



NetLink e340/h340/i640 Wireless Telephones with Session Initiation Protocol (SIP)

Configuration and Administration

Part Number: 72-1089-02
Issue E

Trademark Information

Polycom® and the logo designs
SpectraLink®
LinkPlus
Link
NetLink
SVP

Are trademarks and registered trademarks of Polycom, Inc. in the United States of America and various countries. All other trademarks used herein are the property of their respective owners.

Patent Information

The accompanying product is protected by one or more US and foreign patents and/or pending patent applications held by Polycom, Inc.

Copyright Notice

Copyright © 1998 to 2008 Polycom, Inc.

All rights reserved under the International and pan-American copyright Conventions.

No part of this manual, or the software described herein, may be reproduced or transmitted in any form or by any means, or translated into another language or format, in whole or in part, without the express written permission of Polycom, Inc.

Do not remove (or allow any third party to remove) any product identification, copyright or other notices.

Every effort has been made to ensure that the information in this document is accurate. Polycom, Inc. is not responsible for printing or clerical errors. Information in this document is subject to change without notice and does not represent a commitment on the part of Polycom, Inc.

Notice

Polycom, Inc. has prepared this document for use by Polycom personnel and customers. The drawings and specifications contained herein are the property of Polycom and shall be neither reproduced in whole or in part without the prior written approval of Polycom, nor be implied to grant any license to make, use, or sell equipment manufactured in accordance herewith.

Polycom reserves the right to make changes in specifications and other information contained in this document without prior notice, and the reader should in all cases consult Polycom to determine whether any such changes have been made.

No representation or other affirmation of fact contained in this document including but not limited to statements regarding capacity, response-time performance, suitability for use, or performance of products described herein shall be deemed to be a warranty by Polycom for any purpose, or give rise to any liability of Polycom whatsoever.

Contact Information

Please contact your Polycom Authorized Reseller for assistance.

Polycom, Inc.
4750 Willow Road,
Pleasanton, CA 94588
<http://www.polycom.com>

Table of Contents

1.	About This Document	4
1.1	SpectraLink Corporation Model Numbers	4
1.2	Related Documents	4
1.3	Customer Support Hotline	4
1.4	Icons and Conventions	5
2.	NetLink Wireless Telephone Overview	6
2.1	SpectraLink Voice Priority (SVP) and QoS	6
2.2	Security	6
2.3	Quick Start Guide	7
2.4	System Diagram	8
2.5	System Components	9
2.6	NetLink Wireless Telephone Specifications	11
2.7	Handset Display	12
2.8	Startup Sequence	13
2.9	Handset Modes	14
2.10	Handset Displays	15
3.	NetLink Wireless Telephone Configuration	16
3.1	The Admin Menu	16
3.2	User-defined Preferences	24
3.3	The Favorites Menu	31
4.	Software License and Protocol Management	32
4.1	Requirements	32
4.2	Configuration Process	32
5.	SIP Integration Factors	34
6.	SIP Handset Features	35
6.1	SIP TFTP Server Configuration Files	35
6.2	The Handset Display	38
6.3	Using the SIP Handset	38
7.	Testing a Handset	44
8.	Diagnostic Tools	45
8.1	Run Site Survey	45
8.2	Diagnostics Mode	47
8.3	Syslog Mode	50
9.	Certifying the Handsets	52
9.1	Conducting a Site Survey	52
10.	Software Maintenance	53
11.	Troubleshooting	55
11.1	Access Point Problems	55
11.2	Configuration Problems	55
11.3	Handset Status Messages	56
12.	Appendix A	63

1. About This Document

This document explains how to configure and maintain the NetLink e340/h340/i640 Wireless Telephones with Session Initiation Protocol (SIP); a protocol for the control of voice over IP (VoIP) calls via a proxy server(s).

1.1 SpectraLink Corporation Model Numbers

This document covers the following registered model numbers:

NetLink e340/h340 Wireless Telephone

NetLink i640 Wireless Telephone

1.2 Related Documents

SpectraLink 8000 SVP Server: Administration Guide for SIP (1725-36033-001)

Available at http://www.polycom.com/usa/en/support/voice/wi-fi/spectralink_8000_svp_server.html.

Polycom WLAN Compatibility Table (1725-36040-001)

Access Point Configuration Guide (1725-36xxx-001 where xxx indicates a number corresponding to the type of access point.)

Available at http://www.polycom.com/usa/en/support/voice/wi-fi/wi-fi_interoperability.html.

Deploying Enterprise-Grade Wi-Fi Telephony white paper

Available at

http://www.polycom.com/common/documents/products/voice/mobile/bestpractices_SLNK_032708.pdf.

Open Application Interface (OAI) Specification (Version 2.0) (72-0052-00)

NetLink Wireless Telephones: SIP User Agent: Features and Standards (72-1089-01)

Technical specifications available by request. Please contact Customer Support.

1.3 Customer Support Hotline

SpectraLink wants you to have a successful installation. If you have questions please contact our Customer Support Hotline at (800) 775-5330. The hotline is open Monday through Friday, 6 a.m. to 6 p.m. Mountain time.

For Technical Support: technicalsupport@polycom.com

For Knowledge Base:

<http://www.polycom.com/usa/en/support/voice/voice.html>

For Return Material Authorization: rmacoordinator@polycom.com

1.4 Icons and Conventions

This manual uses the following icons and conventions.



Caution! Follow these instructions carefully to avoid danger.



Note these instructions carefully.

NORM

This typeface indicates a key, label, or button on SpectraLink hardware.

2. NetLink Wireless Telephone Overview

The NetLink e340/h340/i640 Wireless Telephones are mobile handsets for workplace IP telephone systems. The handsets operate over an 802.11b wireless Ethernet LAN providing users a wireless voice over IP (VoIP) extension. By seamlessly integrating into a SIP environment, handset users are provided with high-quality mobile voice communications throughout the workplace. The handset gives users the freedom to roam throughout the workplace while providing all the features and functionality of a SIP desk phone.

The handsets reside on the wireless LAN with other wireless devices using direct sequence spread spectrum (DSSS) radio technology. The handset radio transmits and receives packets at up to 11 Mb/s.

In the SIP environment, the handsets support up to three proxy servers. Each handset may have five line appearances and two calls per line. Each handset may have up to 10 sets of credentials to identify itself by current user.

2.1 SpectraLink Voice Priority (SVP) and QoS

The NetLink SVP Server is an Ethernet LAN device that works with the AP to provide quality of service (QoS) on the wireless LAN. Voice packets to and from the NetLink Wireless Telephones are intercepted by the NetLink SVP Server and encapsulated for prioritization as they are routed to and from a SIP proxy server. See the *SpectraLink 8000 SVP Server: Administration Guide for SIP* document for detailed information about this device.

2.2 Security

NetLink Wireless Telephones support the 802.11i standard including Wi-Fi Protected Access (WPA and WPA2) in the pre-shared key (PSK) mode. As vendors introduce access point (APs) that are eligible to become Wi-Fi CERTIFIED for WPA-PSK and/or WPA2-PSK, SpectraLink will determine compatibility with the NetLink Wireless Telephones and include these APs on the *NetLink Wireless Telephone WLAN Compatibility List*.

NetLink Wireless Telephones support basic WMM as part of the 802.11e standard. If the AP supports WMM, the handset automatically discovers and uses it. WMM does not replace the NetLink SVP Server as described in the first paragraph. WMM settings must be configured on the NetLink SVP Server.

The NetLink e340/h340/i640 Wireless Telephone supports Wired Equivalent Privacy (WEP) as defined by the 802.11 standard. SpectraLink offers the product with both 40-bit and 128-bit encryption.



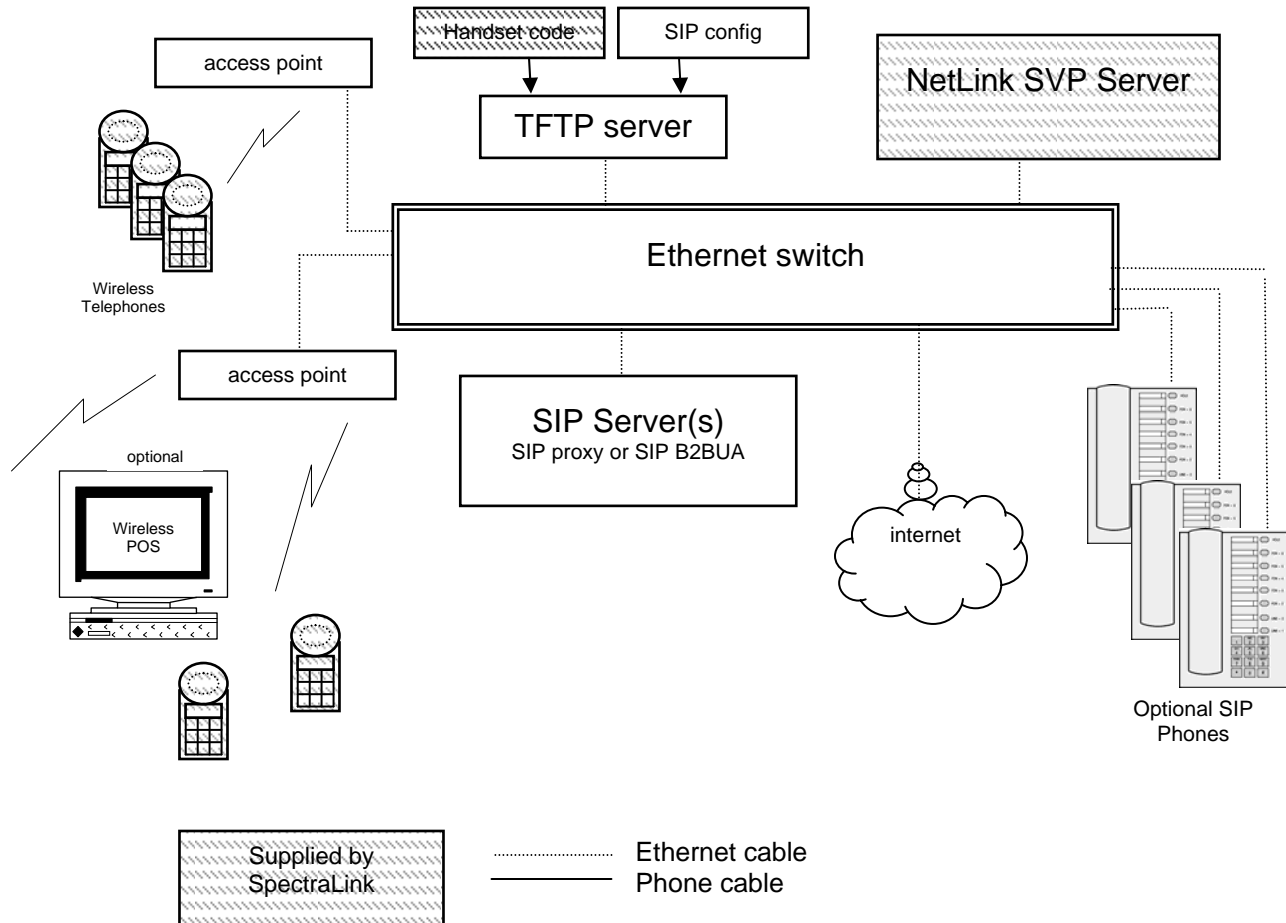
The latest software versions are required to support the features described in this document.

2.3 Quick Start Guide

1. A wireless LAN must be properly configured and operational through the use of 802.11 wireless APs.
2. A TFTP server must be available on the network in order to load the appropriate software into the handsets. See Section 4 *Software License and Protocol Management* for detailed instructions for loading software on handsets.
3. The supported SIP system components must be connected to your network and completely operational.
4. The NetLink SVP Server, which facilitates the QoS on the wireless LAN for the handsets, must be on the same subnet as the handsets and have the proper versions of software.
Ensure you have the following versions for the NetLink SVP Server:
173 svp100.toc
174 zvmlinux
175 flashfs
5. Visit http://www.polycom.com/usa/en/support/voice/wifi/spectralink_8000_svp_server.html to download the latest handset software and any updates to the NetLink SVP Server software.
6. Install the correct handset software and any updates to the NetLink SVP Server software per Section 4.2 *Configuration Process* for the handsets and per *SpectraLink 8000 SVP Server: Administration Guide for SIP* Section 6.1 *Software Updates* for the NetLink SVP Server. Ensure the software is properly loaded on the TFTP server.
7. Configure your handset to ensure that it is associated with the wireless LAN, has the appropriate software, and has the correct IP address for the supported proxy server. See Section 4 *Software License and Protocol Management* and Section 3 *NetLink Wireless Telephone Configuration* for detailed instructions for loading software onto and configuring handsets.
8. Create configuration files on the SIP TFTP server to define parameters for the SIP application. See Section 6.1 *SIP TFTP Server Configuration Files*.

2.4 System Diagram

The following diagram shows the SpectraLink components residing on a network with APs and wireless LAN Ethernet Switch.



2.5 System Components

NetLink e340/h340/i640 Wireless Telephone

The NetLink e340/h340/i640 Wireless Telephone is a lightweight, durable handset specifically designed for mobile workplace use within a facility using SIP and an 802.11 wireless LAN. The handsets are to be used on-premises; they are not cellular or satellite phones.

NetLink e340/h340/i640 Wireless Telephones use direct-sequence spread spectrum radio technology (DSSS) to transmit audio packets over wireless LAN APs that support SpectraLink Voice Priority (SVP).

NetLink SVP Server

SVP is the SpectraLink quality of service (QoS) mechanism that is implemented in the AP to enhance voice quality over the wireless network. SVP gives preference to voice packets over data packets on the wireless medium, increasing the probability that all voice packets are transmitted efficiently and with minimum or no delay. SVP is fully compatible with the IEEE 802.11b standard.

The NetLink SVP Server is an Ethernet LAN appliance that works with the AP to provide QoS on the wireless LAN. All SIP packets to and from the NetLink e340/h340/i640 Wireless Telephones pass through the NetLink SVP Server and are encapsulated for prioritization as they are routed to and from other SIP devices.

Access points

Supplied by third-party vendors, APs provide the connection between the wired Ethernet LAN and the wireless (802.11) LAN. Access points must be positioned in all areas where handsets will be used. The number and placement of APs will affect the coverage area and capacity of the wireless system. Typically, the requirements for use of NetLink e340/h340/i640 Wireless Telephones are similar to that of wireless data devices.

Access points must utilize SpectraLink Voice Priority (SVP). See the *Polycom WLAN Compatibility Table* for information about APs that support SVP.

Ethernet switch

Interconnects multiple network devices, including the NetLink SVP Server, the proxy server(s), wired IP phones and the APs. Ethernet switches provide the highest performance networks, which can handle combined voice and data traffic, and are required when using the NetLink e340/h340/i640 Wireless Telephones.

Although a single Ethernet switch network is recommended, the handsets and the NetLink SVP Server can operate in larger, more complex networks, including networks with multiple Ethernet switches, routers, VLANs and/or multiple subnets. However, in such networks, it is possible for the quality of service (QoS) features of the NetLink SVP Server to be compromised and voice quality may suffer. Any network that consists of more than a single Ethernet switch should be thoroughly tested to ensure any quality issues are detected.

Note that the NetLink e340/h340/i640 Wireless Telephones cannot “roam” from one subnet to another. If routers and multiple subnets are in use, the handsets must

only use APs attached to a single subnet, or be powered off and back on to switch to a different subnet.

SIP server

The SIP server is a component from a third-party vendor that provides access to telephony services. The handsets can recognize up to three distinct SIP servers in a single system.

The handsets can operate with SIP proxy servers such as SER (SIP Extensible Router) or with SIP Back-to-Back User Agents (B2BUA) – the most common form of SIP server for PBX-based systems. The handsets can also operate with no SIP server at all. In this case the IP address location services provided by the SIP server are not available, so direct IP address dialing must be used.

The SIP proxy server connects to another device such as a PBX or gateway and from there, other wired phones and the PSTN.

SIP phone

The optional wired-LAN desksets such as those provided by Cisco, Inter-Tel, and Polycom.

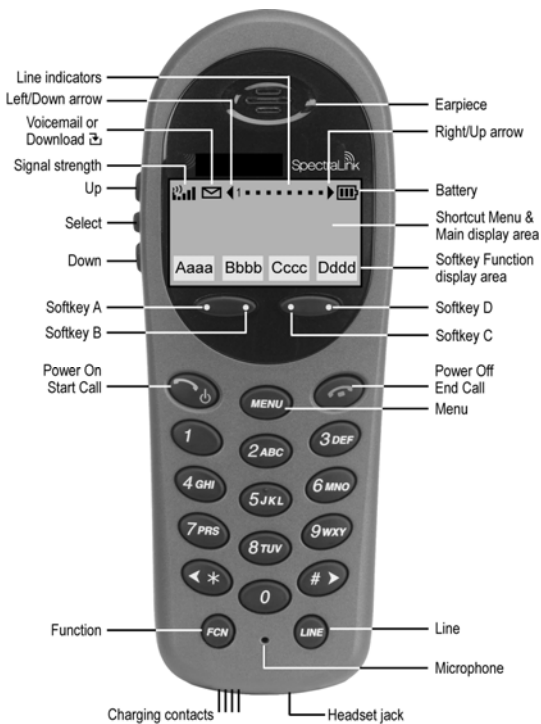
TFTP server

Required in the system to distribute software to the handsets. May be on a different subnet than the gateway, APs and/or handsets.

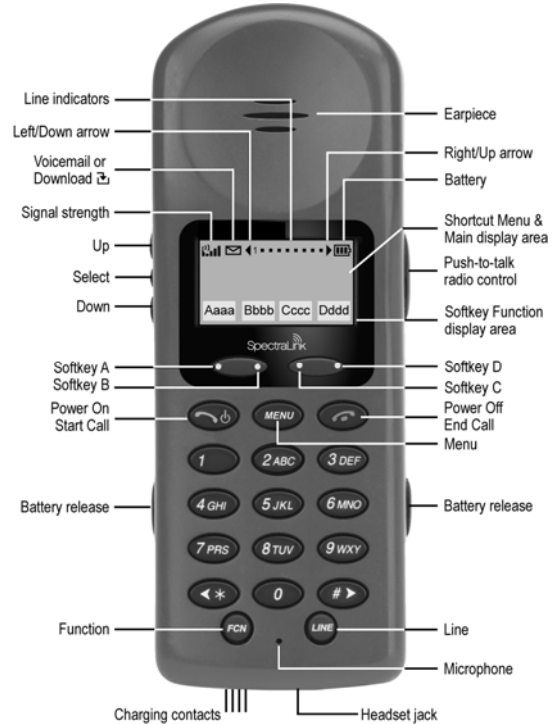
SIP TFTP server

Required in the system to deliver SIP configuration parameters to the SIP handset whenever a SIP handset is powered-up. The location of the SIP TFTP server is separately specified in SIP handset administration parameters (See Section 4.1 *The Admin Menu*.) Normally, the SIP TFTP server is the same as the network TFTP server, see above.

2.6 NetLink Wireless Telephone Specifications



NetLink e340/h340 Wireless Telephone¹

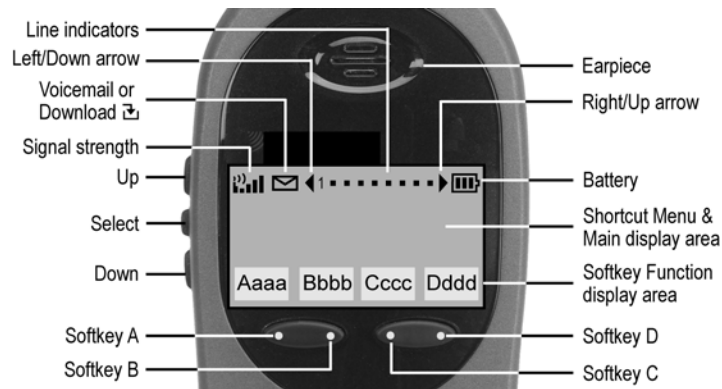


NetLink i640 Wireless Telephone

Radio frequency:	2.4000 - 2.4835 GHz
Transmission type:	Direct-sequence spread spectrum (DSSS)
Transmit data rate:	Up to 11 Mb/s
Radio QoS:	SpectraLink Voice Priority (SVP)
Wireless security:	Wired Equivalent Privacy (WEP), 40-bit and 128-bit, Cisco FSR; WPA-PSK, WPA2-PSK
FCC certification:	Part 15.247
Management:	DHCP, TFTP
Voice encoding:	G.711 (A- and mu-law),
VoIP Protocols:	SIP
Transmit power:	100 mW peak, < 10 mW average
Display:	Pixel-based (up to 4-line x 18-character) alphanumeric, plus line and status indicators.
e340/h340 dimensions:	5.5" x 2.0" x 0.9" (14.0 x 5.1 x 2.3 cm)
i640 dimensions:	5.9" x 2.2" x 1.0" (15.0 x 5.6 x 2.5 cm)
e340/h340 weight:	4.2 ounces (119.0 g)
i640 weight:	6.0 ounces (170.1 g)
Battery capacity:	4 hours talk time, 80 hours standby (30 hours standby if push to talk (PTT) is enabled)

¹The NetLink e340 Wireless Telephone is shown. The NetLink h340 Wireless Telephone's specifications are identical to the NetLink e340 Wireless Telephone's specifications.

2.7 Handset Display



Alphanumeric

The NetLink e340/h340/i640 Wireless Telephones support a two to four line display of up to 19 alphanumeric characters. Display information provided by the proxy server when the handset is off-hook, such as calling party identification, will be processed and put on the handset display.

Line indicators

The line indicators on the handset will convert to a solid or flashing number to indicate the line is in use or ringing. The number or text associated with the line is displayed on the handset by pressing the **LINE** key.

Signal strength

The signal-strength icon indicates the strength of the signal from the AP and can assist the user in determining if the handset is moving out of range. It is always present on the display in the upper left corner.

Battery charge

The battery icon indicates the amount of charge remaining in the Battery Pack. There are three levels and when only one level remains, the Battery Pack needs to be charged. It is always present on the display in the upper right corner.

Voicemail

The voicemail icon is activated whenever any of the specified mail contacts (see SIP configuration files) sends notification to the handset that new messages are available. By activating the **LINE** menu, and observing which lines are flagged with a plus (+) sign, the user can determine which proxy has outstanding mail.

The system administrator defines access to voicemail.

Download

Indicates that the handset is checking for or downloading code. This icon only appears while the handset is running the over-the-air downloader. It appears to the right of the signal-strength icon in the same location as the voicemail icon.

Ring and tones

The ringing type (normal or vibrate) is selected by the handset user. The audible and vibrating ringer on the handset will follow the protocol command provided by the

PBX via the proxy server if the user selects **PBX** cadence described in the *User-defined Preferences* section.

Audio features

Speakerphone features are not available on the e340/h340/i640 handset.

2.8 Startup Sequence

The NetLink Wireless Telephone goes through an initialization sequence at startup. The line icons 1-9 display and count down as the handset steps through this sequence. This is usually very rapid. If there is difficulty at any step that prevents initialization from continuing, an error message will display and the related icon(s) will stay on. Please see the error table at the back of this document for instructions on how to handle error messages that occur during initialization.

Icon	The icon(s) shown in bold turns off when:
123456789	The handset has located and authenticated and associated with at least one AP, and is proceeding to bring up higher-layer networking functions.
12345678	The handset is either configured for Static IP, or if configured for DHCP, the DHCP discovery process has started.
1234567	If DHCP is configured, a DHCP response was received which contains a good DNS server configuration.
123456	Note: Only valid on non-SRP protocol. Indicates one of the following: Static IP configuration, or NetLink SVP Server address found in DHCP response, or NetLink SVP Server address found via DNS lookup.
12345	All networking functions are complete (notably, DHCP), and the handset is proceeding with establishing the SRP link to the NetLink SVP Server.
1234	The SRP link is established; all network stack initialization is complete, proceeding with application-specific initialization.
123	SIP application startup. Icon 3 is extinguished if a generic SIP config file is found.
12	Icon 2 is extinguished if a handset specific SIP config file is found.
(no icons) Registering	Handset is attempting to register each of the specified line contacts.
(no icons) EXT. XXXX	Handset has registered with at least one contact on one proxy server. Initialization is complete. The handset is in standby mode ready to receive and place calls. The line one contact is displayed.

During the last three steps of this process, the handset contacts the SIP TFTP server and downloads general information about the proxy server(s), downloads specific

information pertaining to the handset, registers with the proxy server(s), and verifies handset credentials. Once this process is complete, the handset is ready to use.

If the username and password have not been defined in the Admin menu, you will be prompted to enter both of these items before the extension number can display. The user name must correspond to the configuration file that contains user-specific information. If the file is not found, an error message will appear and the handset will restart. See Section 6.1 *SIP TFTP Server Configuration Files*.

2.9 Handset Modes

Standby mode (on-hook)

In standby mode, the handset is waiting for an incoming call or for the user to place an outgoing call. The extension number is shown on the display and there is no dial tone. In this mode, the handset is conserving battery power and wireless LAN bandwidth.

When an incoming call occurs, the handset will ring, and the handset enters the active mode until the call is answered by pressing the **Start Call** key or the **Answ** softkey. The handset will ring according to user preference as specified in the standby menus. The ringing can be silenced by pressing the **End Call** key. If you do not wish to accept the call, press the **Rej** softkey. The SIP server (if present) will redirect the call as configured by the system administrator, often to voicemail. (Treated like the handset is busy.)

Active mode (off-hook)

The handset is in the active mode when an incoming call is answered or when it is in communication with the SIP server without being in an active call.

When an incoming call occurs during an active call, the handset will play the second call ringing sound until the call is answered, the caller hangs up, or the call transfers to voicemail. If **End Call** is pressed, the first call is terminated and the handset reverts to a full ring.

The active modes utilize the most bandwidth and battery power. To conserve these resources, return the handset to the standby mode when a call is completed by pressing the **End Call** key.

Push-to-talk (PTT) mode

The NetLink i640 Wireless Telephones utilize channels for incoming and outgoing radio communication. While PTT is active, the handset is in PTT mode. It can receive regular phone calls in this mode. When a regular phone call is answered, the handset enters active mode.

Messaging mode

If text messaging functions have been programmed, as in a nurse call system, the handset is able to receive text messages. While these messages are being accessed, the handset is in messaging mode. Incoming calls will ring with the second call ringing sound.

2.10 Handset Displays

Status display area

Displays handset information and available softkeys for the currently selected line. Text may be truncated if there are more than 18 characters because the handset display area is 18 characters wide.

LINE display

Pressing the **LINE** key from the active mode displays a list of line appearances as programmed in the SIP TFTP configuration file. The line appearances are mapped to corresponding line icons. The **LINE** key can be pressed while the handset is in the standby mode to activate the handset.

The currently selected line is indicated by an asterisk (*). Lines for which the corresponding proxy server has outstanding new mail are flagged with plus (+) characters. Exit the **LINE** display by pressing a line number key or by pressing the **End Call** key. The **LINE** display may be used during a call to examine the status of other lines while you are participating in a voice call on another line. If the **Rsme** (resume) softkey is pressed to activate a call on a newly selected line, any previous active call is placed on hold status.

FCN display

Pressing the **FCN** key from the active mode displays a list of telephony options available to the user. Included here are transfer and do-not-disturb functions.

MENU display

Pressing the **MENU** key from the active mode displays options available for the operating mode of the handset. The currently available options set the data entry mode during dialing (and during entry of a forwarding number) to either numeric only or alphanumeric mode.

3. NetLink Wireless Telephone Configuration

Each handset may be configured for site-specific requirements by opening the Admin menu and selecting options or entering specific information. Any settings entered in the Admin menu must conform to system settings. Only the handset being configured is affected by the Admin menu settings.

The Wireless Telephone user may select several usability options from the Standby menu, described below in the *User-defined Preferences* section. This information is also provided in the end-user manual.

The NetLink Configuration Cradle is an accessory device designed to automate configuration of e340/h340/i640 NetLink Wireless Telephones. The Configuration Cradle is connected to a PC via a serial cable. A downloadable Configuration Cradle program runs on the PC and enables the system administrator to establish and store configuration options for system, group and user levels. A configuration plan may be set up in the program and downloaded into a handset or a configured handset may be placed in the cradle and its configuration may be uploaded and edited or saved.

Please see your service representative or contact SpectraLink Customer Service for more information about this time-saving device

3.1 The Admin Menu

The Admin menu contains configuration options that are stored locally (on each handset). Each handset is independent, and if the default settings are not desired, the Admin options must be set in each handset requiring different settings.

Opening the Admin menu

1. With the handset powered off, press and hold the **Power Off** key. While holding the **Power Off** key, press and release the **Power On** key.
2. . The first option on the Admin menu displays.



If an admin password has been set, the display will require its entry before opening the Admin menu. The default password is 123456. If no password is set, the display will proceed directly into the Admin menu.

Entering and editing Admin menu options

An asterisk (*) next to an option on the display indicates that it is selected. Use the **Up**, **Down**, and **Select** side buttons and the softkeys to navigate and select:

- Up/Down buttons:** Display previous/next menu item.
- Select button:** Selects the menu item or option.
- OK softkey:** Selects the menu item or option.
- Save softkey:** Saves the entry.
- Bksp softkey:** Backspaces to allow editing of entry.
- Cncl softkey:** Cancels edit and returns to previous menu level.
- Up softkey:** Returns to previous menu level.
- Exit softkey:** Exits the menu (at the top level).
- End Call key:** Exits to standby mode (from any level)

Alphanumeric string entry

1. Press the first digit/letter. The digit displays. Press the key again to scroll through the letters associated with that key.

Example: if the 2 key is repeatedly pressed, the handset will display 2, A, B, and C, then a, b, and c.

The following table shows which key will allow you to enter non-numeric characters or other characters not represented on the keypad.

To Enter	Press
. - _ ! # \$ % & ' () * + , ; / \ = @ ~	1
Space	0
Q,q	7
Z,z	9

2. When the correct entry displays, press the right arrow key (**#**) to move on to the next character. Repeat for each digit/letter of the entry. To erase, press the left arrow key (*****) or **Bksp** softkey to erase the previous character.
3. Press the **Save** softkey to save the entry.
Press the **Up** softkey to abort and return to the menu without saving any changes.

The following table lists the Admin menu items. The default settings are shown in the table below with an * prior to the option. Detailed descriptions of each item appear below the table.

Admin menu

Admin Menu Items	2 nd Level	3 rd Level	4 th Level	5 th Level
Phone Config	License Option	Set Current	[List per download]	
	SIP Registration	Reg 1 and Login Reg 2 Reg 3 Reg 4	[for each option] Username Password	
	OAI On/Off	*Enable OAI Disable OAI		
	Push-to-talk	Enable Channels	*Channel 1 *Channel 2 *Channel 3 *Channel 4 *Channel 5 *Channel 6 *Channel 7 *Channel 8	
			Allow/Disallow	*Allow PTT Disallow PTT
Admin Password	Enter PW	Re-enter Password		
Network Config	IP Addresses	*Use DHCP		
		Static IP	Phone IP TFTP Server IP Default Gateway Subnet Mask SIP TFTP Svr IP SVP Server IP OAI Server IP	
	ESS ID	*Learn Once		
		Learn Always		
		Static Entry		
	Security	*None		
		WEP	Authentication	Open System Shared Key
			WEP On/Off	WEP Off WEP On
			Key Information	Default Key Key Length Key 1-4
			Rotation Secret	
Cisco FSR		Username Password		
WPA-PSK		Passphrase Direct Entry		
WPA2-PSK	Passphrase Direct Entry			
Reg. Domain: None				

Admin Menu Items	2 nd Level	3 rd Level	4 th Level	5 th Level
	Transmit Power	*Maximum 50 mW † 30 mW † 20 mW 15 mW 10 mW 5 mW		
Diagnostics	Run Site Survey			
	Diagnostics Mode	Diagnostics On *Diagnostics Off		
	Syslog Mode	*Disabled Errors Events Full		
Restore Defaults				

* *default setting*

† *50 mW and 30 mW only appear if Regulatory Domain is set to None or 01.*

Phone Config

License Option

License Option lets you select the VoIP protocol that your site is licensed to download and run. The SIP protocol used for the NetLink e340/h340/i640 Wireless Telephones requires license option selection **11**. Any other protocol will cause the handset to malfunction.

SIP Registration

Individual handsets may be configured to correspond with the SIP configuration information in the TFTP server. The handset is then automatically identified at startup. If username and password information is not configured in the Admin menu, then this information will be requested at startup

In either case, the username and password must agree with a corresponding configuration file. See Section 6.1 *SIP TFTP Server Configuration Files*.

Reg 1 and Login allows you to specify a username and password for automatically acquiring SIP configuration information. If no username is specified, the SIP handset will request username and password at startup and any additional registrations specified here are ignored.

The username should correspond to the primary (line 1) dial number assigned to the user. The username and password should also correspond to the authentication credentials as created by your system administrator for your primary line registration. Usernames or passwords can be erased by selecting the item, then pressing **Bksp** softkey and then **Save** softkey.

Reg 2, Reg 3, and Reg 4 allow you to specify additional authentication usernames and passwords that may be required by your handset for any additional line appearances (registrations) that may appear in the specific user's configuration file. This information will be ignored if a **Reg 1 and Login** username is not provided.

OAI On/Off

SpectraLink's Open Application Interface (OAI) enables third-party computer applications to display alphanumeric messages on the handset display and take input from the handset keypad. Refer to the OAI Specification (Version 2.0)

documentation for information about administering the OAI Gateway and the services it can provide.

If you have an OAI Gateway installed in your system, OAI may be optionally enabled in each handset. You may select whether the handset should attempt to connect to the NetLink OAI Gateway by choosing either the Enable or Disable options in this menu.

If OAI is enabled, and an IP address (called the **OAI Server IP**) is available to the handset (either via DHCP or Static IP configuration), the handset will communicate with the OAI Gateway at power-on, and periodically while it is powered-on. If you don't have a NetLink OAI Gateway installed at your site, you should disable the OAI feature to preserve network bandwidth and battery life.

Push-to-talk (PTT)

PTT is available in the i640 handset only. All eight PTT channels are allowed by default. To toggle the allowed status of any channel, select **Allowed Channels**, scroll to the channel to be disallowed and press the **Select** side button. Allowed channels are displayed with an * in the left column. Only those channels allowed in the Admin menu will appear on the Standby menu where they can be enabled or disabled by the end user. To disallow PTT entirely, select **Allow/Disallow**, scroll to and select **Disallow PTT**.

Admin Password

The Admin Password controls access to the administration functions in the Admin menu. The password must be set in each handset for which controlled access is desired. Handsets are shipped without any Admin menu password. Data entry for the password uses the alphanumeric string entry technique. Type the password and press the **Save** softkey. A confirmation prompt will appear. Type the password again and press the **Save** softkey. If the passwords match, the Admin password has been set.



If you **Save** with no entry, the password is erased and the display will not require it before displaying the Admin menu.

Network Config

IP Address

There are two modes in which the handset can operate: DHCP-enabled or Static IP. Select the mode for operation from the IP Address menu:

*** Use DHCP** Will use Dynamic Host Configuration Protocol to assign an IP Address each time the handset is turned on. If DHCP is enabled, the handset also receives all other IP Address configurations from the DHCP server.

Static IP Allows you to manually set a fixed IP Address. If selected, the handset will prompt for the IP addresses for each configurable network component. When entering addresses, enter the digits only including leading zeroes. No periods are required.

Regardless of the mode in which the handset is operating, the following components are required and must be configured as part of the SIP system:

Phone IP The IP address of the handset. This is automatically assigned if DHCP is used. If using Static IP configuration, you must obtain a unique IP Address for each handset from your network administrator.

Proxy Server IP The IP address of the proxy server. Configure this address only if Static IP addressing is used. If DHCP is used, the IP address does not need to be configured but instead is obtained from DHCP option 43.

SVP Server IP The IP address of the NetLink SVP Server. If using Static IP configuration, this is simply the IP address of the NetLink SVP Server. Note that the NetLink SVP Server must be statically configured to have a permanent IP address. If DHCP is being used, the handset will try the following, in order: the DHCP option 151, then a DNS lookup of “SLNKSV2” if the DHCP options 6 (DNS server) and 15 (Domain Name) are configured.

TFTP Server IP The IP address of a TFTP server on your network, which holds software images for updating the handsets and contains the handset files. If this feature is configured (not set to 0.0.0.0 or 255.255.255.255) with either Static IP configuration or using DHCP option 66 (TFTP server), or the boot server/next server (siaddr) field, the handset will check for newer software each time it is powered on or comes back into range of your network. This check takes only a second and ensures that all handsets in your network are kept up-to-date with the same version of software.

SIP TFTP Server IP The IP address of a TFTP server on your network, which holds SIP configuration files. In static mode, this parameter must be configured with an IP address. In DHCP mode, the SIP TFTP server may be specified by defining the address on the DNS server for the name “siftftp” If this is not defined, the address specified in option 66 will be used. See Section 5, *SIP Integration Factors*.

Default Gateway and Subnet Mask Used to identify subnets, when using a complex network, which includes routers. Both of these must be configured either with an IP address under Static IP (not set to 000.000.000.000 or 255.255.255.255) or with DHCP for the handset to contact any network components on a different subnet. If configured on the DHCP server, use option 3 for the Default Gateway and option 1 for the Subnet Mask. Contact the network administrator for the proper settings for the network.



Note that the wireless telephones cannot “roam” across subnets, since they cannot change IP addresses while operational. Ensure that all APs are attached to the same subnet for proper operation. The handset can change subnets if DHCP is enabled and the handset is powered-off then back on when within range of APs on the new subnet.

Syslog Server IP The IP address of the syslog server. See the *Diagnostic Tools* section for more information.

OAI Server IP The IP address of the NetLink OAI Gateway. If using Static IP configuration, this is simply the IP address of the NetLink OAI Gateway. If DHCP is being used, the handset will try the DHCP option 152.

ESSID

Select the option that will enable the handset to acquire APs with the correct ESSID (Extended Service Set ID, aka SSID) each time it is turned on.

Note about Automatic Learn options: Broadcast ESSID must be enabled in the APs for ESSID learning to function. Refer to the *Configuration Note* for specific APs or call the AP vendor for specifics. Overlapping wireless systems complicate the use of ESSID learning as the handset in an overlapping area could receive conflicting signals. If this is the situation at your site, use Static Entry or Learn Once in an area without overlapping ESSIDs.

*** Learn Once** Allows the handset to scan all ESSIDs for a DHCP server and/or the NetLink Telephony Gateway. Once either is found, the handset retains the ESSID from whichever AP it associates with at that point. When overlapping wireless systems exist, the Learn Once feature allows the handset to use only the ESSID established at first learn at all subsequent power ons. This ESSID is retained by the handset until the ESSID option is reselected.

Learn Always Allows the handset to automatically learn the ESSID at each power on or loss of contact with the wireless LAN (out of range). This may be useful if the handset will be used at more than one site.

Static Entry If the APs do not accept broadcast ESSID, or if there are overlapping wireless systems in use at the site, enter the correct ESSID manually.

Security

***NONE** disables any 802.11 encryption or security authentication mechanisms.



For WEP, WPA-PSK and WPA2-PSK set each of the following options to match exactly the settings in the APs.



Encryption codes display as they are entered. For security reasons codes will not display when a user returns to the Admin menu, Encryption options.

WEP (Wired Equivalent Privacy) is a wireless encryption protocol that encrypts data frames on the wireless medium allowing for greater security in the wireless network. If WEP is required at this site, you must configure each handset to correspond with the encryption protocol set up in the APs. Select the entries from the options below to enable the handset to acquire the system.

Authentication Select either **Open System** or **Shared Key**.

WEP On/Off Select either **WEP Off** or **WEP On**.

Key Information

Default Key Enter the key number specified for use by the handsets. This will be **1** through **4**.

Key Length Select either **40-bit** or **128-bit** depending on the key length specified for use at this location.

Key 1 through 4 Scroll to the key option that corresponds to the **Default Key** that was entered above. Enter the encryption key as a sequence of hexadecimal characters. (Use the **2** and **3** keys to access hexadecimal digits A-F, use the Right Arrow key to advance to the next digit, and the Left Arrow key to backspace.) For 40-bit keys, enter 10 digits. For 128-bit keys, enter 26 digits. The display will scroll as needed.

Rotation Secret This is used for proprietary WEP key rotation. Refer to your custom document if this feature is supported in your system.

Cisco FSR (Fast Secure Roaming) In order to provide the highest level of security without compromising voice quality on Cisco Aironet wireless LAN APs, SpectraLink and Cisco Systems have cooperated to implement the Fast Secure Roaming mechanism. FSR is designed to minimize call interruptions for NetLink Wireless Telephone users as they roam throughout a facility. Existing Aironet 350, 1100, and 1200 APs may require a firmware upgrade to support FSR. Cisco FSR requires advanced configuration of the Cisco APs in your site. See your Cisco representative for detailed documentation on configuring the APs and other required security services on the wired network. To configure Cisco FSR on a handset, you must enter a Radius Server username and password into each handset.

Username Enter a username that matches an entry on the Radius server. Usernames are alphanumeric strings, and can be entered using the alphanumeric string entry technique.

Password Enter the password that corresponds to this Username.

WPA-PSK The security features of WPA (Wi-Fi Protected Access) using PSK (pre-shared key) are available and may be used if supported by the APs in the facility. Select either **Passphrase** and enter a passphrase between eight and 63 characters in length or **Direct Entry** and enter the 256-bit key code.

WPA2-PSK The security features of WPA2 (Wi-Fi Protected Access) using PSK are available and may be used if supported by the APs in the facility. Select either **Passphrase** and enter a passphrase between eight and 63 characters in length or **Direct Entry** and enter the 256-bit key code.



Consult the Configuration Note for the APs installed in your facility for information on which of the WPA versions are recommended by SpectraLink engineering. Configure the recommended version on the AP and select the corresponding option on the Admin menu.

Regulatory Domain

The Regulatory Domain will default to **None** on the handset display. FCC requirements dictate that the menu for changing the domain be available by password, which in this case is the **LINE** key. To change the domain, press **LINE** and

then enter the digits that represent the site's domain. Note that both digits must be entered.

01 North America

02 Europe (except Spain and France); Japan (channels 1-13)

04 Spain

05 France



As of this writing, Spain and France are adopting the general European regulatory rules. Check with your wireless LAN administrator or supplier regarding which domain to enter in these countries.

Transmit Power

Available Transmit Power is regulated by domain. The Regulatory Domain setting above affects the options available for this setting. The default setting is **Maximum** which in North America is 100 mW. The Maximum in other domains is 30 mW. Transmit Power may be set to a lower number if necessary by selecting one of the other levels. If changed from the default, ensure the Transmit Power setting is the same on all handsets and all APs.



Power is limited to 30mW in regulatory domains other than North America.



See *Appendix A* for the full list of certified countries and the corresponding domain for each.

Diagnostics

Run Site Survey

The **Site Survey** mode is activated by selecting this option. The site survey starts running immediately upon selecting this option. See the *Diagnostic Tools* section for more information about site survey.

Diagnostics Mode

See the *Diagnostic Tools* section for a detailed explanation of the **Diagnostics Mode** options.

Syslog Mode

See the *Diagnostic Tools* section for a detailed explanation of the **Syslog Mode** options.

Restore Defaults

The **Restore Defaults** option will set all user and administrative parameters except License Option to their factory defaults.

3.2 User-defined Preferences

The following user-defined preferences are also covered in the *NetLink e340/h340/i640 Wireless Telephone User Guide*. The system administrator can refer to this list for more information about customizing handset settings.

To configure the following options, the handset must acquire the system (no error message may display) and be at the extension display. This is the standby mode.

While in the standby mode, press and hold **FCN** briefly to open the user options menu. Use the following keys to display and select options:

- Up/Down buttons:** Display previous/next menu item.
- Select button:** Selects the menu item or option.
 - OK softkey:** Selects the menu item or option.
 - Save softkey:** Saves the entry.
 - Bksp softkey:** Backspaces to allow editing of entry.
 - Cncl softkey:** Cancels edit and return to previous menu level.
 - Up softkey:** Returns to previous menu level.
 - Exit softkey:** Exits the menu (at the top level).
 - End Call key:** Exits to standby state (from any level).

Standby menu

Standby Menu Items	2 nd Level	3 rd Level	4 th Level
Lock Keys			
Ring Options	Telephone Ring	Ring Cadence	Off *PBX Continuous Short Pulse Long Pulse
		Ring Tone	*Tone 1 Tone 2 Tone 3 Tone 4 Tone 5
		Ring Volume+	Bars
		Vibrate Cadence	*Off PBX Continuous Short Pulse Long Pulse
		Ring Delay**	*No Delay 5 Second Delay 10 Second Delay
	Auxiliary Ring 1		
Auxiliary Ring 2			
Phone Options	Noise Mode	*Normal High Severe	
	Key Tones	*Enable Tones Disable Tones	
	Warning Tones	*Enable warnings Disable warnings	
	Display Contrast	Contrast %	
	Keypad Autolock	*Disable 5 seconds 10 seconds 20 seconds	
System Info	Phone IP Addr		
	Server IP Addr		
	Firmware Version		
Push-to-talk+	Channel	Current Channel: X 1 2 3 4 5 6 7 8 New Channel = ?	
	Enable/Disable	PTT Enabled *PTT Disabled	
	Audio Volume	Bars	
	Tone Volume	Bars	

* Default setting.

**Option appears when Ring Cadence and Vibrate Cadence are both set to a value other than "Off".

+These options are available only on the NetLink i640 Wireless Telephone.

Main menu Scroll through the list of options by pressing the **Up** and **Down** side buttons. Select an option by pressing the **Select** side button.

Lock Keys Ring Options Phone Options System Info Push-to-talk [i640]			
OK			Exit

Lock Keys When enabled, the Keypad Lock option will lock the keypad immediately. If the keypad is locked, it may be unlocked by the end user pressing the **Unlk** softkey and then the **#** key.

Ring Options The Ring Option allows the user to set the ring for three separate functions. Telephone ring is used for usual telephony functions. The Auxiliary Rings may be used to set different ringing patterns for OAI applications.

Telephone Ring Auxiliary Ring 1 Auxiliary Ring 2			
OK			Up

Telephone Ring Telephone Ring allows the user to set a distinctive ring style, volume and sequence. Select from an audible ring or a vibrate-only ring or a vibrate ring along with or followed by an audible ring.

Ring Cadence Ring Tone Ring Volume [i640] Vibrate Cadence Ring Delay			
OK			Up

Ring Cadence The Ring Cadence is the rhythm of the ring. It may be set to a pre-programmed ring cadence, or it may be set to obtain its cadence from the proxy server. The PBX option is designed to utilize any distinctive rings sent by the proxy server while allowing the user to set unique rings for auxiliary applications.

Off			
PBX			
Continuous			
Short Pulse			
Long Pulse			
OK			Up

Off: Silent

PBX: Proxy server determines ring cadence (e.g. the proxy server may send rings that differentiate between internal and external calls)

Continuous: Rings continually until answered

Short Pulse: Rings in short bursts

Long Pulse: Rings in long bursts

Ring Tone Select from five available tones (scroll to Tone 5 option). The Play softkey allows the user to preview the tone before selecting. If Ring Cadence is turned off, the Ring Tone option will not appear on the menu.

Tone 1			
Tone 2			
Tone 3			
Tone 4			
Tone 5			
OK	Play		Up

Ring Volume NetLink i640 Wireless Telephone only. The user may select a volume level by pressing the **Up** and **Down** side buttons and then pressing the **OK** softkey. The graduated volume bar indicates the levels. This setting may be overridden by adjusting volume while the handset is ringing.

Vibrate Cadence Vibrate Cadence options are the same as for Ring Cadence (see above).

Ring Delay Ring Delay determines how long the vibrate cadence will play before the audible ring starts. If Ring Cadence and Vibrate Cadence are turned off, the Ring Delay option will not appear on the menu.

No Delay			
5 Second Delay			
10 Second Delay			
OK			UP

Auxiliary Ring 1 and Ring 2 Auxiliary rings are designed to be utilized by OAI applications, enabling the user to set a distinctive ring for these applications.

Phone Options

Noise Mode Provides options that describe the noise level in your environment. Changing this mode to **High** or **Severe** adjusts the handset's microphone and in-ear speaker volume to account for background noise. Select **Normal** for most office environments; **High** for moderate background noise; or **Severe** for extremely noisy conditions. If you use **High** or **Severe** modes in a quiet environment, the person on the other end of the line may find it difficult to hear your voice.

Key Tones Key Tones may be turned on or off and determine whether tones play when keys are pressed. Key Tones are enabled by default.

Warning Tones The handset plays various Warning Tones such as system up or down, out of range, etc. These tones may be turned on or off and are enabled by default.

Display Contrast The display may need to be adjusted for different lighting situations. Contrast may be set by pressing the **Up** and **Down** side buttons until the desired contrast is displayed and then pressing the **OK** softkey.

Keypad Autolock The handset may be set to lock the keypad automatically when in standby mode. The automatic locking function of the keypad may be disabled (the default) or adjusted for a 5, 10 or 20-second delay before locking.

System Info

Phone IP Addr Displays the IP address currently assigned to the handset.

Server IP Addr Displays the IP address of the NetLink SVP Server and the OAI Server (if installed).

Firmware Version displays the software version running the handset. The MAC address is the hardware identification number and is set at the factory. Three code numbers correspond to the three files that each version uses.

(MAC address) (downloader code) (functional code) (phintl file)			
OK			Up

Downloader: pd11gl3.bin

Functional: pd11spc3.bin

Phintl: phintl24.bin

Push-to-talk (PTT) The NetLink i640 Wireless Telephone incorporates PTT functionality. PTT may be allowed or disallowed in the Admin menu. If allowed, the user may enable or disable locally and may set the channel, tone volume and audio volume. The menu for PTT does not appear if PTT is disallowed on the Admin menu or if no channel is enabled on the Admin menu.

Channel			
Enable/Disable			
Audio Volume			
Tone V Volume			
OK			Up

Channel The user may enable any PTT channel that has been allowed in the Admin menu by entering the corresponding number from the keypad. If PTT has been enabled in this handset, the default channel is the lowest allowed channel as set in the Admin menu.

Current Channel - X			
1 2 3 4 5 6 7 8			
New Channel = ?			
			Up

Enable/Disable The user may enable or disable PTT on this handset. PTT is disabled by default.

PTT Enabled			
PTT Disabled			
OK			Up

Audio Volume, Tone Volume The user may select volume levels by pressing the **Up** and **Down** side buttons and then pressing the **OK** softkey. The graduated volume bar indicates the levels. The Audio Volume setting may be overridden by adjusting volume while the handset is in a PTT call.



If PTT is allowed in the Admin menu and enabled by the user, Battery Pack life when the handset is in standby mode is decreased to about 30 hours.

(Additional options may be present. Contact your system administrator for information.)

3.3 The Favorites Menu

The Favorites menu provides access to a predefined list of dial numbers. The list is programmed by the system administrator and may include generic or specific entries. For specific entries, the user must provide a list of numbers to the system administrator for programming. Numbers on the Favorites list cannot be programmed in or through the handset by the end user.

The Favorites list can include either complete dial numbers for named parties or partial numbers that need additional data entry. Here is a partial entry example: If a PBX feature access code for call forwarding is defined in the Favorites list but you need to add the forwarding destination information before sending the call to the PBX to activate the feature.

Access the Favorites list while in a dialing state by pressing the **Favr** softkey to display a menu of pre-defined numbers or names that can be dialed (as programmed in the SIP TFTP configuration file.) When an item is selected from the list, the dial number is displayed. You may edit or add digits to the displayed number if necessary before pressing **START** to place the call. When using the Favorites menu to perform a blind transfer to someone on the list, select an entry from the Favorites menu and then press **FCN** and select **Transfer**.

Favorites Feature Activation

If you want to...	Then...
Place a call from Favorites menu	<ol style="list-style-type: none"> 1. Press START. 2. Listen for dial tone. 3. Press Favr softkey. 4. Use the side buttons to find and select desired entry. 5. Edit entry if needed. 6. Press START to place the call.
Transfer a call (blind)	<ol style="list-style-type: none"> 1. While in a call, press FCN and then select Transfer (or press the shortcut key 1). (The current call will be placed on hold]. A new call will be started and you will hear a dial tone.) 2. Press the digits for the number to which you wish to transfer the call or press the Favr softkey and select an entry from the Favorites menu.. 3. Press FCN 1 again. The call will be transferred to the number that you have entered and your call will be disconnected.
Transfer a call (consulted)	<ol style="list-style-type: none"> 1. While in a call, press FCN and then select Transfer (or press the shortcut key 1). (The current call will be placed on hold]. A new call will be started and you will hear a dial tone.) 2. Press the digits for the number to which you wish to transfer the call or press the Favr softkey and select an entry from the Favorites menu.. 3. Press Dial to establish a second call. 4. When the party answers, have your conversation and then press FCN 1 to transfer the held call and disconnect the first call and return to standby mode.

4. Software License and Protocol Management

NetLink Wireless Telephones support a number of different IP protocol integrations. All NetLink e340/h340/i640 Wireless Telephones are shipped from SpectraLink with a generic software load that allows them to associate to a wireless LAN and download functional software from a TFTP server. **The handsets will not function properly without downloading appropriate software.**

The following details the process to properly configure NetLink e340/h340/i640 Wireless Telephones and download software via over-the-air file transfer.

4.1 Requirements

- A wireless LAN must be properly configured and operational through the use of 802.11b wireless APs.
- A TFTP server must be available on the network in order to load the appropriate software into the handsets.
- Finally, ensure that the Battery Pack on the handset is fully charged.

4.2 Configuration Process

1. Download the latest NetLink e340/h340/i640 Wireless Telephone IP software from <http://www.polycom.com/usa/en/support/voice/wi-fi/wi-fi.html>.
2. Load the latest version of the SIP code and place it on the TFTP server and ensure the TFTP server is started. The four files that are needed must be named:
slnk_cfg.cfg
pd11sid.bin
pd11sid3.bin
pd11gl3.bin
pi110001.bin
3. If statically assigning IP addresses, ensure that the Phone IP address, TFTP server IP, Subnet Mask, Default Gateway, and SIP TFTP server IP addresses are accurate in the Admin menu. If using a DHCP server, ensure that appropriate options are set for the TFTP server. See the *NetLink Wireless Telephone Configuration* section for detailed configuration instructions.
4. Ensure the handset has properly configured **ESSID** and **Reg Domain** information within the Admin menu. If you are accepting broadcast **ESSIDs** at your APs, the handset will automatically learn the ESSID information when powering on. See *NetLink Wireless Telephone Configuration* section for detailed configuration instructions.
5. Using the Admin menu on the handset, ensure the **License Option** menu option is set to **11**. This ensures the handset will check for the proper SIP files each time it powers on. See *NetLink Wireless Telephone Configuration* section for detailed configuration instructions.
6. Power cycle the handset.

7. The SIP code will now download to the handset. The status bar will increment fully across the display for each function that is being performed in the download process. Upon completion of the update process, the handset will re-boot with the new firmware.
8. During the second download evolution, the handset receives code from the TFTP server for system configuration and for its own settings. Once this second evolution is complete, the handset is ready to use.



For future software upgrades, simply update the files that are stored on the TFTP server. Each time the handset is powered up, it will check with the TFTP server to ensure it has the proper software version.

5. SIP Integration Factors

CODECS

The NetLink e340/h340/i640 Wireless Telephones are compatible with the G.711 μ -law and G.711a-law codecs. There is no setting required on the handset.

DHCP

Dynamic Host Configuration Protocol (DHCP) is a standardized protocol that enables clients to be dynamically assigned with various configuration parameters, such as an IP address, subnet mask, default gateway, and other critical network configuration information. DHCP servers centrally manage such configuration data, and are configured by network administrators with settings that are appropriate for a given network environment. The handset will use the following DHCP options if DHCP use is enabled:

Option	Meaning
1	Subnet mask
3	Default gateway
6	DNS server
15	Domain name
66	TFTP server
151	NetLink SVP Server
152	NetLink OAI Gateway
siaddr	Boot server or next server

DNS

Domain Name System (DNS), an industry-standard protocol, locates computers on an IP-based network. IP networks rely on number-based addresses to move information on the network. However, it is easier to remember friendly names than number-based addresses, so it is necessary to translate user-friendly names into addresses that the network can recognize. The handset will use DNS to automatically translate names into IP addresses for the TFTP server and NetLink SVP Server.

In DHCP mode, the SIP handset will use DNS to look up an address for the logical name “siptftp” to locate the SIP TFTP file server. If this logical name is undefined, then the address specified by option 66 is used for the SIP TFTP server.

6. SIP Handset Features

In order for the handset to function in the SIP environment, it downloads two files from the root directory of the SIP TFTP server during startup. The first file contains generic system information and is downloaded by every handset during the power-up sequence. A second file, unique for each handset, is then downloaded. It contains specific information for each handset such as username, password, and line appearances. Both of these files must be written locally.

6.1 SIP TFTP Server Configuration Files

The two file types, generic and specific, are identical in format. Any or all of the configuration information can be contained in either file. Any information in the specific file that conflicts with the information in the generic file will take precedence over that in the generic file. Authentication information will be accepted from both files. For ease of administration, it is recommended both file types be utilized.

Guidelines

- The files are in plain text, US-ASCII. The general form of the configuration file data is “parameter = value.”
- The generic filename must be SIP_allusers.cfg.
- Each specific filename must have the form of SIP_username.cfg where [username] is as assigned to each individual user by the system administrator. See *SIP Registration* in Section 3.1 *The Admin Menu*.
- Username parameters are: alphanumeric, no spaces, no punctuation, case is ignored, 1-16 characters.
- Generic file information should contain proxy server information and other SIP system data.
- Specific file information should contain data specific to each user such as authentication credentials and line appearance data.
- Some parameter lines accept more than one value, separated by a colon or semicolon character as defined in the following table.
- Any line that begins with a pound sign (#) is ignored.
- In general space characters are ignored. Space characters may be included in string values by replacing the space with “%20.”
- If necessary, other special characters may be included by using a hexadecimal representation: (%hh) where hh is the representation of the character.
- Lines may appear in any order although maintenance may be simplified by preserving the order in the supplied example file.

Program each of the files according to the following instructions.

The generic file (sip_allusers.cfg)

The generic configuration file provides system information common to all handsets.

The handset files (e.g. sip_JohnDoe.cfg)

The handset configuration file provides specific information for the handset to identify itself and communicate to other phones. Each handset must have its own file with a unique filename. Use the same parameters as the generic file when programming the handset files:

Use the following parameters when programming the configuration files:

Parameter	Value	Description	Notes
PROXYn_ADDR	xxx.xxx.xxx.xxx:pppp or proxyname:pppp	Proxy address.	n = 1, 2, 3 xxx.xxx.xxx.xxx = IP4 address pppp = port (optional, 5060 is the default) proxyname = computer name (DHCP only)
PROXYn_DOMAIN	Domain name	Domain served by this proxy server.	n = 1, 2, 3 DOMAIN = [example: spectralink.com] Can be omitted if the proxy does not act as a domain server.
PROXYn_TYPE	Inter-Tel SER Asterisk	Specify the manufacturer of each defined proxy server.	Used by the handset to perform proxy-specific actions based on known behavior for specific proxy types. Only the three shown values may be used. Omit this parameter if the value is not one of these recognized settings.
PROXYn_KEYPRESS_2833	enable disable	Controls generation of in-stream RFC2833 formatted key press events.	n = 1, 2, 3
PROXYn_KEYPRESS_INFO	enable disable	Controls generation of SIP INFO requests to the SIP server for keypress events.	n = 1, 2, 3
PROXYn_HOLD_IPO	enable disable	Controls setting of the media stream IP destination address to 0 (zero) when a call is put on hold.	n = 1, 2, 3 Use for compatibility with older SIP servers that may not recognize newer stream attribute parameters for HOLD status.
PROXYn_MAIL_SUBSCR	name@xxx.xxx.xxx.xxx or sip:name@domain	Contact to whom the handset should subscribe for mail notification.	n = 1, 2, 3 name = mail server contact name. xxx.xxx.xxx.xxx = IP4 address. Domain where the mail resides ² .
PROXYn_MAIL_ACCESS	name@xxx.xxx.xxx.xxx or sip:name@domain	Contact to whom the handset should invite to access the mail center.	See above.

² For mail notifications, in general you will need to define only one contact parameter for each proxy. If the proxy server automatically creates and renews subscriptions when the handset registers, then only the PROXYn_MAIL_NOTIFY contact need be specified. If the handset must subscribe to a particular contact to get mail notification, then only the PROXYn_MAIL_SUBSCR contact needs to be specified.

Parameter	Value	Description	Notes
PROXYn_MAIL_NOTIFY	name@xxx.xxx.xxx.xxx or sip:name@domain	Contact from whom mail notification originates.	³ ⁴
AUTH [see warning note below]	username;password	Credentials. In general credentials are needed for each registered line. ⁵	username = The dial number or string that identifies the line appearance. Generally an extension or phone number. password = a secure password created by the system administrator which enables a handset to register and/or function.
CODECS	codec1, codec2	Comma-separated list of supported codecs in order of preference.	Defaults to "g711u, g711a". If either is omitted it will be added to the end of the list.
LINEn	username	The dial # or name.	n = 1, 2, 3, 4, 5 The registered contact becomes: sip:username@domain
LINEn_PROXY	i	SIP proxy server for this line.	n = 1, 2, 3, 4, 5 i = the number of the proxy server 1, 2, 3.
LINEn_CALLID	callerid	String that displays at the far end.	n = 1, 2, 3, 4, 5 callerid = the text that will display as the caller ID on the called handset.
FAVORITE	Dialstring;identifier	Phonebook list of numbers accessible from the Favorites menu.	Up to 8 entries permitted which may be divided between generic and phone specific files. Dialstring = complete SIP URI or local extension # Identifier = name. If omitted, the dial string appears on Favorites menu.

³ Values as above.

⁴ For Inter-Tel SIP servers, both PROXYn_MAIL_SUBSCR and PROXYn_MAIL_NOTIFY parameters must be set in the configuration file.

⁵ WARNING: providing credentials by using the AUTH parameters in the configuration files is a security risk and should be avoided by entering usernames and passwords in admin menu or by allowing the user to login at startup time. Credentials entered here are in plain text and accessible by anyone who can access the TFTP server files. Credentials stored in the SIP server or in the handsets are protected.

Sample generic file: filename is SIP_allusers.cfg

```

PROXY1_ADDR = 10.1.1.0
PROXY1_DOMAIN = slnkengr.com

PROXY2_ADDR = 10.15.10.2:5060
PROXY2_TYPE = Asterisk
PROXY2_DOMAIN = asterisk
PROXY2_KEYPRESS_INFO = enable
PROXY2_KEYPRESS_2833 = disable
PROXY2_HOLD_IP0 = disable
PROXY2_MAIL_SUBSCR = sip:1001@10.15.10.2
PROXY2_MAIL_NOTIFY = sip:asterisk@10.15.10.2
PROXY2_MAIL_ACCESS = 7999
FAVORITE = 3001;John Doe"
FAVORITE = 799;helpdesk
FAVORITE = *98;"Forward all"

```

Sample specific file: filename is SIP_1002.cfg

```

# Line definitions

LINE1          = 1002
LINE1_PROXY    = 2
LINE1_CALLID   = John Doe

LINE2          = 1002
LINE2_PROXY    = 2
LINE2_CALLID   = John Doe
FAVORITE       = 3555;BOB

LINE3          = 1025
LINE3_PROXY    = 2
LINE3_CALLID   = John Doe addnl line

```

6.2 The Handset Display

When active, the handset screen has six rows that display information in this format:

Row #	Information provided
1	Icons
2	Line number
3	Instructions
4	Call one info
5	Call two info or dial aids
6	Softkeys

Row 1 displays signal, battery and voicemail icons and line number icons. Row 2 displays the line number of the line for which information is being displayed. Row 3 displays instructions where needed. Two calls are permitted on each line. Row 4 displays information for call one and row 5 displays information for call two. Row 5 is also used to provide dialing aid for call one. Row 6 displays available softkeys.

6.3 Using the SIP Handset

By default, the username assigned to the line one appearance is displayed on the standby screen.



The line one appearance username is also used as a caller ID for the PTT application.

View the five line appearances by pressing the **LINE** key. The line number and extension number of the first four lines are displayed. Press the **LINE** key again to

view the fifth line. Active lines are in bold face. Defined but unregistered lines are faded. Lines that have been forwarded are prefixed with the greater-than character (>) followed by the forwarding destination.

Softkey functions change as the state of the handset changes. Softkeys are displayed only when they are available to be activated. Softkeys make usual PBX functions available on the handset. For example, a call may be placed on hold, the handset may be muted, and a second line may be activated for an outgoing call or a second call on the same line may be answered. Calls may also be transferred to another number, either as a consulted transfer or without consult. Other handset features (DND, Transfer) may be accessed by pressing the **FCN** key.

Number dialing may be specified as alpha or numeric code by pressing **Start Call** plus the **MENU** key. Select **Alpha Dialing** if letters and symbols are to be entered in the dialing string.

Making a call

When the **Start Call** key is pressed from the standby mode, the first available idle line is activated. To select a different line, press the **LINE** key plus a number from either the standby mode or after pressing **Start Call**. This example shows that line 1 is selected and a dial string **12345** has been entered with numeric dialing:

1			
Line 1			
Enter number:			
12345			
^			
Dial	<<	>>	Dele

The carat (^) indicates the insertion point for the next character. Up to 80 characters may be entered with automatic scrolling. While in alphanumeric mode, alphabetic characters can be entered by repeatedly pressing the 1 through 9 keys. Punctuation characters are available by repeatedly pressing the asterisk (*), zero (0) or pound (#) keys. Row 5 displays the available characters as the key is pressed. Pausing will enter the highlighted character in the dial string. A space character is available on the pound key or by pressing the >> softkey when the insertion point is at the end of the dial string. The << and >> softkeys may be used to position the insertion point for editing the entry. Press the **Dele** softkey to delete the character prior to the insertion point. Insert a character by pressing its key.

Press the **Dial** softkey or the **Start Call** key to initiate the call. When the call is answered, the screen changes to display outgoing call information as shown in this example.

1			
Line 1 [your dial number]			
*To: [dialed number]			
Hold	Rej		Mute

Answering a call

When the handset rings, the line's icon will flash and row 2 will display the line number and your dial number. Row 4 will display **Fr** (From) and the caller ID of the incoming call. This example shows a call coming in on line 1.

1			
Line 1 [your dial number]			
Fr: [caller ID]			
Answ	Rej		

Press the **Start Call** key or the **Answ** softkey to answer the call. Press **Rej** to reject the call and allow the SIP server to redirect the call elsewhere, usually to voicemail.

When the call is answered an asterisk (*) displays at the start of row 4 which indicates that this line is in an active call with established audio connection. The softkeys for **Hold** and **Mute** appear.

1			
Line 1 [your dial number]			
*Fr: [caller ID]			
Hold		Mute	End

When a call is placed on hold, an equal character (=) replaces the asterisk (*) and the **Rsme** softkey displays.

1			
Line 1 [your dial number]			
=Fr: [caller ID]			
Rsme		Mute	End

When the handset is muted, an x character replaces the asterisk (*). Press the **Mute** softkey again to restore audio pickup.

1			
Line 1 [your dial number]			
xFr: [caller ID]			
Hold		Mute	End

Silence the ring

Press the **End Call** key to silence the loud ring and convert to in-ear ringing. Loud ringing will resume with the next incoming call received while the handset is in standby mode.

Placing a second call on the same line

Only outgoing calls are permitted as the second call on a given line. If there is an incoming call to the number assigned to the line, the caller will get a busy tone and be routed to voicemail or to the second appearance of that call number if defined.

To access the second call dial tone, press **LINE** + [the line number]. Dial the number to place the second call. When a second call is active on the same line appearance, the second call appears below the first on the handset display. Use **LINE** + [the line number] to toggle between calls. The selected call is in bold type the other call is faded.

The following example shows an active incoming call as call one on line 1 (Fr or From) and an outgoing call on hold as call two on line 1 (To). The bold text on row 4 indicates that call one is the currently selected call and that any softkeys or menu functions will apply to call one. The asterisk (*) on row 4 indicates that audio is currently flowing for call one.

1			
Line 1 [your dial number]			
*Fr: [caller ID of caller]			
=To: [number you dialed]			
Hold		Mute	End

Call waiting

If another call comes in on a different line, the called line icon flashes and a tone sounds in the audio stream. In this example, a call is coming in on line 2 and the line 2 icon is flashing.

1 2			
Line 1 [your dial number]			
*Fr: [caller ID]			
Hold		Mute	End

To view the caller ID of the incoming call without interrupting the active call, press **LINE** + [the line number]. The display now shows information about the incoming call and you will continue hearing audio on the first call.

1 2			
Line 2 [your dial number]			
Fr: [caller ID]			
Answ	Rej		

Press **Answ** or **Start Call** to answer the incoming call and place the active call on hold. Pressing the **Rej** softkey will redirect the incoming call to voicemail or as otherwise programmed.

Redial

When available, the left **ReDI** softkey may be pressed to redial the last number called.

Forward

Calls may be forwarded on a per-line basis. To forward calls on a given line, press **LINE** + [the line number], press the **FWD** softkey and enter the forwarding destination. Press the **SAVE** softkey to save the forwarding destination. Cancel forwarding by pressing the **FWD** softkey again.

The **LINE** display will indicate if a line is forwarded by a > character followed by the destination address.

If any line is forwarded, the standby screen will display forwarding status. If the do-not-disturb feature is enabled, the forwarding status will be pre-empted by the **Do Not Disturb** display.



If a given contact number has multiple appearances on the handset, forward the lowest line appearance to forward all calls to that number on any line appearance.

Transfer

In order to transfer an active call, press **FCN 1**. This places the call on hold and gives you a dial tone for a second call on the same line appearance. Dial the number that you want to forward the call to and then press **FCN 1** again. The dialed number is called and your call is disconnected. This is a blind transfer. For a consulted transfer, press **FCN 1**, dial the number, and then press the **Dial** softkey. When the party answers, have your conversation and then press **FCN 1** to transfer the held call and disconnect the first call.

If the second call on the active line appearance is already in use, a consulted transfer is made to the party on that call. Press **FCN 1** to place the first call on hold and converse with the second call. Press **FCN 1** again to transfer the held call and disconnect both calls.

Do not disturb

Activate the do-not-disturb feature to reject all incoming calls with a busy indication by pressing **FCN 2**. The handset will not ring for new incoming calls. Press **FCN 2** again to resume ringing.

When the do-not-disturb feature is enabled, the standby screen will display **Do Not Disturb**.

Voicemail

When any proxy has outstanding messages, the voicemail icon will display. Dial the number assigned to message retrieval and follow system instructions to retrieve messages. Alternately, if a `PROXYn_MAIL_ACCESS` value has been configured for the corresponding proxy, the voicemail system can also be accessed by pressing the **Msg** softkey, which will appear after selecting a line and before beginning to dial.

The **LINE** menu will display a plus (+) indication when there is a new voicemail for that line. Indications are cleared when the handset receives notification that all new voicemail messages have been read.

Softkeys

Softkey	Name	Displayed during...	Press to...
<<	Cursor backward	Entering a dial number.	Move the cursor back one position.
>>	Cursor forward	Entering a dial number.	Move the cursor forward in alphanumeric node, if the cursor is at the end of the line, adds a space character.
Answ	Answer	Incoming call on the selected line.	Answer the call (equivalent to Start Call key).
Dele	Delete previous	Entering a dial number.	Delete the character prior to the cursor position.
Dial	Dial Call	A dial number is being entered on the selected line.	Initiate a phone call to the entered dial number.
End	End Call	An active call on the selected line.	Terminate the call without going back to standby mode.
Favr	Favorites	Prior to entering the first character of a dial number.	Activate the Favorites menu.
Fwd	Forward Definition	Prior to entering the first character of a dial number.	Delete a previously defined forward destination. Or initiate definition of a new forward destination.
Hold	Hold	In an active call.	Place the call on hold. The line status shows x when the call is on hold or * when audio is flowing.
Msg	Message	Initial dial screen when new line is selected and a dial tone is active prior to entering first character of the number to be dialed ⁶ .	Initiate a call to the specified message center contact address for retrieval or administration of voicemail.
Mute	Toggle muting	In an active call.	Toggle audio transmission to the far end. The line status shows * when not muted or x when muted.
OK	OK	Power up registration if username is not configured in admin menu.	Send the username and password to the SIP server for authorization to register the handset.
ReDI	Redial	Prior to entering the first character of a dial number.	Redial the last number that was dialed.
Rej	Reject	Incoming call on the selected line.	Reject the incoming call. The SIP server will then redirect the call elsewhere..
Rsme	Resume	In an active call and you have placed the call on hold.	Resume a call that was previously placed on hold or that went on hold when another line was activated.
Save	Save	Entering a dial number as a forward destination.	Save the dial number as the forwarding destination for the selected line.

⁶ Appears only if the PROXYn_MAIL_NOTIFY is configured. A message center contact address must be defined for the proxy used by the selected line.

7. Testing a Handset

Verify proper registration and operation of each handset by performing the following tests on each handset in an active wireless area.

1. Power on the handset by pressing the **Power On** key. A series of messages will be displayed as the handset acquires the system. The handset should display the user extension.
2. Place a call and listen to the audio quality. End the call by pressing the **End Call** key.
3. Place a call to the handset and verify ring, answer, clear transmit, and clear receive audio.
4. Use the softkeys to verify all softkey programmed features on the handset.
5. Press the **End Call** key. Any line indicators should turn off and the extension number display will return.

If any of these steps fails to operate as described, refer to Section 11 *Troubleshooting* for corrective action.

8. Diagnostic Tools

Run Site Survey, **Diagnostics Mode** and **Syslog Mode** are three diagnostic tools provided to assist the WLAN administrator in evaluating the functioning of the handset and the system surrounding it. Diagnostic tools are enabled in the Admin menu.

8.1 Run Site Survey

Site survey is used to evaluate the facility coverage before certifying that an installation is complete. It can also be used at any time to evaluate coverage by testing signal strength, to gain information about an AP, and to scan an area to look for all APs regardless of ESSID. The information available through the site survey includes:

- ESSID
- Beacon Interval
- Information regarding support of 802.11d, 802.11g, 802.11h, and other 802.11 amendment standards as required.
- Current security configuration

Start the site survey by selecting **Run Site Survey** from the Admin menu. The mode starts immediately.

When the test is started, it is by default in “single ESSID” mode. When the **Any** softkey is pressed (softkey A), all APs regardless of ESSID are displayed, and the softkey changes to say **MyID**. Pressing the **MyID** softkey will revert to the “single ESSID” mode and change the softkey back to **Any**.

The display would look like the following for the multiple AP mode.

1	1	1	1	1	1	-	2	2	3	3	4	4	4
1	1	1	1	1	1	-	2	2	3	3	4	4	4
1	1	1	1	1	1	-	2	2	3	3	4	4	4
1	1	1	1	1	1	-	2	2	3	3	4	4	4
A n y											D e t l		

Where:

- 111111 = The last three octets of the on-air MAC address for a discovered AP.
- 22 = The signal strength for the specified AP.
- 33 = The channel number of the specified AP.
- 444 = The beacon interval configured on the specified AP.
- Any/MyID = Softkey to toggle between “single SSID” and “any SSID” mode.
- Detl/Smry = Softkey to toggle between the multiple AP (summary) display, and the single (detail) displays for each AP.

The following screen shows how the display would look when there are three APs configured with an ESSID that matches that of the handset. The first has a signal strength of –28 dBm, is configured on channel 2, with a beacon interval of 100 ms. The second has a signal strength of –48 dBm, is configured on channel 6, with a

beacon interval of 200 ms. The third has a signal strength of -56 dBm, is configured on channel 11 with a beacon interval of 100 ms.

```

a b 7 b c 8 - 2 8 0 2 1 0 0
2 a e 5 7 8 - 4 8 0 6 2 0 0
2 a e 5 9 6 - 5 6 1 1 1 0 0
A n y                               D e t l

```

When the any ESSID mode is selected, the summary display contains the first six characters of the AP's ESSID instead of the beacon interval as in the example below.

```

a b 7 b - 2 8 0 2 A L P H A
2 a e 5 - 4 8 0 6 W S M T E S
2 a e 5 - 5 6 1 1 v o i c e
M y I D                               D e t l

```

In detail mode the display would appear as follows. The left/right arrow keys will move between AP indices.

```

i : b b b b b b s n c h b c n
e e e e e e e e e e D G H I
r r r r r r r r r r r r + x x x x
m m m G : g g g g P : p p p p
A n y                               S m r y

```

Where:

- i = index of selected AP (value will be from 0 to 3 inclusive)
- bbbbbb = the last three octets of the BSSID for a discovered AP
- sn = signal strength in $-dBm$
- ch = channel
- bcn = beacon interval
- eeeeeeeee = SSID (up to first 11 characters)
- DGHI = standards supported
- rrrrrrr = rates supported. Basic rates will have a “b” following the rate
- + – more rates are supported than those displayed
- xxxx = WMM or UPSD if those QoS methods are supported
- mmm = security mode
- G:gggg = group key security
- P:pppp = pairwise key security
- Any/MyID = softkey to toggle between “single SSID” and “any SSID” modes
- Detl/Smry = softkey to toggle between the multiple AP display (summary), and the single AP display (detail)

Numbers racing across the handset display indicate AP information is being obtained. A **Waiting** message indicates the system is not configured properly and the handset cannot find any APs.

Solving coverage issues

Coverage issues are best resolved by adding and/or relocating APs.

Overlap issues may be resolved by reassigning channels to the APs or by relocating the APs. See the *Troubleshooting* section under *Access Point Problems* for more information.

8.2 Diagnostics Mode

The **Diagnostics Mode** is used to evaluate the overall quality of the link between the handset, AP, and infrastructure side equipment, such as proxy server, NetLink SVP Server, and gateways. Unlike site survey, the **Diagnostics Mode** is used while the functional code is running, and during a call.

When **Diagnostics Mode** is turned on in the Admin menu, the handset can display diagnostic screens any time it is active (in a call).

The display of information is instigated by pressing the **MENU** key. Only four of the diagnostic counters listed below can be shown at a time. Pressing the **MENU** key multiple times will cycle through the various counters and the normal off-hook (proxy server) display. The numeric icon at the top of the display indicates what screen number is being displayed. For example, the first time the **MENU** key is pressed, the **1** icon is shown, and the first four counters are displayed. The next time it is pressed, the **2** icon is shown, and the next four counters are displayed. The counters will be cycled through in this fashion until there are no more counters to be displayed. After all the counters have been displayed, the screen returns to the normal off-hook proxy server screen.

Note that the normal use of the **MENU** key is not available if **Diagnostics Mode** is enabled.

The information provided by the **Diagnostics Mode** includes:

Screen 1

- Missed receive packet count since power up (MissedRcvCnt)
- Missed transmit packet count since power up (MissedXmtCnt)
- Receive retry count since power up (RxRetryCount)
- Transmit retry count since power up (TxRetryCount)

M	i	s	s	e	d	R	c	v	C	n	t	n	n	n	n	n
M	i	s	s	e	d	X	m	t	C	n	t	n	n	n	n	n
R	x	R	e	t	r	y	C	o	u	n	t	n	n	n	n	n
T	x	R	e	t	r	y	C	o	u	n	t	n	n	n	n	n

Screen 2

- Jitter is the average error or “wobble” in received packet timing, in microseconds
- Last successful transmit data rate (LastRate)
- Gateway type (GatewayType)

J i t t e r	n n n n n
L a s t R a t e	n n n n n
G a t e w y T y p e	m n e m o

Where:

mnemo: a mnemonic that indicates what type of gateway is being used

- 11Mb – This system can run at 11 Mb/s.

Screen 3

Screen 3 contains a list of the APs that are heard and the following parameters from each AP:

- Indicator as to whether this is the current AP, or an index into the list of other APs heard (C indicates current).
- Last 2 octets of the MAC address of the AP
- Channel number
- Signal strength
- Either the 802.11 Association ID from the current AP or a mnemonic for the reason code indicating why the handset did not hand off to this other AP.

C	:	m	m	m	m	c	h	-	s	s	a	i	d	
1	:	m	m	m	m	c	h	-	s	s	m	n	e	m
2	:	m	m	m	m	c	h	-	s	s	m	n	e	m
3	:	m	m	m	m	c	h	-	s	s	m	n	e	m

Where:

AP mnem: a mnemonic indicating the reason code:

- Unkn: reason unknown
- Weak: signal strength too weak
- Rate: one or more basic rates not supported
- Full: AP can not handle bandwidth requirements
- AthT: authentication timeout
- AscT: association timeout
- AthF: authentication failure
- AscF: association failure
- SecT: security handshake timeout
- SecF: security handshake failure
- Cnfg: AP not configured correctly for security, QoS mode or infrastructure network

Screen 4

- Association count since power up (AssocCount)
- Re-association count since power up (ReAssocCount)
- Association failures since power up (AssocFailure)
- Re-association failures since power up (ReAssocFail)

```
A s s o c C o u n t      n n n n n
R e A s s o c C o u n t  n n n n n
A s s o c F a i l u r e  n n n n n
R e A s s o c F a i l    n n n n n
```

Screen 5

- Security error count since power up (Sec-ErrCount)
- MAC sequence number of frame with last security error (LstSecErrSeq)

```
S e c - E r r C o u n t  n n n n n
L s t S e c E r r S e q  n n n n n
```

8.3 Syslog Mode

A syslog server must be present on the network in order for the handset to send the log messages and have them saved. The syslog server will be found with DHCP option 7 if the handset is using DHCP. If static addresses are configured, the syslog server's IP address can be configured statically in the Admin menu.



If the syslog server address is blank (000.000.000.000 or 255.255.255.255), or the handset is using DHCP and no option 7 is received from the DHCP server, the handset will not send any syslog messages.

Admin menu options:

- ***Disabled** turns syslog off.
- **Errors** causes the handset to log only events that are considered to be an error (see below).
- **Events** logs all errors plus also some other interesting events (see below).
- **Full** logs all the above plus a running stream of other quality information (see below).

The table below lists the syslog messages and which level of logging will produce them:

Message type	Errors	Events	Full
Failed Handoff	Yes	Yes	Yes
Successful Handoff	No	Yes	Yes
Security Error	Yes	Yes	Yes
Call Start/End	No	Yes	Yes
Audio stats	No	No	Yes (every 5 secs)
Audio error threshold exceeded	Yes	Yes	Yes
Radio stats	No	No	Yes (every 5 secs)
Radio error threshold exceeded	Yes	Yes	Yes

All syslog messages will include:

- Date and time (to 1/100th of second) since handset power on (currently set to Jan-1 00:00.00)
- Handset's MAC address
- Handset's IP address
- Sequence number

The table below lists the additional items in each message type:

Failed Handoff (Sent whenever the handset attempted to handoff, but failed trying.)	Failed AP MAC Failed AP signal strength Current AP MAC Current AP signal strength Failure reason
---	---

Successful Handoff	New AP MAC New AP signal strength Old AP MAC Old AP signal strength Reason for handoff Other candidate APs: MAC Signal strength Reason not used
Security Error	AP MAC AP signal strength Security mode Error details (mode dependent)
Call Start	Call type (telephony, OAI, PTT) AP MAC AP signal strength
Call End	AP MAC AP signal strength
Audio stats	AP MAC AP signal strength Payload size (in msec) Payloads sent Payloads received Payloads missed (not received) Payloads missed rate (over last 5 seconds) Payloads late Payloads late rate (over last 5 seconds) Average jitter
Audio error threshold exceeded (Sent if payloads missed rate or payloads late rate exceeds 2%, or if the average jitter is over 2 msec)	Same as audio stats
Radio stats	AP MAC AP signal strength Directed packets sent Directed packets received Multicast packets sent Multicast packets received Broadcast packets sent Broadcast packets received TX dropped count TX drop rate (over last 5 seconds) TX retry count TX retry rate (over last 5 seconds) RX retry count RX retry rate (over last 5 seconds)
Radio error threshold exceeded (Sent if TX drop rate exceeds 2% or TX or RX retry rate exceeds 5%)	Same as radio stats

Messages are formatted like the following example:

```
Jan 1 00:01:26.72 0090.7a02.2a1b (172.16.0.46) [001a] RStat: AP 00:40:96:48:1D:0C (-56 dBm),
Sent 783523, Recvd 791342, MSnt 245, MRcd 5674, BSnt 43, BRcd 10783, TX drop 43 (0.0%), TX retry
578 (1.2%), RX retry 1217 (1.6%)
```

9. Certifying the Handsets

Prior to determining that an installation is complete, test the handsets following the sequence given in the previous *Testing a Handset* section and conduct a **Site Survey** mode test according to the directions given in the previous *Diagnostic Tools* section.

The installation may need some adjustments. Note any areas where coverage is conflicting or inadequate. Note any system difficulties and work with your wireless LAN and/or LAN system administrator to determine the cause and possible remedy. See Section 11 *Troubleshooting* for clues to possible sources of difficulties. If any adjustments are made to the system, re-test the device in the same vicinity to determine if the difficulty is resolved.

The installer should not leave the site before performing installation verification.

These tests must be performed in typical operating conditions, especially if heavy loads occur. Testing sequence and procedure is different for every installation. Generally, you should organize the test according to area and volume, placing numerous calls to others who can listen while you perform coverage tests. Note any areas with excessive static or clarity problems and report it to a SpectraLink service engineer.

The coverage test will also require you to put the handset in **Site Survey** mode and walk the entire coverage area to verify all APs.

9.1 Conducting a Site Survey

Conduct a site survey of the installation, by walking the site looking for interfering 802.11 systems, adequate coverage and channel assignment, and correct AP configuration.

1. Referring to Section 8.1 *Run Site Survey*, put a handset into **Site Survey** in the **Any/Smry** ESSID mode. Walk throughout the site checking for any expected APs or other ESSIDs.
2. Then, walk the site again, in **MyID/Smry** ESSID mode, this time checking that every location has adequate coverage (there should be at least one AP stronger than -70 dBm in all areas) and has good channel allocation. (At any point, the strongest AP shown should be on a different channel than the next best choice.)
3. Finally, use the single AP (**MyID/Det1**) display to check each AP, to ensure it is configured for the proper data rates, beacon interval, 802.11 options enabled, QoS method, and security method.

Make any necessary adjustments to AP locations and configurations and repeat steps 1 through 3 until the site survey shows adequate coverage and correct configuration at every location.

The installation is not complete until these certification steps have been performed. Do not hand out handsets at a site that has not been certified.

10. Software Maintenance

NetLink e340/h340/i640 Wireless Telephones use proprietary software programs written and maintained by SpectraLink Corporation. The software versions that are running on the handsets can be displayed during power on by holding down the **Power On** button.

SpectraLink Customer Service or an authorized dealer will provide information about software updates and how to obtain the software (for example, downloading from a website).

Upgrading handsets

After software updates are obtained from SpectraLink, they must be transferred to the appropriate location in the LAN to update the code used by the handsets.

NetLink e340/h340/i640 Wireless Telephones allow over-the-air transfer of software updates from the designated TFTP server to the handsets. The downloader function in the handset checks its software version every time the handset is turned on. If there is any discrepancy the handset immediately begins to download the update.

Normal download messages

When the handset is powered on, it displays a series of messages indicating that it is searching for new software, checking the versions, and downloading. The normal message progression is:

Message	Description
Checking Code	Handset is contacting the TFTP server to determine if it has a newer version of software that should be downloaded.
Erasing Memory	Handset has determined that a download should occur and is erasing the current software from memory. This message also displays a progress bar. When the progress bar fills the display line the erase operation is complete.
Updating Code	Handset is downloading new software into memory. The number icons at the bottom of the display indicate which file number is currently being downloaded. This message also displays a progress bar. When the progress bar fills the display line the update operation is complete on that file.

When the update is complete, the handset displays the extension number, and is ready for use.

Download failure or recovery messages

The following display messages indicate a failure or recovery situation during the download process.

Message	Description
Server Busy	Handset is attempting to download from a TFTP server that is busy downloading other phones and refusing additional downloads. The handset will automatically retry the download every few seconds.
TFTP ERROR(x):yy	A failure has occurred during the TFTP download of one of the files. (x) = The file number which was being downloaded; yy is an error code describing the particular failure. Possible error codes are: 01 = TFTP server did not find the requested file. 02 = Access violation (reported from TFTP server). 07 = TFTP server reported "No such user" error. Check the TFTP server configuration. 16 = No TFTP server address. Check the TFTP server configuration. 81 = File put into memory did not CRC. The handset will attempt to download the file again. FF = Timeout error. TFTP server did not respond within a specified period of time.
Erase Failed	Download process failed to erase the memory in the handset. This operation will retry.
Waiting	Handset has attempted some operation several times and failed, and is now waiting for a period of time before attempting that operation again.

11. Troubleshooting

On occasion, you may run into transmission problems due to any number of factors originating from the wireless LAN. NetLink e340/h340/i640 Wireless Telephones can exhibit transmission problems in several ways. They can cease functioning properly, display error messages, or display incorrect data. When using and troubleshooting handsets, consider the following problem sources to determine the best method of approaching any specific situation.

11.1 Access Point Problems

Most, but not all, handset audio problems have to do with AP range, positioning, and capacity. Performing a site survey as described in this document can isolate the AP causing these types of problems. If the handset itself is suspected, conduct a parallel site survey with a handset that is known to be properly functioning.

In range/out-of-range

Service will be disrupted if a user moves outside the area covered by the wireless LAN APs. Service is restored if the user moves back within range. If a call drops because a user moves out-of-range, the handset will recover the call if the user moves back into range within a few seconds.

Capacity

In areas of heavy use, the call capacity of a particular AP may be filled. If this happens, the user will hear three chirps from the handset. The user can wait until another user terminates a call or move within range of another AP and try the call again. If a user is on a call and moves into an area where capacity is full, the system attempts to find another AP. Due to range limitations, this may be the same as moving out of range.

Transmission obstructions

Prior to system installation, the best location for APs for optimum transmission coverage should have been determined. However, small pockets of obstruction may still be present, or obstructions may be introduced into the facility after system installation. This loss of service can be restored by moving out of the obstructed area or by adding/rearranging APs.

11.2 Configuration Problems

Certain problems are associated with improper configuration of either the SIP system or the handset.

Configuration problems are generally corrected by changing the configuration on the SIP system or on the handset. There may also be incorrect programming of the AP. See the *Configuration Guide* for the AP in use at the site.

11.3 Handset Status Messages

NetLink Wireless Telephone status messages provide information about the NetLink e340/h340/i640 Wireless Telephone's communication with the AP and host telephone system. The following table summarizes, in alphabetical order, the status messages.

Message	Description	Action
3 chirps (audio)	Handset is not able to communicate with the best AP, probably because that AP has no bandwidth available.	None. This is only a warning, the call will hand off to the best AP once it becomes available.
Address Mismatch	Handset software download files are incorrect or corrupted.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .
ASSERT xxx c Line yyy	The handset has detected a fault from which it cannot recover.	Record the error code so it can be reported. Turn the handset off then on again. If error persists, try registering a different handset to this telephone port. If error still persists, contact SpectraLink Technical Support and report the error.
Assoc Failed xxxxxxxxxx	x...x = AP MAC address. Handset association was refused by AP; displays MAC of failing AP.	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Note</i> . Try another AP.
Assoc Timeout xxxxxxxxxx	x...x = AP MAC address. Handset did not receive association response from AP; displays MAC of failing AP.	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Note</i> . Try another AP.
Auth Failed xxxxxxxxxx	x...x = AP MAC address. Handset authentication was refused by AP; displays MAC of failing AP.	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Note</i> . Try another AP.
Auth Timeout xxxxxxxxxx	x...x = AP MAC address. Handset did not receive authentication response from AP; displays MAC of failing AP.	Check handset and AP security settings. Ensure AP is configured per <i>Configuration Note</i> . Try another AP.
Bad Code Type xx Expected Code Type yy	xx, yy = software license types. Handset software does not match current handset license selection.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .
Bad Config	Some needed configuration parameter has not been set.	Check all required handset configuration parameters for valid settings.
Bad ESSID	The handset is configured for "static ESSID" (as opposed to "Learn once" or "Learn always"), and no ESS ID has been entered.	Enter an ESSID in the configuration settings or change to one of the "Learn" modes.
Bad Phintl File	Handset software download files are incorrect or corrupted.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .

Message	Description	Action
Bad Program File	Handset software download files are incorrect or corrupted.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .
(battery icon), Battery Low, beep (audio)	Low battery.	<p>In call: the battery icon displays and a soft beep will be heard when the user is on the handset and the battery charge is low. User has 15–30 minutes of battery life left.</p> <p>The Battery Pack can be changed while the call is still in progress. Do not press End Call. Place call on Hold or Park. Quickly remove the discharged battery and replace with a charged battery, power on the handset, and press Start Call to resume the call in progress.</p> <p>Not in call: The battery icon displays whenever the battery charge is low. The message Battery Low and a beep indicate a critically low battery charge when user is not on the handset. The handset will not work until the Battery Pack is charged.</p>
Battery Failure	The Battery Pack is not functioning.	Replace the Battery Pack with a new or confirmed SpectraLink Battery Pack. Only SpectraLink Battery Packs will work.
Battery Failed	Battery Pack is damaged or incompatible with handset.	Replace the Battery Pack with a new or confirmed SpectraLink Battery Pack. Only SpectraLink Battery Packs will work.
Can't Renew DHCP yyy.yyy.yyy.yyy	y...y = DHCP server IP address. DHCP server is not responding to initial renewal attempt.	Configuration problem. Check the IP address configuration in the DHCP server.
Charging ...	The handset is charging in the desktop charger.	No action needed.
Charge Complete	The handset is now fully charged.	No action needed.
Checking Code	Handset is contacting the TFTP server to determine if it has a newer version of software that should be downloaded.	None, this message should only last for approximately one second. If message remains displayed, power off and contact customer support for a replacement phone.
Checking DHCP IP	The handset is retrieving DHCP information from the DHCP server.	None. This is informational only.
CRC Code Error	The software which has been TFTP downloaded has a bad redundancy code check.	Try the download again; it is possible the software was corrupted during download. If the error repeats, check that the download image on the TFTP server is not corrupted.
Code Mismatch!	The software loaded into the handset is incorrect for this model handset.	Verify the License Management value is correct. Replace the software image on the TFTP server with software that is correct for the handset model.

Message	Description	Action
DCA Timeout	The handset has detected a fault for which it cannot recover, possibly due to a failure to acquire any network.	Turn the handset off, then on again. If error persists, contact SpectraLink Technical Support and report the error.
DHCP Error (1-5)	DHCP Error 1. DHCP Error 2. DHCP Error 3. DHCP Error 4. DHCP Error 5.	The handset cannot locate a DHCP server. It will try every four seconds until a server is located. The handset has not received a response from the server for a request to an IP address. It will retry until a server is found. The server refuses to lease the handset an IP address. It will keep trying. The server offered the handset a lease that is too short. The minimum lease time is 10 minutes but SpectraLink Engineers recommend at least one-hour minimum lease time. The handset will stop trying. Reconfigure the server and power cycle the handset. Failure during WEP Key rotation process (proprietary feature).
DHCP Lease Exp yyy.yyy.yyy.yyy	y...y = DHCP server IP address. DHCP is not responding to renewal attempts (at least one renewal succeeded).	The handset failed to renew its DHCP lease, either because the DHCP server is not running, or because the configuration has been changed by the administrator. The handset will attempt to negotiate a new lease, which will either work, or it will change to one of the above DHCP errors (1 through 4).
DHCP NACK error yyy.yyy.yyy.yyy	y...y = DHCP server IP address. DHCP server explicitly refused renewal.	The DHCP lease currently in use by the handset is no longer valid, which forces the handset to restart. This problem should resolve itself on the restart. If it does not, the problem is in the DHCP server.
DL Not On Sector	Handset software download files are incorrect or corrupted.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .
DO NOT POWER OFF	The handset is in a critical section of the software update.	None. Do not remove the Battery Pack or attempt to power off the phone while this is displayed. Doing so may require the handset inoperable.
Duplicate IP	The handset has detected another device with its same IP address.	If using DHCP, check that the DHCP server is properly configured to avoid duplicate addresses. If using Static IP, check that the handset was assigned a unique address.
Erase Failed	Download process failed to erase the memory in the handset.	Operation will retry but may eventually report the error "int. error: OF" Power cycle the handset.

Message	Description	Action
Erasing Memory	Handset has determined that a download should occur and is erasing the current software from memory.	None. When the progress bar fills the display line the erase operation is complete. Do not turn the handset off during this operation.
Files Too Big	Handset software download files are incorrect or corrupted.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .
Flash Config Error	Handset internal configuration is corrupt.	Perform "Restore Defaults" operation via administrator menus (or re-program with Configuration Cradle).
Initializing ...	The handset is performing power-on initialization.	None. This is informational only.
Internal Err. # #	The handset has detected a fault from which it cannot recover.	Record the error code so it can be reported. Turn the handset off then on again. If error persists, try registering a different handset to this telephone port. If error still persists, contact SpectraLink Technical Support and report the error.
Multiple GW Res	More than one NetLink SVP Server has responded.	Caused by two or more handsets sharing the same IP address. Assign unique IP addresses to each handset.
Multiple SVP Reg yyy.yyy.yyy.yyy	y...y = SVP IP address Handset received responses from multiple SVP Servers; displays IP address of one responding SVP Server.	This can happen if the handset has been reconfigured to use a different SVP server and then powered up before the previous server has had time to determine that the handset is no longer connected to it. The problem should go away after about 30 seconds.
Must Upgrade SW!	Handset software is incompatible with hardware.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .
Net Busy xxxxxxxxxxxx	x...x = AP MAC address. Handset cannot obtain sufficient bandwidth to support a call; displays MAC of failing AP.	Try the call again later.
No DHCP Server	Handset is unable to contact the DHCP server.	Check that DNCP is operational and connected to WLAN or use Static IP configuration in the handset.
No ESSID	Attempted to run Site Survey application without an ESSID set.	Let handset come completely up. Statically configure an ESSID in the Admin menu.
No Func Code	Handset software download files are incorrect or corrupted.	Reconfigure the handset to gain access to the WLAN and download new code.
No Host IP	The handset is configured for "static IP" (as opposed to "use DHCP") and no valid host IP address (the handset's IP address) has been entered.	Enter a valid IP address in the configuration settings or change to "use DHCP."

Message	Description	Action
No IP Address	Invalid IP.	Check the IP address of the handset and reconfigure if required.
No SIP DHCP	DHCP is configured but no valid SIP option 43 was found.	Check DHCP configuration for option 43 and reconfigure if required.
No Net Access	Cannot authenticate / associate with AP.	Verify the AP configuration. Verify that all the WEP settings in the handset match those in the APs.
No Net Found No APs	Handset cannot find any APs This indicates any of the following: No radio link. No ESSID: Auto-learn not supported (or) incorrect ESSID. AP does not support appropriate data rates. Out of range. Incorrect Security settings.	Verify that the AP is turned on. Verify the ESSID of the wireless LAN and enter or Autolearn it again if required. Check the AP configuration against Configuration Note for AP. Try getting closer to an AP. Check to see if other handsets are working within the same range of an AP. If so, check the ESSID of this handset. Verify that all the Security settings in the handset match those in the APs.
No Net Found xxxxxxxxxx yy	x...x = AP MAC address. yy = AP signal strength. Handset cannot find a suitable AP; displays MAC and signal strength of “best” non-suitable AP found.	Check AP and handset network settings such as ESSID, Security, Reg domain and Tx power. Ensure APs are configured per <i>Configuration Note</i> . Try Site Survey mode to determine a more specific cause.
No PBX Response	The handset has exceeded its retransmission limit with no ACK response from proxy server.	Verify that proxy server IP address and port are properly configured.
No Reg Domain	Regulatory Domain Not Set.	Configure the Regulatory Domain of the handset.
No SVP IP	The handset is configured for “Static IP” (as opposed to “use DHCP”), and no valid NetLink SVP Server address has been entered.	Enter a valid NetLink SVP server IP address in the configuration setting or change to “use DHCP.”
No SVP Response yyy.yyy.yyy.yyy	y...y = SVP Server IP address. Handset has lost contact with the SVP Server.	This may be caused by bad radio reception or a problem with the NetLink SVP Server. The handset will keep trying to fix the problem for 20 seconds, and the message may clear by itself. If it does not, the handset will restart. Report this problem to the system administrator if it keeps happening.

Message	Description	Action
No SVP Server	Handset can't locate NetLink SVP Server. NetLink SVP Server is not working. No LAN connection at the NetLink SVP Server.	IP address configuration of NetLink SVP Server is wrong or missing. Check error status screen on NetLink SVP Server. Verify NetLink SVP Server connection to LAN.
No SVP Server No DNS Entry	Handset unable to perform DNS lookup for SVP Server, server had no entry for SVP Server.	The network administrator must verify that a proper IP address has been entered for the SVP Server DHCP option.
No SVP Server No DNS IP	Handset unable to perform DNS lookup for SVP Server, no IP address for DNS server.	The network administrator must verify proper DHCP server operation.
No SW Found	A required software component has not been identified.	Check that the handset license type has a corresponding entry in the slnk_cfg.cfg file. Check that the pd11sid.bin and pi110000.bin entries exist in under this license type in the slnk_cfg.cfg file.
Not Installed!	A required software component is missing.	Check that all required software files are on the TFTP server, if over-the-air downloading is being used. If the error repeats, contact SpectraLink Technical Support.
Press End Call	The far end of a call has hung up.	Hang up the near end.
RTP Open Failed	The handset attempted to open an RTP port for audio but was unsuccessful.	Verify that NetLink SVP Server capacity has not been exceeded.
Select License	The correct protocol has not been selected from the license set.	Using the Admin menu, select one license from the set to allow the phone to download the appropriate software.
Server Busy	Handset is attempting to download from a TFTP server that is busy downloading other devices and refusing additional downloads.	None, the handset will automatically retry the download every few seconds.
Skt Open Fail	Socket open fail. Occurs when the handset attempts to open a connection to the proxy server but fails.	Verify that NetLink SVP Server capacity has not been exceeded.
Service Rej.	The NetLink SVP Server has rejected a request from the handset.	The handset will restart and attempt to re-register with the NetLink SVP Server, which should fix the problem. Report to your administrator if it keeps happening.
Storing Config	Handset is storing changes to handset configuration.	None. Informational only. The handset may display this briefly following a configuration change or software download.
SVP Service Rej.	The NetLink SVP Server has rejected a request from the handset	The handset will restart and attempt to re-register with the SVP Server, which should fix the problem. Report to your administrator if it keeps happening.

Message	Description	Action
System Busy yyy.yyy.yyy.yyy	y...y = SVP Server IP Address. SVP Server has reached call capacity.	All call paths are in use, try the call again in a few minutes.
System Locked (with Busy Tone)	NetLink SVP Server is locked.	Try call again later, system has been locked for maintenance.
TFTP ERROR(x):yy	A failure has occurred during a TFTP software download. (x) = The file number which was being downloaded; yy is an error code describing the particular failure. Possible error codes are: 01 = TFTP server did not find the requested file. 02 = Access violation (reported from TFTP server). 07 = TFTP server reported "No such user" error. 16 = No TFTP server address. 81 = File put into memory did not CRC. FF = Timeout error. TFTP server did not respond within a specified period of time.	Error code 01, 02, 07, or 16 - check the TFTP server configuration. Error code 81, the handset will attempt to download the file again. For other messages, power off the handset, then turn it on again to retry the download. If the error repeats, note it and contact SpectraLink Customer Support.
Too Many Errors	The handset continues to reset and cannot be recovered.	Fatal error. Return handset to SpectraLink.
Unknown xx:yy:zz	A phrase is missing from the phintl file.	Download new software from the SpectraLink website per <i>Software Maintenance</i> .
Unsupported Codec	The proxy server has requested using a codec not supported by the handset.	Check proxy server configuration for supported codecs and reconfigure if necessary.
Updating ...	The handset is internally updating its software images.	None. The handset may do this briefly after a download. This is informational only.
Updating Code...	Handset is downloading new software into memory. The number icons at the bottom of the display indicate which file number is currently being downloaded. This message also displays a progress bar. When the progress bar fills the display line the update operation is complete on that file.	None. When the progress bar fills the display line the update operation is complete on that file. Do not turn the handset off during this operation.
Waiting...	Handset has attempted some operation several times and failed.	None. The handset is waiting for a specified period of time before attempting that operation again.
Wrong Code Type	The software loaded into the handset is incorrect for this model phone.	Replace the software image on the TFTP server with software that is correct for the handset model.

12. Appendix A

This table details the specifications for regulatory domain settings. SpectraLink recommends that you check with local authorities for the latest status of their national regulations for both 2.4 and 5 GHz wireless LANs.

Domain Identifier	Band	WMM Preferred Channels	Max. Power Limit (peak power)	Countries
01	2.4000 - 2.4745 mHz	1-11	100mW (+20dBm)	Argentina Canada Mexico Taiwan US
02	2.4000 - 2.4845 mHz	1-13	100mW (+20dBm)	Australia Europe Hong Kong Japan New Zealand Singapore
03				(reserved)
04	2.4445 - 2.4745 mHz	10-11	30mW (+15dBm)	Spain
05	2.4145 - 2.4845 mHz	10-13	30mW (+15dBm)	France
06	2.4000 - 2.4845 mHz	1-13	30mW (+15dBm)	Korea

Index

- Access point
 - Coverage, 47
 - Coverage test, 52
- Access point, description, 9
- Automatic Learn, 22
- Capacity, 55
- Checking code, 53
- Customer Support Hotline, 4
- Download messages
 - Failure or Recover, 54
 - Normal, 53
- Erasing memory, 53
- Ethernet Switch, description, 10
- Favorites menu, 31
- Hotline, 4
- NetLink SVP Server, 9
- OAI
 - OAI Gateway, 20
 - OAI On/Off, 19
 - OAI Server IP, 20, 22
- Obstructions, 55
- Out of range, 55
- Preferences, user-defined, 24
- Regulatory Domain, 24, 63
- Restore Defaults, 24
- Site Certification, 52
- Status messages, 56
- Transmission obstructions, 55
- Updating code, 53
- User Preferences, 24
- Wireless Telephone
 - Configuration problems, 55
 - Description, 9
 - Display IP address of, 29
 - Problems with, 55
 - Status messages, 56