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ShoreTel IP Phone 930D Planning and Installation Guide

November 28, 2016

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Company Information

ShoreTel, Inc.
960 Stewart Drive
Sunnyvale, California 94085 USA
+1.408.331.3300
+1.408.331.3333 (fax)
www.shoretel.com

Contents

Preface

This preface provides contains the following topics:

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About This Book

This guide is intended to help you successfully deploy the ShoreTel IP Phone 930D system.

Audience

This guide is written for the person who plans for, installs, and configures the product components.

Organization

This document is generally organized into major tasks, presented in the order in which they should be completed.

Conventions

The following typographical marking conventions are used in this document.

Marking	Meaning
Bold	Names of interface objects, such as buttons and menus.
`Courier`	Code examples.
`Courier Italic`	Variables in code examples.
Blue	Cross references with hyperlinks. Click the blue text to go to the indicated section. All chapters have a list of section links on the first page. **Note:** Table of Contents entries are also links, but they are not shown in blue.

Related Documentation

The following documents are also available:

- *ShoreTel IP Phone 930D Handset User Guide* describes how to install and use the IP930D handset and charging stand.
- *ShoreTel IP Phone 930D Base Station and Repeater User Guide* describes how to plug in and use the IP930D base station and repeater.

CHAPTER

1

Introduction

This chapter contains the following topics:

- System Overview on page 9
- Understanding System Components on page 10
- Understanding System and Coverage Limits on page 13
- Topology and Technical Specifications on page 14
- Understanding System Management on page 15

System Overview

The ShoreTel IP Phone 930D solution is a state-of-the-art DECT (Digital Enhanced Cordless Telecommunications) system that seamlessly adds wireless handsets to any Shoretel installation running ShoreTel 14 or later software.

Ideally suited for users looking for a full telephony feature set along with in-building roaming capabilities, the IP930D allows users to step away from their desks without losing the ability to manage incoming inquiries or monitor shared extensions.

Easy to deploy and use, the IP930D system offers a handset display that emulates the user interface of the ShoreTel IP Phone 230 models, making it familiar for many users.

The DECT frequency band means excellent voice quality and no need to worry about radio interference with Wi-Fi or Bluetooth devices. DECT offers highly secure communication using a worldwide standard of advanced algorithms for voice and data encryption, ensuring that conversation is protected against eavesdropping.

Understanding System Components

The IP930D system consists of these major components:

■ Handset—A battery-powered mobile handset with charging stand that emulates the user interface of the ShoreTel IP Phone 230 models.

■ Base station—A PoE-powered device containing DECT radio and processing capabilities for wirelessly connecting to handsets and repeaters, and for connecting over Ethernet to the IP network.

■ Repeater—A DECT radio and processing component for extending the range of an IP930D base station.

- ShoreTel IP930D Manager—A web-based interface used for system management, including viewing and modifying configuration parameters, and enabling handset and repeater registration.

- ShoreTel IP930D Configuration Tool—A Windows-based program that generates required configuration files and an installation summary report.

IP930D Handset

The handset is powered by a replaceable lithium-ion battery and features a color LCD. The user interface on the handset emulates the interface of a ShoreTel IP Phone 230 model.

The handset has volume controls and a mute switch on its left side and a headset jack on its right side. The four bottom-most keys provide quick one-push access to the transfer, conference, redial, and hold features.

The handset has a built-in speakerphone for hands-free operation and can also be used with a wired headset.

The three line appearances can be programmed in the same way as line appearances on other ShoreTel IP Phones, using ShoreTel Director.

A Menu button permits access to additional system features. Hold down the Menu button for more than three seconds to access an internal handset settings menu.

For more information refer to the *ShoreTel IP Phone 930D Handset User Guide*.

IP930D Base Station

The base station unit can be mounted on a desk or wall and uses an RJ-45 connector for network access and power.

On the front side of the unit is an operational status LED indicator. On the back side of the unit is the RJ-45 Ethernet connector and a reset button.

For more information, refer to the *ShoreTel IP Phone 930D Base Station and Repeater User Guide*.

IP930D Repeater

The repeater is an optional component used to extend the range of a base station unit. It can be powered by either a PoE cable or by a small wall transformer and two meter cable.

The repeater can be mounted on a wall or ceiling. On the front side is an LED indicator that shows the repeaters status.

For more information refer to the *ShoreTel IP Phone 930D Base Station and Repeater User Guide*.

Understanding System and Coverage Limits

The capacity of the IP930D system is limited by the number of DECT radio channels available in close proximity to the bases and repeaters.

Frequency Bands

The IP930D system uses these frequency bands:

- 1920 - 1930 MHz (US)

- 1880 - 1900 MHz (Europe, Australia, New Zealand)

System Capacities

Each base station and each repeater uses a 12-timeslot DECT radio.

In the US and Canada (US/CA), there are 5 frequencies available for voice: 5 x 12 timeslots = 60 channels maximum.

In Europe, Australia, and New Zealand (EU/ANZ), there are 10 frequencies available for voice: 10 x 12 timeslots = 120 channels maximum.

Each base station can support a maximum of 4 handsets.

Each base can, optionally, support up to 4 repeaters. Adding repeaters does *not* increase the number of handsets that a base can support; it only extends the range, or footprint, that those handsets can roam.

You can daisy chain/cascade repeaters up to a maximum of three (although doing so may introduce delays).

Capacities (US/CA):

- With 1 base and 0 repeaters = 4 handsets
- With 10 bases and 0 repeaters = 40 handsets
- Maximum combined base units and repeater units = 24 handsets (average)

Capacities (EU/ANZ):

- With 1 base and 0 repeaters = 4 handsets
- With 20 bases and 0 repeaters = 80 handsets
- Maximum combined base units and repeater units = 48 handsets (average)

Capacities are limited to these maximums to ensure that all handsets can be guaranteed non-blocking voice paths—even when all handsets are on a three-party call.

Note that these IP930D system capacities refer to a single site or airspace within which the handsets are used; a single ShoreTel system can support multiple IP930D systems in different locations, so long as there is no airspace contention between them.

Example of a System Layout

This example shows a four-handset IP930D system that uses one base and four repeaters.
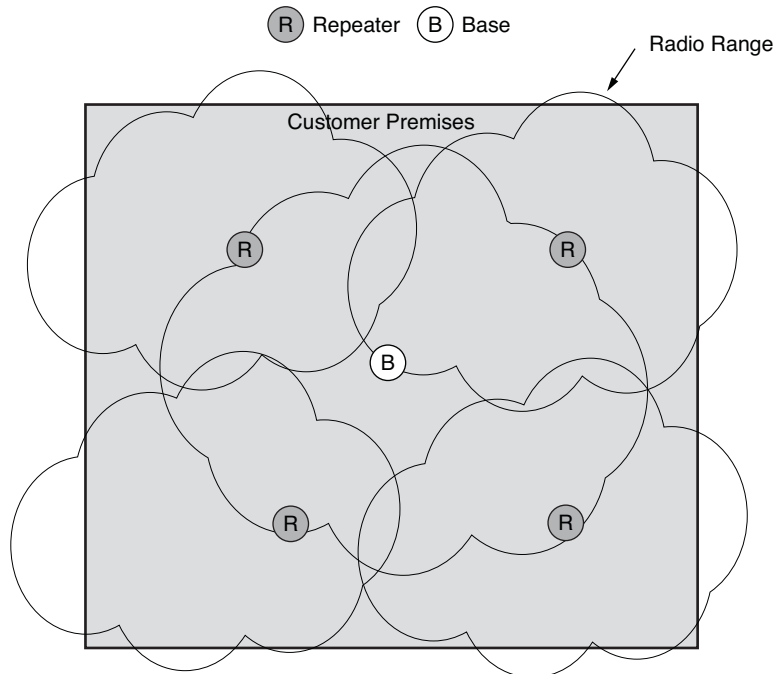
As long as component limits for the system are honored, you could alter coverage area or capacity in this system to suit your needs. For example:

- If this system included daisy chained repeaters, coverage dimensions could take on different shapes.

- If more handsets were needed, additional bases and repeaters could be overlaid in the same locations as the bases and repeaters shown in the example.

For more information about designing a system layout see Chapter 2, Planning.

Topology and Technical Specifications

Each base station requires the assignment of an IP address (DHCP or static).

Each handset requires the assignment of an IP address (static). The IP addresses for handsets must be in a continuous range (example: 192.168.11.50 – 89).

Each handset uses the same ShoreGear switch IP Phone resources as any other ShoreTel IP Phone.

From a resource prospective, each base can appear to be as many as four IP phones (one for each handset).

An IP930D base supports the same networking features as other ShoreTel IP phones, including DHCP, VLANs, LLDP, and 802.1x.

In a multi-base (multicell) environment, multicast IP packets are used to communicate among bases. Therefore, all bases in a single airspace should be on the same IP subnet (this avoids complex multicast routing configurations).

Call Handoff Limitations and Synchronization

Call handoff is not supported between base stations. Call handoff is supported across repeaters that are associated with the handset's registered base station.

Because base-to-base-handoff is not supported, the maximum continuous coverage area of any installation will be limited to the coverage that can be obtained by using a combination of a base and its associated repeaters. For this reason, this system is best suited for a single air-space (such as one or two floors of an office building) and is not appropriate for a campus environment where handsets need to operate across buildings.

DECT radio synchronization is required between the bases and the associated repeaters that make up a system. Synchronization between bases and repeaters is done entirely over the air using DECT spectrum. See Synchronization on page 48 for more information.

Understanding System Management

Managing the IP930D generally requires that you use the same approach and software tools you would use to manage other ShoreTel IP Phones. Additionally, a web-based interface called ShoreTel IP930D Manager allows you to:

- Verify and modify system configuration

- Troubleshoot issues

- Reset a base remotely

- Enable handset and repeater registration

- Check upgrade status for components

- See which components are currently in use

See Understanding System Management on page 51 of the Reference Material chapter for more information about ShoreTel IP930D Manager.

CHAPTER

2

Planning

This chapter contains the following topics:

Planning Overview

This overview lists planning steps to complete before installing your ShoreTel IP Phone 930D system.

1. Understand system components and limitations (described in Chapter 1, Introduction.)

2. Understand networking, power, and environmental requirements (described below).

3. Understand how architectural features can impact coverage (described below).

4. Gather requirements and information specific to the installation site (described below).

5. Conduct a site survey to measure the coverage range and identify equipment needs (described below).

6. Prepare a draft installation layout (described below).

7. Order components (described below).

Understanding Networking and Power Requirements

This topic contains information about network and power requirements and recommendations.

Networking Requirements and Recommendations

The following are networking requirements and recommendations:

- Assign an IP address (DHCP or static) for each base (required).

- Assign an IP address (static) for each handset (required).

- Use a switched 10 or 100 Mbps capable network connection to connect to the base (recommended).

- Connect multi-base systems to a common subnet and identify a free multicast address for base-to-base communications (required).

Power Requirements

The following are system power requirements:

- Handset charging stands require a non-switched AC outlet (100-240V 50/60 hz) within two meters of the charger.

- Bases are Class 2 devices and require PoE.

- Repeaters require one of these for power:

  □ A non-switched AC outlet (100-240V 50/60hz) within two meters of the repeater.

  □ A SKU 10478 PoE wire adapter along with a PoE splitter, such as the Phihong POE14-050, for use with a powered Ethernet connection. (See Using a SKU 10478 PoE Wire Adapter and a PoE Splitter to Power the Repeater on page 19.)

Using a SKU 10478 PoE Wire Adapter and a PoE Splitter to Power the Repeater

Using a SKU 10478 PoE wire adapter and a 5 Volts DC output PoE splitter, such as the Phihong POE14-050, allows you to install a repeater in a location that does not have a nearby AC outlet. Use the splitter to provide power only. Refer to the illustration below.

Align "TIP" and "+"
as shown

SKU 10478 PoE wire adapter

Phihong PoE splitter

IP930D Repeater

Powered Ethernet cable plugs in here
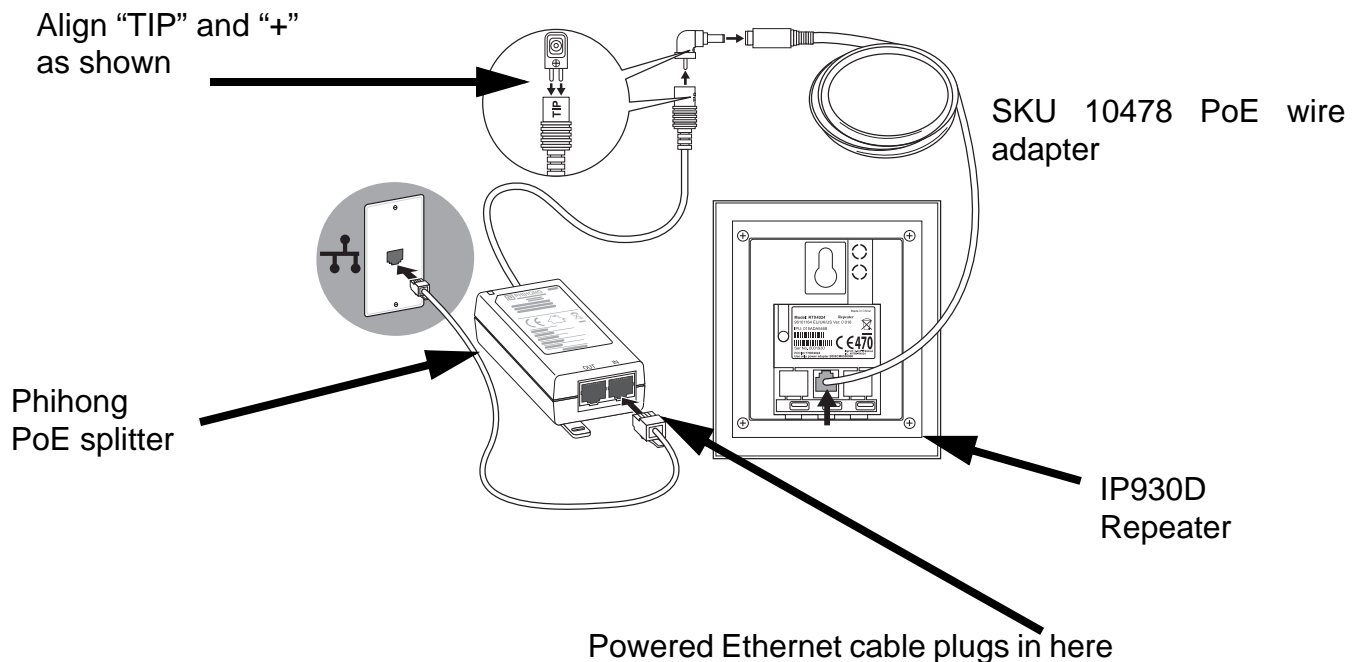
Understanding Environmental Requirements

Consider the following environmental guidelines when planning your IP930D installation:

- Mount bases and repeaters indoors, in dry and protected areas, and connect these components to indoor wiring only.

- Whenever possible, mount the base near the ceiling, vertically on the wall. Avoid mounting on metal walls, metal beams, or on concrete structures containing steel reinforcement.

- Bases and repeaters must be placed with at least one meter of separation between units. Range and system capacity might be reduced if components are located less than one meter apart.

IP930D components emit RF radiation that is below all government and industry limits. However, some devices containing sensitive microphones can be affected by this radiation and should be kept at a distance from IP930D components.

Understanding Architectural Impacts to Coverage

Construction materials and architectural features at the installation site can greatly impact base and repeater coverage. In open or outdoor areas, the coverage radius of a base or repeater can be 150 meters or more. Indoors, the distance can drop to as low as 10 meters. In addition, the base mounting height, nearby metal objects, and interference sources can impact coverage.

Wall Materials

This table shows coverage ranges for some typical wall materials:

Wall Material	Coverage Range in Meters
Plaster walls over studs	30-60
Concrete	10-30
Heavily reinforced concrete	0-10
Stone/Brick	30-50
Metal	0-10
None	150-300

Multiple Floors

Many floor and ceiling materials allow coverage to extend to the floors above and below the base or repeater floor. If that proves not to be the case, find areas where repeaters can link to the base or other repeaters through stairwells or other openings in the building.

When planning multi-floor installations, it is helpful to think in three dimensions. Here is an example:
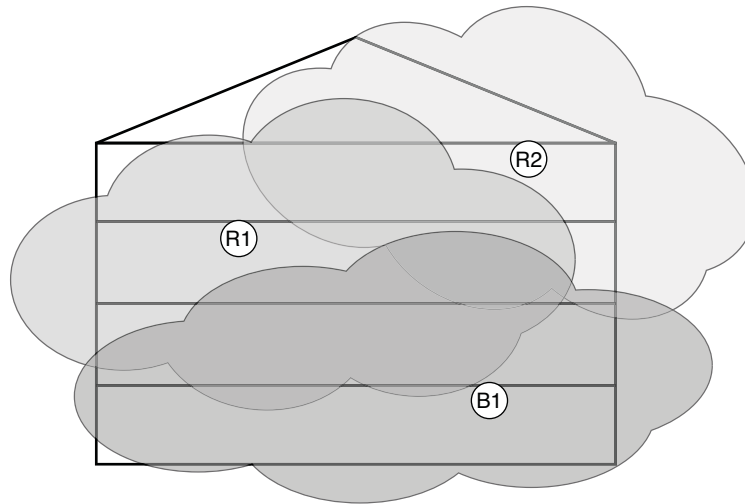
Front View

Coverage needs to overlap between floors in areas like stairwells, where handset users move between coverage zones while on a call. A stairway can be a good location to achieve coverage across two floors.
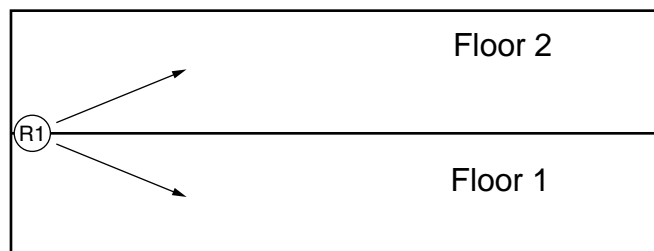
Hallways

Hallways are often good spaces for mounting base units and repeaters. For L-shaped corners, mount the base on the outside corner for best coverage down both hallways. The intersection of two hallways can also be a good location because of open transmission in multiple directions.

Multiple Buildings

Installation sites located in multiple buildings that are not within radio range of each other must be installed as two separate systems; handsets from one system will not operate on the other system.

Gathering Site Requirements and Information

Make a preliminary visit to the site to gather information described in this section.

Obtain a Floor Plan

Obtain a floor plan with a distance scale and note the following items on the drawing:

- Metal walls or concrete walls greater than 1M thick

- Screen rooms

- Large metal objects, such as cabinets and machines

- Radio frequency sources, such as RF welders and WiFi

- Stairwells or similar openings where floor-to-floor transmissions might be enhanced (for multi-floor installations)

Identify Interference Sources

Check the customer for any pre-existing DECT use, such as a large number of DECT headsets or residential DECT systems.

If possible, perform an RF analysis of the DECT band to check for interfering devices from neighbors.

Plan to disable any residential DECT systems at the time when you install the IP930D system.

Clarify Coverage Expectations

Make sure you understand which areas of the site require coverage, including outdoor or warehouse spaces. Also understand if continuous coverage with handoffs is expected for multi-floor or multi-building sites.

Because the system does not support call handoffs between bases (but only between a base and its repeaters), your ability to provide continuous coverage with handoffs is limited by the coverage range that your repeaters offer. This range varies by site and might not prove adequate for a multi-building or campus environment.

Consider Traffic Capacity

The IP930D system is designed to be non-blocking in most cases. However, for future reference it is good to understand the call frequency and talk times per hour for handset users. Consider locating a base in the area where the majority of users spend most of their talk time.

Conducting a Site Survey

Before you plan your installation layout, it is essential that you conduct a site survey to measure handset coverage from the base station at the installation site. A site survey allows you to effectively estimate the equipment needed to build your system.

It is recommended that you conduct the site survey during business hours to check for competing DECT systems that might degrade performance of the installation.

Gather Equipment for the Site Survey

To conduct the site survey, you will need the following equipment:

- A base station configured with a static address that is otherwise in a factory default state

- A PoE mid-span power brick connected to a small Ethernet switch or hub

- A fully charged handset

Configure the Base with a Static IP Address

Before you visit the site, configure the base station that you plan to use for the site survey.

1. Put the base in a factory default mode.

   a. Plug the base into a powered Ethernet switch on a live network that can allocate an IP address using DHCP (or use a mid-span power brick and Ethernet switch).

   b. Wait for the LED indicator to start flashing green.

   c. Press and hold the reset button on the back of the base until the LED indicator turns off (at least ten seconds). The base resets.

2. Wait one to two minutes for the base to obtain an IP address from DHCP and to start up.

3. Open ShoreTel IP930D Manager for the base.

   a. From a PC on the same subnet as the base, enter the following:

   http://sd_<*MAC address of base*>

   If this step fails, see Cannot log into a base with ShoreTel IP930D Manager on page 84.

   b. Enter "admin" for the login ID and the last four digits or characters of the base MAC address for the password.

4. Navigate to the Network Configuration page and turn DHCP off and set the IP address to "192.168.123.10" and the subnet value to "255.255.255.0".

5. At the bottom of the page click **Save New Settings**.

   Now you can move on to positioning and powering the base at the installation site.

Position and Power up the Base

For this procedure you will need a PoE mid-span power brick connected to a small Ethernet switch or hub. This equipment serves to power the base during the site survey and satisfies the base's need to detect an Ethernet connection. **The small Ethernet switch or hub does *not* need to be connected to a live network**.

You might want to bring push pins to the site to temporarily mount the base station that you want to connect onto the wall.

1. Temporarily secure the base on a wall. Choose a location that is:

    ■ Near the center of the site

    ■ On a central floor (for multi-story buildings)

    ■ Near the ceiling (at least 2 meters above floor level)

2. Connect the base to the mid-span power brick and Ethernet.

Display Signal Strength on the Handset

After powering up the base, you can display the RSSI (Received Signal Strength Indicator) level on the handset to measure the coverage range from the base to the handset.

Follow the steps below.

1. On a deregistered handset, press the **Menu** button. (If you are using a handset that is registered to a base, press and hold the **Menu** button for 2 - 3 seconds.)

    The Settings Menu displays.

2. Enter ***47***.

3. Highlight the matching MAC address of the base station that you are using for the site survey and choose **Select**.

    The handset displays the RSSI level. For the site survey, aim to achieve a value on the handset that displays as 75 dBm or lower.

Understanding RSSI Levels

The dBm value is a measurement that the system uses to report RSSI levels and is usually represented as a negative value. Therefore, a -40dBm signal is stronger than a -60 dBm signal. The handset does not display the minus sign for the dBm value. Nonetheless, the smaller the dBm number on the handset, the stronger the signal.

For example, here is how the handset displays an RSSI of -49dBm.
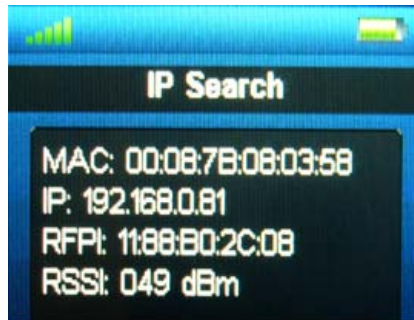
The IP930D components function properly when RSSI levels are as follows:

- For handsets: -75 dBm or better. (This value appears on the handset as 75 or a lower number; the minus sign is not displayed on the handset.)

- For bases and repeaters: -70 dBm or better. (You can view levels for bases and repeaters from ShoreTel IP930D Manager after installation.)

Walk the Site to Measure RSSI levels

To get a sense of the average coverage range of the site, start with the base in a central location and walk the site (including the floors above and below the base station, if applicable) to measure RSSI levels from the base. Whenever construction materials vary significantly in one area of the site, move the base and measure again in that area. Record the results on the floor plan.

If you know the location where you are likely to install the base, measure the coverage range from this location, as well (for example, in the area where most handset users spent the most talk time).

Wherever the handset RSSI level reads higher than 75 dBm, you have moved out of performance range. In this case, you might need to add one or more repeaters to achieve adequate coverage for the site. Record these locations on the floor plan.

Identify Repeater Locations (if applicable)

Follow these steps:

1. On the floor plan, note the edge of the base station signal range (where the handset RSSI value reads higher than 75 dBM). You can assume that you will need to install a repeater at this location.

2. Move the base to a location near this reference point and measure the handset range from the new location.

3. Repeat if needed, recording repeater locations and RSSI levels on the floor plan.

Preparing a Draft Installation Layout

Using the coverage range measurements from your site survey, estimate base and repeater layouts that are likely to provide a value of 75 dBm RSSI or lower everywhere that handset coverage is required.

The purpose of the draft layout is primarily to order equipment for installation. Determining the exact location of the base and repeaters can only be approximated at this stage. The layout can be fine-tuned when you perform the final equipment installation.

Keep in mind:

- Each base station supports as many as four handsets.

- Each base station supports as many as four repeaters.

- You can daisy chain as many as three repeaters, although doing so can introduce delays.

- To increase the number of handsets for your system, you can overlay additional bases and repeaters at a location where you have already successfully installed a base and repeaters. However, the total number of handsets must be within system limits and components must be spaced at least one meter apart. See Understanding System and Coverage Limits on page 13.

Draft Installation Layout—an Example

This system uses multiple bases and associated repeaters to support 12 handsets
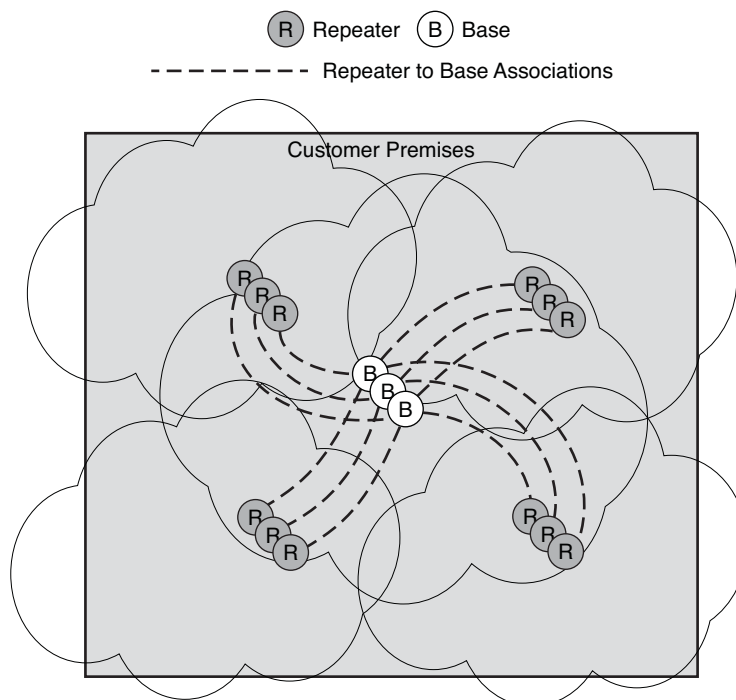
In the illustration, solid outlines represent the -70 dBm RSSI contours for each group of bases and repeaters; dashed lines show the repeaters associated with each base.

A base and its connected repeater (or a repeater connected to another repeater) should be near the -70dB RSSI contour of the base or repeater to which it is connected. It is good to be conservative to avoid underestimating the required equipment.

The equipment order for this example consists of three bases, 12 repeaters, and 12 handsets.

Ordering Equipment

After completing the steps described in this chapter, you can determine the equipment that you need to order. Consider if users require extra equipment, such as wired headsets or additional handset charging stands.

Once you have the necessary equipment, complete the steps in the Installation chapter.

CHAPTER

3

Installation

This chapter contains the following topics:

Installation Overview

Once you obtain ShoreTel IP930D equipment, complete the tasks described in this installation overview. For more information about each step, see the topics that follow.

1. Use the ShoreTel IP930D Configuration Tool to create base-specific configuration files.

2. Store the configuration files on the FTP server in the same directory where the standard IP phone configuration files are located.

3. Register handsets and repeaters with their associated bases.

4. At the installation site, temporarily install a base and its associated repeaters at a location specified in your draft installation layout.

5. Perform a site survey to check that handset RSSI levels are -75 dBm or better in the areas requiring coverage. Adjust locations or add repeaters, as needed.

6. If needed, add bases and repeaters in new or existing locations, repeating the site survey for each addition.

7. Permanently install equipment at the site.

8. Assign user extensions and distribute handsets and charging stands.

> **Note**
>
> To simplify installation and debugging procedures, it is good practice to check that hard-wired phones are working properly and install/test any common equipment prior to installing the IP930D components.

Creating Configuration Files

Use the ShoreTel IP930D Configuration Tool to generate the required configuration files.

Prepare to Use the Configuration Tool

Before you use the ShoreTel IP930D Configuration Tool, complete these preparation tasks:

1. Gather the following unique identifiers from your IP930D equipment:

    ■ For each base, note the MAC address (located on the rear label).

    ■ For each handset, note the IPUI (located under the battery).

    ■ For each repeater, note the IPEI (located on the rear label).

2. Have ready the number of repeaters per base and the total number of handsets used by the system.

3. Reserve static IP addresses for handsets in the IP930D system prior to deploying. Consider reserving an adequate range of addresses to allow for future growth.

> **Note**
>
> Option 156 is used in the bases to ensure that they download the required files. Make sure that option 156 is configured on the DHCP server.

Create and Install Configuration Files

Use the ShoreTel IP930D Configuration Tool to prepare MAC-specific configuration files for each base. Load the files onto the FTP server in the same directory as the standard IP phone configuration files. The configuration files should be prepared prior to the installation visit.

Follow these steps:

1. Run the IP930D Configuration Tool and follow the wizard to enter the necessary information.

   For screen-by-screen instructions, see Appendix A, Installation Example.

Note

If you do many installations, it may be worth investing in a bar code scanner to read the MAC address and other identifiers from the IP930D components. This can reduce data entry errors that can cause system malfunctions.

---

2. Save the project to your computer. If you need to replace or add equipment, you can start from this project file.

3. Save the MAC-specific configuration file for each base station and install these files on the FTP server in the same directory as the standard IP phone configuration files. To do this, choose **File > Save Configuration Files As** and select the **\\Inetpub\ftproot** folder on the FTP server. (These instructions assume that you are running the IP930D Configuration Tool from the HQ server.)

4. Choose **File > Print Installation Summary** to print the installation summary. Save a copy to use during installation of the equipment and for future reference.

   The installation summary indicates which devices need to be installed where, and which handsets and repeaters are associated with each base. It also shows the RPN (radio fixed part number) assignment for each base and repeater. The RPN identifier is used by ShoreTel IP930D Manager and can be useful when troubleshooting.

Registering Handsets and Repeaters to Bases

The next step is to register handsets and repeaters to their associated bases.

Note

A factory fresh base station is locked initially. After you enable it for handset and repeater registration, the base station stays open for 10 minutes. If registration takes longer than this 10 minute window, the base station shuts down and you must unlock it again.

Registration Checklist

Before beginning registration, review this checklist to make ensure you are well prepared:

■ Has a planning site survey been performed and a draft installation plan created for locating bases and repeaters?

■ Have the MAC-specific configuration files been prepared for each base in the system? Have those files been loaded onto the ShoreTel FTP server in the same directory as the standard IP phone configuration files?

- Have static IP addresses been reserved for all of the handsets, including extra capacity for future growth?

- If 802.1x is being used, has authentication been configured for each base on the Ethernet switches and/or RADIUS (Remote Authentication Dial In User Service) servers?

- Is a common subnet available for all bases to share?

- Have arrangements been made for providing power to repeaters?

- Is option 156 configured on the DHCP server to ensure that the bases will download the required files?

- Is the MAC address written down for each base station? (The MAC address is located on the rear label of the base station.)

Registering Handsets

Before you begin registering handsets, note the following:

- Be sure registration is enabled on only one base at a time so that you register repeaters and handsets to the intended base.

- If your system uses multiple bases, the first base you configure must be the one designated RPN 0. Refer to the installation summary to identify the MAC address of the base with this designation.

- If you are attaching the base to an 802.1x secured network, you must pre-configure security credentials in the base before Registering the handsets and Repeaters. See Configuring Bases on a Network Secured with 802.1x on page 70.

To register handsets, follow these steps:

1. Factory clear the base.

  a. Plug the base into a powered Ethernet switch until the LED indicator starts flashing green.

  b. Press and hold the reset button on the back of the base for at least 10 seconds or until the LED indicator turns off.

  The base resets and downloads configuration file(s) and any software upgrades. This can take several minutes. The process is finished when the green LED on the base turns steady green. Do not proceed to the next step until the LED is steady green.

⚠️ **WARNING!**
Never unplug a base while its LED indicator is flashing red or it may be permanently damaged.

2. Wait one to two minutes for the base to obtain an IP address from DHCP and start up.

3. Open ShoreTel IP930D Manager for the base.

   a. From a PC on the same subnet as the base, enter the following:

      http://sd_<*MAC address of base*>

      If this step fails, see Cannot log into a base with ShoreTel IP930D Manager on page 84.

   b. Enter "admin" for the login ID and the last four digits or characters of the base MAC address for the password.

4. From the Base Security page, turn on **Handset/Repeater Registration** and save the settings.

5. Turn on each handset associated with this base. (You can turn on all of the handsets at once.)

6. On the handset, choose **Menu > Connectivity > Register/Deregister** and enter the Handset Registration code "0000". Press the **OK** softkey.

   The handset displays the idle screen after successfully registering and contacting the switch.
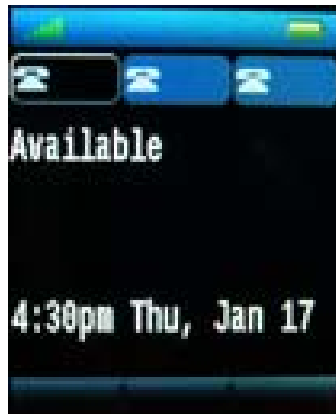
7. If you are registering repeaters, continue on to the topic below. Otherwise, disable Handset Registration in the Base Security page of ShoreTel IP930D Manager and save the settings.

Registering Repeaters

After registering handsets, register any repeaters that are associated with the base. (You can skip this step if your system does not include repeaters).

Note

If you have daisy chained repeaters, always start by registering the repeater that is connected to the base. Leave all repeaters on until the last one is registered.

Before you begin: Confirm that Handset/Repeater registration is still active on the Base Security page in ShoreTel IP930D Manager. This state is indicated by a blinking green/red LED on the base station.

1. Plug in a repeater. Make sure it is near the base you are registering to.

2. Perform a factory reset of the repeater.

   Press and hold the reset button on the repeater for about 3 seconds until the LED turns solid red, then release the button. Wait for the green LED to start double flashing.

   Within one minute the repeater should register with the base and the green LED should turn green steady.

3. Repeat steps 1 and 2 for the remaining repeaters associated with this base. Be sure registration is enabled on only one base at a time so that you register repeaters and handsets to the intended base.

4. When you have finished registering all repeaters, disable Handset Registration from the Base Security page of ShoreTel IP930D Manager and save the settings.

Performing a Site Survey to Confirm Coverage

After temporarily locating one base and its repeaters at the locations specified in the installation plan, perform a site survey to check coverage.

Follow these steps:

1. Turn on one of the handsets registered to the base and make sure it powers up and shows the idle screen.

2. Open ShoreTel IP930D Manager for the base.

   a. From a PC on the same subnet as the base, enter the following:

      http://sd_<*MAC address of base*>

      If this step fails, see Cannot log into a base with ShoreTel IP930D Manager on page 84.

   b. Enter "admin" for the login ID and the last four digits or characters of the base MAC address for the password.

3. Go to the Manage Bases page and scroll to the "Repeater reported RSSI Information (dBm)" table at the bottom of the page.

4. Look for RSSI values highlighted in red. A red highlighted value indicates a repeater that is receiving an insufficient signal (-75 dBm or a greater negative number) from its upstream device and must be moved closer. It may take up to 15 minutes after you move a repeater for its signal to be updated.

   See the Understanding Repeater RSSI Levels on page 35 for more information on interpreting the RSSI table.

5. Enter the site survey mode on one of the handsets by pushing the **Menu** button for more than 3 seconds (the Settings menu appears), then typing ***service*** (*7378423*) on the key pad.

An overlay displays the RPN of the base or repeater the handset is connected to (left-most) and any other base or repeaters it can see. The RSSI of the base or repeater the handset is connected to is also shown. See Handset Service Menu on page 79 for a more detailed look at site survey mode.

6. Press **End/Power** on the handset to exit the Settings menu.

7. Place a test phone call to a wired phone to check audio performance as you move about the site.

8. Walk the complete coverage area to verify an adequate signal in all locations over the desired area.

9. Make adjustments as necessary to the repeater and base locations until satisfactory coverage is available.

10. Turn off the site survey mode on the handset by pushing **End/Power** to turn off the handset.

Understanding Repeater RSSI Levels

Here is an example to help you understand how to interpret the "Repeater reported RSSI Information (dBm)" table for a base and its repeaters. This table is found in the Manage Bases page in ShoreTel IP930D Manager.

Repeater reported RSSI Information (dBm)

RPN	RSSI (dBm) level received from Base or Repeater			
	0x20	0x21	0x22	0x23
0x21	-75	--	--	--
0x22	-71	--	--	-75
0x23	-96	--	-71	--

These tables use the RPN assignments from the installation summary to identify repeaters and bases. The repeaters reporting information are listed by RPN in the left column. The 2nd column shows the base RPNs, followed by any repeaters on the system.

Here is what we can interpret from example table, above:

■ The repeater with RPN 0x21 sees a signal level of -75 dBm from the base with RPN 0x20.

■ The repeater with RPN 0x22 sees a signal level of -71 dBm from the base with RPN 0x20 and -75dBm from the repeater with RPN 0x23.

■ The repeater with RPN 0x23 sees a signal level of -96 dBm from the base and -71 dBm from the repeater with RPN 0x22.

Keep in mind that repeaters need to receive adequate signals from their upstream synchronization source only. The repeaters in this example with RPN 0x21 and 0x22 have the base as their source. Repeater 0x23 uses the repeater with RPN 0x22 as it upstream source, and not the base. Therefore, the -96 dBm level reported for the base at RPN 0x20 is not important.

A red entry in the table indicates that the signal is too low and the repeater must be moved closer to its synchronization source. The level to aim for is -75 dBm or better.

> **Note**
> - It can take up to 15 minutes after moving a repeater before updated signal strengths are reported in ShoreTel IP930D Manager. You must refresh the web page to see updated RSSI values.
> - The dBm value is a measurement used to report RSSI levels and is usually represented as a negative value. A -40 dBm signal is stronger than a -60 dBm signal. However, unlike the IP930D Manager, the IP930D handset does not display the dBm value with a minus sign.

Finalizing Installation

Finalizing installation includes overlaying additional bases and repeaters, permanently installing equipment, and assigning user extensions.

Installing Additional Bases

Depending on your coverage and capacity needs, you might choose to overlay additional bases and repeaters at the same location as your initial installation to increase the number of handsets supported in that area. Keep in mind that the total number of handsets your system supports is limited. (See Understanding System and Coverage Limits on page 13.)

When you are installing multiple bases, be sure to install one base and its associated repeaters completely before installing the next base. This means repeating the site survey for each base and its associated repeaters individually before making the installation permanent. For an example of an installation of this scale, see Appendix A, Installation Example.

When installing more than one base, keep the following in mind:

- For systems with more than one base, the first base you configure when registering handsets and repeaters must be the base designated RPN 0, as indicated by the Installation Summary.

- Each base will require a dedicated PoE switch port and each repeater will require a power source.

- Each base and repeater must be separated by at least 1 meter for proper performance.

Assigning User Extensions

The last step for finalizing installation is to assign user extensions to the IP930D handsets using the ShoreTel Director interface. The procedure for doing this for IP930D devices is the same as for any other ShoreTel IP Phone.

You or your system administrator must distribute, and possibly install, handsets and charging stands to users. Be sure to deliver product documentation, as well. See Related Documentation on page 8.

> **Tip**
> In ShoreTel Director, IP930D handsets display a MAC address that begins with "02" and ends with the IPUI of the handset.

CHAPTER

4

Maintaining Your System

This chapter contains the following topics:

- Replacing a Handset on page 37
- Replacing a Repeater on page 40
- Replacing a Base on page 40
- Adding a new Base and Handsets on page 41
- Updating IP930D Firmware on page 46

Replacing a Handset

To replace a handset, follow this procedure.

1. In the ShoreTel IP930D Configuration Tool, load the saved *.XML project file for the existing installation by choosing **File > Open Project**.

Note
Make sure the file is up to date and matches the installed configuration or you will cause the system to stop working when you apply the files it generates.

For this example, we will open the project file that we created in Appendix A, Installation Example, as shown below.
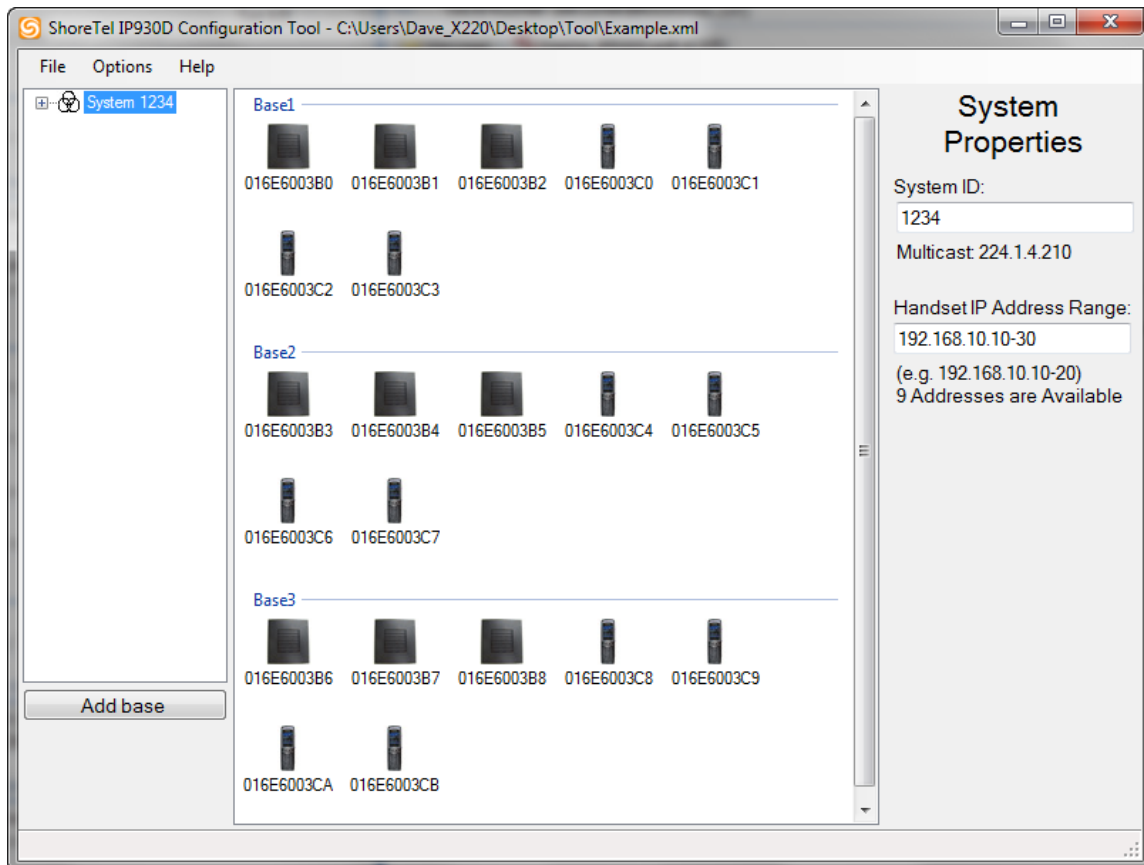
2. To replace a device, first click on that device and enter the new identifier, as appropriate.

For this example, we will replace the handset with IPUI 016E6003C3 with a new handset with an IPUI of 016E6003F1. To do this, first select Base1 in the left pane, then select the handset with IPUI of 016E6003C3 in the center window.

3. In the Handset Properties in the right pane, enter the new IPUI for the handset you are replacing, as shown below.
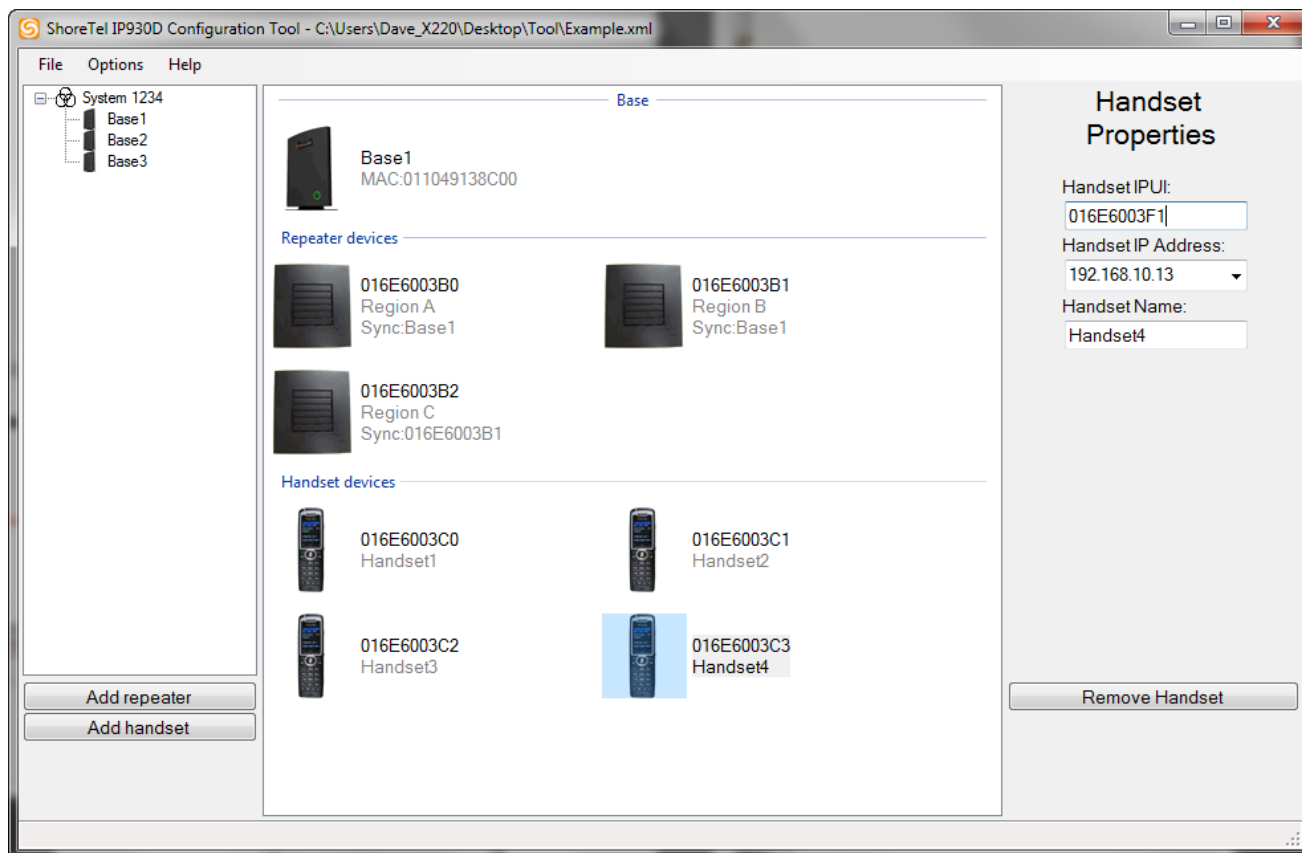
4. Choose **File > Save Project As** to save the new configuration with a new filename.

5. Backup the existing MAC-specific configuration files for all bases before proceeding. You might need to restore these files if you encounter problems later.

6. Generate new MAC-specific configuration files by choosing **File > Save Configuration Files As**. Save these to the FTP root directory for the system, or to a temporary location where you can copy the files to the root directory later.

7. Reset the base on which the handset is located using ShoreTel IP930D Manager. To do so, go to the Reset Base page in ShoreTel IP930D Manager, check **Reset Base**, and click **Reset**.

   The base restarts and downloads the updated configuration file.

8. After the LED indicator on the base has turned steady green, enable registration for the base with the new handset using ShoreTel IP930D Manager from the Base Security page.

9. On the new handset, choose **Menu > Connectivity > Registration**. Enter the Handset Registration code "0000" and press the **OK** soft key.

   The handset should now be operational and a user can be assigned.

Replacing a Repeater

The procedure for replacing a repeater is similar to that for a handset (see above), except that you must enter the IPEI value for the new repeater in the Repeater Properties area of the applicable web page in the ShoreTel IP930D Configuration Tool.

After backing up the old MAC-specific configuration files and after the new ones have been placed into the FTP root directory, reset the base on which the repeater is located using the Reset Base page of ShoreTel IP930D Manager. This will cause the base to restart and download the updated configuration file.

Next, enable registration for the base with the new repeater using ShoreTel IP930D Manager from the Base Security page and plug in the new repeater at its installation location. Press and hold the reset button on the repeater for about 3 seconds until the LED turns solid red and then release the button. Wait for the green LED to start double-flashing. Within one minute the repeater should register with the base and the LED should turn green steady, indicating it is operational.

Replacing a Base

The procedure for replacing a base is similar to that for a handset (see above) except that you must enter the MAC address for the new base in the Base Properties area of the applicable web page in the ShoreTel IP930D Configuration Tool.

Note

If you are replacing the base designated RPN 0x00, be sure to read the section below for special procedures. You can find RPN assignments in the installation summary.

After the updated MAC-specific configuration files have been placed into the FTP root directory, all bases in the system need to be reset in order to learn about the new base. For each base, go to the Reset Base page in ShoreTel IP930D Manager, check **Reset Base**, and click **Reset**. Continue until all bases have been reset.

Replacing the Base designated RPN 0x00

When the base designated RPN 0x00 is replaced, all repeaters and handsets in the system need to be re-registered with their respective bases. This base has an RFPI (Radio Fixed Part Network Identity) that is used system-wide for authentication; if this RFPI changes without re-registering components, authentication of all handsets and repeaters in the system will fail.

If the base you are replacing is not RPN 0x00, you can disregard this section.

You can see which base in the system has been designated RPN 0x00 by looking at the installation summary. If your system has only one base, this base is always RPN 0x00.

To replace the base designated RPN 0x00, follow the instructions for Replacing a Base on page 40. However, when resetting bases from the Reset Base page of ShoreTel IP930D Manager, start with the base at RPN 0x00. Otherwise, the system will not operate properly.

After all bases have restarted, reregister all of the handsets and repeaters with their respective bases (these relationships are specified in the installation summary). To do this, enable registration on one base at a time using ShoreTel IP930D Manager from the Base Security page.

To register handsets, choose **Menu > Connectivity > Registration**. Enter the Handset Registration code "0000" and press the **OK** soft key.

Repeaters must be re-registered starting with the repeaters directly connected to the base and working outward, if any are daisy chained.

Press and hold the reset button on the repeater for about 3 seconds until the LED turns solid red and release the button. Wait for the green led to start double flashing. Within one minute, the repeater registers with the base and the green LED turns green steady, indicating that it is operational.

Note

Keep in mind that the handset registration mode only stays enabled for about 10 minutes. If registration takes longer, you must re-enable registration mode before proceeding.

Adding a new Base and Handsets

To add a new base and additional handsets to the system, follow these steps.

1. Load the project file for the existing installation by choosing **File > Open Project** in the ShoreTel IP930D Configuration Tool. For this example, we can open the project file we created previously.
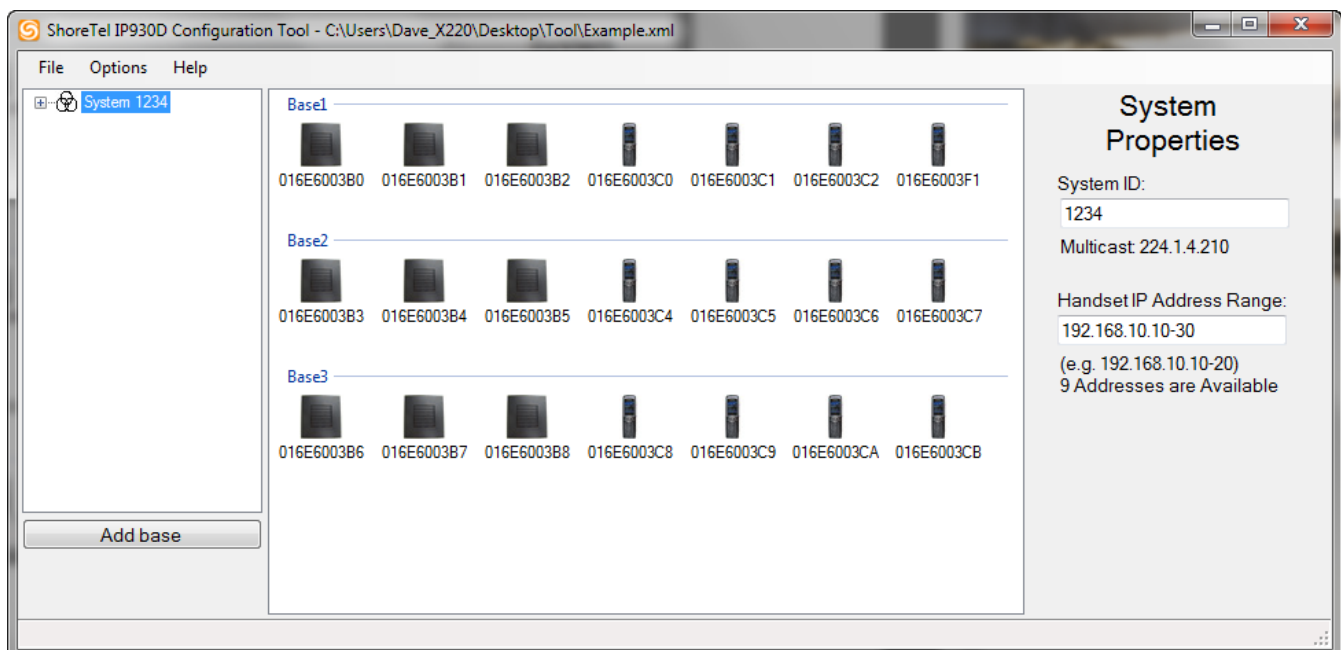
In the right hand pane, you can modify the static IP address range available to assign to handsets. If the range is insufficient, leave the starting address as-is and extend the range. In this case, nine addresses are available and therefore no such action is required.

2. In the left pane, click **Add base**.

3. Select the new base in the left pane.

4. Enter the MAC address of the new base in the Base Properties area, as shown below.
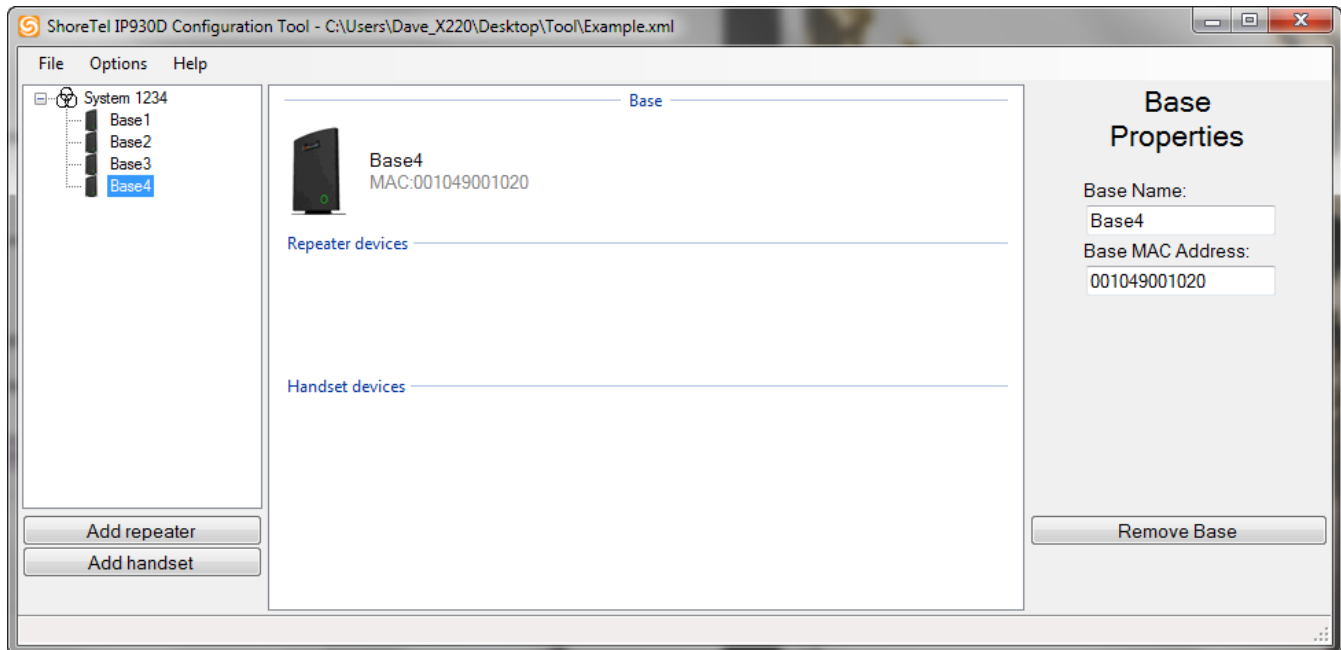
5. To add a repeater to the base, click **Add repeater** in the left pane. A window opens asking you to select a repeater.

6. Choose **New repeater** and **OK**. A new repeater is added.

7. Add the IPEI of the new repeater in the Repeater Properties area.

In the example below, the procedure was repeated for two more two repeaters, for a total of three new repeaters.
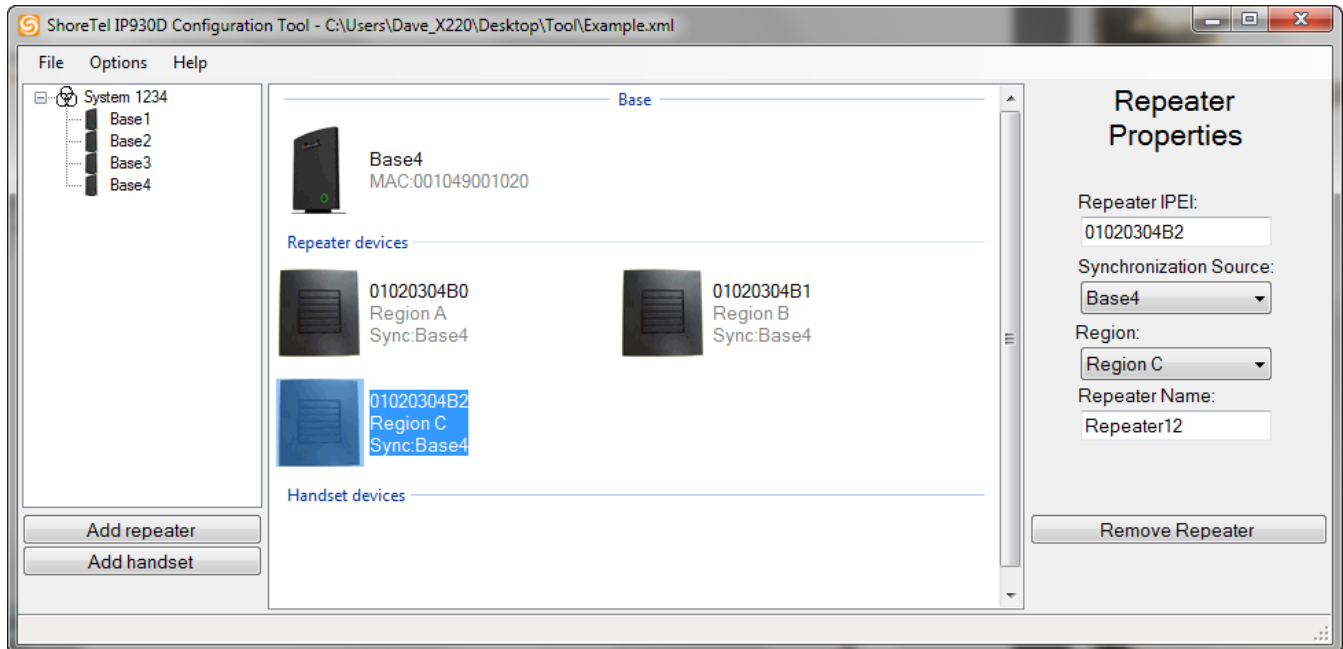
8. The next step is to make sure the synchronization source for each repeater matches that used by other bases in the system. Do this by selecting one of the existing bases in the left pane and noting the sync source for each repeater.

For example, Base 1 is selected below.
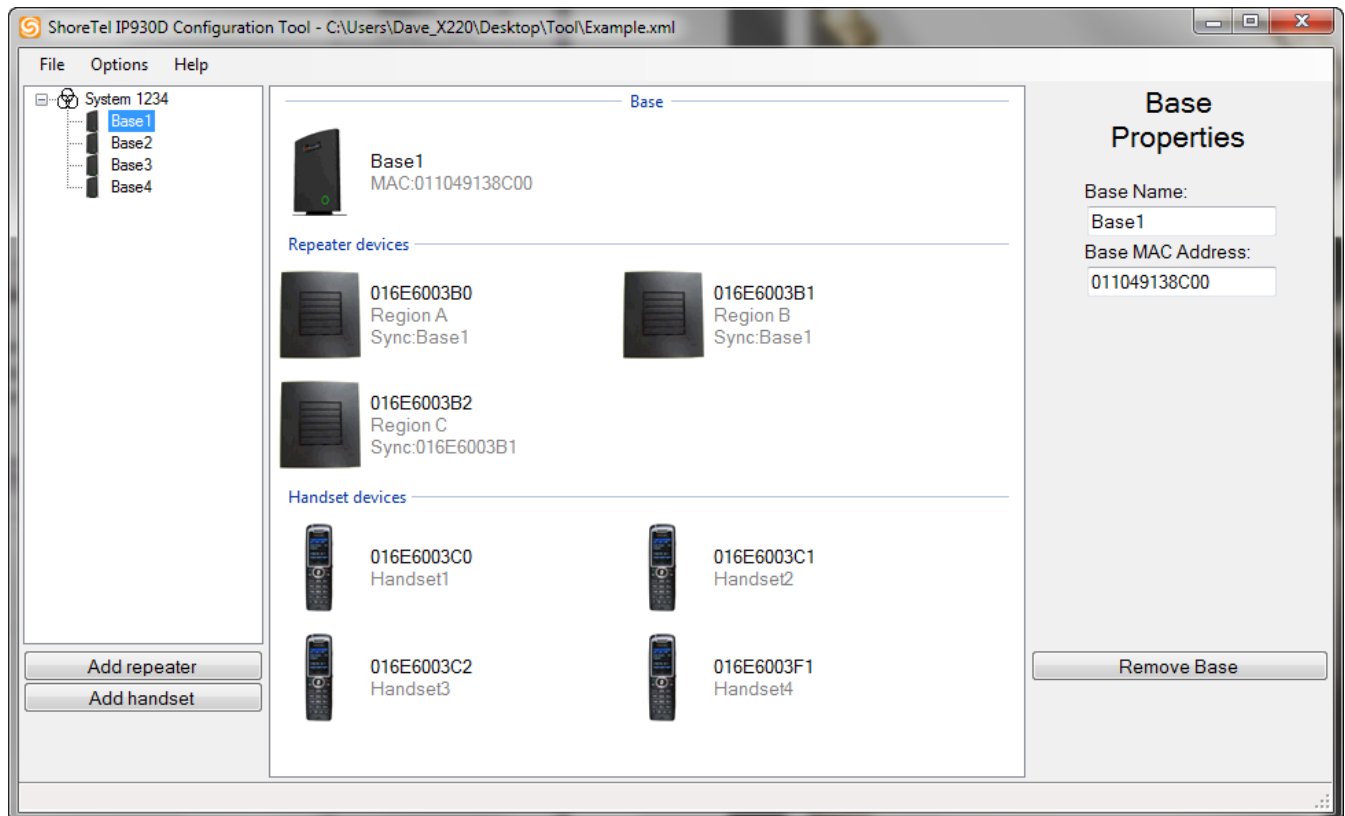
Note that Region A and B bases are synced to the Base, but region C is synced to the repeater in Region B. We need to match this arrangement for the new repeaters.

To do this, choose the IPEI for the Region B repeater from the drop-down list under Synchronization source for the repeater serving Region C on Base4, as shown below.
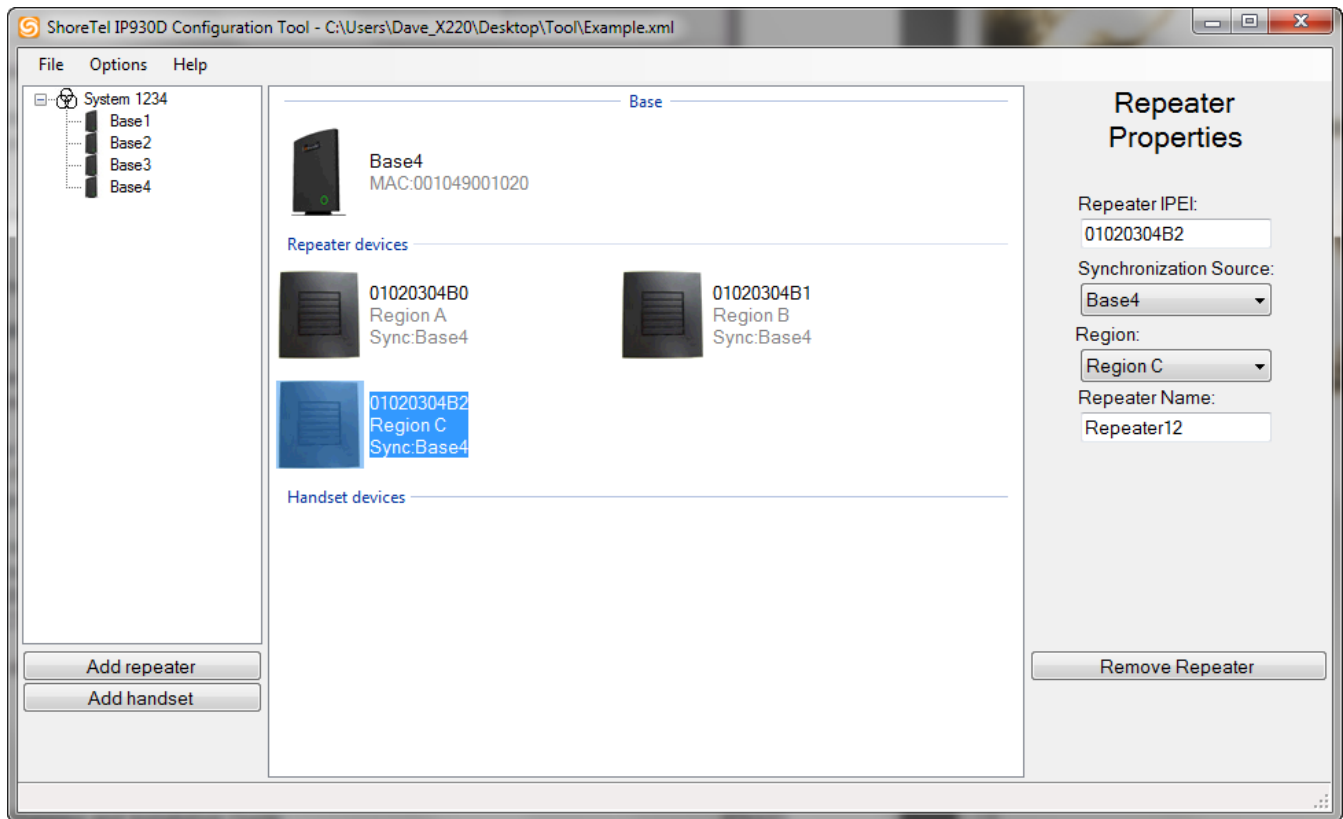
9. Add new handsets to this new base. In this example, we will add two new handsets. Begin by making sure you have Base4 selected and then click **Add handset** in the left pane. A new window opens.

10. Click **Add New** and then click **OK**. Enter the IPUI for the new handset in the Handset Properties area.

11. Repeat the procedure for the 2nd handset.

12. Save the modified configuration using a new file name by choosing **File > Save Project As**.

13. Print the system configuration by choosing **File > Print Installation Summary**. Keep this on hand for future reference.

14. Generate new MAC-specific configuration files by choosing **File > Save Configuration Files As**. Save these to the FTP root directory for the system or to a temporary location where you can copy them to the ftproot directory later.

15. After backing up the old MAC-specific configuration files, and after the new ones have been placed into the FTP root directory, you must reset all bases in the system. Starting with the base assigned to be RPN 0x00 and proceeding one base at a time, reset bases from the Reset Base page in ShoreTel IP930D Manager.

> **WARNING!**
>
> If you do not start with the base at RPN 0x00, the system will not operate properly.

16. After all bases have restarted, plug in the new base and re-register all of the handsets and repeaters to the new base as specified in the installation summary. To do this, enable registration on the new base using ShoreTel IP930D Manager from the Base Security page. On the handsets, choose **Menu > Connectivity > Registration**. Enter the Handset Registration code "0000" and press the **OK** soft key.

17. Finally, register the repeaters to the new base starting with the repeaters directly connected to the base and working outward, if any are daisy chained. Keep in mind that the handset registration mode will only stay enabled for about 10 minutes; if it takes longer than 10 minutes to register all handsets and repeaters, you must re-enable registration mode before proceeding.

Updating IP930D Firmware

You can update the firmware for all of the IP930D components associated with a base station system by using one of these methods:

- From ShoreTel IP930D Manager—Reset the base from the Reset Base page. This is the recommended method. ShoreTel IP930D Manager allows you to see if any devices are in use before resetting the devices and displays upgrade progress. See Resetting and Factory Clearing the Base Station on page 56.

- From ShoreTel Director—Search for and then update/reboot all of the IP930D handsets from the Diagnostics & Monitoring page. Be aware that resetting a handset from Director also resets the hosting base and all other handsets used by that base. Calls in progress will be dropped.

- From a registered IP930D handset—Perform a Mute+RESET by pressing the **Mute** button and typing the word "RESET" on the handset key pad. Taking this action resets the associated hosting base station. Other handsets and/or repeaters associated with the same base will reset automatically if firmware updates are needed. (If you have a multicell system and do not know which base the handset is associated with, you may want to use an alternate method to update firmware.)

> **Note**
>
> - Power-cycling a handset will *not* trigger a handset firmware upgrade (if available); only a base station reboot/reset will trigger the system to check for firmware updates.
> - Handset and repeater updates are performed over the air and can take between 30 minutes to 3 hours. The Current Status page in ShoreTel IP930D Manager displays upgrade progress for each component. For more information, see Understanding System Software Upgrades on page 50.

CHAPTER

5

Reference Material

This chapter contains the following topics:

Theory of Operation

The ShoreTel IP930D base appears to the MGC (Media Gateway Controller) to look like as many as four independent ShoreTel IP Phone 230 models. Each IP930D handset has a unique MAC address, achieved by adding a "02-" prefix to the handset's IPUI number.The primary IP address of the base may be statically configured or obtained using DHCP and assigned to one handset. The remaining IP addresses must be configured using the DectHandset configuration parameter.

Each base is limited to supporting four handsets; this limit ensures non-blocking service to all handsets (when all handsets are on independent three-way calls).

IP 230 MGCP signaling received by the base from the MGC is translated by the base to a format the IP930D handsets can understand; in the opposite direction, the base translates DECT signaling into MGCP. Each handset on the base is handled independently.

Each handset will use the MGCP endpointID of "SHOR_aabbccddeeff@www.xxx.yyy.zzz" where aabbccddeeff is the 40-bit IPUI of the handset (extended to 48-bits by pre-pending the value 0x02 in hex format) and www.xxx.yyy.zzz is the handset IP address. On an IP 230, the phone's MAC address is used for the aabbccddeeff field. (ShoreTel Director uses the endpoint ID reported by the MGCP RSIP sent by the base.)

When managing IP930D handsets in Director, the IPUI of the handset (found on a label under the battery or accessible from the Setup Menu) can be used to link physical handsets to the information in Director. An IP930D handset with an IPUI of 116E5001FB will be reported by Director to have a MAC address of 02116E5001FB (pre-pended 02).

Synchronization

This section contains information about synchronization.

Call Handoffs and Synchronization

Although call handoffs between bases are not supported in the system, handoffs do occur between a base and its repeaters.

When more than one base is used to create a system, it is called a multicell system. To maximize the channel capacity in such a system, it is necessary for all bases and repeaters in the system to be synchronized with each other. Synchronization is also required for seamless handoffs between the base and its repeaters.

The IP930D system uses over-the-air synchronization and syncing relationships between bases will be determined automatically by the system. This method is preferred because it improves reliability over a manual static configuration that cannot adapt to propagation changes or equipment failures.

The syncing relationship for repeaters is simple and a static manual configuration must be used.

All bases in a multicell system must be assigned the same DectSysChainId. In the unlikely event that multiple multicell systems are sharing the same subnet (or multicast forwarding is enabled between different subnets) they must each be assigned a unique ID (this could happen if a subnet covers a very large area and two independent and spatially distant multicell systems are installed that share the same subnet or multicast domain.)

Understanding DECT Synchronization Modes

DECT uses a radio protocol "Multi Carrier, Time Division Multiple Carrier, Time Division Duplex" or MC/TDMA/TDD. This provides a total of 60 duplex channels in the US and Canada and 120 duplex channels in other regions. To achieve this channel usage, all bases and repeaters in a system need to be synchronized in the time domain. Synchronization is also required for handovers between bases and repeaters.

IP930D bases can automatically configure themselves to identify the hierarchy of synchronization relationships on a dynamic basis using wireless links. These relationships can be observed using ShoreTel IP930D Manager on the Manage Bases page. Repeaters must have their synchronization relationships assigned using the DectRepeaterSyncSrcRpn configuration parameter.

For bases or repeaters to synchronize with each other wirelessly, they must be in range of each other. A maximum of 7 sync levels may exist between the synchronization master (always one of the bases) and the last base or repeater in the sync chain. For example:
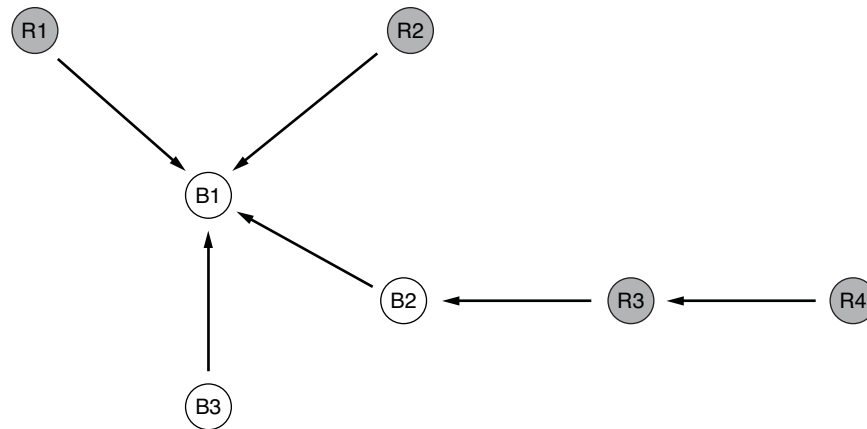
In this installation, Base B1 is the sync master. Bases B2, B3, and Repeaters R1 and R2, are at sync level 2. Repeater R3 is at sync level 3 and Repeater R4 is at sync level 4. In most cases, it is desirable to have the sync master located in the center of the coverage area to create the most flexible sync chain arrangement. When automatic synchronization is used the base master can change over time as determined by the system. Having more than one base within sync range permits the system to establish sync paths around base failures.

Understanding the DECT Registration Process

Handsets and repeaters are authorized to access the system once they are registered with a base. The overall process looks like this:

1. During startup, the base downloads its MAC-specific configuration file that contains DectHandset and DectRepeaterIpei parameters. The IPUI and IPEI values in these parameters are used to build a white list of devices that are permitted to register with the base.

2. From the Base Security page in ShoreTel IP930D Manager, handset registration is enabled. Registration will be automatically disabled after 10 minutes.

3. On the handset, push the Menu button and select Connectivity followed by Register.

4. Enter the appropriate access code (0000).

5. On the repeater, press and hold the reset button for 3 seconds until the LED indicator turns red; the repeater registers.

Registration is required before a handset attempts to register with the switch (and show up in Director).

If a handset is deregistered (or powered off), it does not attempt to register with the switch and will stop responding to all communications from the switch; in this case, calls to the handset go to call coverage, such as a voicemail box.

Understanding System Software Upgrades

When the base first starts running, system software is automatically checked to see if it is up to date. If a newer version of software is found on the FTP server, it is downloaded to the base. Base firmware is upgraded prior to the start of system operations. Base updates can take up to 5 or more minutes to complete depending on how many software elements are upgrading.

Handset and repeater updates are performed over the air and in the background of normal system operations. Handset and repeater upgrades can take up to 3 hours or more depending on the activity of the system. Transmission of the upgrade is halted during phone calls to minimize the impact of the transmission on the operation of the system.

The status of all upgrades can be monitored from the Current Status page in ShoreTel IP930D Manager (last column).

ShoreTel

IP930D Manager

Base IP 192.168.0.91
Base1
Logoff Administrator

Administration
- Network Configuration
- Base Security
- Reset Base
- Manage Bases
- Configuration
- System Log

Maintenance
- Current Status

Current Status

Registered Handsets IPUI	IP Address	MGC Server	Firmware Version	Update Status
11-88-A0-00-D3	192.168.0.91	192.168.0.201	80.0	43% Copied
11-88-A0-00-D0	192.168.0.227	192.168.0.201	80.0	43% Copied
11-88-A0-00-E0	192.168.0.228	192.168.0.201	80.0	43% Copied
11-88-A0-00-DC	192.168.0.229	192.168.0.201	80.0	43% Copied

Repeater IPEI	RPN		Firmware Version	Update Status
015AD9E548	0x1		33	99% Copied
015AD9E518	0x2		33	100% Copied
015AD9E558	0x3		33	86% Copied

Firmware Version of Base
Boot Version:	0.0.53 Build Date : Apr 16 2013 17:29:15
App Version:	0.0.53 Build Date : Apr 16 2013 17:42:38
Base Version:	80.0 Build Date : Mar 20 2013 15:01
RF Band in Use	US
Configuration File Version	ECI_NJ_test.xml
Current Time	2:04pm Tue, Apr 16
Up Time	00 day 00:39:50
Base MAC address	00087B080356
Base RFPI	11:88:b0:2c:00
Primary IP Address and source	192.168.0.91
Number of Active Handsets (on a call)	0
Registration Mode	Off
System Chain ID	1500

For handsets, the update status passes through these states: Percentage (%) Copied, Complete, Checked, Complete, Charge Handset, and Complete.

For repeaters, the update status passes through these states: Percentage (%) Copied, Checked, Restarted, and Complete.

Handsets are not upgraded until they are returned to the charging stand; this ensures that adequate battery life is available to complete the upgrade once it begins.

When a handset is returned to the charging stand, the LED indicator at the top of the handset shows the progress of the upgrade:

1. Slow green flash after the handset is first placed into the charger for about 90 seconds—Checking the transferred image for errors.

2. Fast green flash for about 60 seconds—Writing image to Flash.

3. Amber flash for about 30 seconds—Verifying image.

4. Red flash for about 10 seconds—Clearing downloaded image.

5. Handset restarts and shows the idle screen after a few seconds.

> **WARNING!**
> Never remove a handset from the charging stand during the upgrade process, which takes approximately four minutes. If the battery condition is marginal, the upgrade may not complete properly if the handset is removed prematurely.

Repeater upgrades are completely automatic.

Understanding DECT Registration Security

White lists are used to limit the handsets and repeaters that may register with a given base. For bases, the DectHandset parameter is placed in a MAC-specific configuration file associated with a base to limit what handsets can register with that base. The DectHandset parameter also assigns an IP address for each handset.

Similarly, the configuration parameter DectRepeaters is used to limit the repeaters that may register with a given base. For repeaters, the DectRepeaters parameter is placed in a MAC-specific configuration file associated with a base to limit what repeaters may register with that base.

Both handsets and repeaters use the registration code 0000. (You do not need to enter a registration access code for repeaters; repeaters use 0000 automatically).

Understanding System Management

The IP930D system is primarily configured using downloadable configuration files, similar to the ShoreTel IP Phone 230. However, the base and repeaters have special configuration needs that require a browser-based interface called ShoreTel IP930D Manager.

Using ShoreTel IP930D Manager

The IP930D base provides a web server on port 80 of the primary IP address of the base to create the ShoreTel IP930D Manager interface. ShoreTel IP930D Manager is required because certain procedures, such as registering a handset, require handset registration to be temporarily enabled.

> **Note**
>
> Although many parameters can be modified from ShoreTel IP930D Manager, it is highly recommended that configuration files be the primary method for setting and changing parameters.

To access ShoreTel IP930D Manager:

1. From a PC on the same subnet as the base, enter the following:

http://sd_<*MAC address of base*>

If this step fails, see Cannot log into a base with ShoreTel IP930D Manager on page 84.

2. Enter "admin" for the login ID and the last four digits or characters of the base MAC address for the password.

From one base, you can click links on the Manage Bases page to quickly switch to other bases in the system.

Web access is password protected using digest authentication as defined in RFC 2617. The password can be changed on the Base Security page.

A brief overview of each page in ShoreTel IP930D Manager follows.

Viewing Current Status

The Current Status page shows an overview of the system. It is useful to perform a quick check on how the base is configured, the software versions in use, and which handsets and repeaters are attached.

ShoreTel

IP930D Manager

Base IP 192.168.0.91
Base1
Logoff Administrator

Administration
- Network Configuration
- Base Security
- Reset Base
- Manage Bases
- Configuration
- System Log

Maintenance
- Current Status

Current Status

Registered Handsets IPUI	IP Address	MGC Server	Firmware Version	Update Status
11-88-A0-00-D3	192.168.0.91	192.168.0.201	80.0	Complete
11-88-A0-00-D0	192.168.0.227	192.168.0.201	80.0	Complete
11-88-A0-00-E0	192.168.0.228	192.168.0.201	80.0	Complete
11-88-A0-00-DC	192.168.0.229	192.168.0.201	80.0	Complete

Repeater IPEI	RPN		Firmware Version	Update Status
015AD9E548	0x1		33	Complete
015AD9E518	0x2		33	Complete
015AD9E558	0x3		33	Complete

Firmware Version of Base

Boot Version:	0.0.53 Build Date : Apr 16 2013 17:29:15
App Version:	0.0.53 Build Date : Apr 16 2013 17:42:38
Base Version:	80.0 Build Date : Mar 20 2013 15:01
RF Band in Use	US
Configuration File Version	ECI_NJ_test.xml
Current Time	2:04pm Tue, Apr 16
Up Time	00 day 00:39:50
Base MAC address	00087B080356
Base RFPI	11:88:b0:2c:00
Primary IP Address and source	192.168.0.91
Number of Active Handsets (on a call)	0
Registration Mode	Off
System Chain ID	1500

Viewing and Configuring Network Settings

The Network Configuration page shows the current network settings of the base and provides a way to manually configure values for the IP address, Subnet Mask, and Gateway that cannot be set using a configuration file.

Enabling Registration and Changing Your Password

The Base Security page allows you to enable handset and repeater registration, view handsets and bases that are registered in the base, and modify the base's IP930D Manager password from its default (the last 4 digits of the base's MAC address).

ShoreTel

IP930D Manager

Base IP 192.168.0.91
Base1
Logoff Administrator

Administration
- Network Configuration
- Base Security
- Reset Base
- Manage Bases
- Configuration
- System Log

Maintenance
- Current Status

Base Security

Current Settings

	New Settings
Handset / Repeater Registration (Off)	○ ON ◉ OFF
Handset / Repeater Registration Code	0000
Web Password (0356)	0356

Clear New Settings   Save New Settings

Registered handsets

	Registered Handsets IPUI	IP Address	Firmware Version
☐	11-88-A0-00-D3	192.168.0.91	80.0
☐	11-88-A0-00-D0	192.168.0.227	80.0
☐	11-88-A0-00-E0	192.168.0.228	80.0
☐	11-88-A0-00-DC	192.168.0.229	80.0

Deregister handset

Registered Repeaters

	ID	RPN	Version	IPEI	Sync Source	Status
☐	0	0x1	33	015AD9E548	0x0	Present
☐	1	0x2	33	015AD9E518	0x0	Present
☐	2	0x3	33	015AD9E558	0x2	Present

Deregister repeater

Resetting and Factory Clearing the Base Station

Use the Reset Base page to reset the base station (allowing for firmware updates as needed on all associated system components) or to return the base to factory default settings.

You can also perform a "Mute Clear," which does the following:

1. Turns on DHCP.

2. Erases the DHCP cache.

3. Sets the DHCP SiteOption to the default value of 156.

4. Clears the MGCP IP cache.

5. Sets the 802.1x cached login and password to be "" and stops the 802.1x supplicant if it is running.

6. Resets the base.

Managing Bases

The Manage Bases page can be used to manage many properties of the system, particularly those related to multicell operation. The "Base units in System" list has a rich set of information about each base in the system.

The graphic below shows the top portion of the Manage Bases page.

Refer to the sections below for more information about specific areas of the Manage Bases page.

Table 1—Base Units in System

This table lists all base units in the system.

Base units in System 1500

	ID	RPN	Base Version	MAC Address	IP Address	IP Status	Sync Source	Sync Property	Base Name
☐	0	0x0	80	00087B080356	192.168.0.91	This unit	0x20	Locked	Base1
☐	1	0x8	80	00087B08037A	192.168.0.85	Connected	0x0	Locked	Base2
☐	2	0x10	80	00087B080358	192.168.0.81	Connected	0x0	Locked	Base3
☐	3	0x18	80	00087B080371	192.168.0.180	Connected	0x10	Locked	Base4
☐	4	0x20	80	00087B08033C	192.168.0.133	Connected	0x20	Primary	Base5

The columns in this table provide the following information:

1. **ID**—Index of all bases from 0 to N for this table.

2. **RPN**—Radio Fixed Part Number (0x00 to 0xff) assigned to each base.

3. **Base Version**—Base firmware version.

4. **MAC Address**—MAC address of base.

5. **IP Address**—Hyperlink of the IP address of base (links to that base's management page).

6. **IP Status:**

   - **This unit**—If this is the unit being managed.

   - **Connected**—If communications with this base are working.

   - **Connection Lost**—If communications to this base are not working.

7. **Sync Source**—The RPN that is the synchronization source for this base. These are automatically assigned by the system.

8. **Sync Property:**

   - **Primary**—Base station to which all other nodes are under in the sync hierarchy.

   - **Locked**—Base is locked to the base that is its master (shown in sync source).

   - **Searching**—Looking for a sync source.

   - **Free Running**—Base that has lost its sync.

   - **Unknown**—State of sync is unknown (usually because IP Status is in Connection Lost state).

9. **Base Name**—Name assigned to this base using the BaseName configuration parameter within the ShoreTel IP930D Configuration Tool.

Table 2—Base reported RSSI Information

The Base reported RSSI Information (dBm) table shows the RSSI values that are being received by every base from every other base. This can be used to make sure bases are located within range of each other and/or are operating properly from a radio perspective. RSSI levels that are too low are highlighted in red.

Base reported RSSI Information (dBm)

RPN	RSSI (dBm) level received from Base				
	0x0	0x8	0x10	0x18	0x20
0x0	--	-52	-28	-37	-26
0x8	-45	--	-54	-64	-50
0x10	-26	-56	--	-33	-30
0x18	-39	-71	-35	--	-43
0x20	-26	-45	-28	-41	--

Table 3—Repeaters on this Base

The Repeaters on this Base table shows a list of all repeaters associated with this base and their status.

Repeaters on this Base

	ID	RPN	Version	IPEI	Sync Source	Status
☐	0	0x1	33	015AD9E548	0x0	Present
☐	1	0x2	33	015AD9E518	0x0	Present
☐	2	0x3	33	015AD9E558	0x2	Present

The columns in this table provide the following information:

1. ID—Index of all bases from 0 to N for this table.

2. RPN—Radio Fixed Part Number (0-255) assigned to each base.

3. Version—Base firmware version.

4. IPEI—International Portable Equipment Identity, the unique identifier for the repeater.

5. Sync Source—The RPN of the base or repeater that is the synchronization source for this repeater. Repeater synchronization sources are assigned using the ShoreTel IP930D Configuration Tool.

6. Status:

   ■ Present—The repeater is working and in contact with the base. It may take up to 60 minutes for this status to be correctly shown after making changes or starting the system.

   ■ Unknown—The repeater is not in communications with the base and its status is unknown.

Table 4—Repeater Reported RSSI Information

The Repeater reported RSSI Information (dBm) table shows the RSSI values that are being received by all repeaters on the base. This can be used to make sure repeaters and/or bases are located within range of each other. RSSI levels that are too low are highlighted in red. See Understanding Repeater RSSI Levels on page 35.

Repeater reported RSSI Information (dBm)

RPN	RSSI (dBm) level received from Base or Repeater			
	0x0	0x1	0x2	0x3
0x1	-45	--	-94	--
0x2	-79	--	--	-64
0x3	--	--	-62	--

DECT Synch Chain

The DECT Sync Chain area on the Manage Bases page shows the hierarchy of synchronization relationships among bases in the system. This hierarchy is automatically created and managed by the system.

DECT Sync Chain

- Primary: RPN 0x20 : Base5
  - Level 1: RPN 0x0 : Base1
    - Level 2: RPN 0x8 : Base2
    - Level 2: RPN 0x10 : Base3
      - Level 3: RPN 0x18 : Base4

Viewing Configuration Data and System Logs

The Configuration and System log pages are used for debugging the system. The configuration data shows the settings that the base is currently using. This can be examined to see if it agrees with the desired configuration.

The System log shows the same information that is sent to the Syslog server and is used primarily for debugging. The debug levels used by this log can be set using the SysLogInfo parameter. This log will show the last 50,000 characters that have been sent.

Using ShoreTel Director to View and Reset Handsets

IP930D handsets appear in the IP Phone List in Director as individual IP phones with the model number IP930D.

Caution must be exercised when remotely resetting an IP930D handset from the Diagnostics & Monitoring / Status / IP Phones page; resetting a handset also resets the base that is hosting the handset and therefore impacts all of the handsets used by that base. Calls in progress will be dropped. It is recommended that you instead use ShoreTel IP930D Manager to reset handsets and bases; in ShoreTel IP930D Manager, you can easily see if these components are in use before resetting them. Navigate to the Current Status page in ShoreTel IP930D Manager and look at the "Number of Active Handsets (on a call)."

Understanding Configuration Parameters

The table below describes configuration parameters and default values.

Parameter	Value Type	Value	Sources	Default
2833PayType	96-127, "dynamic"	If a fixed value is chosen, that value should be used in SDP offers for the 2833 payload type. If "dynamic" is chosen, the current dynamically allocated payload type logic should be used.	CFG	102
5004Enable	Up to 1 ASCII character	This enables or disables the special Shoretel use of port 5004 for RTP traffic. 0=Disable 1=Enable	CFG, MGCP	1
8021xEnable	Up to 1 ASCII character	802.1x authentication is enabled is set to 1 and disabled if set to 0.	MAN	1
802.1xPwd	Up to 255 ASCII Characters	String that is displayed when the handset prompts for the 802.1x authentication password. Characters in this string must be specified using UTF-8.	CFG	"PWD:" "Speaker= <- #=OK"
802.1xSid	Up to 255 ASCII Characters	String that is displayed when the handset prompts for the 802.1x authentication supplicant ID. Characters in this string must be specified using UTF-8.	CFG	"802.1x Startup Error….." "-802.1x Aborted….." "802.1x Authenticating…" "Seconds" "-Failed-Restarting"
AmPm	Up to 32 ASCII Characters	String used to localize the AM/PM text in the date. Characters in this string must be specified using UTF-8.	CFG	"am" "pm"
AppName	Up to 32 alphanumeric characters	This is the name of the application image that is in the base. The application file name can be at most 24 characters long. The combination of filename and path can be up to 32 characters long. A new application name is specified in a configuration file and is checked against the NV value to decide if a new version needs to be downloaded. The NV value is updated after a successful download and flash programming sequence.	CFG	Value from factory in NV Storage

Parameter	Value Type	Value	Sources	Default
BackLight	1-255	Number of seconds the backlight remains on at full brightness when the handset is idle.	CFG	20
BackLightDim	0-255	Number of additional seconds the backlight remains on at a DIM level after the BackLight interval has passed since an idle state was entered.	CFG	20
BackLightSave	0 or 1	If set to 1 then line status updates on the handset will NOT turn on the handset backlight.	CFG	0
BootName	Up to 32 alphanumeric characters	This is the name of the boot image that is in the base. The boot file name can be at most 24 characters long. The combination of filename and path can be up to 32 characters long. A new boot name is specified in a configuration file and is checked against the NV value to decide if a new version needs to be downloaded. The NV value is updated after a successful download and flash programming sequence.	CFG	Value from factory in NV Storage
Country	Up to 3 ASCII Characters	This parameter specifies the Country that is used by the Include parameter to identify a particular file to include. May be between 1 and 255.	SSON, CFG, MAN	1
DaysOfWeek	Up to 64 ASCII Characters	Comma separated list of the day of week abbreviations used by the S1 phone to display the time. First day is Sunday.	CFG	Sun,Mon,Tue, Wed,Thu,Fri,Sat
DectAutoSync	Yes or No	Enable or disable auto synchronization of the base radios in a multicell system. Manual configuration is required if set to No.	CFG	"Yes"
DectBaseAppName	Up to 32 alphanumeric characters	This is the name of the DECT processor application image that is in the base. The application file name can be at most 24 characters long. The combination of filename and path can be up to 32 characters long. A new application name is specified in a configuration file and is checked against the NV value to decide if a new version needs to be downloaded. The NV value is updated after a successful download and flash programming sequence.	CFG	Value from factory in NV Storage
DectBaseMac	Comma separated list of up to 32 MAC addresses in hex	Comma separated list of up to 32 Base MAC addresses that are in the system. The index of this list (0 to 31) multiplied by 8 is the RPN for that base. Example: DectBaseMac 00087B00AA1F, 00087B00AA12 00087B00AA1F is assigned RPN 0 00087B00AA12 is assigned RPN 8	CFG	""
DectBaseName	Up to 32 alphanumeric characters	User friendly name for identifying the base.	CFG	"Primary Base"
DectBaseNetworking	Multicast	Specify the type of networking the bases will use to communicate with each other. All bases on a system must be set identically. Multicast requires bases to be on the same subnet or intermediate routers to have IGMP V2 implemented.	CFG	"multicast"
DectBasePrimary	IP Address in dotted decimal format	IP address of the Network Primary Base. This is the base to which all bases will communicate to synchronize behavior. All bases in a system must use the same DectBasePrimary.	CFG	"0.0.0.0"

Parameter	Value Type	Value	Sources	Default
DectBaseSyncSrcRpn	Comma separated list of up to 32 decimal or hex RPN values between 0 and 255	Comma separated list of up to 32 RPN values that assigns the synchronization source to each repeater in the DectBaseMac list. Example: DectBaseSyncSrcRpn 0x0, 0x8	CFG	0x0
DectCallProgLevelDb	-128 to 0	Set the audio level of call progress tones on the handset.	CFG	-27
DectCancel	Up to 64 ASCII Characters	String that is displayed on a softkey to cancel the current operation. Must be 6 characters or less. This must exactly match the systems string softkey assignment for the active language. Characters in this string must be specified using UTF-8.	CFG	"Cancel"
DectCountry	Up to 32 alphanumeric characters	This parameter specifies the country for localizing call progress tones. Available countries are: Germany, Luxembourg, France, Italy, Holland, Greece, Ireland, Sweden, Spain, Denmark, Finland, Turkey, Switzerland, Portugal, Belgium, Austria, United Kingdom, Norway, US, Australia, New Zealand	CFG	"US"
DectDateTimeFormat	Up to 64 ASCII Characters	Tokens are specified in the string with a preceding "\" character. Here are the token definitions: d = numeric day D = numeric day with leading zero n = numeric month N = numeric month with leading zero y = numeric year two digits Y = numeric year four digits a = DaysOfWeek string b = MonthsOfYear string h = hour H = hour 24-hour clock with leading zero m = minute p = am/pm using AmPm parameter for localization examples: DateTimeFormat "\a, \b \d \Y \h:\m\p" = Wednesday, Oct 1 2008 5:50pm DateTimeFormat "\N/\D/\y \h.\m\p" = 5/03/08 6.22am DateTimeFormat "\Y-\N-\D \hh\m" = 2008-05-08 6h22	CFG	"\a, \b \d \Y \h:\m\p"
DectDial	Up to 64 ASCII Characters	String that is displayed on a softkey to dial. Must be 6 characters or less. This must exactly match the systems string softkey assignment for the active language. Characters in this string must be specified using UTF-8.	CFG	"Dial"
DectDirectory	Up to 64 ASCII characters	String that is displayed on the Menu screen to access the directory. Must be 14 characters or less. Characters in this string must be specified using UTF-8.	CFG	"Directory"
DectDtmfLevelDb	-128 to 0	Set the audio level of DTMF tones on sent to the network.	CFG	-16

Parameter	Value Type	Value	Sources	Default
DectHandset	Up to 256 Characters	This parameter associates an IP address to a specific handset. This parameter may be repeated in a configuration file up to 4 times, once for each handset assigned to the bases. Two values are specified: the IPUI (10 characters) and IP address. IP address must be specified in dotted decimal notation for 3 of the 4 handsets. One of the four handsets may use the value "Base" to reuse the IP address assigned to the base. Examples: DectHandset 1abcdef012, Base DectHandset 1abcdef013, 192.168.0.12 The IPUI can be found on the label underneath the battery on the back of the handset.	CFG	""
DectHandsetAppName	Up to 32 alphanumeric characters	This is the name of the handset application image. The application file name can be at most 24 characters long. The combination of filename and path can be up to 32 characters long. A new application name is specified in a configuration file and is checked against the NV value to decide if a new version needs to be downloaded. The NV value is updated after a successful download and flash programming sequence.	CFG	Value from factory in NV Storage
DectHandsetLevelsDb	Up to 255 ASCII Characters	Set the audio levels of the handset using a comma separated list of the following settings. The default values in decimal are listed next to the name for clarity. TxGain 0 RxGain1 -14 RxGain2 -11 RxGain3 -8 RxGain4 -6 RxGain5 -2 RxGain6 2 Sidetone 0 It is recommended that you do not change any value by more than +/- 2 dB from the default values listed.	CFG	Refer to "Value" column.
DectHeadsetLevelsDb	Up to 255 ASCII Characters	Set the audio levels of the headset using a comma separated list of the following settings. The default values in decimal are listed next to the name for clarity. TxGain 0 RxGain1 -3 RxGain2 0 RxGain3 3 RxGain4 6 RxGain5 9 RxGain6 12 Sidetone 0 It is recommended that you do not change any value by more than +/- 2 dB from the default values listed.	CFG	Refer to "Value" column.
DectHistory	Up to 64 ASCII Characters	String that is displayed on the Menu screen to access the call history. Must be 14 characters or less. Characters in this string must be specified using UTF-8.	CFG	"Call History"
DectIntercom	Up to 64 ASCII Characters	String that is displayed on the Menu screen to access the Intercom. Must be 14 characters or less. Characters in this string must be specified using UTF-8.	CFG	"Intercom"
DectMcDebug	0, 1, 2, 3	0=none, 1=Data Sync Logging, 2=Auto DECT Tree Logging, 3= Data Sync and DECT Tree Logging.	CFG	0

Parameter	Value Type	Value	Sources	Default
DectMultiCell	Yes or No	This parameter specifies whether or not the base is part of a system of more than one base or repeater.	CFG	"No"
DectMultiMaster	Yes or No	Some manually configured base synchronization arrangements require more than one synchronization master (when a base is not within radio range, for example). In this case the value should be set to Yes.	CFG	"No"
DectOk	Up to 64 ASCII Characters	String that is displayed on a softkey to OK the current operation. Must be 6 characters or less. This must exactly match the systems softkey string assignment for the active language. Characters in this string must be specified using UTF-8.	CFG	"Ok"
DectNbOnly	0 or 1	Limit all calls to narrowband if 1 by removing G.722 from SDP offers/answers.	CFG	1
DectRepeaterApp Name	Up to 32 alphanumeric characters	This is the name of the repeater application image. The application file name can be at most 24 characters long. The combination of filename and path can be up to 32 characters long. A new application name is specified in a configuration file and is checked against the NV value to decide if a new version needs to be downloaded. The NV value is updated after a successful download and flash programming sequence.	CFG	""
DectRepeaterAuto CfgMode	Comma separated list of up to 100 Mode values 0, 1, or 2	Comma separated list of mode values that assigns the synchronization mode to each repeater in the DectRepeaterIpei list. 0=manual assignment using DectRepeaterSyncSrc, 1=local automatic, 2=chain automatic	CFG	1
DectRepeaterData Configured	Comma separated list of up to 100 configured values 0 or 1	Comma separated list of configured state values that assigns the configured state to each repeater in the DectRepeaterIpei list. 0=not configured, 1=configured	CFG	0
DectRepeaterIpei	Comma separated list of 4 repeater values in hex	Comma separated list of 4 repeater IPEIs that are associated with this base. Index of this list links a specific repeater to other repeater parameter such as DectRepeaterRpn. Unused repeaters use IPEI=0. Example: DectRepeaterIpei 005ad85dd0, 005ad85dd1,0,0,0,0,0	CFG	""
DectRepeaters	Comma separated list of up to 4 IPUI values in hex	Comma separated list of up to 4 repeater IPEIs that associated with this base. This is used as a white list to limit repeater registrations and IPUI values must be unique to each base (no reuse). Example: DectRepeaters 005ad85dd0, 005ad85dd1	CFG	""
DectRepeaterRpn	Comma separated list of up to 100 decimal or hex RPN values between 0 and 255	Comma separated list of RPN values that assigns an RPN value to each repeater in the DectRepeaterIpei list. Example: DectRepeaterRpn 0x0, 0x1	CFG	0
DectRepeaterSync SrcRpn	Comma separated list of up to 100 decimal or hex RPN values between 0 and 255	Comma separated list of RPN values that assigns the synchronization source to each repeater in the DectRepeaterIpei list. Example: DectRepeaterSyncSrcRpn 0x0, 0x1	CFG	0

Parameter	Value Type	Value	Sources	Default
DectRingerLevelsDb	Up to 255 ASCII Characters	Set the audio levels of the ringer using a comma separated list of the following settings. The default values in decimal are listed next to the name for clarity. RxGain 0 -128 RxGain1 -12 RxGain2 -8 RxGain3 -5 RxGain4 0 RxGain5 4 RxGain6 8 It is recommended that you do not change any value by more than +/- 2 dB from the default values listed.	CFG	Refer to "Value" column.
DectSpeakerLevelsDb	Up to 255 ASCII Characters	Set the audio levels of the speakerphone using a comma separated list of the following settings. The default values in decimal are listed next to the name for clarity. TxGain 0 RxGain1 3 RxGain2 6 RxGain3 9 RxGain4 12 RxGain5 14 RxGain6 18 It is recommended that you do not change any value by more than +/- 2 dB from the default values listed.	CFG	Refer to "Value" column.
DectSyncTime	10 to 360	Period in seconds between when the elements in the multicell system are synchronized.	CFG	60
DectVoiceMail	Up to 64 ASCII Characters	String that is displayed on the Menu screen to access voice mail. Must be 14 characters or less. Characters in this string must be specified using UTF-8.	CFG	"Voice Mail"
DectSysChainId	0 to 9999	This parameter identifies the ID of the System Chain that the base belongs to. Systems with the same ID will have a radio synching relationship to maximize channel usage.	CFG	0821
DHCP	1 ASCII Character	DHCP enable/disable 0=Disabled 1=Enabled	MAN	1
DhcpCache	1 ASCII Character	Enable or disable DHCP caching. 0=Disabled 1=Enabled When the config file is processed, if set to 0 the DHCP cache is cleared and DHCP will not be cached again until enabled.	CFG	1
DscpAudio	Up to 2 ASCII characters	Differentiated services code point for audio packets. Allowed values of 0 to 63. This parameter applies to all Layer 3 packets.	CFG, LLDP	0
DscpSignaling	Up to 2 ASCII characters	Differentiated services code point for audio packets. Allowed values of 0 to 63. This parameter applies to all Layer 3 packets.	CFG, LLDP	0

Parameter	Value Type	Value	Sources	Default
Ethernet1	Up to 10 ASCII Characters	Status of the 1st Ethernet Interface. Ethernet1 Status, Speed/Duplex Where: Status is 0 or 1 (disabled or enabled) Speed/Duplex is one of the following: Auto 10/FD 10/HD 100/FD 100/HD	CFG, MAN	1,Auto
FtpServers	Up to 255 ASCII Characters	A comma separated list of up to 2 FTP servers. If a server is unavailable the base goes through the list until a working server is found.	DHCP, MAN	0.0.0.0
GatewayAddress	Dotted Decimal ASCII	Gateway address for the base.	DHCP, MAN	0.0.0.0
IcmpArpTimeout	Up to 5 ASCII Characters	Number of minutes before routing table entries created by ICMP redirects are timed out of the routing table. If 0, then they never time out.	CFG	0
Include	Up to 64 ASCII Characters	The file name that is specified shall be read and its contents included into the master configuration file. Files may be specified completely, or may include the variables $Hardware, $Country or $Language. The value of the Hardware Version (programmed into flash at the factory e.g. K01M01P01L01), Country or Language Parameter shall be substituted for $Hardware, $Country or $Language when the file name is created. For example: Include "Country_$Country.txt" with the Country parameter set to 3 would load in the file "Country_3.txt" This will permit parameters to be specified based on the Country and Language parameter values.	CFG	""
IPAddress	Dotted Decimal ASCII	IP address to be used by the base.	DHCP, MAN	0.0.0.0
KeepAlive	Up to 3 ASCII Characters	Number of seconds to wait for an audit endpoint command before initiating the recovery procedures in ShorelinePR.4.2.170. If set to zero recovery procedures will never be started. Valid range is 0 to 999 seconds.	CFG	120
Language	Up to 3 ASCII Characters	This parameter specifies the Language that is used by the Include parameter to identify a particular file to include. May be between 1 and 255.	SSON, CFG, MAN	1
Layer2Audio	1 ASCII character	Layer 2 audio priority values from 0 to 7.	CFG, LLDP	5
Layer2Tagging	1 ASCII character	802.1Q tagging enable on Port 1 0=Disable 1=Enable	SSON, CFG, MAN, LLDP	0
Layer2Signaling	1 ASCII character	Layer 2 signaling priority values from 0 to 7.	CFG, LLDP	0
LldpEnable	1 ASCII character	LLDP enabled if 1 and disabled if 0.	MAN	1
MaxJitter	Up to 4 ASCII characters	The maximum value that the jitter buffer may be allowed to grow. Valid values are 40 to 140 mS in 1 mS steps.	CFG	50

Parameter	Value Type	Value	Sources	Default
MgcAuthenticate	1 ASCII character	If enabled, then only authenticated MGC messages are accepted by the base. 0=disable, 1=enable	CFG	0
MgcpBackoffEnable	0 or 1	Enable or disable the advanced retransmit algorithm. If set to 0 the legacy behavior of retransmitting 7 times at 100 mS intervals is used.	CFG	1
MgcpMaxRetx	1 to 10	Maximum number of unacknowledged retries before the handset enters the disconnected state.	CFG	4
MgcpRtoInit	MgcpToMin to 1000	Initial retransmit timeout value in milliseconds. Must be equal or greater than MgcpToMin.	CFG	300
MgcpToMin	50 to 1000	Minimum allowable retransmit timeout in milliseconds. Prevents good acknowledgement algorithm from reducing the interval to too small of a value.	CFG	200
MgcpTsMax	1 to 10	Maximum amount of time in seconds that can elapse before the final retry attempt is sent before the handset enters the disconnected state.	CFG	5
MgcServers	Up to 64 ASCII Characters	Comma separated list of up to 2 MGC Servers. Must be in dotted decimal format. Example: 192.168.0.1, 192.168.0.2	MAN	
MonthsofYear	Up to 64 ASCII Characters	Comma separated list of the months of the year abbreviations used by the handset to display the time. First month is January.	CFG	Jan,Feb,Mar,Apr, May,Jun,Jul,Aug, Sep,Oct,Nov,Dec
NoSvc	Up to 64 ASCII Characters	String that is displayed when the handset has lost service. Characters in this string must be specified using UTF-8.	CFG	"No Service"
PersistantEvents	Up to 255 ASCII Characters	Comma separated list of persistent events. Example: L/hu,L/hd, U/kd,U/ku	CFG	""
ReqSvc	Up to 64 ASCII Characters	String that is displayed as the handset is waiting for service from the switch. Characters in this string must be specified using UTF-8.	CFG	"Requesting Service"
RtpBase	Up to 5 ASCII Characters	This is the base port from which the base transmits and receives media. The valid range should be an even number from 3000 to 65408. 65408 is the highest even 16 bit number that allows enough headroom for the 64 RTP and 64 RTCP ports that are reserved when you establish an RTP base value. Given an RTP base, the base should use the next 64 consecutive even numbers for RTP ports. If within that range an existing (reserved) odd or even UDP port number is used the base should skip over an even/odd pair to the next even number. So, for example, if the user set rtpBase to 5550 we would use 5550, 5552, 5556, 5558, etc. In this example we skipped 5554 because 5555 is a reserved port used by the phonectl server (Actually 5554 is also used and also provides a reason for skipping over 5554). If an odd number is specified, the base should use the next lowest even number if it fits the above limitations.	CFG	3000
RtcpEnable	0 or 1	If Enabled the base will send an RTCP report to the far end phone.	CFG	0

Parameter	Value Type	Value	Sources	Default
SetupPassword	32 ASCII Characters	This is the MD5 hash of the password that must be entered after the Mute button is pushed to enter a manual key command. Note that this password must be saved in flash after a value has been received from the MGC so it can be enforced on subsequent reboots. It is not cleared by the CLEAR command nor the clear step in the SETUP command.	MGCP, DHCP	1234
SntpServer	Dotted Decimal ASCII	SNTP server address in dotted decimal format.	DHCP, CFG, MAN	0.0.0.0
SubNetMask	Dotted Decimal ASCII	Network Mask for the base. On boot, the base checks for a non-zero NV value, and if one is present it is used.	DHCP, MAN	0.0.0.0
SysLogInfo	Up to 32 ASCII Characters	IP Address, module, verbose level, facility code, and output device of the SysLog function. The port number may be optionally identified and appended to the IP address. The default of 514 will be used if no port is specified. The module is a 32-bit integer where each bit refers to the debug enable/disable status from a specific software module. Bit assignments are: 0: "MGCC" #MGCP 1: "MCFGP" #config file parser 2: "MUSTG" #not used 3: "MNETC" #network configuration 4: "MUI" #DECT man machine interface 5: "MDIS" #not used - display module 6: "MPROV" #provisioning 7: "MAINT" #maintenance 8: "MRMON #not used 9: "MFWU" #DECT firmware upgrade 10: "MVPN" #not used 11: "MM" # DECT mobility management 12: "MLCMD" #local mode 13: "MFACT" #DECT factory test 14: "MISC" #DECT miscellaneous API 15: "MEPT" #not used	CFG	0.0.0.0,0,0,0,0

Parameter	Value Type	Value	Sources	Default
		16: "HMTST" #hammer test 17: "MIND" #not used 18: "MKBD" #not used 19: "MLLDP" #not used 20: "MPROF" #not used 21: "MRTPT" #SRTP 22: "MAIL" #DECT mail socket interface 23: "MCC" #DECT call control 24: "MBOS" #not used 25: "MRCOV" #not in used yet 26: "MGSIG" #not used 27: "EAP" #DECT embedded access protocol 28: "module29" #not used 29: "module30" #not used 30: "module31" #not used 31: "RTXLOG" #syslog from Sitel The verbose level indicates the level of information that is printed. Levels are 0 to 7. Facility code is the syslog facility code. The output devices are 0= serial port, 1=syslog server.This parameter may appear multiple times to permit the assignment of unique logging levels to modules. Example: SysLogInfo 192.168.0.51:514,0x8000000,3,21,1 Sets RTXLOG to level 3 to a syslog server at 192.168.0.51		
Version	Up to 16 ASCII Characters	This parameter specifies the version identifier of the configuration file. It is then reported via the Mgt/gi signal request.	CFG	""
VlanId	Up to 9 ASCII Characters	VLAN ID to be used on all packets from base. Example: 1234	SSON, CFG, MAN, LLDP	

Setting Audio and Backlight Parameters

You can set audio levels for some parameters within the system: DectHandsetLevelsDb, DectSpeakerLevelsDb, DectRingerLevelsDb, and DectDtmfLevelDb. Recommended values are shown in the table in Understanding Configuration Parameters on page 61.

The parameter BackLightSave can be used to prevent the backlight from turning on when line status updates occur in order to preserve battery life. The Backlight and BacklightDim parameters can be used to adjust the length of time the display stays backlit after it is used. See Understanding Configuration Parameters on page 61.

Configuring Bases on a Network Secured with 802.1x

Bases that will operate on an 802.1x secured network must first be configured with an 802.1x supplicant ID and password from the Network Configuration page in ShoreTel IP930D Manager. This procedure must be performed before the bases are connected to the secured network and before handsets and repeaters are registered for the first time.

To connect a base to an 802.1x secured network, follow this procedure:

1. Identify the supplicant ID and password that the base will use. This is usually configured into the RADIUS server that the Ethernet switch uses for authentication services.

2. Perform a factory reset (See Step 1 under Registering Handsets on page 32).

3. Connect the base to an unsecured PoE-enabled connection to a network with a DHCP server, allowing the base to receive an IP address.

4. Wait for the base to start and then open ShoreTel IP930D Manager for the base.

    a. From a PC on the same subnet as the base, enter the following:

    http://sd_<*MAC address of base*>

    If this step fails, see Cannot log into a base with ShoreTel IP930D Manager on page 84.

    b. Enter "admin" for the login ID and the last four digits or characters of the base MAC address for the password.

5. Go to the Network Configuration page in the ShoreTel IP930D Manager and enable 802.1x. Enter the Supplicant ID and Password assigned to this base on the secure network and save settings.

6. Unplug the base.

    You can now plug the base into the secure network to register handsets and repeaters and it will use the configured information to authenticate with the 802.1x secured Ethernet port. Be sure to skip step 1 for factory clearing the base when following the steps in "Registering Handsets" or you will clear the supplicant ID and Password.

CHAPTER

6

Diagnostics and Troubleshooting

This chapter contains the following topics:

- Tool Overview on page 73

- Common Problems on page 81

Tool Overview

The ShoreTel IP930D system has several tools that are available to assist with diagnosing and troubleshooting. Refer to the sections below for more information.

- ShoreTel IP930D Manager on page 74

- Phonectl/Telnet on page 77

- Syslog on page 77

- Handset Settings Menu on page 78

- Handset Service Menu on page 79

- Mute-INFO on page 80

- Base LED Indicator on page 80

- Repeater LED Indicator on page 81

ShoreTel IP930D Manager

ShoreTel IP930D Manager provides detailed status information on all aspects of the base and attached handsets and repeaters. ShoreTel IP930D Manager also provides a listing of the active configuration that is in use by the base (Configuration page) and a snapshot of recently logged system events (System Log page).

The following sections contain information about ShoreTel IP930D Manager pages.

Current Status Page

From this page you can quickly check:

- Handsets registered to the base, their IPUI, IP address, MGC Server, Firmware version, and Update Status

- Firmware version of the base

- Configuration file version

- System time of day and up time

- Base MAC address, RFPI, and IP address

- Number of handsets active on a call

- System chain ID

Network Configuration Page

Access current network interface settings from this page (similar to what is available when using the Mute-SETUP procedure of a wired ShoreTel phone).

Manage Bases Page

Monitor the performance of a multicell system from this page. For multicell to work properly, all bases must be able to synchronize with each other over the air and over the network. From this page, you can verify both, as well as check many other settings.

To verify that all bases are in communication, check that each base in the list (except the base you are managing) shows "Connected" in the IP Status column of the Base units in System XXXX table.

To verify that all bases are synchronized over the air, check the Sync Property column. All bases should show either "Locked," indicating that they are synchronized to the "Sync Source" in the column to the left, or "Primary," indicating they are the primary over-the-air synchronization source.

To quickly manage another base, click its IP address in the Base units in System XXXX table.

The Repeaters on this Base table shows the repeaters connected to this base. All should display a status of "Present" and should show the synchronization relationships you established in the MAC-specific base configuration files. You can also check the software version for each repeater in this table.

The Repeater reported RSSI Information (dBm) table shows the RSSI values that are being received by all repeaters on the base. Use this table to verify that repeaters are located within range of each other. RSSI levels that are too low are highlighted in red.

Use the DECT Sync Chain section to review synchronization relationships between bases and to ensure that the hierarchy contains no more than seven levels.

Configuration Page

The configuration page shows the actual values that the system has collected from the configuration files.

By checking the configuration, you might discover typos or other errors that have occurred in the processing or the creation of the various configuration files used by the system.

Here is the mapping between the configuration page parameter listing and the configuration
parameters used in the configuration files:

```
%AC_CODE%: 0000
%MIN_JITTBUF_DEPTH%: 0
%MAX_JITTBUF_DEPTH%:MaxJitter/20 (20 mS per MAX_JITTBUF_DEPTH)
%BACKLIGHT_BRIGHT_TIME%: BackLight
%BACKLIGHT_DIM_TIME%: BackLightDim
%BACKLIGHT_SAVE%: BackLightSave
%HANDSET_MIC_LEVEL%: First value of DectHandsetLevelsDb
%HANDSET_SPEAKER_LEVELS%: Values 2 through 7 of DectHandsetLevelsDb
%HANDSET_SIDETONE_LEVEL%: Value 8 of DectHandsetLevelsDb
%HEADSET_MIC_LEVEL%: First value of DectHeadsetLevelsDb
%HEADSET_SPEAKER_LEVELS%: Values 2 through 7 of DectHeadsetLevelsDb
%HEADSET_SIDETONE_LEVEL%: Value 8 of DectHeadsetLevelsDb
%SPKPHONE_MIC_LEVEL%: First value of DectSpeakertLevelsDb
%SPKPHONE_SPEAKER_LEVELS%: Values 2 through 7 of DectSpeakerLevelsDb
%DTMF_TONE_LEVEL%: DectDtmfLevelDb
%CALLPROGRESS_TONE_LEVEL%: DectCallProgLevelDb
%RINGER_LEVELS%: DectRingerLevelsDb
%DAYS_OF_WEEK%: DaysOfWeek
%MONTHS_OF_YEAR%: MonthsOfYear
%AM_PM%: AmPm
%GMT_TIME_ZONE%:(Will match value received from MGC in the Mgt/gmt signal)
%COUNTRY_VARIANT_ID%: DectCountry
// 0x00 GERMANY,
// 0x01 LUXEMBURG,
// 0x02 FRANCE,
// 0x03 ITALY,
// 0x04 HOLLAND,
// 0x05 GREECE,
// 0x06 IRELAND,
// 0x07 SWEDEN,
// 0x08 SPAIN,
// 0x09 DENMARK,
// 0x0A FINLAND,
// 0x0B TURKEY,
// 0x0C SWISS,
// 0x0D PORTUGAL,
// 0x0E BELGIUM,
// 0x0F AUSTRIA,
// 0x10 UNITED KINGDOM,
// 0x11 NORWAY,
// 0x12 US,
// 0x13 AUSTRALIA
// 0x14 NEW_ZEALAND
%LANGUAGE_ID%: Language
%NETWORK_DECT_AUTO_SYNC_TREE_CONFIG%: DectAutoSync (Yes=1, 0=No)
%NETWORK_SYNC_DEBUG_ENABLE%: DectMcDebug (0=none, 1=Data Sync, 2=Auto Dect Tree,
3=Data Sync+Auto Dect Tree)
%NETWORK_SYNC_ENABLE%: DectMultiCell (Yes=1,No=0)
%NETWORK_SYNC_TIME%: DectSyncTime
%NETWORK_SYNC_CHAIN_ID%: DectSysChainId
```

```
%NETWORK_SYNC_DATA_TRANSPORT%: DectBaseNetworking (multicast=0)
%NETWORK_SYNC_PRIMARY_STATIC_IP%: DectBasePrimary
%NETWORK_ALLOW_MULTI_PRIMARY%: DectMultiMaster (0=No, 1=Yes)
%NETWORK_SYNC_MAC_CHAIN%: DectBaseMac
%NETWORK_DECT_SYNC_TREE%: DectBaseSyncSrcRpn
%LOCAL_HTTP_SERVER_TEMPLATE_TITLE%: DectBaseName
%LOCAL_HTTP_SERVER_TEMPLATE_TITLE_LEN%: (length of DectBaseName)
%REPEATER_RPN%: DectRepeaterRpn
%REPEATER_SYNC_SRC_RPN%:DectRepeaterSyncSrcRpn
%REPEATER_AUTO_CONFIG_MODE%: DectRepeaterAutoCfgMode
%REPEATER_DATA_CONFIGURED%: DectRepeaterDataConfigured
%REPEATER_DECT_IPUI%:DectRepeaterIpei
%CODEC_PRIORITIES%:0,5,1,4,6
```

System Log Page

This web page shows the most recent events logged by the system. Modules that are logged, and their debug levels, are set using the SysLogInfo parameter. Refresh the web page to update the log.

Phonectl/Telnet

Phonectl is a PC-based program for ShoreTel phones that can also be used to access IP930D bases.

The primary purpose of the phonectl application is to enable the telnet port on a base station. It is run from the DOS shell and uses this command structure: *phonectl -pw XXXX -telneton hostIP*, where XXXX is the system password and hostIP is the IP address of the base you are accessing.

From telnet, you can access the VxWorks console and perform various diagnostic commands that are beyond the scope of this document. See the Phonectl documentation for details.

Syslog

Syslog can be used to capture long-running logs of events that occur in the system on a syslog server. These detailed logs are most useful when investigating infrequent and difficult-to-diagnose issues. The level of logging is fully programmable, depending on the area of interest.

The ShoreTel IP930D Configuration Tool can be used to configure the SysLogInfo parameter. The SysLogInfo parameter determines what information is sent to a syslog server.
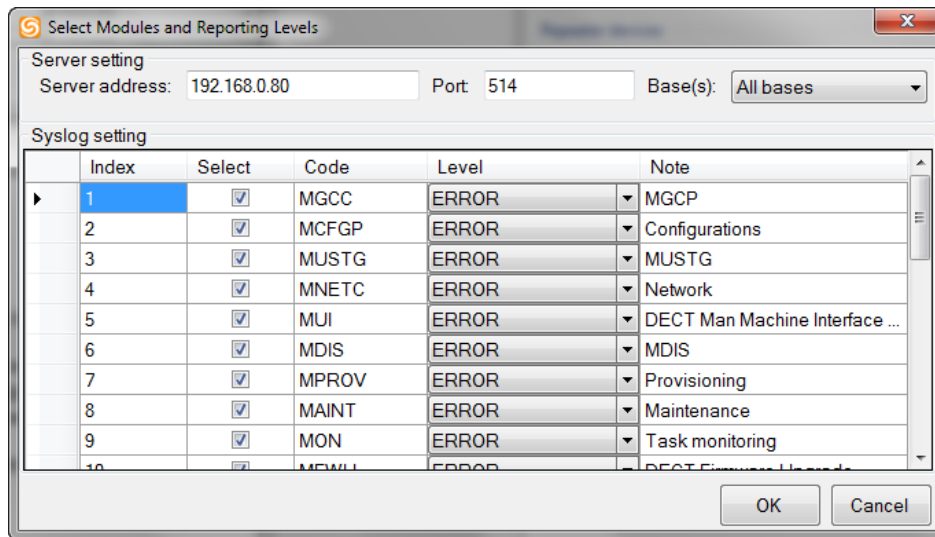
1. Load the project file into the IP930D Configuration Tool.

⚠️ **WARNING!**
Make sure the project file is up to date and matches the installed configuration or you will cause the system to stop working when you apply the files it generates.

2. Under the Options menu, select **Syslog Settings**. A dialogue box opens, as shown below.

3. Following the guidance provided by technical support, select the Module and error levels you desire and click **OK**.

Handset Settings Menu

Use this menu to perform a search for active bases and to review the status of the handset and base.

To access the Settings menu on a registered handset, press and hold the **Menu** button for more than three seconds to display the Settings menu. On a deregistered handset, press the **Menu** button one time (no need to hold the button down).

Use the Status menu item to display the base station software version, hardware version, IP address, and MAC address.

Using IP Search

From the Settings menu, you can use the IP Search menu item (visible if the handset is deregistered) to display a list of all bases within range, even if they are not part of the handset's system. Accessing this function is a convenient way to check that all bases are running. You can also see the MAC address, IP address, RFPI, and RSSI of each base.

To access the IP Search functionality on either a registered or deregistered handset, enter ***47*** while the Settings menu is open. On a deregistered handset, you can alternately choose IP Search from the Settings menu.

The handset should always be power-cycled after using the IP Search option.

Handset Service Menu

The handset Service menu is a hidden menu for accessing site survey mode and other status information.

To access this menu, enter ***SERVICE*** on the handset when the Settings menu is open. The handset goes into site survey mode.

Site survey mode is used primarily during installation to determine the signal strengths of nearby bases and repeaters, but can be used at any time to check coverage and to verify proper functioning of the bases and repeaters associated with the handset. Site survey mode shows all bases and repeaters within range and that the handset can connect to for service.

The graphic below shows the handset screen in site survey mode.
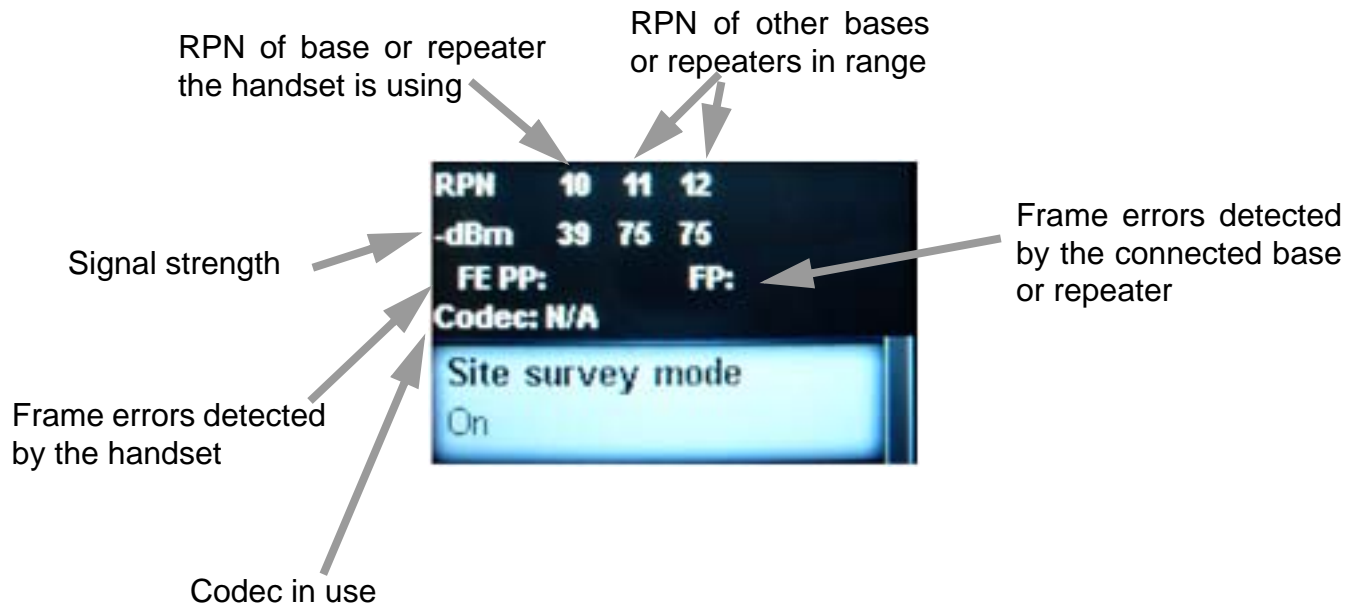
This screen shows:

- The base at RPN 0x10 has an RSSI of -39 dBm (it is a base because it is at a multiple of 0x08).

- The repeater at RPN 0x11 has an RSSI of -75 dBm.

- The repeater at RPN 0x12 has an RSSI of -75 dBm.

- Frame Errors (FE) have not been reported by the handset (PP) or base (FP). These numbers change dynamically.

- If a call were in progress, the DECT air interface CODEC would be displayed.

- The handset is currently connected directly to the base at RPN 0x10 (because it is listed first).

Mute-INFO

This information is displayed on the handset after Mute-INFO# is entered on an idle handset:

- Base IP address, subnet mask, and gateway
- Handset IP address
- Base Ethernet link speed
- FTP, MGC, and SNTP servers
- VLAN tagging status
- Application and boot file names
- MAC configuration filename and date
- Configuration file date
- Country and language settings
- Base and handset application versions
- Base and handset model numbers
- Base MAC address
- Handset IPUI
- Base and handset hardware version
- 802.1x status
- LLDP status

Base LED Indicator

LED State	Description
Off	No Power.
2 Red flashes followed by Flashing Green (1 sec on/1 sec off)	Base is starting.
Winking Green (800 mS on/200 mS off)	Base has started running but has not yet synchronized to a master (Multicell only).
Solid Green	Unit is operating normally and is synchronized to a master.
Winking Red (800 mS on/200 mS off)	No Ethernet.
Fast Flashing Red (500 mS on/500 mS off)	Unit is upgrading firmware. Do not remove power.
Flashing Red/Green (1 S red/1 S green)	Registration Enabled.
Solid Red	Critical Error.

> **WARNING!**
> **Never unplug a base while its LED indicator is flashing red or it may be permanently damaged.**

Repeater LED Indicator

LED State	Description
Off	No Power.
Slow Flashing Green (400 mS on/250 mS off)	Searching for FP.
Double Flashing Green (900 mS on/200 mS off/ 200 mS on/200 mS off repeated)	Searching for FP in registration mode or performing registration procedures.
Steady Green (possibly with occasional red flashes)	Repeater is synchronized to its master and is operating properly. Red flashes indicate traffic is passing through the repeater.
Alternating Red/Green Flashing (200 mS red/200 mS green)	Repeater is in recovery mode and cannot find base or RPN allocation error.
Steady Red	Critical Error.

Common Problems

Handset is stuck on searching screen

The base that is hosting this handset is off or has not yet synchronized to the rest of a multicell system

Check that the base that is hosting the handsets is active and synced. To do this, log into the base with ShoreTel IP930D Manager and navigate to the Manage Bases page. From there, check the status of the base in the table. See "Bases will not synchronize with each other" (below) if the bases are not synchronized.

The base is out of range or a nearby repeater is not functional

Move close to the handset's base and check to see if the problem clears. If it does, the problem may be with one of the repeaters associated with the base.

Check that the repeaters associated with the base hosting the handset are all functional by logging into ShoreTel IP930D Manager and navigating to the Manage Bases page. From there, check that all repeaters associated with the hosting base are active and synchronized. If not, see "Repeater will not synchronize with its base" (below).

Check that the handset can see all of the base's repeaters using the site survey mode of the handset. You may need to move closer to the repeaters to see them all. See Handset Service Menu on page 79.

Insufficient free DECT channels

If there are no free DECT channels available for the handset to connect to a base or repeater, the phone may enter the "Searching" mode. Check that channel limits for the system have not been exceeded and, if possible, turn off nearby interfering DECT systems or devices.

Handset is deregistered

Register the handset to the base by first logging into the base using ShoreTel IP930D Manager and enabling registration on the Base Security page. Enable registration to one base at a time to speed the process. Use the registration code "0000" when registering a handset. When finished, disable registration to that base (registration mode will automatically become disabled after about 10 minutes).

Cannot register handset

Value of IPUI in DectHandset not set correctly

If registration fails, double-check that the IPUI of the handset is properly set in the hosting base's MAC-specific configuration file in the parameter DectHandset.

Insufficient free DECT channels

If there are no free DECT channels available for the handset to connect to a base or repeater the phone may not be able to register with the base. Check that channel limits for the system have not been exceeded and, if possible, turn off nearby interfering DECT systems or devices.

Handset is stuck "Requesting Service" or displays "No Service"

Here are some items to check if this happens:

- Verify that the MGC server is properly configured either in a DHCP site-specific parameter or a configuration file's MgcServers parameter. The value in use can be checked on the Current Status page in ShoreTel IP930D Manager, or by entering Mute-INFO# on the handset.

- Check that sufficient licenses are available for the handsets you are adding.

- Try using Mute-ping from the handset to ping the MGC server to see if the network connection and server are working.

Bases will not synchronize with each other

SNTP Server not working

If, after about 10 minutes, the bases have not synchronized, make sure that the SNTP server is properly configured and working for all bases by checking the current time and date reported on the Current Status page in ShoreTel IP930D Manager for each base in the multicell system. All bases must have a working SNTP server or they will be unable to synchronize properly.

IP Network Communications not working

Check that the bases in the multicell system are in IP communication with each other by verifying that they are reporting a "Connected" state in the Bases in System XXXX table on the Manage Bases page in ShoreTel IP930D Manager. If they report "Connection Lost," there is an issue with IP connectivity between the bases.

Check that all bases are operating on the same subnet by examining their IP addresses on the Manage Bases page in ShoreTel IP930D Manager. If they are not, multicast communications between bases will fail, thereby blocking communications.

Check that bases are properly configured

Double-check the configuration file settings for these parameters, which are critical for bases to synchronize properly: SntpServer, DectBaseMac, DectSysChainId, DectMultiCell, and DectAutoSync.

Repeater will not synchronize with its base

Configuration errors

If a repeater will not synchronize with its base, as indicated on the Manage Base page in ShoreTel IP930D Manager, or by the LED on the repeater flashing green or red/green, double-check these parameters in the MAC-specific configuration file for the base:

- DectRepeaterAutoCfgMode
- DectRepeaterDataConfigured
- DectRepeaterIpei
- DectRepeaters
- DectRepeaterRpn
- DectRepeaterSyncSrcRpn

Signal level too low

See the Understanding Repeater RSSI Levels on page 35 for information on how to check that all repeaters are receiving a sufficient signal from their synchronization source.

Insufficient free DECT channels

If there are no free DECT channels available for the repeater to connect to a base or repeater the repeater may not be able to synchronize with a base or repeater. Check that channel limits for the system have not been exceeded and if possible turn off any nearby interfering DECT systems or devices.

Intermittent or unreliable response by the handset

Here are some items to check:

- Check that the handset's IPUI appears in the DectHandset parameter of only one base.

- Check the signal level of the connected base or repeater by entering the site survey mode and checking the RSSI level of the first RPN in the list. See Handset Service Menu on page 79.

- Monitor for frame errors as reported by the site survey. If the RSSI is above -75 dBm, but there are frequent errors and you are connected to a repeater, the issue may be with the signal strength received by that repeater or any intermediate repeaters.

Calls are dropped

Calls may be dropped for many reasons, but a likely cause is that the communications channel to the handset from the base encountered too many errors or that a handoff was unsuccessful. Here are some items to check:

- Using the site survey mode, check that there is a greater than -75 dBm signal from at least one base or repeater in the area that the call drop occurred. Repeater locations may need to be optimized or additional repeaters added to provide sufficient coverage. See Handset Service Menu on page 79.

- Using the site survey mode check that all repeaters connected to the base hosting the handset with a dropped call are properly functioning. You may need to move closer to a repeater to see it in the site survey.

- See Understanding Repeater RSSI Levels on page 35 for information about ensuring that every repeater is receiving a sufficient signal from its synchronization source.

Cannot log into a base with ShoreTel IP930D Manager

To log into the base station, first try entering the following from a PC on the same subnet as the base:

http://sd_<*MAC_Address_of_Base*>

If that fails, use the IP address of the base, which can be obtained from one of the following methods (try these in the order listed):

- Perform a site survey on an deregistered handset by using the IP Search menu item from the Handset Settings menu. See Handset Settings Menu on page 78.

- Run a Mute-SETUP command on a handset has been registered to the base you are trying to contact. Press the **Mute** button on the handset, then type "SETUP" using the handset keypad.

- Check the base's lease on the DHCP Server or make a DHCP reservation in advance for the base to use. Checking the list of leases on your DHCP server allows you to see the IP address used by the base.

- Perform a Wireshark capture of base booting. Apply a filter of "eth.addr==aa:bb:cc:dd:ee:ff" to see any broadcast traffic from the base with the MAC address aa:bb:cc:dd:ee:ff.

If you forget the password for a base, return the base to its factory default settings by following the steps below:

1. Plug the base into powered Ethernet and wait for the LED indicator to start flashing green.

2. Hold down the reset button on the back of the base for at least 10 seconds or until the LED indicator turns off.

   The base will restart in a factory default state. The factory default password is the last 4 characters of the base's MAC address.

A beep is heard about every 3 seconds when on a call

A debug mode for repeaters has been accidently activated. While on the call, use the site survey tool to detect the repeater that is in debug mode. Press the reset button on this repeater for at least 20 seconds to turn off the beeping. See Handset Service Menu on page 79.

APPENDIX

A

Installation Example

This chapter contains the following topics:

Example Installation Overview

This example illustrates how to use the ShoreTel IP930D Configuration Tool to install a multicell system.

In this example, the draft installation layout indicated a need for multiple bases and repeaters to cover an L-shaped site on a single floor.

Here are the components called for in this example:

- Three base stations

- Nine repeaters

- 12 handsets

Example Step 1: Plan to Assign Synchronization Sources

Each repeater in the IP930D system needs to be assigned a synchronization source within radio range.

In this example, the repeaters in Regions A and B will obtain their synchronization from the base. Because the repeaters in Region C are out of range of the base, they must obtain synchronization from the repeaters in Region B.

Refer to the draft installation diagram below.
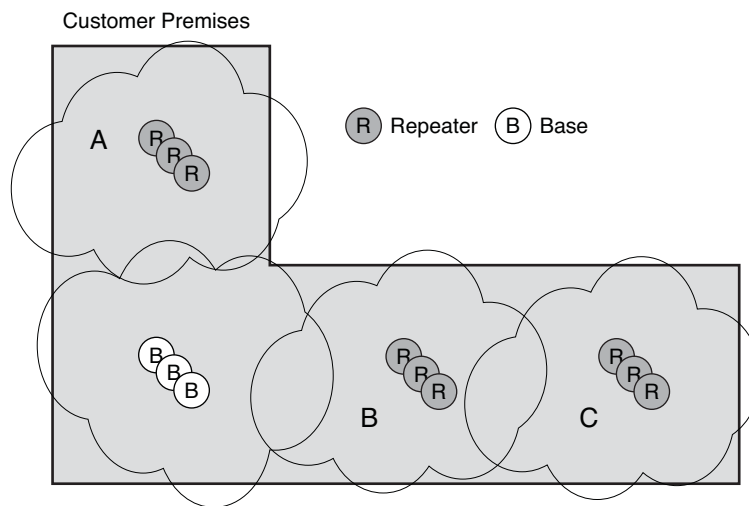
Example Step 2: Gathering Unique Identifiers

To prepare for the installation, gather the MAC address of each base, the IPUI of each handset, and the IPEI of each repeater that you plan to install.

This example uses the following identifiers:

Base MAC Addresses (See Rear Label)	Handset IPUIs (See Label under battery)	Repeater IPEIs (See Rear Label)
011049138C00	016e6003c0	016e6003b0
011049138C01	016e6003c1	016e6003b1
011049138C02	016e6003c2	016e6003b2
	016e6003c3	016e6003b3
	016e6003c4	016e6003b4
	016e6003c5	016e6003b5

Base MAC Addresses (See Rear Label)	Handset IPUIs (See Label under battery)	Repeater IPEIs (See Rear Label)
	016e6003c6	016e6003b6
	016e6003c7	016e6003b7
	016e6003c8	016e6003b8
	016e6003c9	
	016e6003ca	
	016e6003cb	
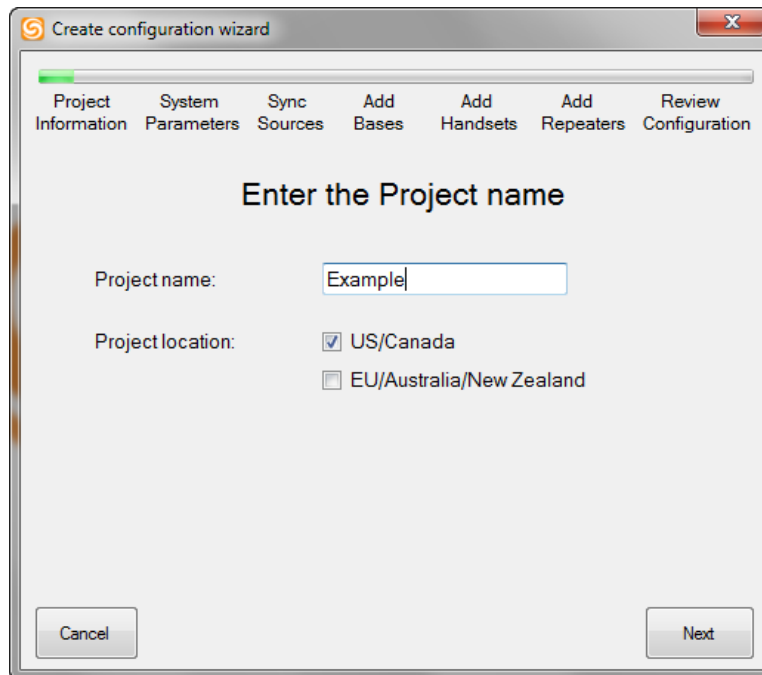
Example Step 3: Running the Configuration Tool

The next step is to run the ShoreTel IP930D Configuration Tool.

Here is the first window you see when running the tool.
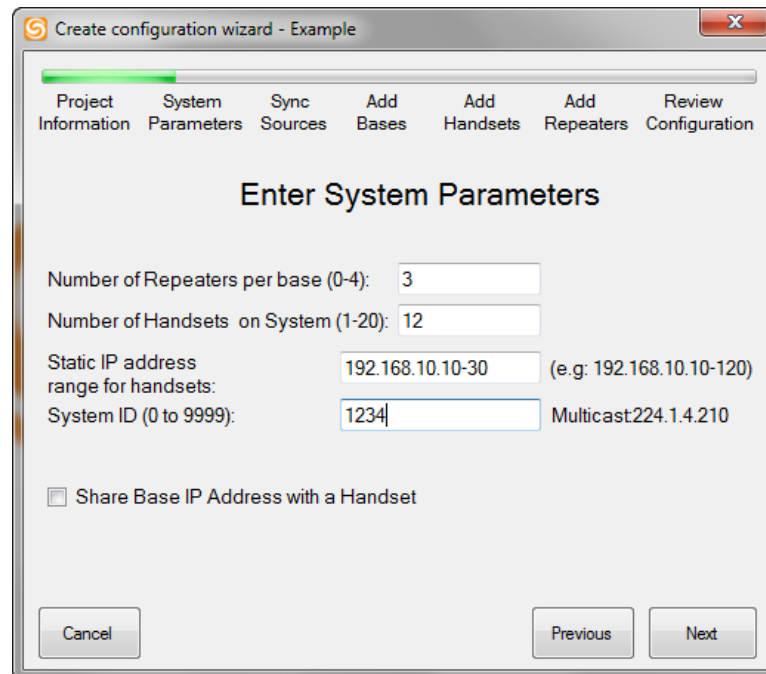
Since you are starting a new project, begin by choosing **File > New Project**. A wizard opens that prompts you for all of the required information about the installation.

Enter a name for the project and choose the correct location for the installation.

Click on **Next** to move to the next page of the wizard.

On this page, enter the number of repeaters per base. In this example, we have 3 repeaters per base, for a total of 9 repeaters.

We are installing 12 handsets and have reserved the IP addresses between 192.168.10.10 and 192.168.10.30 (extra IP addresses have been reserved for future growth).

Finally, we are assigning a System ID of 1234. This number assignment will be used to create a multicast address used by the system for base-to-base communications. If multiple independent systems are installed on a common multicast zone, they must use different IDs.

Note

Be sure to check the multicast address for conflicts on the target network. The address is shown to right of the System ID field. If there is a conflict, change to a different System ID.

Click on **Next** to move to the next page of the wizard.
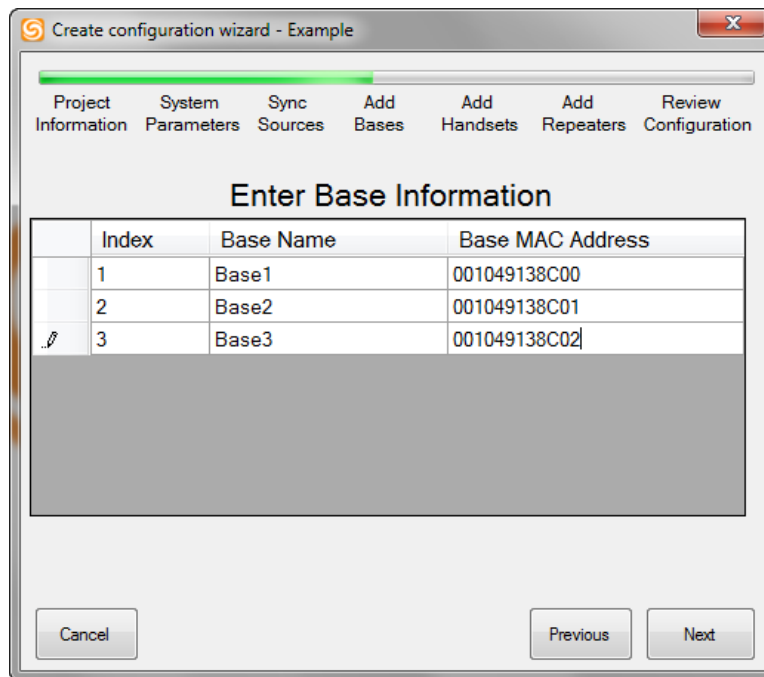

On this page, set the synchronization sources for the repeaters by region. Recall that our draft installation diagram requires the repeaters in Regions A and B to synchronize to the base. Repeaters in Region C synchronize to those in Region B.

Make these selections as shown above and click **Next**.

On the next page, enter the MAC address for each base you are installing into the wizard.

The MAC address can be found on the back of the base.

MAC address

💡 **Tip**

If you do many installations, it may be worth investing in a bar code scanner to read the MAC address and other identifiers into the IP930D Configuration Tool from the device you are installing. This saves time and can reduce data entry errors that cause system malfunctions.

You can give each base a unique name or you can use default names.

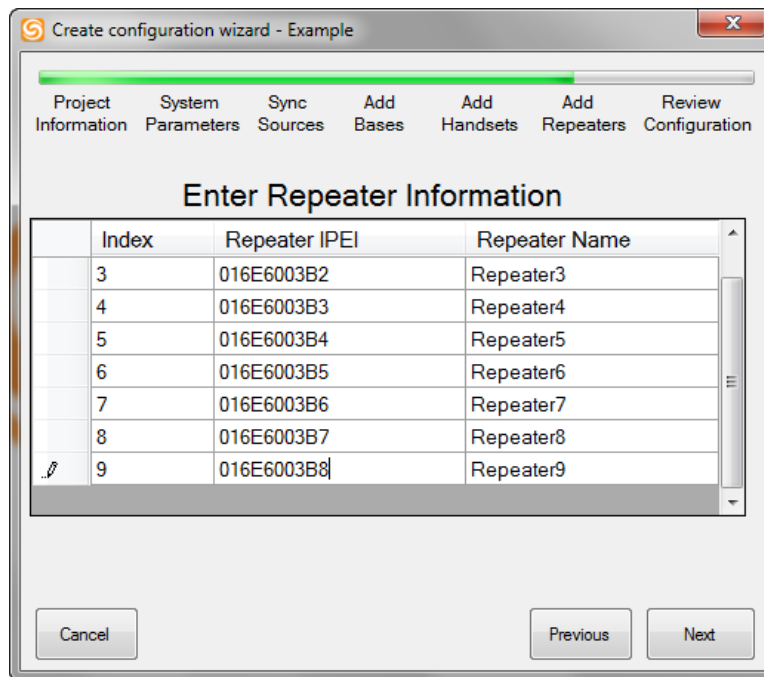Click on **Next** to move to the next page of the wizard.
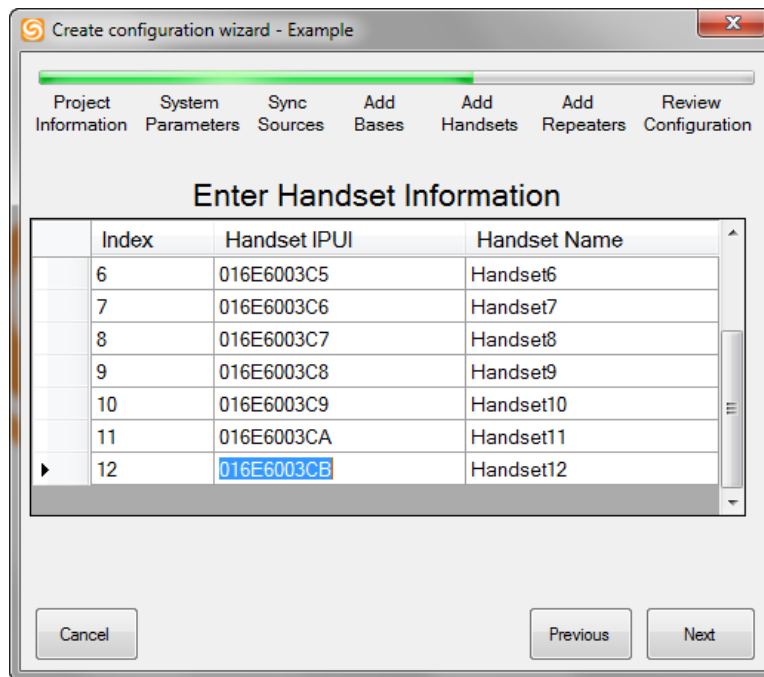
Copy the IPUI from each handset you are installing into the wizard. The IPUI may be found under the battery of the handset.

You can give each handset a unique name or you can use the default names.

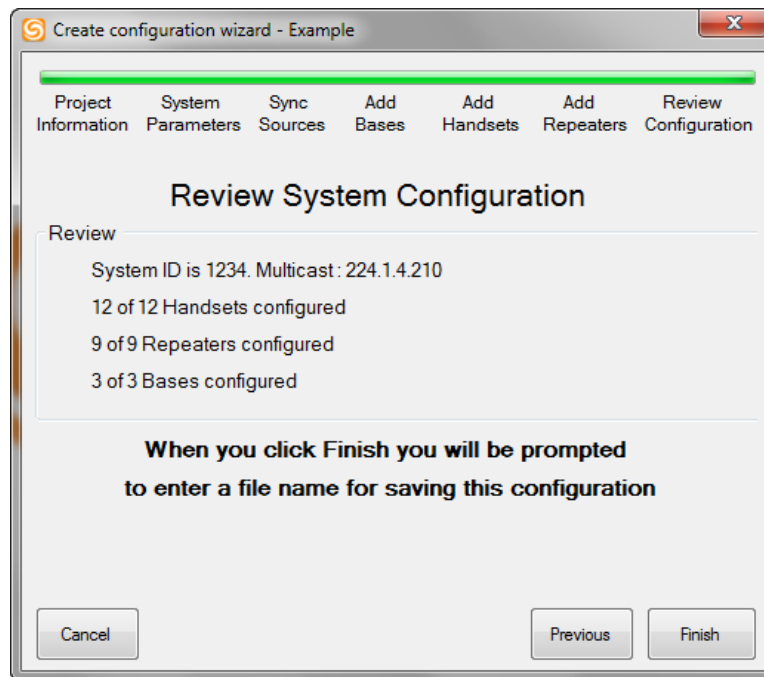Click on **Next** to move to the next page of the wizard.

Copy the IPEI from each repeater you are installing into the wizard. The IPEI is found on the rear of the repeater.

You can give each repeater a unique name or you can use the default names.

Click on **Next** to move to the next page of the wizard.

Review the data to make sure all items are completely configured.

💡 **Tip**

It is a good idea to go back (using the Previous and Next buttons) to double-check the identifiers that were entered for all devices. If any are misconfigured, the system will not operate properly.

Click **Finish** and you will be prompted to save the project file to your computer. You can choose a unique name or use the default file name.

After saving the file, this window opens:
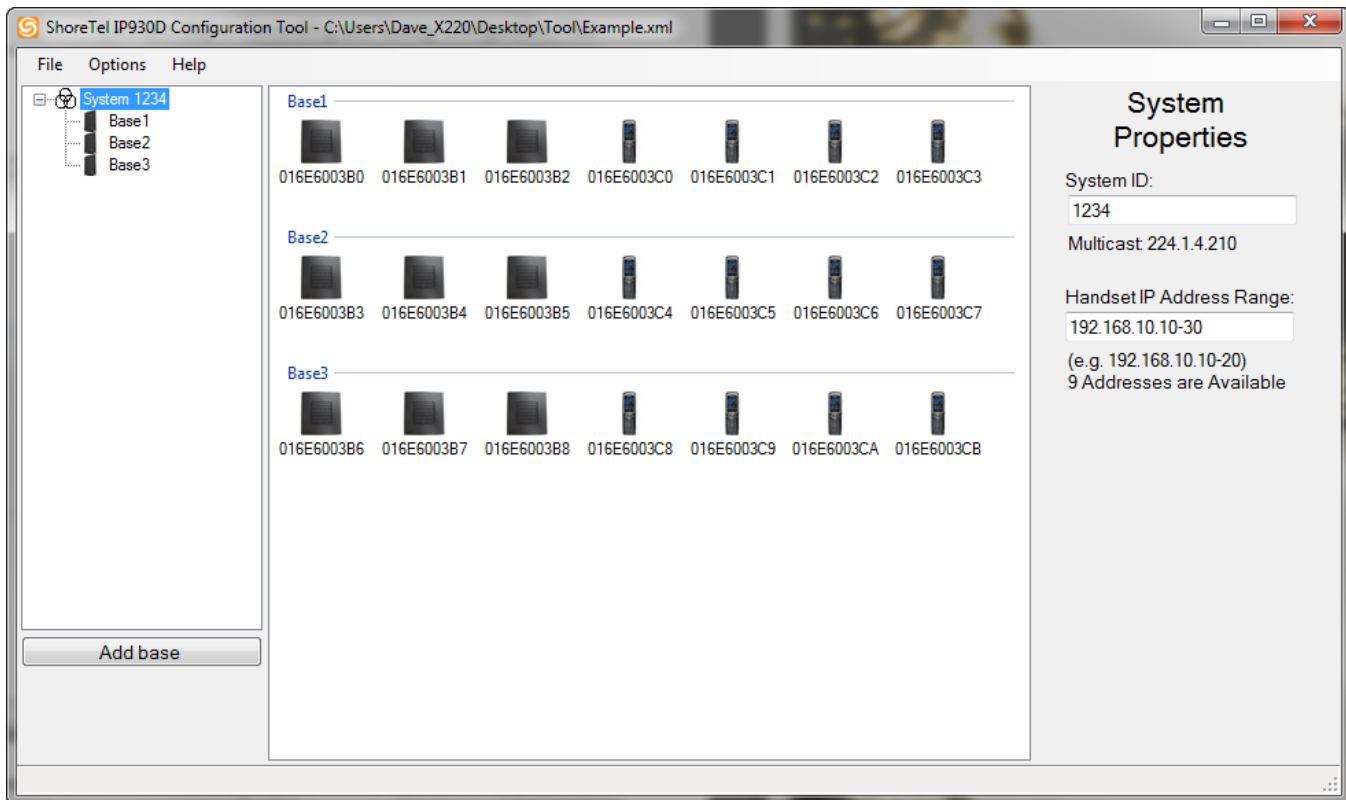
From this window, you can customize the configuration of your system.

The window is broken into 3 panes:

■   The left pane shows the system and all bases that are a part of the system. You can click on the + sign to expand the list and show all of the bases in the system.

■   The center pane shows all of the components that make up the item that is highlighted in the left pane.

■   The right pane shows the system properties associated with the selected item. In this case, the selected item is the system and only the System ID can be modified.

Expand the list in the left pane by clicking on the + sign and then select Base1 to see this:
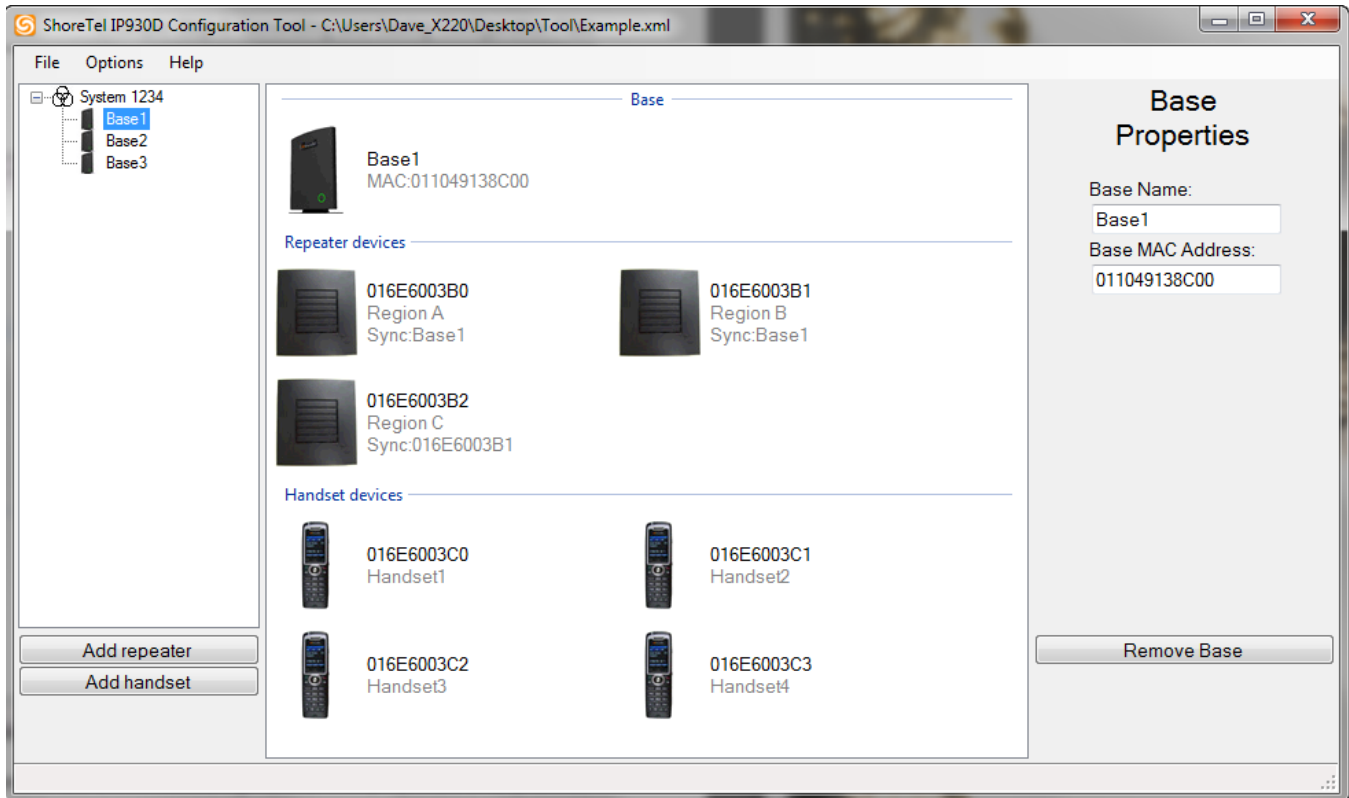
Because Base1 is highlighted, its properties are shown on the right pane. The properties of any device can be modified by highlighting that device.

Later, if you need to add, replace, or remove equipment, you will do so from this screen.

The configuration is now complete. Save the project to your computer for safe keeping and future reference. If you ever need to replace or add equipment you will need to start from this project file.

Example Step 4: Generating and Saving Configuration Files

Next, we need to generate and store the MAC-specific configuration files.

To do this, choose "Save Configuration Files As" from the File menu in the IP930D Configuration Tool. Select the root directory of the ShoreTel FTP server (for example, save files to c:\inetpub\ftproot), or choose another location from which the files can be copied over to the FTP server later.

Example Step 5: Print the Installation Summary

The final step is to print the installation summary. The summary provides a guide to show which devices need to be installed where, as well as which handsets and repeaters are associated with each base. To print the installation summary, select **File > Print Installation Summary**.

Here is what the first part of the summary looks like for our example:

```
Project Example Installation Summary

Bases to Install (must be >1 meter separation between bases and all bases must be on the same subnet)
Base Name            BaseMAC       RPN
Base1                011049138C00  0x00
Base2                011049138C01  0x08
Base3                011049138C02  0x10

Repeaters to Install for Region A (must be >1 meter separation between repeaters)
Repeater Name        Repeater IPEI Sync Source    RPN
Repeater1            016E6003B0    0x00           0x01
Repeater4            016E6003B3    0x08           0x09
Repeater7            016E6003B6    0x10           0x11

Repeaters to Install for Region B (must be >1 meter separation between repeaters)
Repeater Name        Repeater IPEI Sync Source    RPN
Repeater2            016E6003B1    0x00           0x02
Repeater5            016E6003B4    0x08           0x0A
Repeater8            016E6003B7    0x10           0x12

Repeaters to Install for Region C (must be >1 meter separation between repeaters)
Repeater Name        Repeater IPEI Sync Source    RPN
Repeater3            016E6003B2    0x02           0x03
Repeater6            016E6003B5    0x08           0x0B
Repeater9            016E6003B8    0x10           0x13

Devices to Register with each Base (Enable registration on only 1 base at a time)
Base MAC       Repeater IPEI Repeater IPEI Repeater IPEI Repeater IPEI Handset IPUI  Handset IPUI  Handset IPUI  Handset IPUI
011049138C00  016E6003B0    016E6003B1    016E6003B2                  016E6003C0    016E6003C1    016E6003C2    016E6003C3
011049138C01  016E6003B3    016E6003B4    016E6003B5                  016E6003C4    016E6003C5    016E6003C6    016E6003C7
011049138C02  016E6003B6    016E6003B7    016E6003B8                  016E6003C8    016E6003C9    016E6003CA    016E6003CB

System Summary
Location:                   US
System ID:                  1234
Multicast Address:          224.1.4.210
Number of Bases:            3
     Repeaters:             9
     Handsets :             12

Base Name            Base MAC      Base IP Address     Base RPN
Base1                011049138C00  DHCP                0x00

Handset Name         Handset IPUI  Associated Base     IP Address
Handset1             016E6003C0    Base1               192.168.10.10
Handset2             016E6003C1    Base1               192.168.10.11
Handset3             016E6003C2    Base1               192.168.10.12
Handset4             016E6003C3    Base1               192.168.10.13

Repeater Name        Repeater IPEI Associated Base     Repeater RPN  Sync Source
Repeater1            016E6003B0    Base1               0x01          0x00
Repeater2            016E6003B1    Base1               0x02          0x00
Repeater3            016E6003B2    Base1               0x03          0x02
```

This summary identifies:

■ Bases to be installed, identified by MAC address

■ Repeaters to be installed per region, identified by IPEI

■ Repeaters and handsets to be registered with each base

The installation summary also provides a complete summary of the system (not shown) that includes RPN assignments for each base and repeater. This information can be useful when installing multiple bases and for troubleshooting purposes.

Print and save a copy of the installation summary to use for future reference. Repeaters must be installed according to this summary or the system will not function properly.

APPENDIX

B

Glossary

This glossary defines terms and abbreviations relevant to the ShoreTel IP930D system.

Term	Definition
dBm	A power level measurement that the system uses to report RSSI levels. Note that a -40 dBm signal is greater than a -60 dBm signal and that sometimes the minus sign is not used, such as when the dBm level is displayed by the site survey tool on a handset.
DECT Channel	The combination of a timeslot and frequency for transmitting information in a DECT system. In the US and Canada, 12 timeslots times 5 frequencies yields 60 available channels. Europe, Australia and New Zealand provide up to 120 channels.
FP	Fixed Part. Refers to bases and repeaters.
IPEI	International Portable Equipment Identity—a unique identifier for repeaters.
IPUI	International Portable Unit Identity—a unique identifier for handsets.
MGC	Media Gateway Controller.
Multicell	A system consisting of more than one base.
PoE	Power over Ethernet (802.3af)
PP	Portable Part. Refers to handsets.
RF	Radio Frequencies.
RFPI	Radio Fixed Part Network Identity—a unique identifier for bases.
RPN	Radio Fixed Part Number—a unique number between 0-255 assigned to each base and repeater in a system.
RSSI	Received Signal Strength Indicator.

Term	Definition
Synchronization Source	Every base or repeater must be assigned a synchronization source either automatically (in the case of bases) or manually (in the case of repeaters.) This is the source from which the base or repeater derives its clocking synchronization for the radio interface.
0x23	Any number starting with "0x" is in hexadecimal. 0x23 is 35 in decimal.