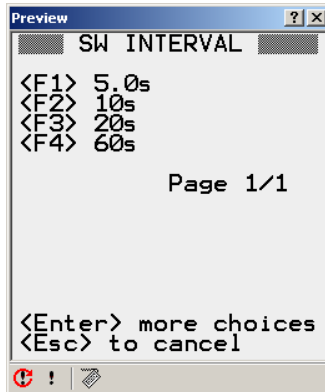
Figure 17: Custom Config Switch Blink Interval

4.2.7   Custom Configuration Switch Retrigger

Selecting <G> Sw Retrigger from the custom configuration screen 1 will allow the user to set the switch event retrigger time. The same switch event will be ignored until the retrigger timer expires. The timer starts after the tag has sent its last switch event blink. The retrigger times range from 1 second to over 1 minute. As soon as the user selects a retrigger time, the WhereWand application will return to custom configuration screen 2 to allow another parameter to be selected and modified. The user can press <Enter> to go between the retrigger pages, or <ESC> to return to the previous menu. Figure 18 shows the available intervals. This configuration parameter applies only to tags with ID greater than 17,000,000.
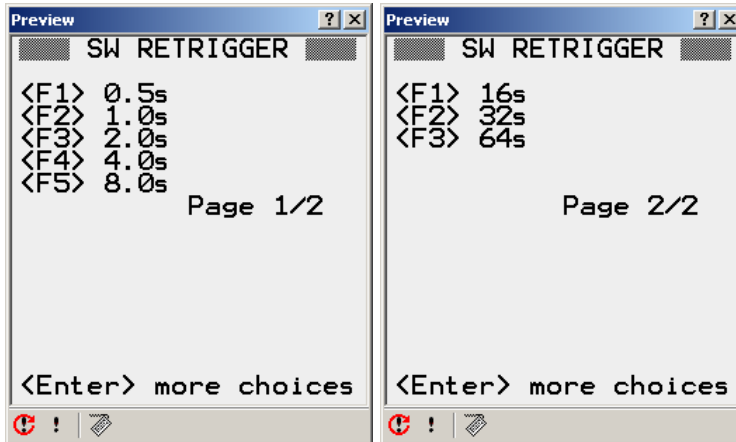
```
Preview                 ?|X|     Preview                 ?|X|
▓▓▓  SW RETRIGGER  ▓▓▓           ▓▓▓  SW RETRIGGER  ▓▓▓

<F1>  0.5s                      <F1>  16s
<F2>  1.0s                      <F2>  32s
<F3>  2.0s                      <F3>  64s
<F4>  4.0s
<F5>  8.0s
           Page 1/2                        Page 2/2




<Enter> more choices           <Enter> more choices
C ! ▒                          C ! ▒
```

Figure 18: Custom Config Switch Retrigger

4.2.8 Custom Configuration Receiver Wakeup Interval

Selecting <H> RX Wakeup from the custom configuration screen 2 will allow the user to set the receiver wakeup interval for the tag. The user can select 200 or 500 milliseconds. As soon as the user selects an interval, the WhereWand application will return to custom configuration screen 2 to allow another parameter to be selected and modified. The user can press <ESC> to return to the previous menu. Figure 19 shows the RX wakeup screen.

Note

Setting the receiver wakeup interval to 500 msec will result in significant degradation in WhereWand - to - tag communications and will also require the tag to be in a WherePort field longer to ensure the capture of the WherePort message.
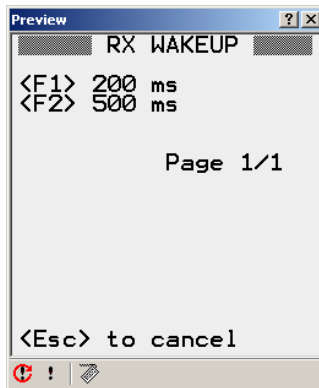

Figure 19: Custom Config RX Wakeup

4.2.9 Custom Configuration Number of Sub-blinks

Selecting <I> SB Count from the custom configuration screen 2 will allow the user to set the number of sub-blinks from 1 to 8 per blink. As soon as the user selects the number of sub-blinks, the WhereWand application will return to custom configuration screen 2 to allow another parameter to be selected and modified. The user can press <Enter> to go between the sub-blink pages, or <ESC> to return to the previous menu. Figure 20 shows the sub-blink screens.
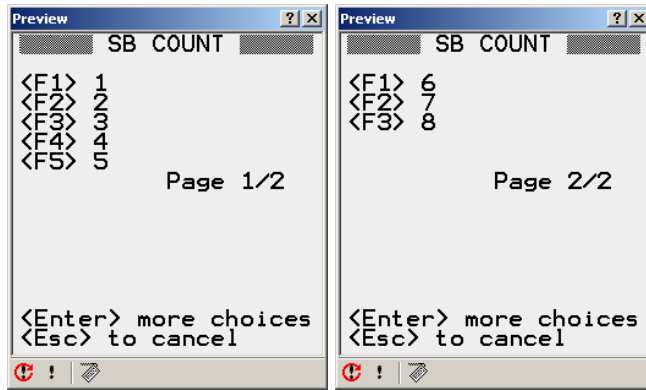

Figure 20: Custom Config Sub-blinks

Note

Changing the number of sub-blinks will have impacts on both system capacity and the reliability of the system in locating tags.

4.2.10 Custom Configuration Long Message Interval

Selecting <J> Long Intrvl from the custom configuration screen 2 will allow the user to set the tag up to periodically send long message blinks with the 12 byte tag data register contents appended to the message. This periodic long message can be disabled by selecting OFF, or it can be set to occur at every 8th or 64th normal keep alive blink. If ALL is selected, every tag blink including WherePort and switch event blinks will be long. As soon as the user selects an interval, the WhereWand application will return to custom configuration screen 2 to allow another parameter to be selected and modified. The user can press <ESC> to return to the previous menu. Figure 21 shows the RX wakeup screen.
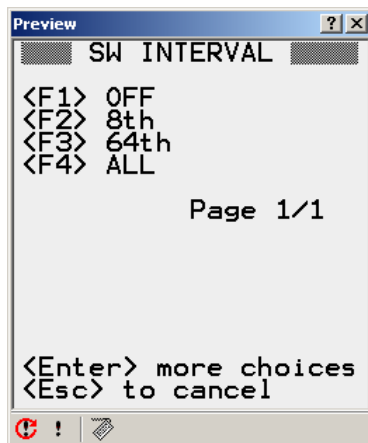
```
Preview                    ?|X|
▓▓▓▓  SW INTERVAL  ▓▓▓▓

<F1> OFF
<F2> 8th
<F3> 64th
<F4> ALL

           Page 1/1



<Enter> more choices
<Esc> to cancel
 C !  ▨
```

Figure 21: Custom Config Long Interval

4.3 Read Tag Configuration

When the user selects <F2> Read Config from the Tag Utilities screen, the
WhereWand screen changes to the tag ID entry screen for tag read. The user can
either scan the tag bar code using the WhereWand laser scanner or manually type
the tag ID using WhereWand keypad. The WhereWand will automatically
determine the correct protocol for communicating with the WhereTag or
WhereCall based on the tag's unique identification on the bar code label. Figure
22 shows the read configuration tag ID entry screen.

Note

WhereTag products with IDs less than 17,100,000 must be separated from other
nearby tags by 18 inches or more when reading the tag to ensure other tags do not
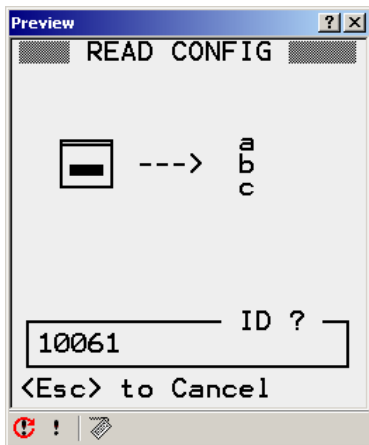respond and collide with the response of the desired tag.

Figure 22: Tag Read ID Entry

![WhereNet logo]

The data displayed will depend on the type of tag being read. The data from a WhereCall tag is displayed in figure 23. The data from a WhereTag is displayed in figure 24. Table 1 (at the beginning of section 4.2) details the parameter meaning.
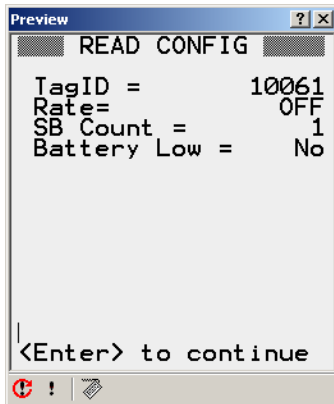
```
Preview                    ? X
 ▓▓▓▓  READ CONFIG  ▓▓▓▓

 TagID =           10061
 Rate=               OFF
 SB Count =            1
 Battery Low =       No




|
<Enter> to continue
 C !  ✎
```

Figure 23: WhereCall Read Information

```
Preview            ? X      Preview            ? X
 ▓▓▓ READ CONFIG ▓▓▓         ▓▓▓ READ CONFIG ▓▓▓

 TagID =        123          TagID =       10061
 Rate=          OFF          RX WakeUp=   200 ms
 WP Count=        0          SB Count =        1
 WP Interval=   0.5          Long Intrvl=    OFF
 WP Retriggr=   10sL         Battery Low =    No
 Sw Count=        0
 Sw Interval=   0.5
 Sw Retriggr=   0.5s



<Enter> to continue        <Enter> to continue
 C !  ✎                      C !  ✎
```
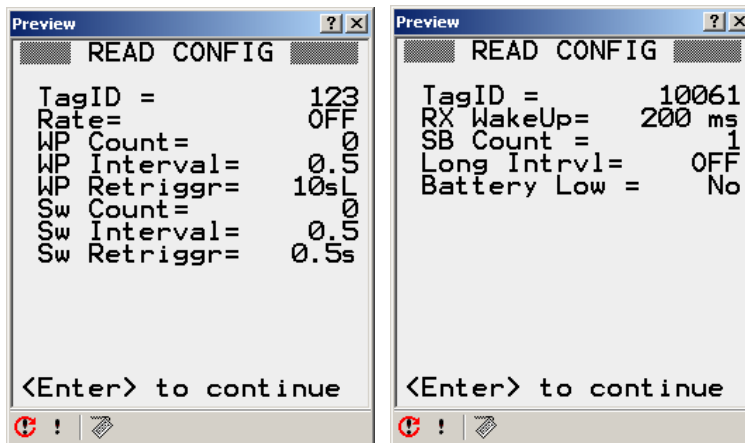
Figure 24: WhereTag Read Information

WhereTag II version 2.0 configuration read is through a configuration data mirror. It is possible for certain WherePort or other information to overwrite this data mirror. The read configuration will display the information it does read even if it is not configuration data, as shown in figure 25.
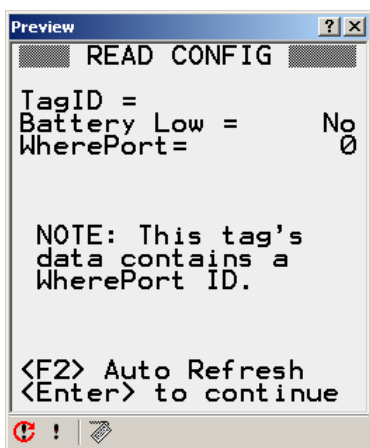

Figure 25: Configuration Data was Overwritten

4.4 Turn Tag Off

When the user selects <F3> Read Config from the Tag Utilities screen, the WhereWand screen changes to the tag ID entry screen for turn off.   The user can either scan the tag bar code using the WhereWand laser scanner or manually type the tag ID using WhereWand keypad. The WhereWand will automatically determine the correct protocol for communicating with the WhereTag or WhereCall based on the tag's unique identification on the bar code label. The WhereWand will set the tag blink interval to OFF, and set the number of WherePort blinks to 0. Figure 26 shows the turn tag off ID entry screen.
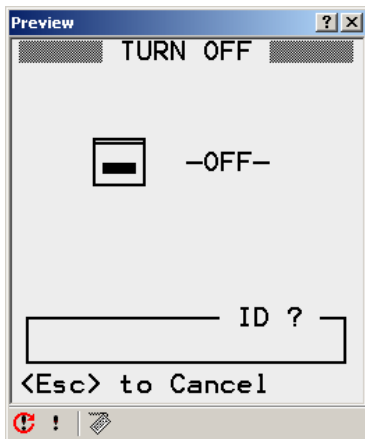
Figure 26: Turn Tag Off ID Entry

5   WHEREPORT UTILITIES

The user enters the WherePort utilities by press <F2> from the WhereWand utilities screen shown in figure 3. The WherePort utilities allow the user to set and read WherePort configuration. Communications with WherePort devices require the use of the configuration cable included with the WhereWand in the shipping box. This cable is a standard 10-conductor RJ-45 cable. Figure 27 shows the WherePort Utilities screen. The magnetic field in the WherePort will be disabled while connected to the WhereWand via the configuration cable.
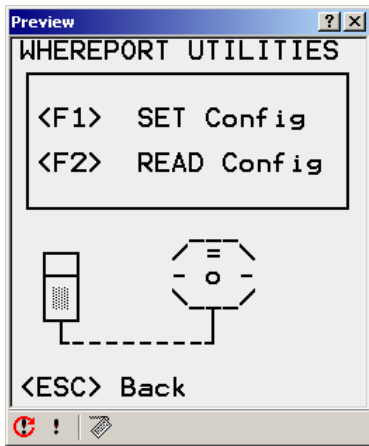

Figure 27: WherePort Utilities

5.1   Set WherePort Configuration

To set the WherePort configuration, the user press <F1> from the WherePort utilities screen. The set WherePort configuration screen is shown in figure 28.
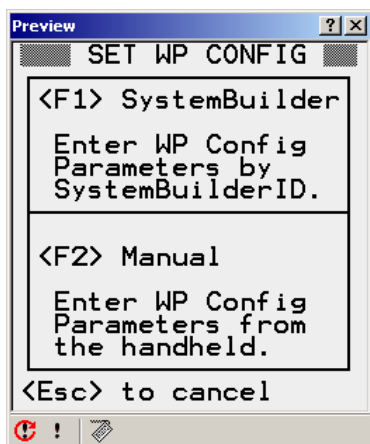
![WhereNet logo]

Figure 28: Set WherePort Configuration

5.2 SystemBuilder WherePort Configuration

Selecting <F1> from the set WherePort configuration screen allows to use predefined configurations. The first step is to complete the site design using SystemBuilder. One of the outputs of this operation is the file WherePortLocations.txt. Copy this file to the following directory on the VSS server:

C:\Program Files\WhereNet\PDT\PDT\PDT Install\link\.

Next use PDT Install to re-install the WhereWand Utilities, as described in section 3.1 and in appendix A. The WherePortLocations.txt file will be installed on the WhereWand during this operation.

The user will first be prompted to enter in the SystemBuilder WherePort ID (not the serial number). This ID is set using SystemBuilder. Figure 29 shows the SystemBuilder WherePort configuration screen
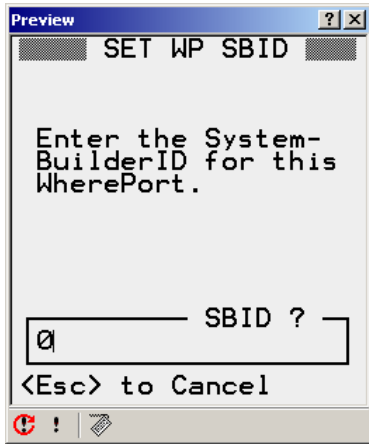

Figure 29: SystemBuilder WherePort Configuration

If the SystemBuilder WherePort ID is found, the configuration information is displayed for verification, as shown in figure 30.
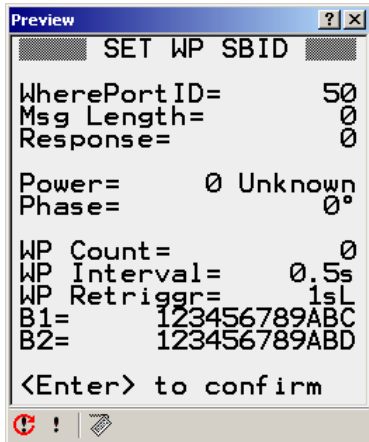

Figure 30: SB Configuration Confirm

WhereNet

If the SystemBuilder ID was not found in the file, the error message shown in figure 31 will be displayed.

Figure 31: SB Configuration Error

5.3   Manual WherePort Configuration

Selecting <F2> from the set WherePort configuration screen allows the user to manually select and modify some or all of the WherePort parameters. The WhereWand will display the screen shown in figure 32.
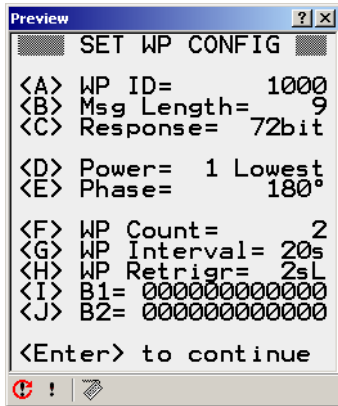
Figure 32: Manual WherePort Configuration

When the user press <Enter> from this screen, the WhereWand will send the WherePort configuration via the cable. It will read back the configuration to verify the communication was successful, and if so it will the show the screen in figure 33.
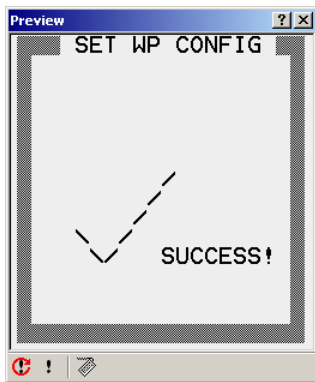

Figure 33: WherePort Configuration Success

5.3.1 Configure WherePort ID

Selecting <A> WP ID from the set WP config screen allows the user to set the WherePort ID. Any ID from 256 to 32,767 can be used, but it is important to keep from repeating the ID of nearby WherePorts to avoid retrigger issues. Figure 34 shows the WherePort ID screen.

Figure 34: WherePort ID

5.3.2 Configure WherePort Message Length

Selecting <B> from the set WherePort configuration screen allows the user to set the message length, which defines the message type. There are 4 different message lengths supported. The message length defines which of the other WherePort configuration parameters are applicable. Table 3 outlines the applicable parameters versus the message length.

Table 2: WherePort Message Parameters

Parameter	WherePort Message Length			
	Message Length 9	**Message Length 27**	**Message Length 43**	**Message Length 143**
WherePort ID	8 - 15	0 - 32,767	0 - 32,767	
Tag Response		1: 72-bit blinks 3: 152-bit blinks	1: 72-bit blinks 3: 152-bit blinks	
Power	1 - 8	1 - 8	1 - 8	1 - 8
Phase	0°, 90°, 180°, 270°	0°, 90°, 180°, 270°	0°, 90°, 180°, 270°	0°, 90°, 180°, 270°
WP Count			0 - 15	
WP Interval			5 sec - 1 min	
WP Retrigger			1 sec - 2 min, 3 modes	
Buffer 1				12 hexadecimal characters
Buffer 2				12 hexadecimal characters

<F1> or length 9 is the legacy mode compatible with some early installations and only supports a WherePort ID between 8 and 15. The tag will send normal 56-bit messages with the WherePort ID embedded in the 4-bit status. This message will work with WhereTag II V2.0 and WhereTag II V2.1.

Most applications will use <F2> or length 27. This will support any WherePort ID between 0 and 32,767. The message also includes the tag response information to select between 72-bit or 152-bit tag blink response. The 15-bit WherePort ID is added to the normal tag blink. The tag's 4-bit status will always be 1000. This message only works with WhereTag V2.1 tags.

<F3> or length 43 will support any WherePort ID between 0 and 32,767. The message also includes the tag response information to select between a 72-bit or 152-bit tag blink response. The 15-bit WherePort ID is added to the normal tag blink. The tag's 4-bit status will always be 1000. This message also includes limited tag configuration parameters. The parameters include:

   Number of WherePort Blinks (0 through 15)

   WherePort Blink Interval (5 seconds to 1 minute)

   WherePort Retrigger (1 second to 2 minutes, three modes)

These parameters will permanently overwrite the existing tag configuration. This message only works with WhereTag V2.1 tags.

<F4> or length 143 is used to send the tag 12 bytes of data. The data is the entire WherePort message, so there is no associated WherePort ID in the tag blinks. This message only works with WhereTag V2.1 tags.
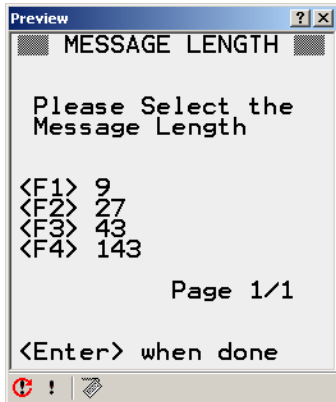
Figure 35 shows the message length screen.

Figure 35: WherePort Message Length

5.3.3 Configure WherePort Tag Response

Selecting <C> from the set WherePort configuration screen allows the user to set how the tag will respond to the WherePort message. This is only applicable to message lengths of 27 and 43. The options are to have the tag send 72-bit blinks or 152-bit blinks. Both will contain the 15-bit WherePort ID. Figure 36 shows the tag response screen.
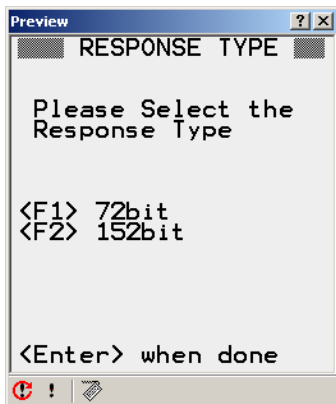

Figure 36: WherePort Tag Response

5.3.4 Configure WherePort Power

Selecting <D> from the set WherePort configuration screen allows the user to select from one of eight power levels. The maximum power setting 8 will give about a 20 foot range. The minimum power setting 1 will give about a 3 foot range. Care should be taken when setting the power to avoid under covering an area, or over covering an area and having the signal bleed into undesired areas. Figure 37 shows the WherePort power screens.
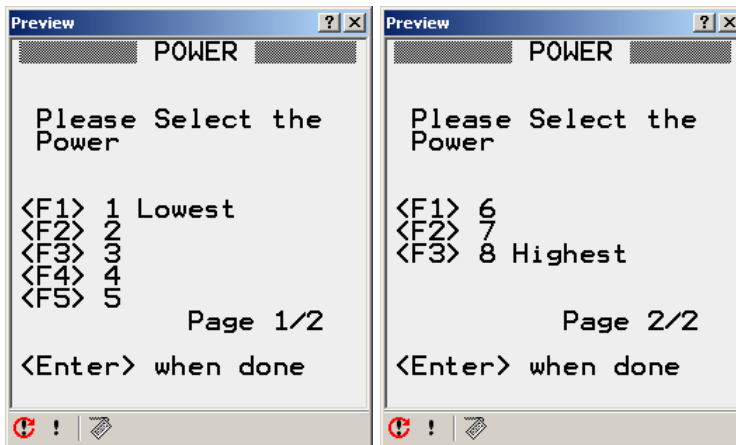

Figure 37: WherePort Power

Table 3 outlines the WherePort to Tag range for the power levels. Since the range is dependent on the tag orientation in the WherePort field, the table defines 3 zones. The green zone is the range at which the tag will always see the WherePort, regardless of orientation, as it passes through the zone. The yellow zone will typically work, but the tag may not receive the WherePort message if it is oriented poorly in relation to the field. The red zone is an area that the tag will

not likely, but still may receive the WherePort message. The WherePort field does reach to the red zone and can cause interference with other WherePorts.

Table 3: WherePort Power vs. Range

Power	Green Zone (ft)	Yellow Zone (ft)	Red Zone (ft)
8	0 - 14	14 - 21	21 - 30
7	0 - 12	12 - 17	17 - 24
6	0 - 8	8 - 11	11 - 17
5	0 - 7	7 - 10	10 - 15
4	0 - 6	6 - 9	9 - 13
3	0 - 5	5 - 8	8 - 11
2	0 - 4	4 - 6	6 - 9
1	0 - 3	3 - 5	5 - 6

5.3.5   Configure WherePort Phase

Selecting <E> from the set WherePort configuration screen allows the user to set the phase of WherePorts when multiple WherePorts are connected to provide a larger area of coverage.

The phase of a single WherePort should always be set to 0°.

When multiple WherePorts are connected, the first WherePort in the chain should always be set to 0°.   WherePorts facing the same direction should have the same phase, and every 90°change in the mounting direction should correspond to a 90° phase change. Figure 38 shows the WherePort phase setting screen. Figure 39 shows an example of the phase setting in a typical multi-WherePort installation.
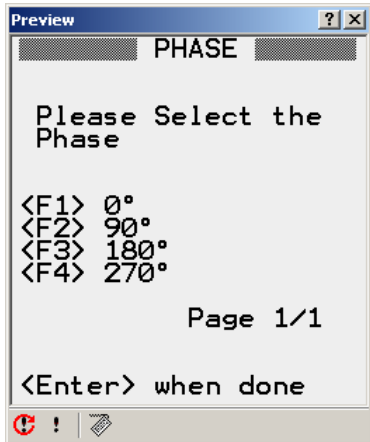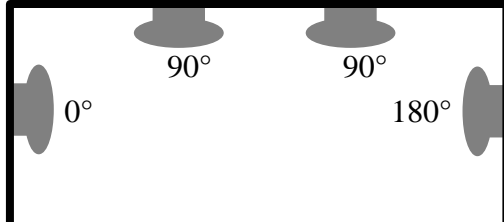
Figure 38: WherePort Phase

Figure 39: Multi-WherePort Phase Example

5.3.6 Configure WherePort Tag Parameters

Options <F> <G> or <H> apply only to WherePort message length 43. These
parameters allow the user to set the tag's WherePort response configuration
parameters. This allows the user to globally change the way tags respond to
WherePorts without configuring each tag. Any tag that passes within the field of a

WherePort sending these messages will respond using the new parameters included in the WherePort message. Since these parameters are written to the tag configuration, they are identical to the parameters described in the tag utilities section of this document.

CAUTION: These changes are permanent and will affect the way the tag will respond to all WherePorts until the tag is re-configured with either the WhereWand or another configuring WherePort.

The WherePort Blink Count is described in section 4.2.2. The WherePort Blink interval is described in section 4.2.3. The WherePort Retrigger is described in section 4.2.4. The screens are also shown in section 4.2, figures 12 through 14.

5.3.7   Configure WherePort Data Buffer

Selecting <I> or <J> from the set WherePort configuration screen allows the user to enter the data sent in WherePort message length 143. The buffer is 12-bytes long and is broken into 2 parts for display purposes.   The data is entered in hexadecimal (12 characters per half). Figure 40 shows the screen for entering buffer data.
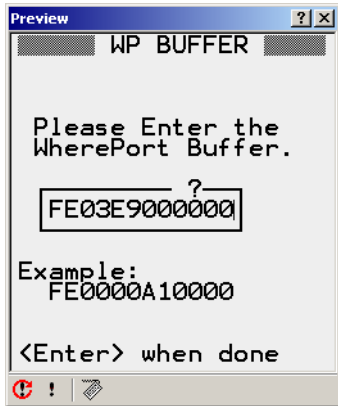
Figure 40: WherePort Buffer

When the user presses <Enter> from the set WherePort configuration screen, the WhereWand will send the WherePort configuration via the cable. It will read back the configuration to verify the communication was successful, and if so it will show the success screen in figure 34.

5.4   Read WherePort Configuration

When the user selects <F2> from the WherePort utilities screen, the WhereWand will read and display the WherePort configuration. The cable must be connected between the WhereWand and the WherePort. Figure 41 shows the read WherePort configuration screens.
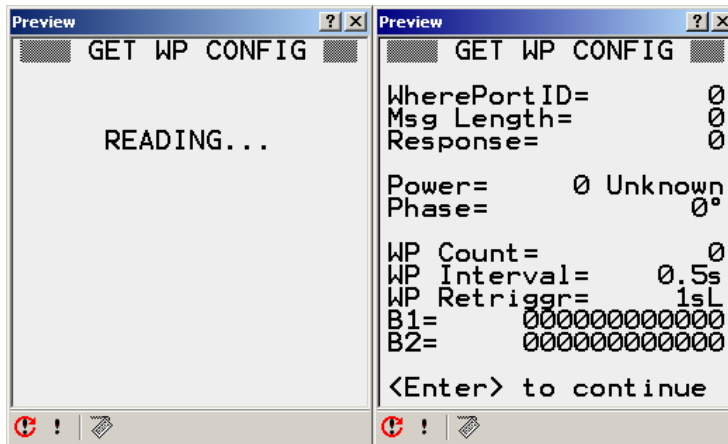

Figure 41: Read WherePort Configuration

6   LOCATION SENSOR UTILITIES

The user enters the WherePort utilities by press <F3> from the WhereWand utilities screen shown in figure 3. The Location Sensor utilities allow the user to

- Perform link check by flashing the LEDs on the Location Sensor
- Reconfigure the Location Sensor network parameters
- Re-boot the Location Sensor.

The WhereWand communicates with the Location Sensor by sending DSSS blinks containing the MAC address of the Location Sensor. The first screen the user sees is a prompt for the Location Sensor's MAC address. This can be manually typed in using the WhereWand keypad, or scan from the Location Sensor bar code label using the WhereWand laser scanner. The bar code label is located on the back of the Location Sensor and in the site design document. Figure 42 shows the MAC address entry screen.

Important: If the MAC does not start with 0004F1, all LS operations will result in an error. This is a safety feature to prevent unnecessary transmissions from the WhereWand.

Alternately, the user can enter the System Builder ID for that Location Sensor. This will access the file LocationSensors.txt on the WhereWand to get the MAC address.

Important: The LocationSensors.txt file should be in directory C:\Program Files\WhereNet\PDT\PDTInstall\link directory prior to running PDT install.

Important: This LS configuration operations consume a significant part of the System RF capacity.
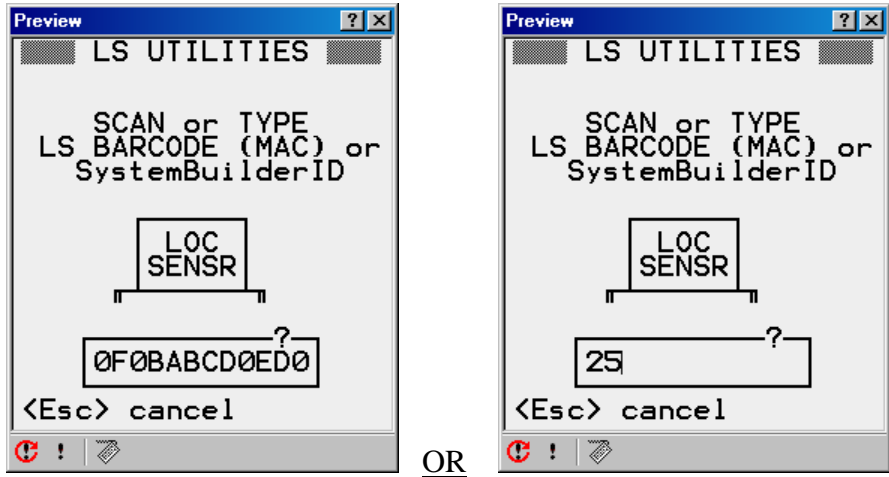
Figure 42: Location Sensor MAC Address or System Builder ID for that LS.

After entering the Location Sensor MAC address, the utilities screen shown in figure 43 is displayed.
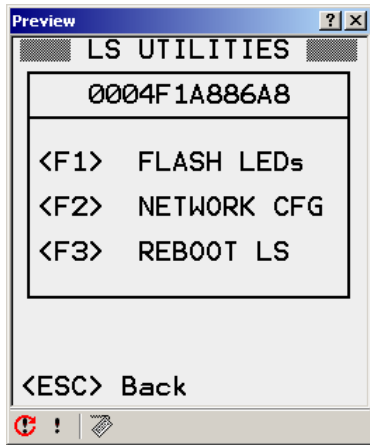

Figure 43: Location Sensor Utilities

6.1 Flashing Location Sensor LEDs

Pressing <F1> will cause the WhereWand to transmit the messages to flash the Location Sensor LEDs. This is useful in verifying that the user is communicating with the correct Location Sensor and that the link is functional. The WhereWand will automatically stop after 30 seconds, or the user can press <Enter> to stop the test at any time. Figure 44 shows the LED flash screen.
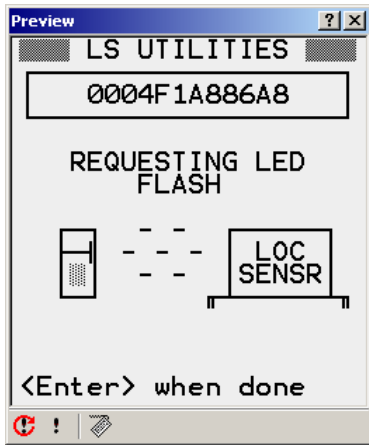

Figure 44: Location Sensor LED Flash

6.2 Configuring the Location Sensor Network Properties

Pressing <F2> will allow the user to set the network properties of the Location Sensor. First the user can select to enable or disable DHCP, as shown in figure 45.
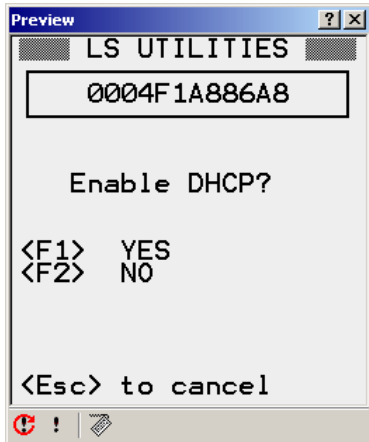
WhereNet

Figure 45: Location Sensor DHCP

If the user selected NO on the enable DHCP screen, the user will be prompted for the IP address, as shown in figure 46. This screen is skipped if the user selected YES to enable the DHCP.
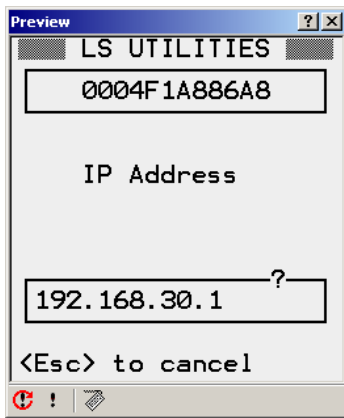

Figure 46: Location Sensor IP Address

The user is next prompted for the subnet mask and the default gateway as shown in figure 47. If the gateway is left blink and the user hits enter, the gateway defaults to 0.0.0.0.
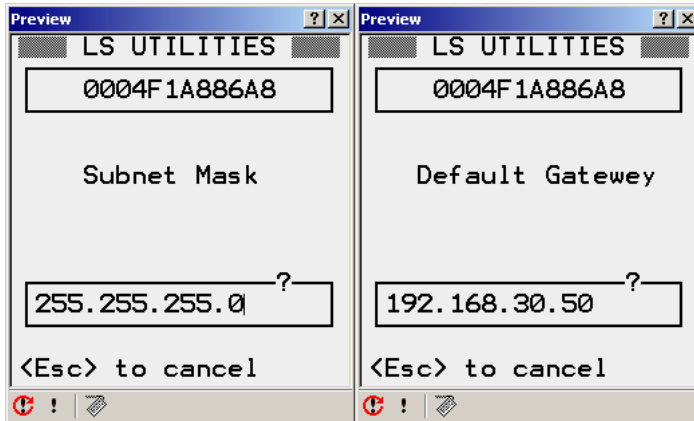

Figure 47: Location Sensor Subnet Mask and Gateway

The Location Sensor network properties are then displayed for confirmation by the user, as shown in figure 48.
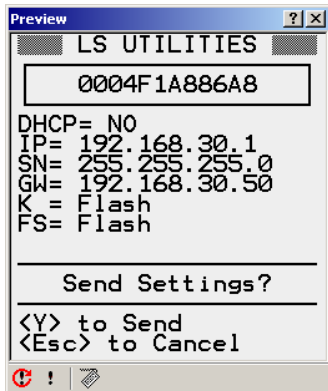

Figure 48: Location Sensor Network Properties

The user can press <Y> to send the properties to the Location Sensor or hit <Esc> to cancel and change the settings again. It takes 10 seconds to transmit all the properties from the WhereWand to the Location Sensor. The screen show in figure 49 is displayed while the WhereWand is sending the properties. The LED on the Location Sensor will flash on and off at a 1 second rate if the link is functional and the command is being received correctly.
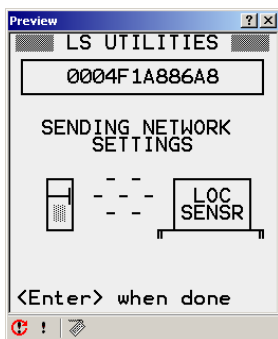
Figure 49: Location Sensor Sending

6.3   Rebooting the Location Sensor

Rebooting the Location Sensor will take it out of commission until it completes the reboot. This can take several minutes so a confirmation screen is presented as shown in figure 50.

Important: The reboot message will be transmitted for 15 seconds. Pressing a key will stop the transmission.
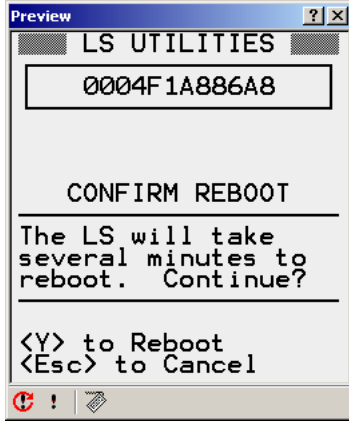
Figure 50: Location Sensor Confirm Reboot

The user can press <Y> to proceed and re-boot the Location Sensor, or hit <Esc> to cancel the operation. It takes 15 seconds to send the reboot sequence from the WhereWand to the Location Sensor. The LED on the Location Sensor will flash on and off at a 1 second rate if the link is functional and the command is being received correctly. Press any key during this time will stop the transmission. During this time, the screen shown in figure 51 is displayed.

Figure 51: Location Sensor Rebooting

7   LOGGING

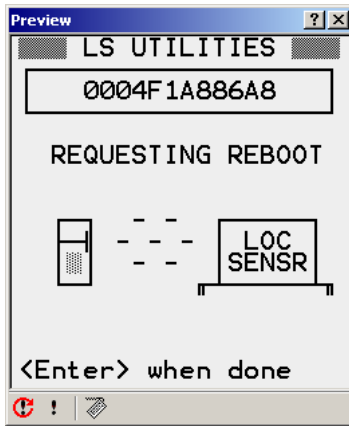Reading or writing to hardware via the WhereWand Utilities is logged. The log file contains the timestamp of the event, the operation performed, and the configuration parameters used. The file is saved on the WhereWand in C:\WhereNet\Log.txt. Below is a sample log file:

```
02/14/1980 05:11:40,TAG SET,TE_SUCCESS,0016777405,0,2,10,3,3,4,0,0,0,0,0,0,4,1,5,1,1,0,0,0
02/14/1980 05:11:49,TAG READ,TE_SUCCESS,0016777405,0,2,10,3,3,4,0,1,0,0,0,0,4,1,5,2,1,0,0,0
02/14/1980 07:31:06,LS FLASH LEDS,TE_SUCCESS,0004F1A886A8
02/14/1980 07:31:26,LS REBOOT,TE_SUCCESS,0004F1A886A8
02/14/1980 07:31:30,LS FLASH LEDS,TE_SUCCESS,0004F1A886A8
02/14/1980 08:12:05,LS REBOOT,TE_SUCCESS,0004F1A886A8,,255.255.255.0,192.0.0.0,1,1,1
02/14/1980 08:15:12,LS REBOOT,TE_SUCCESS,0004F1A886A8,90.0.0.0,255.255.255.0,192.0.0.0,1,1,1
02/14/1980 08:22:26,LS REBOOT,TE_SUCCESS,0004F1A886A8,,255.255.255.0,1.1.1.1,1,F,F
```

All read and write operations to WhereTag/WhereCall, WherePort, or Location Sensors will be logged.

7.1   Log File Disk Usage

The log file consumes approximately 80 bytes per record. The WhereWand typically starts with about 800K free disk space. This means that after about 1000 operations the log file must be transferred to another computer and deleted from the WhereWand. If you get a message like the one shown in figure 52, the disk is probably full:

Figure 52: Log Write Error

Important: About every 1000 operations the log file should be transferred to another computer. Otherwise the drive will fill and no further logging will take place.

Logging utilities are entered from the main utilities screen (figure 3) by pressing <F5>. The user will be prompted for the password, which is **LOG**. The password screen is shown in figure 53.

Figure 53: Log Utilities Password

The user types in **LOG** and hits <Enter> to get to the Log Utilities screen shown in figure 54. The available options are to upload the log file to a computer, or delete the log file.
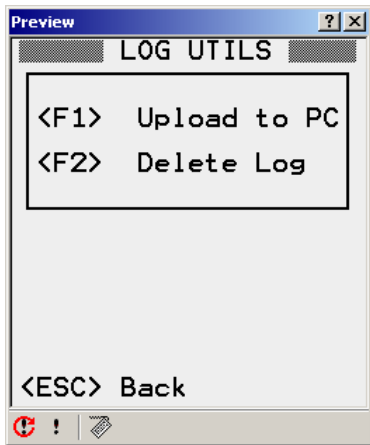

Figure 54: Log Utilities

7.2   Uploading the Log File

Press <F1> from the log utilities screen to upload the file. To upload the log file, the user must put the WhereWand in the battery charging dock and connect the serial cable from the dock to the computer's serial port. Figure 55 shows the WhereWand upload log file screen.

Figure 55: Log File Upload

The log file is uploaded using the WhereTools Dock program which is run on a laptop or desktop computer. It can be launched through the windows start menu by:

At Windows desktop, click   **Start >>**
                                        Programs >>
                                            WhereNet Visibility Server Software >>
                                                WhereTools >>
                                                    Dock.

Press <Enter> on the WhereWand and then click the Download button on the computer screen. Activity will show on both screens. When the upload is complete, the log file will be displayed in the window on the computer screen. The WhereWand will ask the user to confirm that the log file is displayed on the computer with the screen shown in figure 56. Appendix B shows the computer screen for WhereTools Dock.

Figure 56: Log File Confirmation

7.3   Deleting the Log File

Pressing <F2> from the log utilities screen will allow the user to delete the log file from the WhereWand memory. The user will be prompted be sure the log file should be deleted. The user can hit <Y> to delete the file or <Esc> to cancel the operation. Figure 57 shows the confirm delete screen.

Important: Deleting the log without first downloading it to the host computer will result in the loss of the log data.

Figure 57: Delete Log File

8   WHEREWAND ADAPTER SPECIFICATION

8.1   Mechanical

Operating Temperature   0 to +55°C

Storage Temperature   -20 to +85°C

Humidity   95% non condensing

Dimensions   4.2 x 2.5 x 1.0 inches

Weight   135 oz

8.2   DSSS RF Transmit Performance

Frequency	2441.75 MHz
Spreading	511 chips/bit
Chip Rate	30.52 MHz
Data Rate	59.73 kbit/sec
Power	<1 mW
Range (to Location Sensor)	up to 200 feet

8.3   OOK/FSK Transmit/Receive Performance

Frequency	2441.75 MHz
OOK/FSK Rates	375 kHz / 535 kHz
Power	<1 mW
Data Rate	19.83 kbit/sec
Range (to/from Tag)	0 to 6 feet

8.4   Magnetic FSK Transmit Performance

FSK Frequencies	114.7 kHz / 127.0 kHz
Power	<1 mA/meter
Data Rate	2.048 kbit/sec
Range (to Tag)	0 to 12 inches

8.5 Wired WherePort Link Performance

Cable Length   10 feet

Data Rate   1.0 kbit/sec

8.6 Bar Code Scanner Performance

Code   Code39 or Code128

Range (to Tag or Location Sensor)   2 to 12 inches

A   PDT INSTALL SCREENS

This appendix describes the PDT Install program operation. This program should be done to reload the WhereWand software, download SystemBuilder WherePort configuration files, or the download software upgrades to the WhereWand. This program is run on a desktop or laptop computer. The computer serial port COM1 should be connected to the WhereWand battery charging dock with the serial cable included in the WhereWand shipping box. This program is launched through the Windows start menu by clicking:

Start >>
   Programs >>
      WhereNet Visibility Server Software >>
         WhereTools >>
            PDT Install

The first screen is shown figure 58.

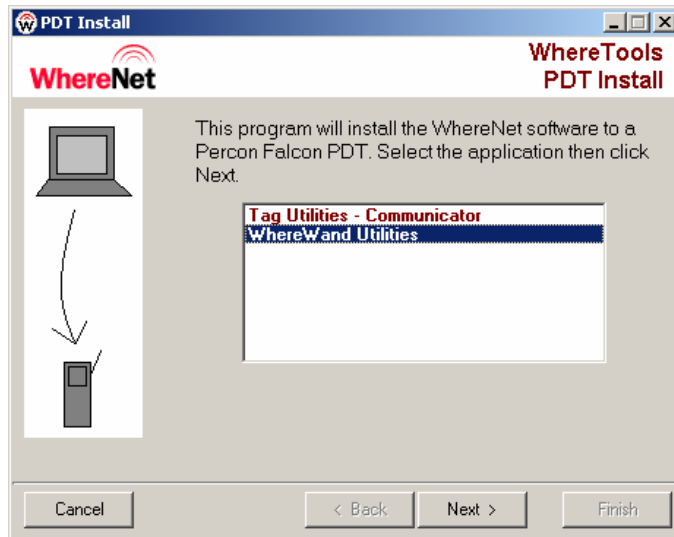Figure 58: PDT Install Screen

The user should select **WhereWand Utilities** and the click <Next>. The next screen allows the user to select the WhereWand platform. This should typically be the Percon Falcon 320 (WhereWand). The screen is shown in figure 59.
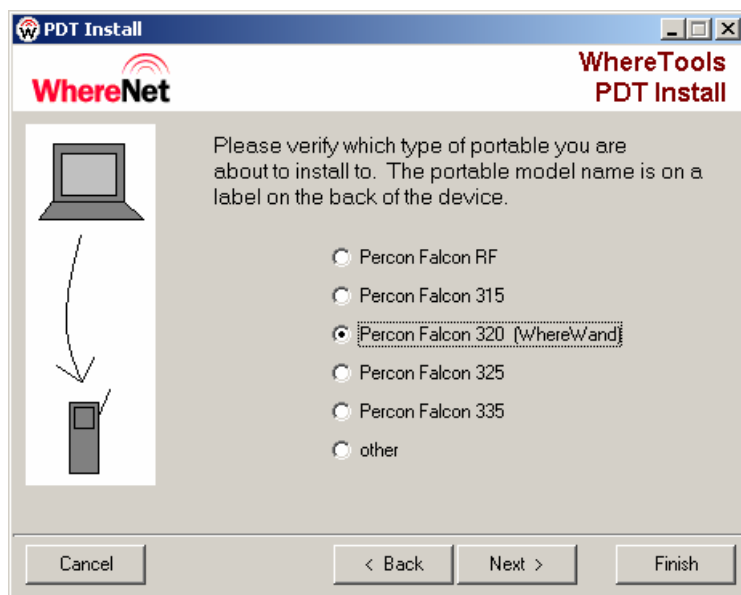

Figure 59: PDT Install Platform

The user should select Percon Falcon 320 (WhereWand) and then click <Next>. The next screen will direct the user to cold-boot the WhereWand. This is done by pressing <CTL><ALT><DEL> simultaneously on the WhereWand. When the WhereWand display shows "WAIT", the user should press <ESC><DEL> simultaneously. This happens quickly, so it is suggested that the user locate all these keys and be ready to press them before starting this step. The directions are shown in figure 60.
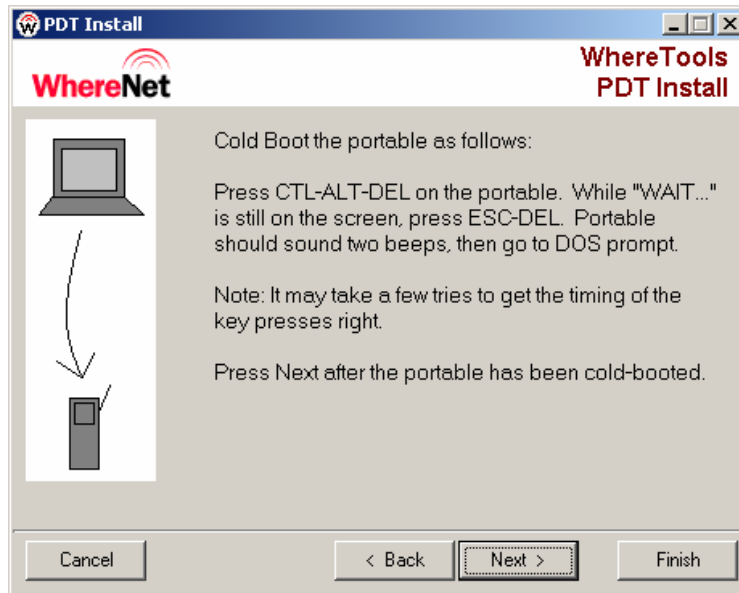

Figure 60: PDT Install WW Boot

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After successfully cold-booting the WhereWand, the user should click <Next>. The next screen will direct the user to launch the file transfer program on the WhereWand and place the WhereWand in the battery charging dock. The user should type "LD" and the <Enter> at the DOS prompt on the WhereWand. Then the user should place the WhereWand in the dock, and then click <Finish> on the screen. Figure 61 shows the instructions.
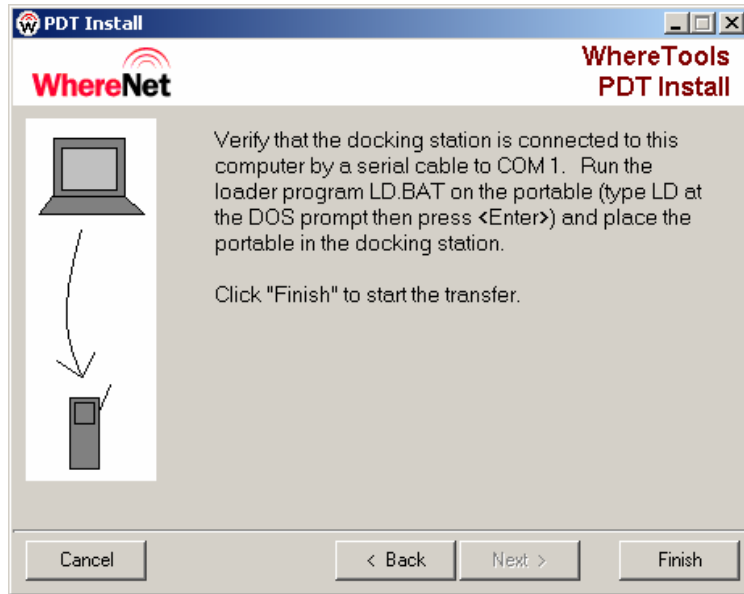

Figure 61: PDT Install WW Launch

After the user has launched the file transfer program on the WhereWand and clicked <Finish>, the transfer will begin. The screen shown in figure 62 will display the file transfer status.
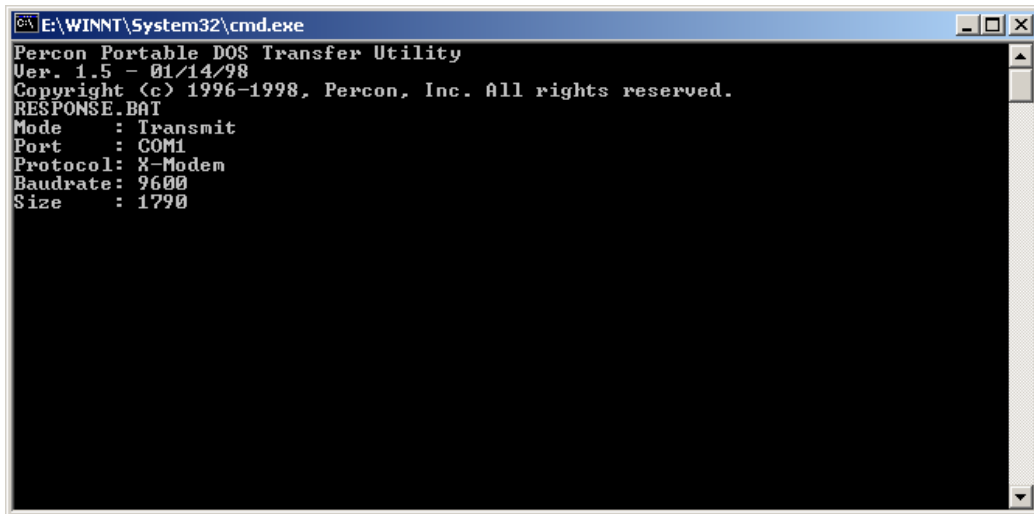

Figure 62: PDT Install Transferring

After the last file has been downloaded to the WhereWand, the screen shown in figure 66 will be displayed. The user is instructed to re-boot the WhereWand and then either close PDT Install or download the software to another WhereWand. Figure 63 shows the screen.
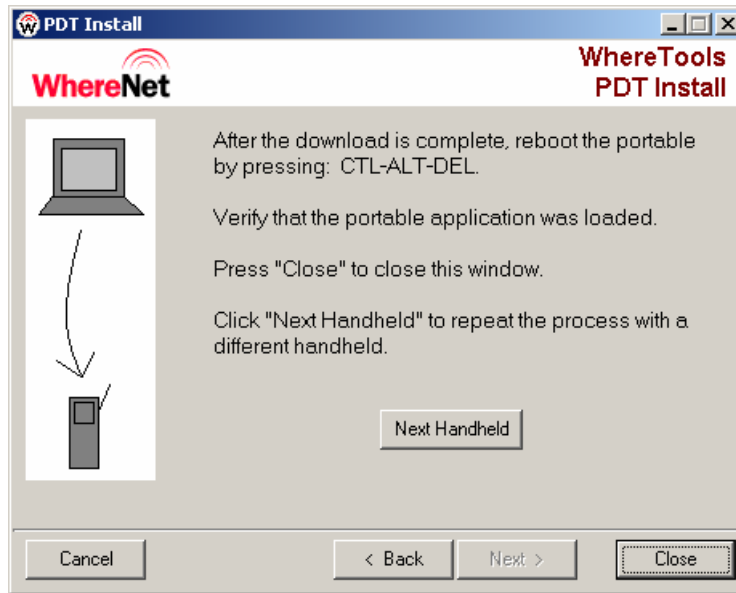

Figure 63: PDT Install Complete

D1258 rev A

B   LOG DOCK SCREEN

This appendix describes the WhereTools Dock program operation. This program is run to upload the log file from the WhereWand to a desktop or laptop computer. This program is run on a desktop or laptop computer. The computer serial port COM1 should be connected to the WhereWand battery charging dock with the serial cable included in the WhereWand shipping box. This program is launched through the Windows start menu by clicking:

> **Start >>**
> > **Programs >>**
> > > **WhereNet Visibility Server Software >>**
> > > > **WhereTools >>**
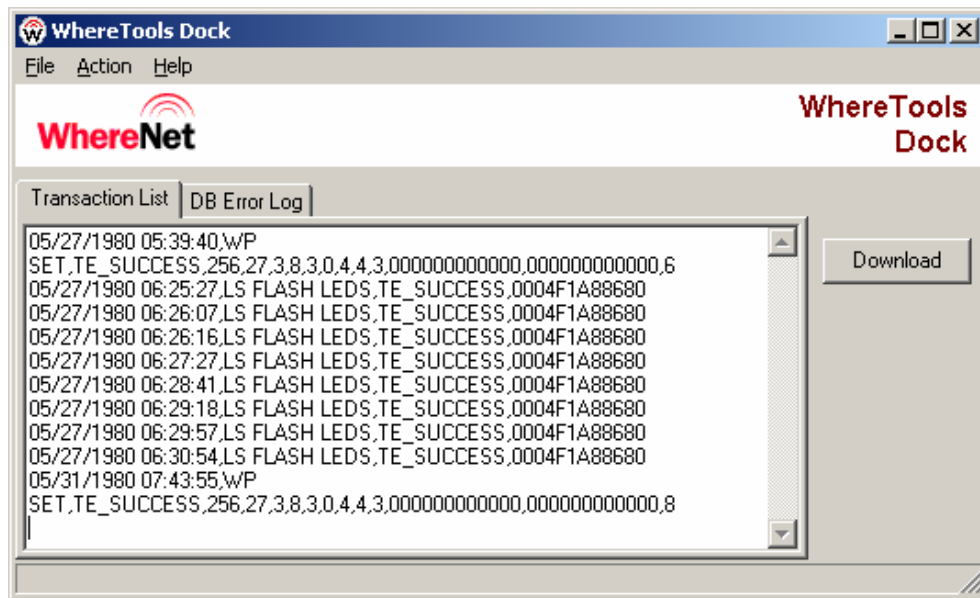> > > > > **Dock**

The WhereTools Dock screen is shown in figure 64.

Figure 64: WhereTools Dock Screen