USER'S GUIDE

Wi-Fi Designer

April 21, 2015
Release 1.9

XIRRUS
WI-FI NETWORKS

Part Number: 812-0092-001 RevH April 21, 2015

Release 1.9

Contents

Xirrus Wi-Fi Designer

The Xirrus Wi-Fi Designer is a laptop or tablet-based tool developed by Xirrus for performing RF site surveys. Use it to perform predictive designs and active surveys for design and verification of Wi-Fi deployments. It maps signal strength over an entire site, revealing areas that meet your specified design criteria, as well as those that fail to meet them. Using Wi-Fi Designer to plan a wireless deployment allows you to optimally predict the number, type, and location of Xirrus Arrays for a particular site, without having access to the site. Wi-Fi Designer allows you to ensure the desired wireless coverage with the minimum number of Arrays. A floor plan map is used to graphically position the Arrays and display coverage. Post-deployment, use Wi-Fi Designer to check coverage and fine-tune SSID and IAP (radio) assignments.

About Wi-Fi Designer

Wi-Fi Designer is designed to facilitate the process of placing Arrays at a site for best wireless coverage. Use Wi-Fi Designer on a laptop running Windows 7, either the 32-bit or 64-bit version, with an external or internal wireless adapter. For the most accurate and consistent site surveys, use a Proxim 8494 adapter with the Xirrus driver. Specify an image of your floor plan to be used as a map background. How to proceed at this point depends on the type of project you are working on.

Wi-Fi Designer offers three types of projects:

- **Device Centric Site Survey**

  Place one or more physical Arrays in likely positions at the deployment site, and locate them on Wi-Fi Designer's floor plan map at the corresponding positions. Then walk with your laptop to a location where you wish to take radio signal strength indicator (RSSI) measurements. Place the mouse at the corresponding location on the floor plan map, and click. Continue taking measurements at additional locations. Wi-Fi Designer uses this set of measurements to analyze signal strength over your site, display a heatmap of RSSI strength at the site for wireless

Arrays and other APs (wireless access points), and indicate whether your Array placements meet your design criteria.

A site survey is often accomplished by collecting measurements from a single Array, and then physically moving that Array if coverage from the first Array is insufficient for the entire site. A new set of measurements is then taken and associated with the secondary Array placement. The heatmap associated with both Arrays may then be displayed individually or together. In this way, you can perform a survey with just one Array and achieve a good approximation of a deployment of multiple Arrays.

- **SSID Centric Site Survey**

  As in a Device Centric Site Survey project, a floor plan is used to represent the site. In Wi-Fi Designer, select the SSIDs and channels to be measured. As above, use Wi-Fi Designer on your laptop to take measurements at a number of locations. Wi-Fi Designer displays a heatmap of RSSI strength at the site.

  This type of survey is typically used following an installation to check coverage on individual SSIDs and channels. This can be used to determine which channels are strongest in specific area for tuning and troubleshooting.

- **Planning**

  A Planning (or predictive) project is used to initially calculate the number and placement of Arrays on a site, without needing physical Arrays or access to the site. Drag and drop one or more Arrays on your floor plan map. In this predictive mode, Wi-Fi Designer uses knowledge of Array performance and your selected environment conditions, as well as information that you provide about walls inside the building, to calculate the estimated RF coverage. The results of a planning project may be used as a starting point for selecting initial Array positions for a Device Centric Site Survey.

Requirements

Wi-Fi Designer runs on Microsoft Windows® compatible laptops and requires:

- A 32- or 64-bit laptop running Microsoft Windows 7 using a DirectX 9-compatible graphics device with WDDM 1.0 or later revision driver.
- Processor speed of at least 1GHz with at least 1 GB (32-bit) or 2 GB (64-bit) of RAM and 16 GB available hard disk space (32-bit) or 20 GB (64-bit)
- For best results, use an ORiNOCO Proxim 8494 802.11a/b/g/n USB Wi-Fi adapter (Model 8494 WD). The use of an external adapter is not required, however **use of the Proxim 8494 adapter with the Xirrus Driver is required to perform a Xirrus certified survey**. During the installation of Wi-Fi Designer, the driver associated with the USB adapter will be replaced with the Xirrus developed driver. Do not override this driver by reinstalling the ORiNOCO-provided driver.

Once a project is started on a specific system and adapter, you should continue to use the same system and adapter for further work on that project to ensure consistent results.

If you will be performing a site-centric site survey in a new facility where you want to measure signal levels and do verification of a wireless design, you typically need:

- One or more Xirrus wireless Arrays, set up with all radios turned on at maximum signal strength.
- (Optional, but useful) A tall tripod for each Array, to allow you to place the Array at trial deployment locations at the appropriate height.

Installing Wi-Fi Designer

Wi-Fi Designer is installed as an executable file on your laptop. Double click on the installation file to see the welcome screen. (**Figure 1**)

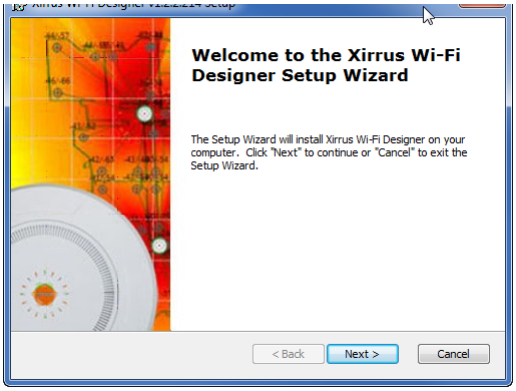


Figure 1. Wi-Fi Designer Installation

Select **Next >** and answer the installation questions. You will also be reminded to insert your wireless adapter following the installation, as shown in **Figure 2**. The use of an external adapter is not required, however use of the Proxim 8494 adapter with the Xirrus Driver has been tested and is recommended by Xirrus for accurate survey results. The Xirrus Driver for the wireless adapter is installed as part of the installation process.

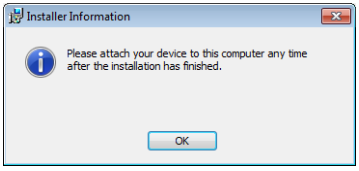


Figure 2. Installation Adapter Reminder

Note that Wi-Fi Designer auto-saves your work. If you open an existing survey and make changes to it, Wi-Fi Designer will overwrite the old file, even if you do not explicitly **Save** the project. To keep the old version of the project, make a copy of it before you open it, or use **Save As** to a new name before making any changes.

Updates

You may check for new releases of Wi-Fi Designer at our web site. New AP models may require a new release of Wi-Fi Designer that includes those models.

Creating a Device Centric Site Survey

Using Wi-Fi Designer is simple and intuitive. Here is a quick summary of the steps for creating and completing a new Device Centric Site Survey project.

1. **Prepare a Floor Plan Image (page 8)**.
2. If you are doing a survey of existing infrastructure or verification of a new installation, skip to the next step.

   If you are performing a planning/design survey, place one or more physical wireless Arrays at initial locations in your site. Make sure all radios are **Enabled** and have their **Cell Size** set to **max**. Use the **IAP Settings** page on the Array's Web Management Interface (WMI) to set up the radios. An **SSID** must be defined and enabled and broadcasting on all radios. Use the WMI **Express Setup** page to configure the SSID.
3. **Start Wi-Fi Designer (page 9)**.
4. **Create a New Project: Device Centric Site Survey (page 12)**.
5. **Set the Map's Scale and Display Options (page 20)**.
6. **Start the Site Survey (page 23)**.
   a. **Select a Source (page 23)**.
7. **Survey the Site (page 29)**.
8. **Analyze the Results (page 36)**.

For the other types of projects that Wi-Fi Designer can create, see:

- **Perform an SSID Centric Site Survey (page 48)**
- **Planning a Deployment (page 59)**

For additional details on Wi-Fi Designer features, see:

- **File Menu Options (page 39)**

Prepare a Floor Plan Image

You must supply a floor plan of the deployment site as a background image for your project. The easiest way to do this is to obtain a graphic file for the floor plan of the building floor being surveyed, or scan a floor plan. If you are planning a deployment at a multi-floor building, each floor should be done as a separate project.

Wi-Fi Designer will accept the following graphic file formats for your background images: GIF, PNG, BMP, or JPG. In particular, whenever possible, optimize your image files and try to keep the file size between 50KB and 100KB. Files in this size range will load into the client quickly, give reasonable image resolution, and will perform well when zooming in.

Preferred Image Formats

- **PNG (Portable Network Graphics—Preferred)**

  This format is an alternative to the GIF format but supports 24-bit images with "no loss" compression and produces background transparency without jagged edges. It offers a good balance between scaling with good quality, and reasonable file size. If you use any other format, Wi-Fi Designer will convert it to a PNG file and use that.

- **GIF (Graphics Interchange Format)**

  This is the file format most commonly used to display indexed-color graphics and images in HTML documents over the Web and other online services. Simple graphics (for example, floor plans) with or without spot colors are considered most suitable for the GIF file format, which is designed to minimize the image file size and electronic transfer time.

- **JPEG (Joint Photographic Experts Group)**

  This format is commonly used to display photographs and other continuous-tone images. Unlike GIF images, the JPEG format retains all color information in an RGB graphic, but compresses the file size by selectively discarding data without serious degradation to the quality of the original image.

Physical Size

The physical size of the image is not critical because Wi-Fi Designer scales the image automatically. However, the more scaling that is required the greater the loss in quality. We recommend a physical size of between 10 inches and 14 inches wide, while maintaining the aspect ratio of the original image (when scaled, the vertical axis will retain the correct proportion with the horizontal axis).

Resolution

The preferred resolution for your map background images is 72 dpi (standard for online viewing). A higher resolution will generate a smoother image, but the file size will be increased relative to the resolution you choose.

Start Wi-Fi Designer

Following installation, start Wi-Fi Designer using the Windows Start button.

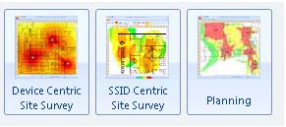
Wi-Fi Designer will open to its start window. (**Figure 3**)

Figure 3. Wi-Fi Designer Start Window

Wi-Fi Designer saves its settings and results in projects. Projects can be accessed or created using three of the options on the left of the initial screen:

New

A Site Survey or Planning project may be started by clicking the icon for the desired project type. See **Create a New Project: Device Centric Site Survey (page 12)**, **Create a New Project: SSID Centric Site Survey (page 48)**, and **Planning a Deployment (page 59)** for a further explanation of new project creation.



Open

Browse to the .xwd file (or project folder, for projects created by prior software releases) for the project in order to resume work on it. If your project was saved in a folder by a previous release, Wi-Fi Designer will open the selected folder and create an .xwd file.

Existing projects will be updated for current Wi-Fi Designer environment types and attenuation values automatically.

Note that Wi-Fi Designer auto-saves your work on an open project. If you open an existing survey and make changes to it, Wi-Fi Designer will overwrite the old file, even if you do not explicitly **Save** the project. If you want to keep the old version of the project, you may make a copy of it before you open it, or use **Save As** to a new name before making any changes.

Two additional options, **About** () and **Exit** (), provide information about the Wi-Fi Designer application and its license, and exit Wi-Fi Designer, respectively.

Perform a Device Centric Site Survey

The following sections will walk you through performing a site survey based on Array placement on the floor plan map.

- **Create a New Project: Device Centric Site Survey (page 12)**
- **Understanding Project Wireless Environment Settings (page 15)**
- **Settings Panel (page 22)**
- **Set the Map's Scale and Display Options (page 20)**
- **Select a Source (page 23)**
- **Survey the Site (page 29)**
- **Analyze the Results (page 36)**

Create a New Project: Device Centric Site Survey

Select the **New** option from the File Menu on the left, and click **Device Centric Site Survey.** (**Figure 3**) The **Create New Wi-Fi Designer Project** dialog appears.(**Figure 4**)

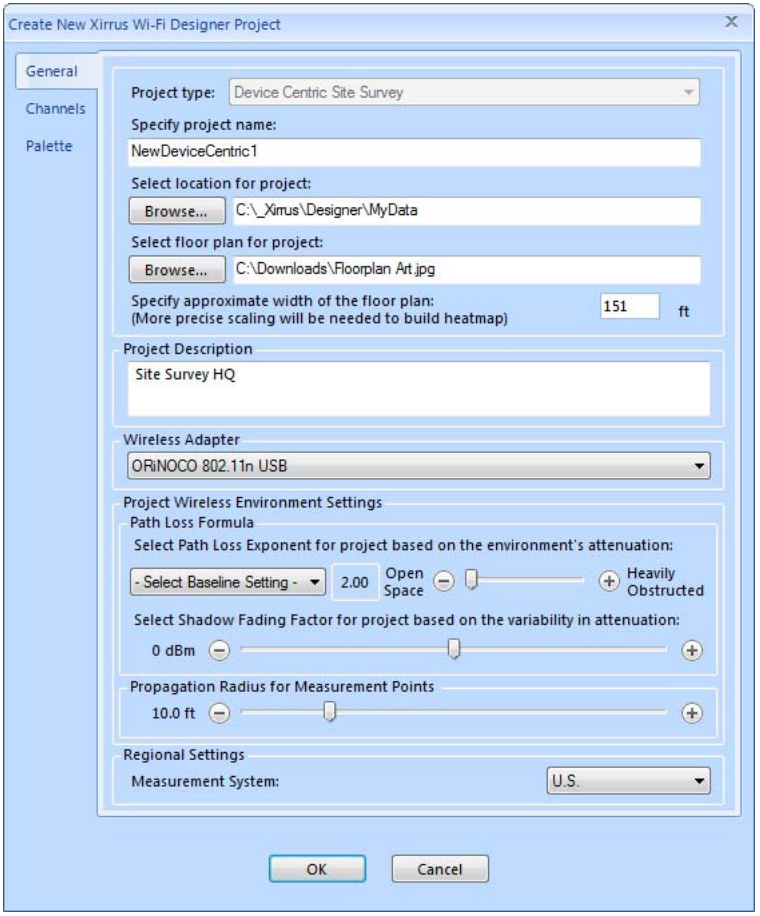


Figure 4. Create New Device Centric Site Survey Project Dialog

The fields in this dialog are shown below. Press **OK** when all values have been set.

Tab	Field	Usage
General	Project Type	This field displays the type of project that was selected.
	Specify project name	This should be set to a unique name for the project. The project will be saved in an .xwd file created beneath the project folder set in the next field.
	Select location for project	This should be set to a central folder that will hold this project or all projects. The **Browse...** button may be used to find or create a folder.
	Select floor plan for project	This should be set to the name of a graphics file of one of the supported types as described in **"Preferred Image Formats" on page 8**.
	Specify approximate width of the floor plan	Indicate the approximate width of the site that is represented by the horizontal aspect of the floor plan. You will be required to more precisely specify the scale in a later step.
	Project Description	Optionally enter a comment related to the project.
	Wireless Adapter	Select the wireless adapter that you wish to use. For a Xirrus certified survey, use of the ORiNOCO Proxim 8494 adapter is required.

Tab	Field	Usage
	Project Wireless Environment Settings — Path Loss Formula	These settings specify the type of RF environment in the site that corresponds to the floor plan. Wi-Fi Designer uses the settings to estimate path loss (signal attenuation) over the entire site. First, **Select Baseline Setting** from the drop-down list to set the path loss exponent for the project. Select the closest match for your site, for example, **Office (Cubicles)**. The remaining settings allow you to make further adjustments. You may use the **Manual** option to set all values manually. For more information see **Understanding Project Wireless Environment Settings (page 15)**.
	Propagation Radius for Measurement Points	The radius around the measurement for which it is valid.
	Regional Settings	Select the **Measurement System** to be used: ● **U.S.** —This is the default. Distance is measured in feet. ● **Metric**—Distance is measured in meters.
Channels	2.4 GHz	This may be used to restrict the survey to a particular set of channels. Later on, when you click **Start Survey**, only the selected channels will be measured. Note that for the 2.4 GHz band, only channels 1, 6, and 11 are enabled by default. This speeds surveys by reducing the amount of time required for each reading.
	5 GHz	This may be used to restrict the survey to a particular set of channels. Later on, when you click **Start Survey**, only the selected channels will be measured.

Tab	Field	Usage
Palette		This field selects the color palette to be used while displaying RSSI signal strength. The first choice (-90 -80 -70 -60 -50 -40 -30) shows a smooth gradation of strength. The second choice (-90 -80 -70 -60 -50 -40 -30) shows a stepped display for each 5db. The third choice (-90 -80 -70 -60 -50 -40 -30) offers slightly subdued colors and a smoother gradation.

Understanding Project Wireless Environment Settings

Wi-Fi Designer uses three wireless environment settings to compute signal attenuation for your project: **Path Loss Exponent**, **Shadow Fading Factor**, and **Propagation Radius for Measurement Points** as described on **page 17**. Path Loss Exponent is automatically set (**Figure 5**) when you select any environment type other than **Manual**. The corresponding Path Loss Exponent value is shown just to the right of your selection. You may adjust this value up or down using the slider to its right.

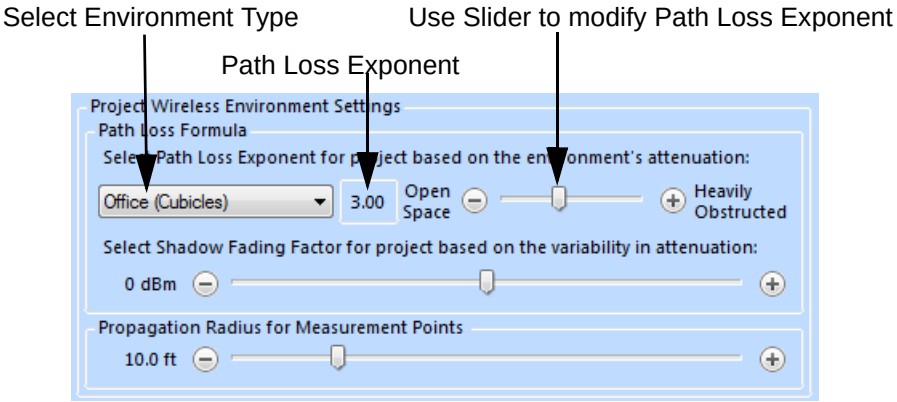


Figure 5. Project Wireless Environment Settings

The choices for your environment type are:

- **Manual** (Set your Path Loss Exponent value using the slider. In Planning mode projects, this is replaced with the **Drawing Walls** option.)
- **Outdoors**
- **Convention Center**
- **Office (Cubicles)**
- **Office (Walled)**
- **School**
- **Warehouse**
- **Apartment Building**
- **Hotel**
- **Hospital**

The three Project Wireless Environment Settings are described in more detail below. These settings are used by default for every Array, but may be overridden for any particular Array. See **Survey the Site (page 29)**. For example, if a floor plan for a building includes both office and warehouse space, individual Office (Cubicles) and Warehouse settings may be applied to different Arrays covering those areas.

Note that the Shadow Fading Factor and the Propagation Radius for Measurement Points may also be adjusted using sliders.

- **Path Loss Exponent**

  Path loss is the difference between transmitted power and received power, and represents the level of signal attenuation present because of the effects of free space propagation, reflection, diffraction, and scattering. The path loss exponent is a function of frequency, environment, and obstructions. Commonly-used path loss exponents range from a value of 2 for open free space, to values up to 4.5 in environments where many obstructions are present. At 2.4 GHz, for example, a typical path loss exponent for an indoor office environment is 3.3, and for a very dense home environment it is 4.5.

- **Shadow Fading Factor**

  Indoor shadow fading varies depending on the number of obstructions present. In an environment with many partitions, walls, or other obstructions interfering with line of sight between the mobile device and each receiver, the shadow factor may be in the range of ± 7dBm and sometimes more. The default value is 0 dBm.

- **Propagation Radius for Measurement Points**

  The radius around the measurement for which it is valid. The default is 10 feet (3 m).

The Project Window (Device Centric Site Survey)

After you complete the **Create New Wi-Fi Designer Project** dialog as described in the previous section, the main Wi-Fi Designer window appears. (**Figure 6**) To continue the site survey, proceed to **Set the Map's Scale and Display Options (page 20)**.

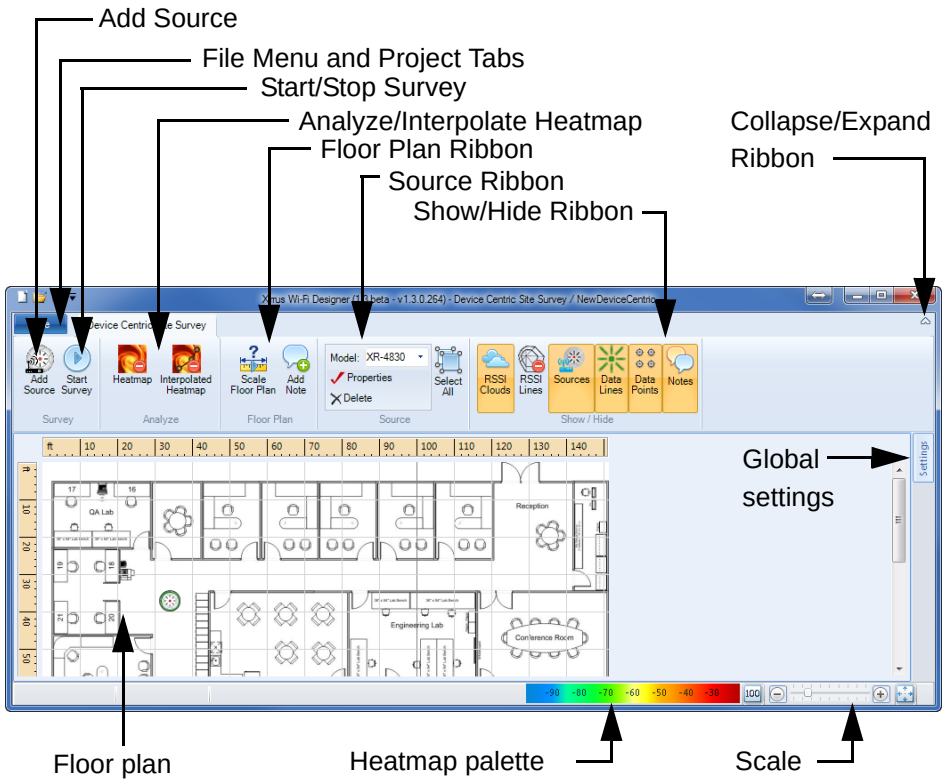


Figure 6. The Main Wi-Fi Designer Window

Note that you can use the control on the upper right to collapse or expand the entire command ribbon. This is very useful when you're working on a device with limited screen size. The main elements of the project window are described below for reference.

Field	Usage
Tabs	• **File**—select this to display the File menu as described in **File Menu Options (page 39)**. • **Device Centric Site Survey**—when selected displays the floor plan and associated controls.
Ribbons	Buttons and ribbon sections are used to run Wi-Fi Designer and control the display: • **Add Source** Button—selects Arrays to place on the map. • **Start/Stop Survey** Button—Click to start the survey, where you collect data at various locations. Once complete, click again to stop the survey. You can restart the survey and collect more data points if desired. • **Heatmap Analyze**—these buttons display the heatmap. If **Interpolated Heatmap** is selected, Wi-Fi Designer interpolates the values between data points to display a complete coverage map. The interpolation uses the values associated with each source's Wireless Environment settings given during project initiation (**"Create a New Project: Device Centric Site Survey" on page 12**) or as a later property setting (**"Array Properties" on page 29**). An example is shown in **Figure 20**. • **Floor Plan**—sets the scale for the map and allows notes to be added to the map. • **Source**—sets the properties associated with Arrays and selection of all Arrays. • **Show/Hide**—shows or hides various elements on the map.
Floor plan	The project's floor plan is displayed in the Wi-Fi Designer window. Arrays, measurements, and heatmaps are placed on the floor plan.
Zoom	The size of the floor plan display is controlled by the slider. Click  to display the floor plan at its original resolution. Click  to fit the floor plan into the available space.

Field	Usage
Heatmap palette	The selected project palette is shown as a key to the heatmap display.
Settings	This panel includes several settings related to the floor plan display. See **Settings Panel (page 22)** for further details.

Set the Map's Scale and Display Options

It is important to set the scale of each map in order for the results to display accurately and for location information to be as precise as possible.

It is very easy to set the scale. Before you start, measure the actual length of a wall or other feature represented on the map. The longer the object being measured is, the more accurate the scale will be.

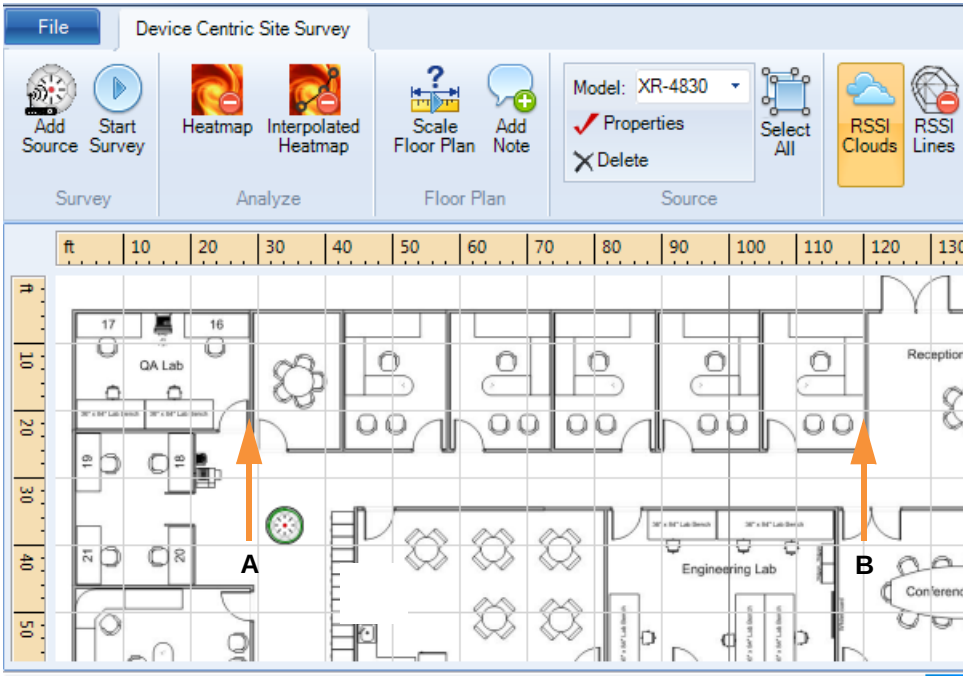


Figure 7. Calibrating the Map Scale

1. Measure a wall or other feature that is represented accurately on the map. **Figure 7** shows both ends (A and B) of a wall being measured.

2. Click the **Scale Floor Plan** button in the **Floor Plan** ribbon. 

The mouse pointer will change to a calibration tool in the next step.

3. On the map, position the mouse pointer at one end of the wall or other feature that you measured and click (A). Move the mouse pointer to the other end of the feature and click again (B).

   The Complete Floor Plan Scale dialog box appears.

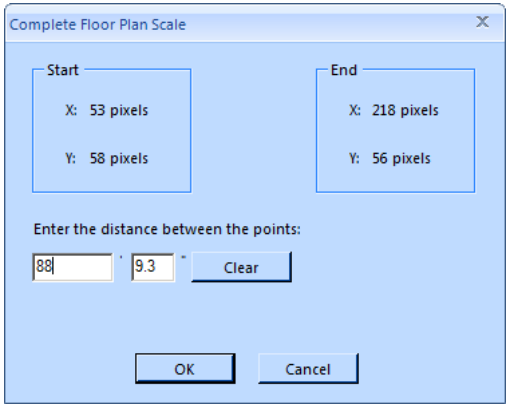


Figure 8. Complete Floor Plan Scale (Calibrate Distance)

4. Set the two boxes with the measured length of the feature, in feet and inches. Click **OK**.

Settings Panel

The Settings panel pulls out from the right edge of the Wi-Fi Designer window. It will retract when something else is selected, but may be made permanently visible by pushing in the push-pin ( ). Tablet users will find it convenient to close this panel when not in use.

The window offers several display-related settings:

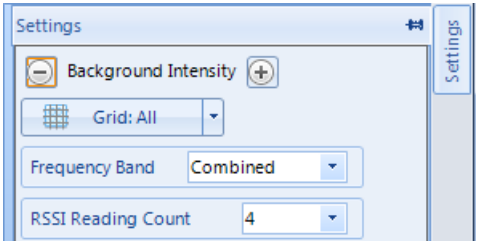


Figure 9. Settings Panel

The fields in this panel are:

Field	Usage
Background Intensity	The and buttons will fade or darken the floor plan in the main window. You may fade the floor plan in order to make the heatmap and RF sources stand out.
Grid	Three choices are available for displaying grid lines: • All—The grid scale is computed, based on the total size represented by the map. Grid lines are displayed at intervals that are a multiple of 10 feet. • Major—grid lines are displayed at 100′ intervals. • None—no grid lines are displayed.
Frequency Band	Three choices filter the contents of the map display: • Both—data for both 2.4 GHz and 5 GHz is displayed. • 2.4 GHz—data for 2.4 GHz only is displayed. • 5 GHz—data for 5 GHz only is displayed.

Field	Usage
RSSI Reading Count	The number of RSSI measurements, between one and five, to take at each location. The values are averaged. The default is four readings. Note that the higher this number is set, the longer it will take to collect RSSI readings at each location.

Start the Site Survey

Three basic steps are used in creating a site survey:

- **Select a Source**

  Select an Array or other access point to be used as the source for RSSI measurements. See **Select a Source (page 23)** for details.

- **Survey the Site**

  The laptop on which Wi-Fi Designer is installed is used to collect measurements for locations on the floor plan. See **Survey the Site (page 29)** for details.

- **Analyze the Results**

  The measurement results are displayed to determine whether further readings are needed or more Arrays must be added to the coverage. See **Wi-Fi Designer Window at Start of Survey (page 30)** for further details.

Select a Source

Before starting the actual survey, you must add one or more Arrays or other RF sources (i.e., access points) to the floor plan.

Click the **Add Source** button in the Survey ribbon 

. An additional panel will be displayed below the floor plan, showing the Arrays and access points within range of the laptop. (**Figure 10**) The size of the panel can be adjusted by dragging the thick line above the **Sources** label. If there are a large number of entries in the list, see **Sorting, Searching, and Filtering Entries (page 26)**.

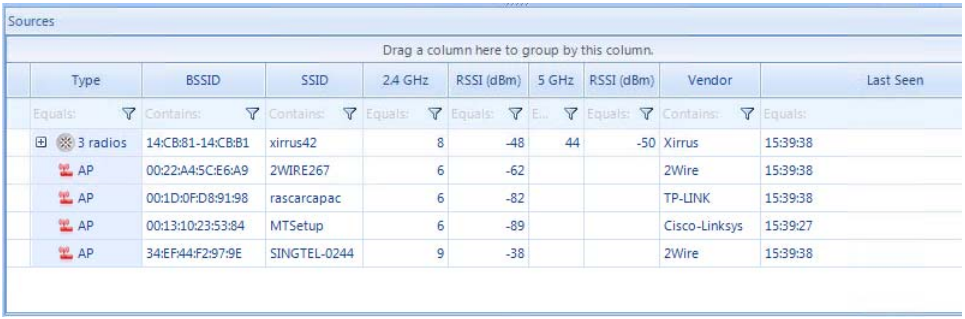


Figure 10. Sources Panel

Before placing any sources on the map, make sure that they will be displayed—see **Show/Hide Ribbon Settings: (page 34)**.

Place an Array or other source onto the floor plan. Select the source in the list and drag and drop it onto the floor plan. Place the icon so that it is centered at the location on the floor plan that corresponds as accurately as possible to its physical location at the deployment site. The floor plan may need to be scaled or scrolled to make the location visible with sufficient resolution. The location of the cursor with respect to the floor plan is updated in real time in the lower left hand corner of the window. The location of the source may be adjusted on the map later, as needed.

If you are using more than one physical Array (or other AP) for your survey, drop additional sources onto the map as required. Note that if you will be moving one Array from location to location to approximate the coverage provided the deployment of multiple Arrays, it is simplest to just cut and paste a copy of the Array on the map at the new location when you need it. See **Working with Sources (Copy and Paste, Modify Properties, etc.) (page 27)**.

You may use the push-pin ( ) to close the source list panel and free up room on the window. When you are done adding sources, the source list panel will close automatically when you click **Start Survey** to go on to the next step of your project.

Proceed to **Survey the Site (page 29)** to start taking readings.

More information about the sources list and working with sources is in the following sections:

- **Source List Details** describes all of the columns in the list.
- **Sorting, Searching, and Filtering Entries** describes using these features to make it easier to find the desired RF sources in the list.
- **Working with Sources (Copy and Paste, Modify Properties, etc.)** describes how to move, delete, and duplicate sources, and change wireless environment properties on a per-device basis.

Source List Details

The columns in the Sources list are:

Column Heading	Contents
SSID	A source is identified by its service set ID. Your Arrays will be listed here, as well as other APs found in the area. Clicking on the plus sign to the left of an Array causes all radios to be displayed. A non-Xirrus access point is displayed like this:  .
Type	The type of source that was found. A Xirrus Array is shown with the number of radios associated with the Array.
BSSID	The base station ID for the source.
2.4 GHz RSSI (dBm)	This pair of columns displays the strongest 2.4 GHz channel from the source, along with its signal strength express in dBm.
5 GHz RSSI (dBm)	This pair of columns displays the strongest 5 GHz channel from the source, along with its signal strength express in dBm.
Vendor	The source's manufacturer.

Column Heading	Contents
Last Seen	The local time that the source was last observed. Devices that have not been seen for 30 seconds or more will be removed from the list automatically.

Sorting, Searching, and Filtering Entries

If there are many RF sources in the environment, you may use sorting, searching, and filtering to make it easier to find the desired Arrays or APs in the list.

- Sort on any column by clicking the column header. Click again to sort in the reverse direction.
- To reduce the number of entries in the Sources list to only desired entries, use filtering. Click the Filter button in the desired column header . All entries in that column are displayed. **Figure 11** shows the Filter dialog for the SSID column. Click the **All** checkbox to select or deselect all entries. Click individual entries to select or deselect them. Click **OK** when done, and only the checked entries will appear in the Sources list. To return to displaying all entries, click the Filter button again and click **Clear Filter** on the upper left, or use the All checkbox.

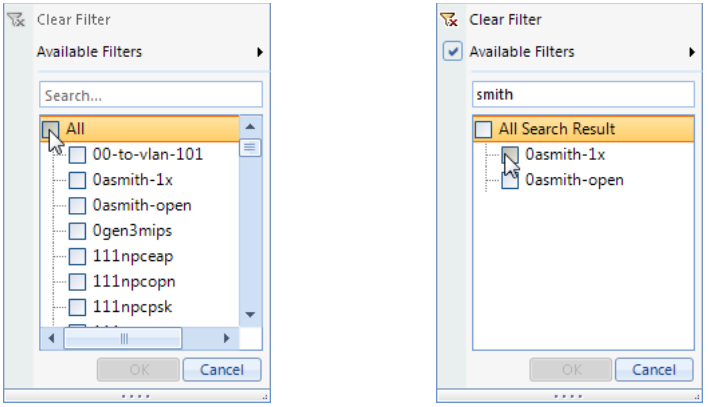


Figure 11. Filtering (left) Searching (right)

- To search for particular Sources, click the Filter button in the desired column header  . (**Figure 11**) Start typing in the Search field, and the entries shown will be filtered as you type. Search strings are not case-sensitive. Click the **All Search Results** checkbox to select or deselect all matching entries. Click individual entries to select or deselect them. Note that by default, all entries that **Contain** the search string will be matched. To change the match criterion, click **Available Filters** at the top and select another option, such as **Does not contain**, **Starts with**, **Ends with**, etc.

  Remember to select the desired entries from the filtered list, and click **OK** when done. Only the checked entries will appear in the Sources list. To return to displaying all entries, click the Filter button again and click **Clear Filter** on the upper left, or use the **All** checkbox.

Working with Sources (Copy and Paste, Modify Properties, etc.)

The sources may be manipulated in several ways:

- **Move**

  Select the source on the map and move it to the correct position by holding down the left mouse button. The position, measured in feet, from the upper left corner of the floor plan is shown at the lower left of the screen.

- **Delete**

  The source can be deleted. Select the source and press the **Delete** key on your keyboard. You may also delete a selected Array by using the **Delete** option in the **Source** section of the ribbon, or by right-clicking the Array and selecting **Delete** from the drop-down menu. You will be asked to verify the deletion.

- **Copy and Paste**

  This operation is especially useful after a survey has been taken with an Array and a new series of measurements is desired from the same Array after having physically moved it to a different location. To duplicate the Array at a new location, right-click on the Array and select **Copy**. Then,

move your cursor to the new location on the map and right-click at that location, selecting **Paste**.

- **Modify properties**

  This operation is useful when you have used copy and paste to duplicate an Array in a different location that has a different RF environment. For example, you may have taken readings with an Array placed in an office area, and then moved the Array to a warehouse portion of the deployment site.

  Right click on a source (or select multiple sources with ctrl+click) and then select **Properties**, or use the **Properties** option in the **Source** section of the ribbon. One of two dialogs will be displayed depending upon whether the source is an Array or other AP. (**Figure 12**) Array properties will include a selection for the **Array Type**. Properties for other types of APs will display the **Channel** number in use.

  Both dialogs allow the **Wireless Environment** to be adjusted. To indicate that the source is located in an environment different than that set in the new project dialog (**Create a New Project: Device Centric Site Survey (page 12)**), uncheck the **Use Project Settings** box and set appropriate values.

Array Properties

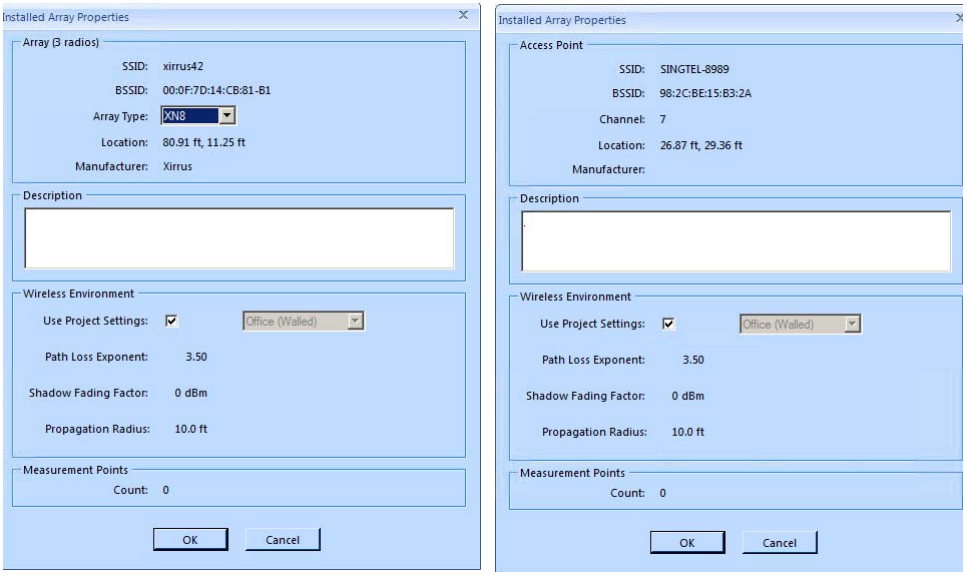


Figure 12. Properties for Xirrus Arrays and non-Arrays

Survey the Site

Before starting the survey, make sure that the sources are correctly positioned.

During the survey step, measurements will be taken from the current position of the laptop with respect to all selected sources. Therefore, before beginning the survey, make sure to select all of the sources that will be used for this series of measurements. When a source has been copied, ensure that only the source icon corresponding to the current position is selected.

Click the **Start Survey** button on the Survey ribbon 

. The Sources panel will disappear and the floor plan will be displayed. The Wi-Fi Designer window shows the **Active Sources** panel on the right and a new **Active Source** section on the ribbon.

Active Sources Panel

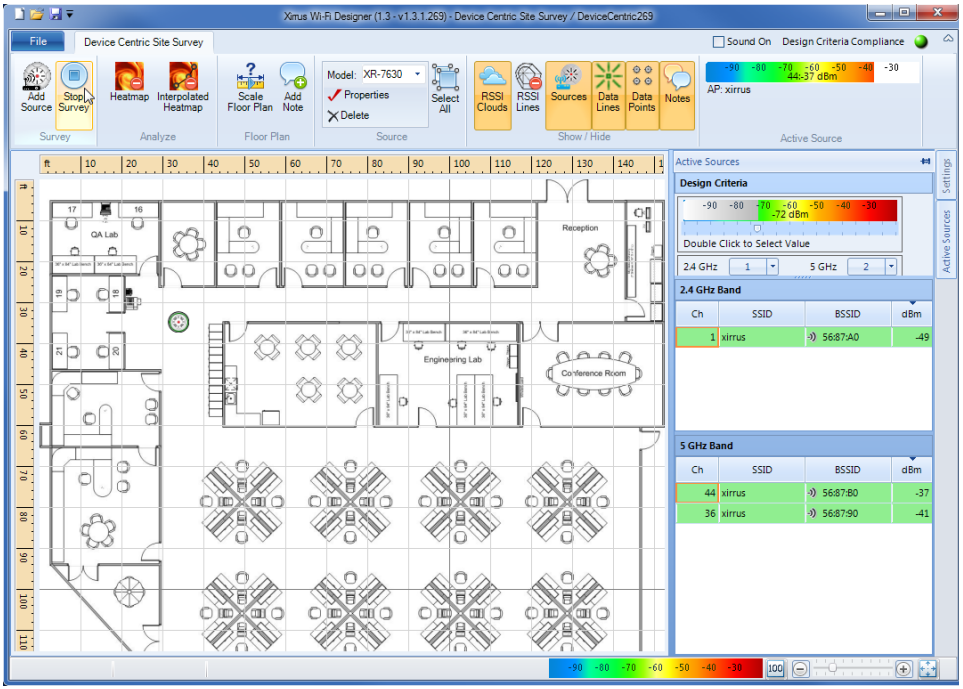


Figure 13. Wi-Fi Designer Window at Start of Survey

The Active Sources panel slides in from the right. As in the Settings dialog, the Active Sources panel may be pinned in place or hidden through the use of the push-pin ( ). Hiding the panel is convenient when you're running Wi-Fi Designer on a device with limited screen real estate.

The panel contains several important settings used during the survey.

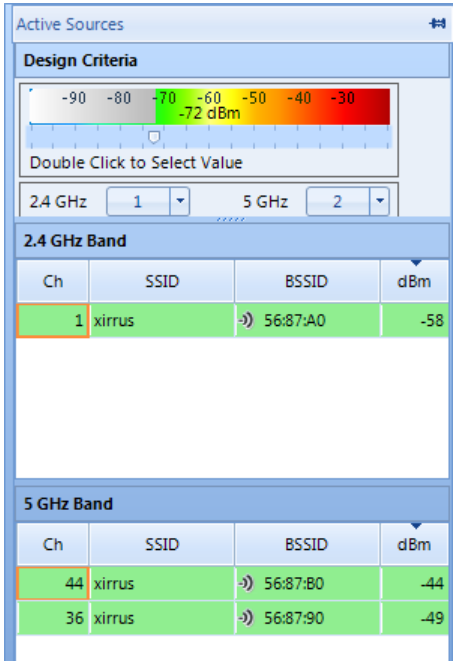


Figure 14. Active Sources Panel

The **Design Criteria** section specifies the minimum acceptable wireless coverage at each survey measurement point that is acceptable for this deployment. For example, in **Figure 15** we specified that at each survey point we have the following minimum RF signal requirements for Design Criteria compliance:

- At least one 2.4 GHz Band radio available.
- At least two 5.0 GHz Band radios available.
- All radios must have an RSSI of at least -72 dBm.

The scale and slider are used to set the minimum RSSI value.

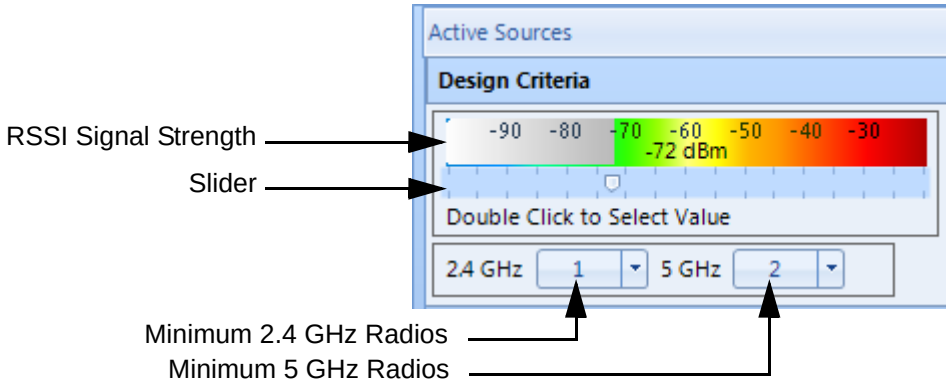


Figure 15. Setting Design Criteria

To set the minimum signal strength, move the slider and double click at the desired strength. The dividing line between the colors and the gray area indicates the minimum acceptable RSSI value. To specify the minimum number of **2.4 GHz** and **5 GHz** radios that must meet that RSSI requirement, select the number from the respective drop down menus.

The **2.4 GHz Band** and **5 GHz Band** sections of the Active Sources panel will show the real-time RSSI signal strength in the dBm column while making survey measurements. If a particular channel fails the RSSI signal strength criterion, then that line is highlighted in red.

A similar display of real-time RSSI values is shown in the Active Source ribbon section (on the right hand side of the ribbon).

Figure 16. Active Source Panel

The name of the source (XN8 Array: xirrus42 in **Figure 16**) is displayed along with the signal strength of the two strongest radios observed at the moment.

Taking Survey Measurements

Measurements are taken by:

1. Walking to a location in the site. At a minimum, measurements should typically be taken at the four corners of each room.
2. Position the cursor on the floor plan map where you are standing. Left-click with the mouse and remain stationary until this reading is complete. While measurements are being taken, a revolving blue circle is displayed at the cursor location. Remain stationary for the reading until the blue circle is replaced by a survey data point. A number of measurements are taken and averaged for the data point. The default is four measurements, but you may change this using the **RSSI Reading Count (page 23)**. If the reading violates your selected Design Criteria, then the **Design Criteria Compliance** indicator will be displayed as a red ball 

in the upper right hand corner of the window. In addition, click the **Sound On** checkbox if you wish to have a sound played when a survey measurement is out of compliance.
3. Depending on the elements selected in the **Show/Hide** ribbon, the floor plan will reflect the survey measurement.
4. Repeat **Step 1** through **Step 3** until the entire area served by the sources is covered.
5. Stop the survey by pressing the **Stop Survey** button 

.

During and after the survey, the floor plan reflects sources and data points in a number of ways. The selected elements in the **Show/Hide** ribbon dictate what is displayed in the floor plan. With the default selections, a floor plan might appear as shown in **Figure 17**.

Figure 17. Floor Plan Display

Each of the measurement points is connected by a line to the source(s) measured, and is labeled with up to the four strongest RSSI readings at that point. Each point is surrounded by a cloud that reflects the strongest signal strength measured, represented with the appropriate color from the palette legend. The cloud around the measurement becomes the propagation radius when **Heatmap** is enabled (see **"Analyze the Results" on page 36**).

Show/Hide Ribbon Settings:

Show/Hide Elements	Usage
	When you disable display of one of the elements below, this red circle appears on the button.
RSSI Clouds	If selected, each data point is surrounded by a circular cloud whose color corresponds to the lesser signal strength of the measurement.

Show/Hide Elements	Usage
RSSI Lines	If selected, contour lines are drawn indicating equal RSSI values. See **Figure 18** for an example of this display.
Sources	If selected, the sources are displayed. If not selected, the sources and corresponding data points for the sources are removed from the display.
Data Lines	If selected, lines connect each measurement to the corresponding source.
Data Points	If selected, data points and RSSI measurement values are displayed.
Notes	If selected, any notes present on the floor plan are displayed.

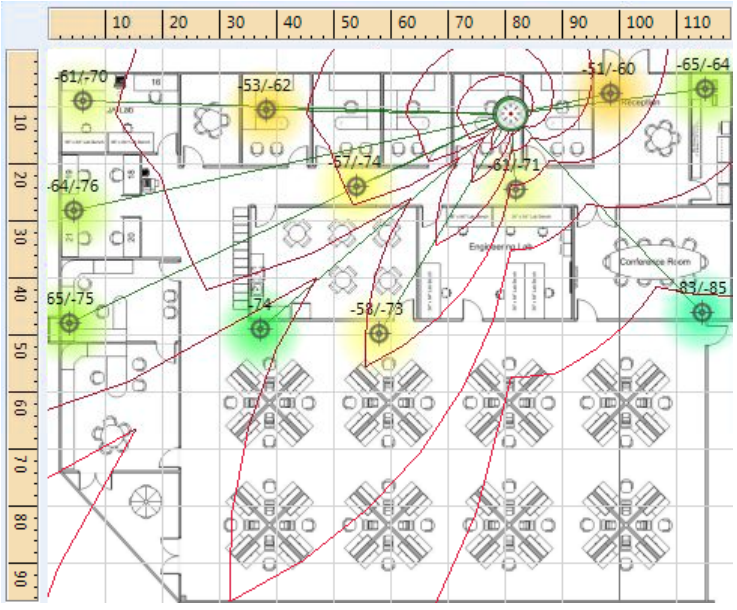
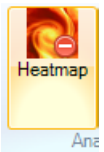


Figure 18. RSSI Lines

Analyze the Results



In addition to the information available while taking the survey, further analysis is offered by the Heatmap Analyze ribbon. Click the **Heatmap—Analyze** button to start the analysis. With the default Wi-Fi Designer settings, the heatmap might look as shown below.

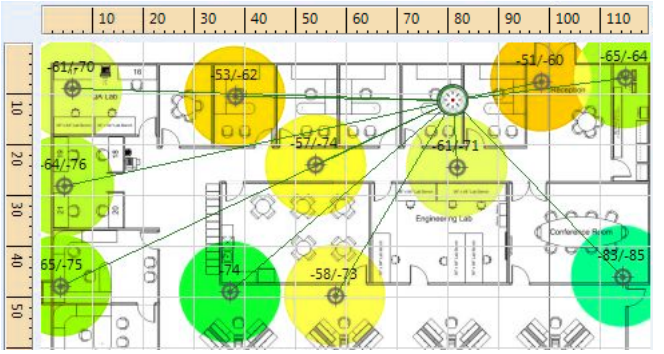
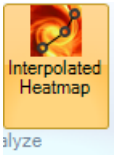


Figure 19. Heatmap Display (Not Interpolated)

The display is similar to that shown in survey mode, except that RSSI clouds are replaced by circles having the **Propagation Radius** set in the project settings (see **"Perform a Device Centric Site Survey" on page 11**).



Another analysis option is offered by the **Interpolated Heatmap—Analyze** button. When this option is selected, Wi-Fi Designer interpolates the values between data points to display a complete coverage map. The interpolation uses the values associated with each source's Wireless Environment settings given during project initiation (**"Create a New Project: Device Centric Site Survey" on page 12**) or as a later property setting (**"Array Properties" on page 29**). An example is shown in **Figure 20**.

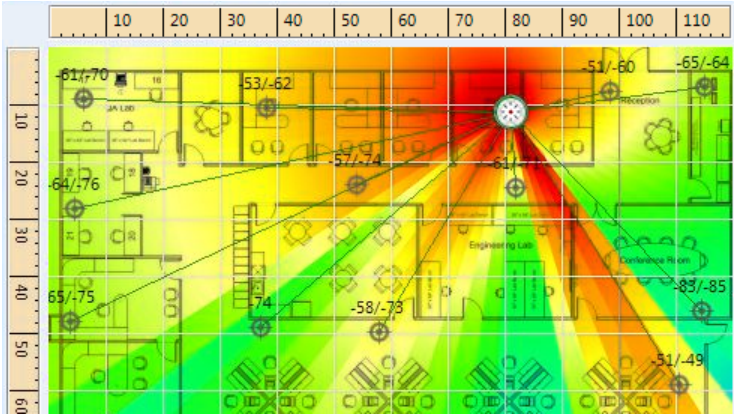


Figure 20. Interpolated Heatmap

In Analyze mode, several elements are added to the Settings panel. Background Intensity, Grid, Frequency Band, and RSSI Reading Count are the same as already described in **"Settings Panel" on page 22**.

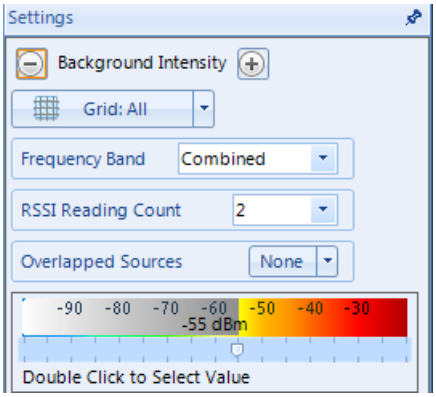


Figure 21. Additional Global Settings in Analyze Mode

The additional controls available are described in the following table.

Field	Usage
Overlapped Sources	This setting indicates the minimum number of sources that must cover a sample. A sample with fewer than this number of source readings is displayed in gray in the floor plan.
Color Band and Slider	The position of the slider in the color band indicates the minimum RSSI value acceptable for a reading. A survey point must have at least **RSSI Reading Count** readings that meet this value to be in compliance with design criteria. Survey points that fail this test are displayed in gray in the floor plan. See **Figure 22** for an example.

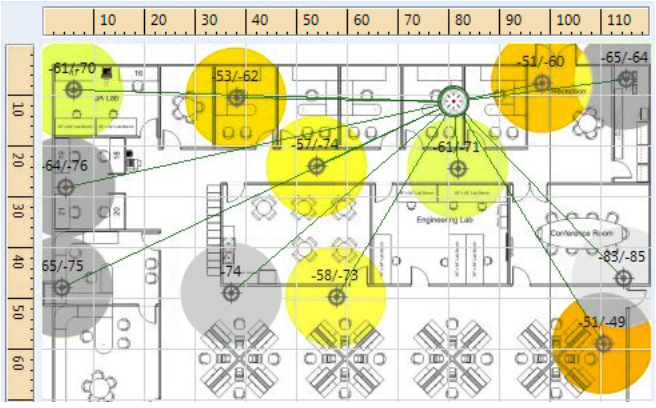


Figure 22. Heatmap with Unacceptable Data Points

File Menu Options

Click the File Menu Tab to display file options. (**Figure 23**) In addition to the usual file creation, open, and saving options, this menu allows you to modify a project's options.

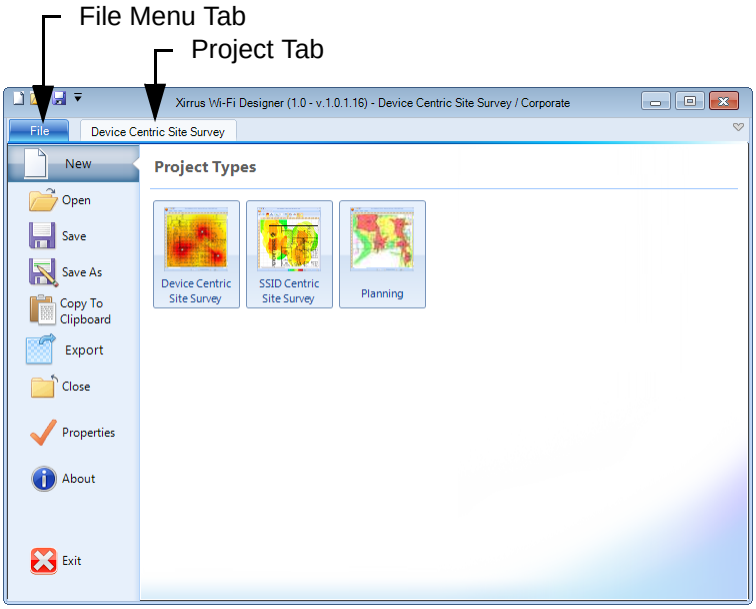
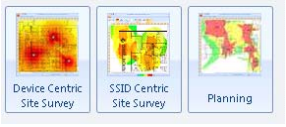


Figure 23. Wi-Fi Designer File Menu

New

A Site Survey or Planning projects may be started by selecting the appropriate icon. See **Create a New Project: Device Centric Site Survey (page 12)**, **Create a New Project: SSID Centric Site Survey (page 48)**, and **Planning a Deployment (page 59)** for a further explanation of new project creation.



Open

This option displays a dialog to browse for your project. Find and select the .xwd file that corresponds to the project in order to resume work on it. If your project was saved in a folder by a previous release, Wi-Fi Designer will open the selected folder and create an .xwd file.

Existing projects will be updated for current Wi-Fi Designer wall types and attenuation values automatically. For example, Plasterboard walls will be renamed to Drywall/Plasterboard and the attenuation will be modified to the latest values, 3dB for 2.4Ghz and 5dB for 5Ghz.

Note that Wi-Fi Designer auto-saves your work. If you open an existing project and make changes to it, Wi-Fi Designer will overwrite the old file, even if you do not explicitly **Save** the project. If you want to keep the old version of the project, you may make a copy of it before you open it, or use **Save As** to a new name before making any changes.

Save

This option saves the current project under the directory specified when it was opened or created.

Save As

This option saves the current project under a newly specified directory.

Copy to Clipboard

This option saves the current layout image to the clipboard. This image may be imported into a Word document or graphics editor.

Export

This option saves snapshots of the current display of your project. There are options to select what is displayed. You may also save a "bill of materials" for the project. You may specify export of multiple projects. See **"Export Options" on page 41** for details.

Close

This option closes the current project. If changes have been made, you will be given the opportunity to save before closing the project.

Properties

This option allows you to change the floor plan, description, and/or wireless environment associated with the project. These parameters were specified when the project was created; see **Create a New Project: Device Centric Site Survey (page 12)**, **Create a New Project: SSID Centric Site Survey (page 48)** or **Planning a Deployment (page 59)**.

Two additional options, About ( ) and Exit ( ), provide information about the Wi-Fi Designer application and exit Wi-Fi Designer, respectively.

Export Options

When you select the Export option from the File menu, you are offered a number of choices of what to export, as shown below.

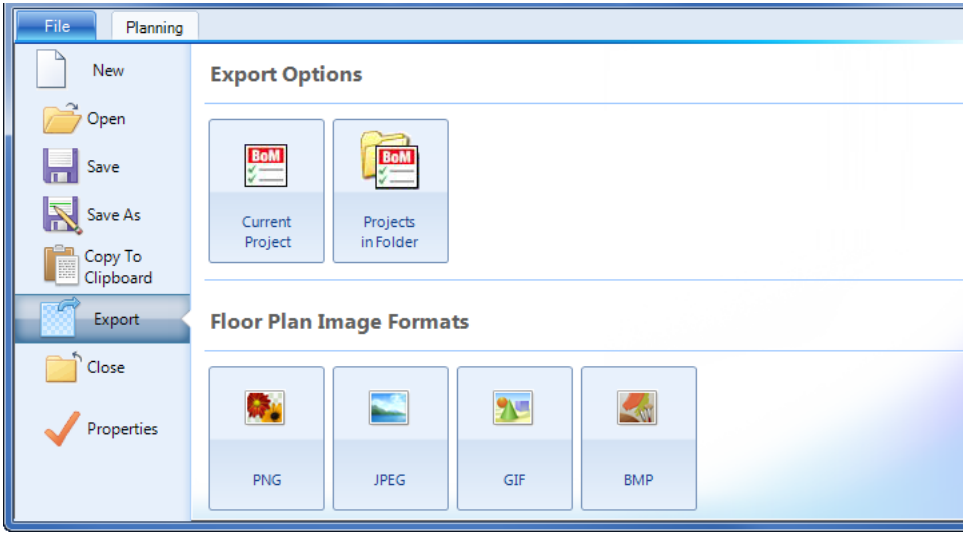


Figure 24. Export Options

The Export feature operates in three main modes:

- **Floor Plan Image**—this option is available for any project type.
- **Current Project**—this option is only available for planning projects.
- **Projects in Folder**—this option is only available for planning projects.

Floor Plan Image

This option saves the current display of the floor plan section of the Wi-Fi Designer window to an image file. The image appears exactly as it does in the Wi-Fi Designer. Options such as heatmap display and show/hide for walls/RSSI lines, etc., are all shown or not, according to their current settings.

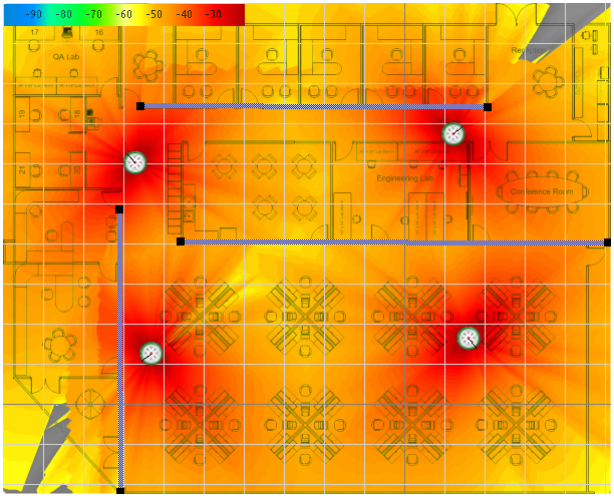


Figure 25. Exported Floor Plan Image

To export a current image of the project display, simply click one of the **Floor Plan Image Formats** shown in **Figure 24 on page 41**. The options are PNG, JPEG, GIF or BMP format. These formats are described in **"Preferred Image Formats" on page 8**. Select the file type desired and specify the folder where the image is to be saved.

Current Project

This option exports your Wi-Fi Designer Planning project into a zip file that contains selected images and a Bill of Materials (BoM) in Excel format. This provides simple one-step export. The BoM lists the Arrays required for the project and may be easily incorporated into proposals, quotes, and orders.

To export the project, simply click the **Current Project** option shown in **Figure 24 on page 41**. Additional options are displayed.

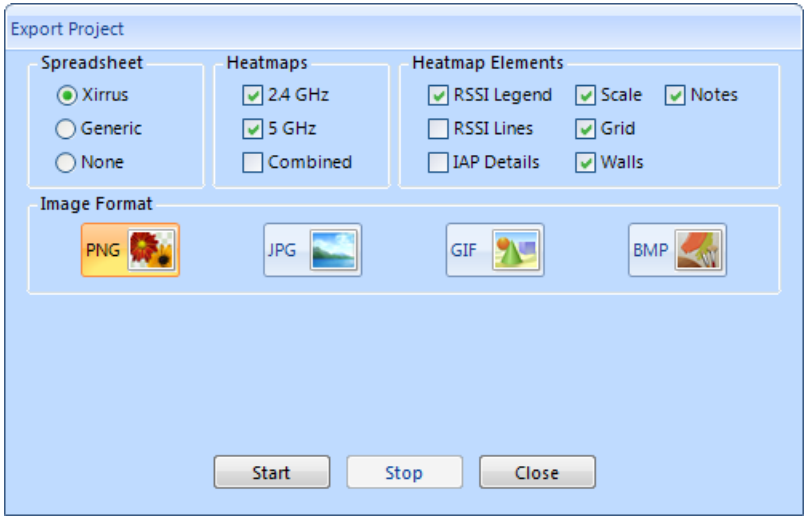


Figure 26. Export Project Options

The **Spreadsheet** options apply to the BoM. All other options relate to the project image. Note that the output zip file is placed in the same folder as your project.

- **Spreadsheet**

  The spreadsheet contains a BoM that summarizes the Xirrus Arrays required by the project. Quantities are detailed in terms of totals of each Array type, and total **Array Count**. Total **IAP Count** is shown, and then broken out into **IAP 3x3 Count** and **IAP 2x3 Count**.

  Select **Xirrus** to create an Excel .xlsx file for the BoM with the Xirrus logo as shown in **Figure 27**. Select **Generic** to omit the logo. Select **None** if you do not wish to create a BoM.

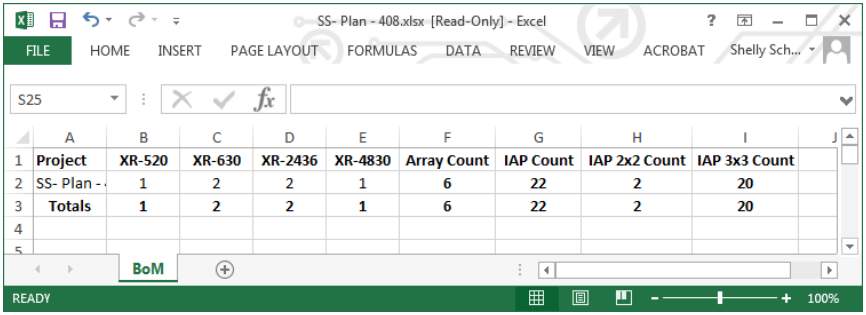


Figure 27. Export Bill of Materials

- **Heatmaps**

  Select whether and how to display heatmap data on the project display image. (**Figure 25**) Check **2.4 GHz** or **5 GHz** to show the associated signal strength on an image, or check both to create two image files, one for each band. Check **Combined** to show both bands on the same image. For each checkbox you select (2.4 GHz, 5 GHz, or Combined) one image will be created. Thus, if you select all three checkboxes you will get three images: one for 2.4 GHz, one for 5 GHz, and one that shows both on the same image. Uncheck all three options if you do not wish to show the heatmap on the image.

- **Heatmap Elements**

  Select whether to display a variety of optional elements on the project image. Check the options to be displayed on the image file.

  - RSSI Legend—see **"Palette" on page 15**
  - IAP Details—see **Figure 52 on page 73**
  - Scale—see **Figure 5 on page 15**
  - Grid—see **"Grid" on page 22**

  See **"Show/Hide Elements" on page 64** for the following elements.

  - RSSI Lines
  - Walls
  - Notes

- **Image Format**

  Select the file type desired for the project display image(s). Options for **Heatmaps** and **Heatmap Elements** are all shown or not shown in the image(s), according to your selections.

Click the **Start** button when you have set your desired options. (**Figure 26**) Note that you do not need to specify a folder for the result. A progress bar shows export status. You may click the **Stop** button to abort the operation. Click **Close** when done to close export window. When the export is complete, the export file's name and path will be displayed. (**Figure 28**) You may click **OK** to open the folder that contains this file.

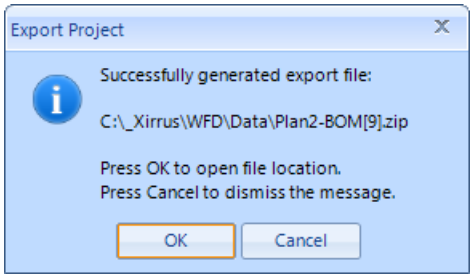


Figure 28. Export Complete

Your results, including the .xlsx file and the image(s), are placed in a zip file in the same folder as your project's .xwd file. The filename will be:

***<project-name>*-BOM.zip**

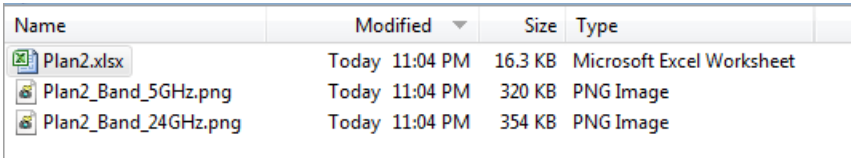


Figure 29. Exported Zip File

Projects in Folder

This option documents multiple Wi-Fi Designer planning projects in just the same way that **Current Project** documents just one planning project. Output includes one Bill of Materials (BoM) summarizing the Arrays required by each of the selected projects, as well as images for each of the selected projects.

Click the **Projects in Folder** option shown in **Figure 24 on page 41**. Wi-Fi Designer will display a message informing you that you must close your current project before proceeding. Click **OK**. Since your project is automatically saved as you work, there is no need to explicitly save before closing.

Additional options are displayed.

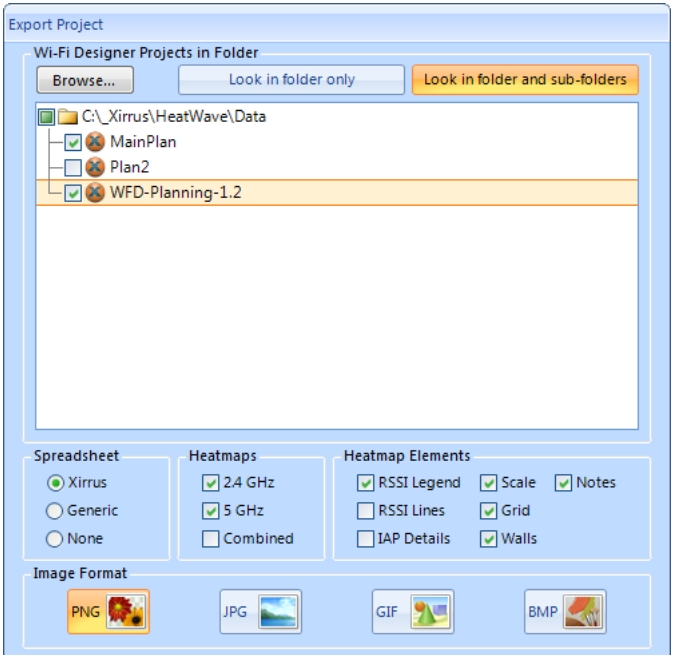


Figure 30. Export Projects in Folder Options

Click **Browse** and select the folder that has the projects to be exported. You may click **Look in folder and subfolders** if you wish to consider projects in subfolders as well. The dialog box lists all planning projects that it finds. If you wish to

exclude any of these from being exported, uncheck them. For example, suppose you are working on a large deployment. You might have **CustomerName** as the top level folder, with **Building1**, **Building2**, **Building3**, and **Building4** subfolders with each floor as a separate project. You could then click **Look in folder and subfolders** to export the complete deployment with a BoM that shows the requirements of each project and the totals for all projects.

Next, set the following options exactly as you would for exporting a **Current Project**:

- See **"Spreadsheet" on page 43**
- See **"Heatmaps" on page 44**
- See **"Heatmap Elements" on page 44**
- See **"Image Format" on page 45**

Click the **Start** button to proceed. The options that you select will apply to all of the selected planning projects to be exported.

	Project	XN4	XR-7630	Array Count	IAP Count	IAP 3x3 Count	IAP 2x3 Count
2							
3	MainPlan	1		1	4	0	4
4	WFD-Planning-1.2		1	1	16	16	0
5	Totals	1	1	2	20	16	4

Figure 31. Export Bill of Materials for Projects in Folder

Just as for exporting a Current Project, the results are presented in a zip file. (**Figure 28**) The resulting spreadsheet will contain one line for each of the exported projects, plus a summary of the totals in each column.

The exported zip file will also contain all of the requested images.

Perform an SSID Centric Site Survey

The following sections will walk you through performing a site survey based on SSIDs and channels.

Create a New Project: SSID Centric Site Survey

Select the **New** option from the File Menu, and click **SSID Centric Site Survey.** (**Figure 3**) The **Create New Wi-Fi Designer Project** dialog appears. (**Figure 4**)

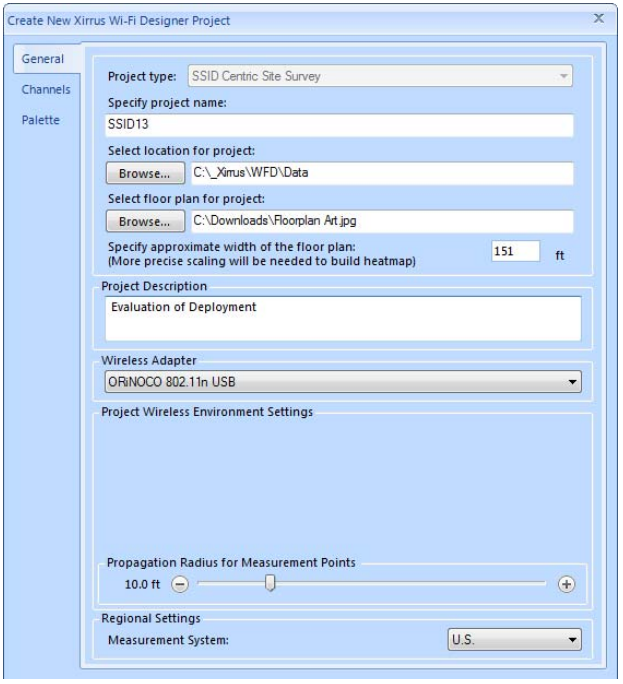


Figure 32. Create New SSID Centric Site Survey Project Dialog

The settings for this dialog are similar to **Create a New Project: Device Centric Site Survey (page 12)**, except that several settings from the **Wireless Environment** dialog are not needed. This environment settings are pared down because SSID Centric surveys do not calculate propagation through objects. The SSID Centric Site Survey does use the **Propagation Radius** setting. Refer to **Understanding Project Wireless Environment Settings (page 15)** for details.

The **Channel** tab provides a set of check boxes for each possible 2.4 and 5 GHz channel. (**Figure 33**). This may be used to restrict the survey to a particular set of channels. Later on, when you click the **Add Sources** button, only SSIDs broadcasting on the selected channels will be shown. Note that for the 2.4 GHz band, only channels 1, 6, and 11 are enabled by default. This speeds surveys by reducing the amount of time required for each reading.

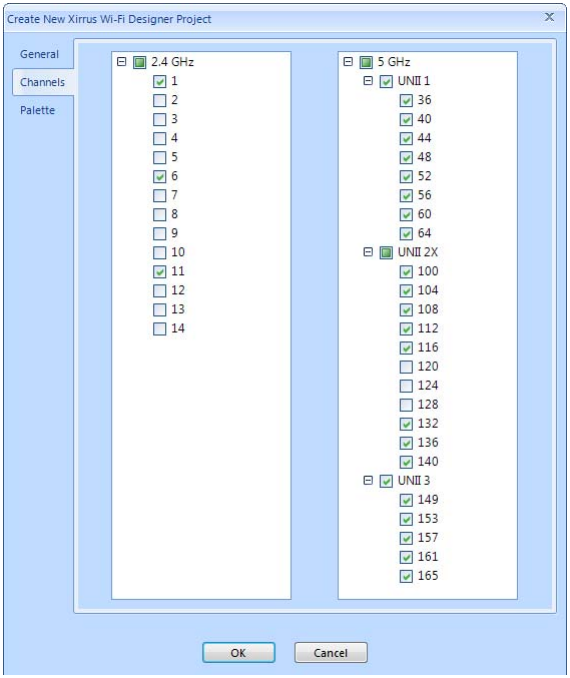


Figure 33. Channel Selection Options

The Project Window (SSID Centric Site Survey)

After you complete the **Create New Wi-Fi Designer Project** dialog, the main Wi-Fi Designer window appears. This window is very similar to that used in the Device Centric Site Survey, with fewer ribbon choices. (**Figure 34**). To continue the site survey, proceed to **Set the Map's Scale and Display Options (page 50)**.

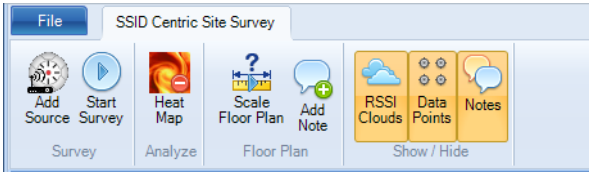


Figure 34. SSID Centric Main Window Ribbon

Set the Map's Scale and Display Options

It is important to set the scale of each map in order for the results to display accurately and for location information to be as precise as possible. This is the same procedure as used in Source Centric Site Surveys, as described in **Set the Map's Scale and Display Options (page 20)**.

Other map and survey options may be selected with the **Settings** panel, including setting floor plan display intensity and whether to display the map grid, the frequency bands to display, and the number of measurements to take at each location. See **"Settings Panel" on page 22**.

Select a Source

Before starting the actual survey, you must select one or more SSIDs to survey.

Click the **Add Source** button in the Survey ribbon. The Sources panel will be displayed below the floor plan, showing the SSIDs within range of the laptop. (**Figure 35**) Check off the SSIDs that you wish to include in this survey.

The Sources panel will only show SSIDs broadcasting on the channels you selected earlier using the **Channels** tab. (**Figure 33 on page 49**) To change the channels that are selected, click the **File** tab in the upper right corner and select **Properties** to display the Xirrus Wi-Fi Designer Properties window. (**Figure 32 on page 48**) Click the **Channels** tab on the left, and change the selected channels as desired.

The size of the Sources panel can be adjusted by dragging the thick line above the **Sources** label. If there are a large number of entries in the list (after you have selected the desired channels as described above), see **Sorting, Searching, and Filtering Entries (page 26)**.

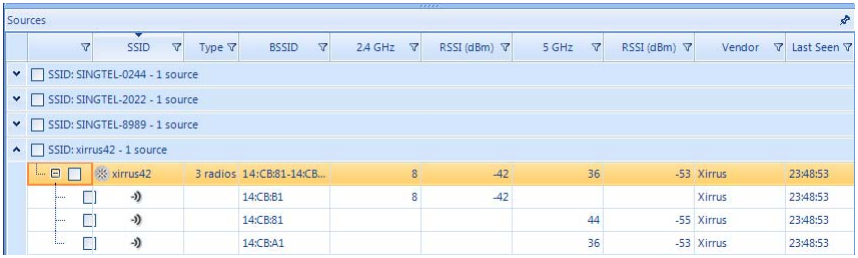
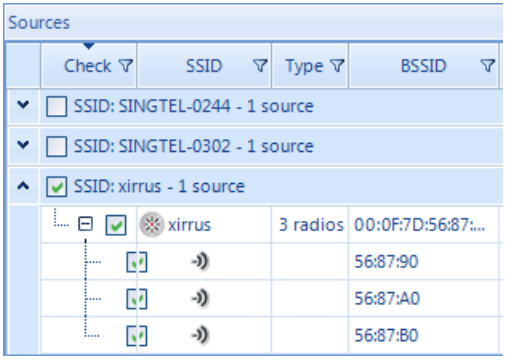


Figure 35. SSID Sources Panel

The columns are as described in **Source List Details (page 25)**. Select one or more SSIDs that you wish to survey.

SSID Tree Structure



Use the down caret to the left of an SSID to expand it and show SSID details. You may use the up caret to hide details. Click the + sign in front of an expanded SSID to display a tree structure listing all of the radios on an Array that offer that SSID. Click again to collapse the entry. Also note that multiple Arrays may offer that same SSID, and they will all be listed. The number of sources for an SSID is displayed on the top-level entry for the SSID, after its name.

Survey the Site

Before starting the survey, make sure that the correct SSID sources are selected.

During the survey step, measurements will be taken from the current position of the laptop with respect to all selected sources. Therefore, before beginning the survey, make sure to select all of the SSID sources that will be used for this series of measurements.

Click the **Start Survey** button on the Survey ribbon 

. The Sources panel will disappear and the floor plan will be displayed. The Wi-Fi Designer window shows the **Active Sources** panel on the right and a new **Active Source** section on the ribbon.

Active Sources Panel

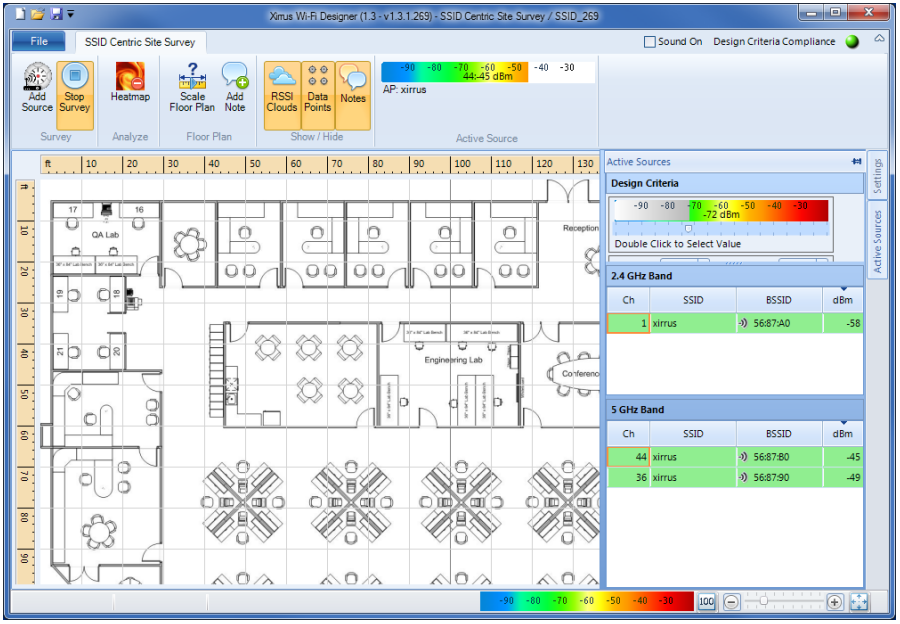


Figure 36. SSID Centric Start of Survey

The Active Sources panel slides in from the right. As in the Settings dialog, the Active Sources panel may be pinned in place or hidden through the use of the push-pin ( ). Hiding the panel is convenient when you're running Wi-Fi Designer on something like a tablet, where screen real estate is at a premium.

The panel contains several important settings used during the survey.

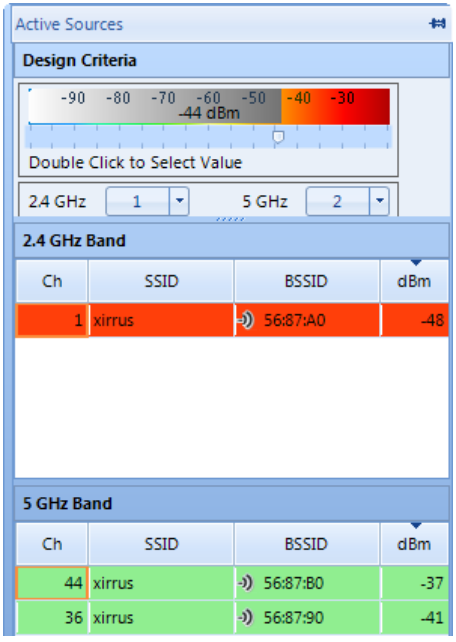


Figure 37. Active Sources Panel

The **Design Criteria** section specifies the minimum acceptable wireless coverage at each survey measurement point that is acceptable for this deployment. For example, in **Figure 38** we specified that at each survey point we have the following minimum RF signal requirements for Design Criteria compliance:

- At least one 2.4 GHz Band radio available.
- At least two 5.0 GHz Band radios available.
- All radios must have an RSSI of at least -44 dBm in this example. This value was used just to illustrate a case where design criteria aren't met.

The scale and slider are used to set the minimum RSSI value. (**Figure 38**)

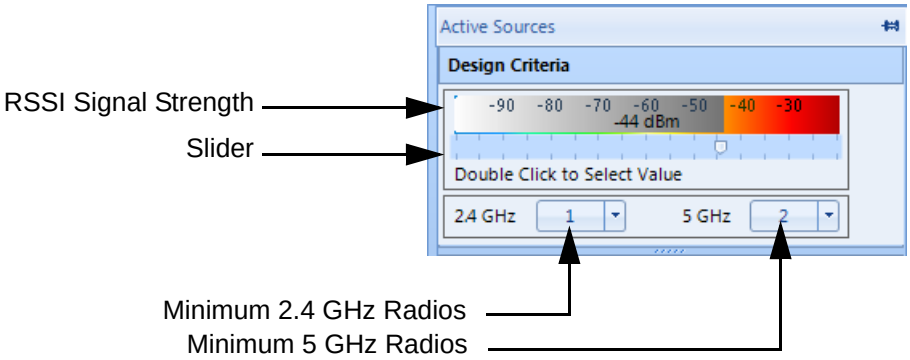


Figure 38. Setting Design Criteria

To set the minimum signal strength, move the slider. The dividing line between the colors and the gray area indicates the minimum RSSI value. To specify the minimum number of **2.4 GHz** and **5 GHz** radios that are acceptable, select the number from the respective drop down menus. The indicated number of radios of each type must meet or exceed the selected RSSI signal strength in order for the reading to meet the Design Criteria.

The **2.4 GHz Band** and **5 GHz Band** sections of the Active Sources panel will show the real-time RSSI signal strength in the dBm column while making survey measurements. (**Figure 37**) If a particular channel fails the RSSI signal strength criterion, then that line is highlighted in red. If a particular channel fails the RSSI signal strength criterion, then that line is highlighted in red.

A similar display of real-time RSSI values is shown in the Active Source panel.

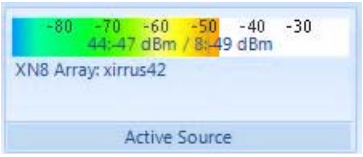


Figure 39. Active Source Panel

The name of the source (XN8 Array: xirrus42 in **Figure 16**) is displayed along with the signal strength of the two strongest radios observed at the moment.

Settings

The Settings panel for SSID Centric Site Surveys is similar to the Settings panel for Device Centric Surveys.

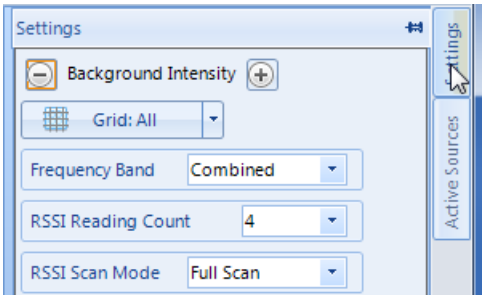


Figure 40. Settings Panel - SSID Centric Site Survey

All parameters are as described for **"Settings Panel" on page 22**, with the addition of one new setting.

- **RSSI Scan Mode**—to speed up the survey, set this to **Quick Scan**. This will take measurements only on the channels of radios recently seen (in the last ten seconds) by a background scanner that runs constantly. For increased reliability, leave this at the default setting of **Full Scan**.

Taking Survey Measurements

To take measurements:

1. Walk to a location in the site. You must take sufficient measurements around the facility to ensure you have an accurate coverage map. The more measurements you take, the more accurate your results will be. At the least, take a measurement on either side of every significant RF obstruction and inside every room.
2. Position the cursor on the floor plan map where you are standing. Left-click with the mouse and remain stationary for the reading until the blue circle is replaced by a survey data point. A number of measurements are taken and averaged for the data point. The default is four measurements, but you may change this using the **RSSI Reading Count (page 23)**. If the

reading violates your selected Design Criteria, then the **Design Criteria Compliance** indicator will be displayed as a red ball 

in the upper right hand corner of the window. In addition, click the **Sound On** checkbox if you wish to have a sound played when a survey measurement is out of compliance.

3. Depending on the elements selected in the **Show/Hide** ribbon, the floor plan will reflect the survey measurement.
4. Repeat **Step 1** through **Step 3** until the entire area served by the sources is covered.
5. Stop the survey by pressing the **Stop Survey** button 

.

During and after the survey, the floor plan reflects sources and data points in a number of ways. The selected elements in the **Show/Hide** ribbon dictate what is displayed in the floor plan. With the default selections, a floor plan might appear as shown in **Figure 41**.

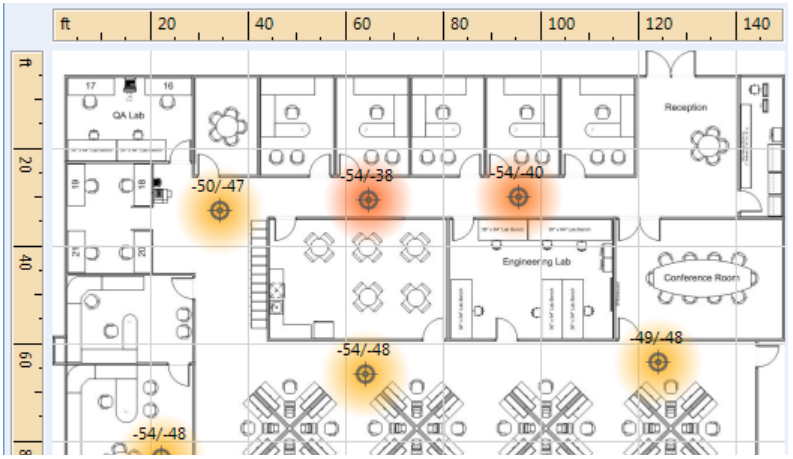
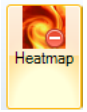


Figure 41. Floor Plan Display

Each of the measurements is labeled with up to the four strongest RSSI readings at that point, and is surrounded by a cloud that reflects the strongest signal strength in the palette legend. The cloud around the measurement becomes the propagation radius when the Wi-Fi Designer project was created.

Analyze the Results



In addition to the information available while taking the survey, further analysis is available through use of the Heatmap Analyze ribbon. Click the **Heatmap—Analyze** button to start the analysis. With the default Wi-Fi Designer settings, the heatmap might look as shown below.

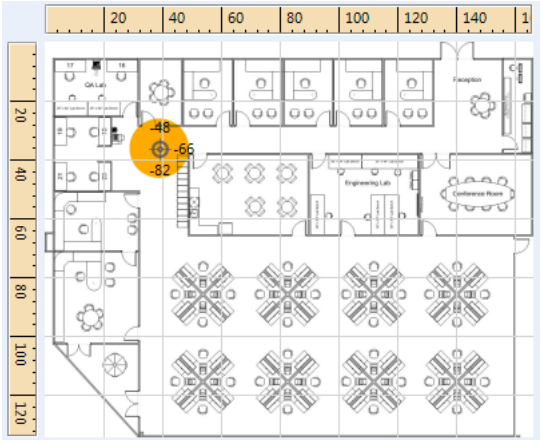


Figure 42. Heatmap Display

The display is similar to that shown while taking measurements, except that the RSSI clouds are replaced by circles whose radius is the propagation radius set in the project settings, as described in **Perform an SSID Centric Site Survey (page 48)**. In Analyze mode, several additional elements are added to the Setting panel that was originally described in **"Settings Panel" on page 22**.

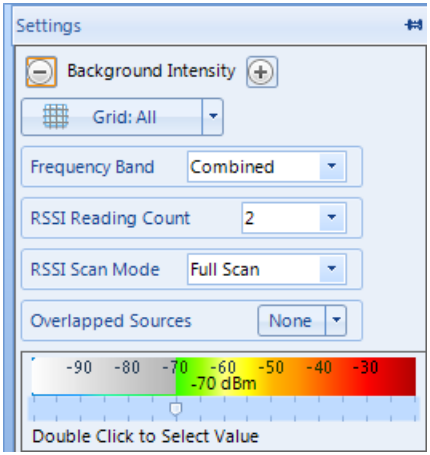


Figure 43. Additional Global Settings in SSID Centric Analyze Mode

The additional controls available are:

Field	Usage
RSSI Scan Mode	To speed up the survey, set this to **Quick Scan**. This will take measurements only on the channels of radios recently seen by a background scanner that runs constantly. For increased reliability, leave this at the default setting of **Full Scan**.
Overlapped Sources	This setting indicates the minimum number of sources that must cover a sample. A sample with fewer than this number of source readings is displayed in gray in the floor plan.
Color Band and Slider	The position of the slider in the color band indicates the minimum RSSI value acceptable for a reading.

Planning a Deployment

Planning mode is useful for helping you decide where to deploy Arrays in advance of performing a physical site survey. This is a practical first step to take before you **Perform a Device Centric Site Survey**. As with the other Wi-Fi Designer modes, you start with a floor plan, and drag and drop the desired Array models onto the map. In Planning mode, you may refine the floor plan by drawing in walls of various construction types to make the RF coverage model more accurate. You may further refine the Array deployment down to the level of individual radios by specifying the band (2.4GHz or 5 GHz) and transmit power of each radio.

The following sections will walk you through planning a wireless deployment based on Array placement on the floor plan map.

- **Creating a New Planning Project (page 60)**
- **The Project Window (Planning) (page 62)**
- **Set the Map's Scale and Display Options (page 64)**
- **Draw Walls (page 65)**
- **Select Sources (page 70)**
- **Analyze the Results (page 74)**

Creating a New Planning Project

Select the **New** option from the File Menu on the left, and click **Planning.** (**Figure 3**) The **Create New Wi-Fi Designer Project** dialog appears. (**Figure 44**)

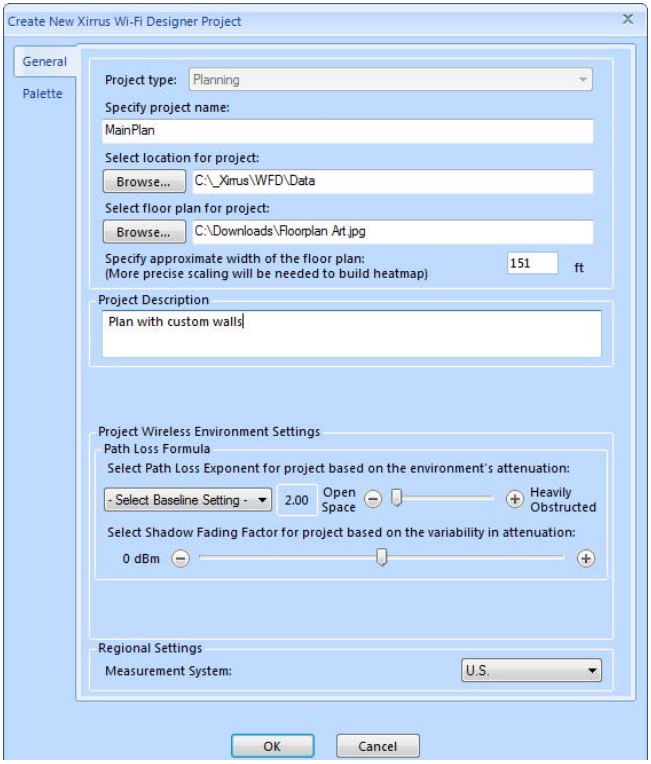


Figure 44. Create New Planning Project Dialog

The fields in this dialog are shown below. Press **OK** when all values have been set.

Tab	Field	Usage
General	Project Type	This field displays the type of project that was selected, in this case **Planning**.
	Specify project name	This should be set to a unique name for the project. The project will be saved in an .xwd file created beneath the project folder set in the next field.

Tab	Field	Usage
	Select location for project	This should be set to a central folder that will hold this project or all projects. The **Browse...** button may be used to find or create a folder.
	Select floor plan for project	This should be set to the name of a graphics file of one of the supported types as described in **"Preferred Image Formats" on page 8**.
	Specify approximate width of the floor plan	Indicate the approximate width of the site that is represented by the horizontal aspect of the floor plan. You will be required to more precisely specify the scale in a later step.
	Project Description	Optionally enter a comment related to the project.
	Project Wireless Environment Settings — Path Loss Formula	These settings specify the type of RF environment in the site that corresponds to the floor plan. Wi-Fi Designer uses the settings to estimate path loss (signal attenuation) through walls and other obstructions for this survey, over the entire site. First, **Select Baseline Setting** from the drop-down list to set the path loss exponent for the project. Select the closest match for your site, for example, **Office (Walled)** or **School**. The remaining settings allow you to make further adjustments. You may use the **Draw Walls** option to specify the environment more precisely. See **"Draw Walls" on page 65** and **Understanding Project Wireless Environment Settings (page 15)** for more information.
	Regional Settings	Select the **Measurement System** to be used: ● **U.S.** —This is the default. Distance is measured in feet. ● **Metric**—Distance is measured in meters.

Tab	Field	Usage
Palette		This field selects the color palette to be used while displaying RSSI signal strength. The first choice () shows a smooth gradation of strength. The second choice () shows a stepped display for each 5db. The third choice () offers slightly subdued colors and a smoother gradation.

The Project Window (Planning)

After you complete the **Create New Wi-Fi Designer Project** dialog as described in the previous section, the main Wi-Fi Designer window appears. This window is very similar to that used in the Device Centric Site Survey, with fewer ribbon choices. (**Figure 45**). To continue the site survey, proceed to **Set the Map's Scale and Display Options (page 64)**.

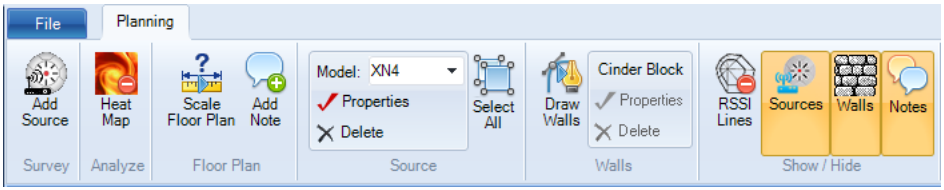


Figure 45. Planning Main Window Ribbon

Note that you can use the control on the upper right to collapse or expand the entire command ribbon. This is very useful when you're working on a tablet with limited screen size. The main elements of the project window are described in the following table for reference.

Field	Usage
Tabs	Two tabs are available: ● **File**—select this to display the File menu as described in **"File Menu Options" on page 39**. ● **Planning**—when selected displays the floor plan and associated controls.
Ribbons	Two buttons and four ribbon sections are used to run Wi-Fi Designer and control the display: ● **Add Source** Button—used to select Arrays to place on the map. ● **Heatmap (Analyze)** Button—displays the heatmap. ● **Scale Floor Plan**—sets the scale for the map and allows notes to be added to the map. ● **Source**—sets the properties associated with Arrays and selection of all Arrays. ● **Walls**—draw walls of the selected construction type on the floor plan. ● **Show/Hide**—shows or hides various elements on the map.
Floor plan	The floor plan associated with the project is displayed in the main body of the Wi-Fi Designer window, including any walls that you have drawn. Arrays, measurements, and heatmaps are placed on the floor plan.
Scale	The scale of the floor plan display is controlled by the slider on the lower right of the window. Click  to display the floor plan at its original resolution. Click  to fit the floor plan into the available space in the window.
Heatmap palette	The selected project palette is shown as a key to the heatmap display.
Settings	This panel includes several settings related to the floor plan display. See **Settings Panel (page 22)** for further details.

Show/Hide Elements	Usage
	When you disable display of one of the elements below, this red circle appears on the button.
RSSI Lines	If selected, contour lines are drawn indicating equal RSSI values. See **Figure 18** for an example of this display.
Sources	If selected, the sources are displayed. If not selected, the sources and corresponding data points for the sources are removed from the display.
Walls	If selected, the walls that you have drawn in are displayed.
Notes	If selected, any notes present on the floor plan are displayed.

Set the Map's Scale and Display Options

It is important to set the scale of each map in order for the results to display accurately and for location information to be as precise as possible. This is the same procedure as used in Device Centric Site Surveys, as described in **Set the Map's Scale and Display Options (page 20)**.

Draw Walls

When you created the planning project, you specified the Wireless Environment by selecting the predominant construction type at your site, for example, Office (Cubicles), Office (Walled), or Warehouse. Many sites have a combination of different areas with different types of construction. By drawing walls, you can specify precisely the location of walls (and windows and doors) that cause different levels of attenuation of RF signals. You can specify a type of wall construction, and then draw the walls on your floor plan in the correct location. If you have different types of walls at the site, they may all be represented.

If you are drawing walls, we recommend that you set the default **Wireless Environment-Path Loss Exponent** for the project to **2.00** or **Drawing Walls**, since the path loss for walls combines with other environment settings and a higher path loss setting is likely to produce an overly conservative heatmap. When you begin drawing walls, Wi-Fi Designer will prompt you to change this setting if the path loss exponent is above 2.00.

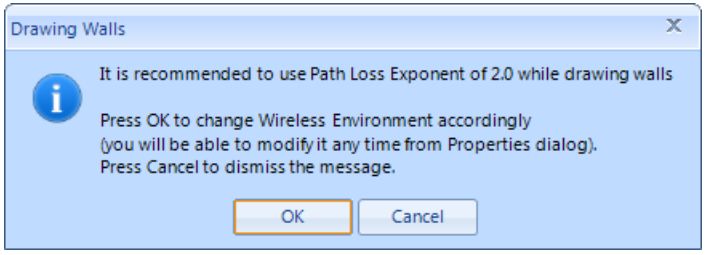


Figure 46. Wireless Environment Path Loss Exponent Warning

*If you select a Path Loss Exponent other than Drawing Walls for your Wireless Environment, **do not** draw walls that are already expected in the selected environment. For example, if you select Office (cubicles), the path loss exponent takes cubicle walls into account. If you were to explicitly draw cubicle walls as well, this would result in path loss calculations factoring in the cubicle walls twice.*

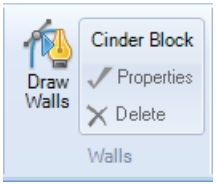


Figure 47. Controls for Drawing Walls

To draw walls, use the **Walls** section of the control ribbon as follows.

1. Click the construction type on the upper right of **Figure 47**. The Wall Properties dialog appears.

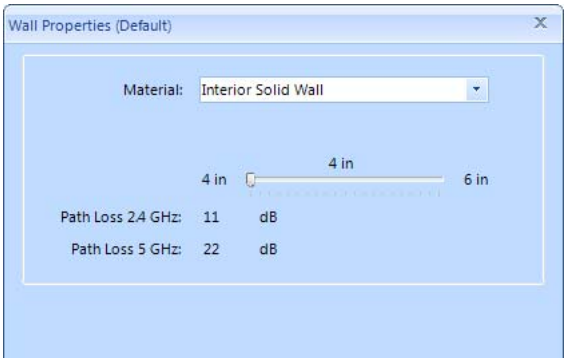


Figure 48. Specifying the Wall Material

2. Before drawing any walls on the map:
   a. Make sure that the walls will be displayed—check that **Walls** are enabled in the **Show/Hide** section of the control ribbon.
   b. We recommend that you set the default **Wireless Environment** for the project to **Drawing Walls**. (See **"Properties" on page 41**.) Attenuation factors for drawn walls and for the general environment and individual Arrays are additive. Similarly, consider the **Wireless Environment** set in the **Properties** of Arrays. (See **"Modify properties" on page 28**.)

3. Select the **Material** (type of construction) for the wall from the drop-down list. Note that **Path Loss** is displayed for that type of construction, for the 2.4 GHz and 5 GHz bands. Certain materials, (for example, **Interior Walls**, **Safety Glass-Wire**, and **Concrete Wall**) have a slider to select the thickness of the material. Note that walls of a similar kind may differ in their construction. You may wish to check the actual path loss values at your site against the values defined in the Wi-Fi Designer. You may create your own custom materials as described in the next paragraph.

   If none of the Material choices are appropriate for your situation, select **Custom** to define your own material. Enter a name for your **Custom Material**, then enter the **Path Loss** values for **2.4 GHz** and **5 GHz**. Your new material will be selected, and will be added at the bottom of the drop-down list, flagged with an asterisk (*) to indicate that it is a custom material. Any custom materials that you add will be defined for the current project only.

4. Click the **Draw Walls** button. The mouse pointer changes to the **Walls** pointer.

   Any time you are done working with walls and wish to return to the normal pointer, click the **Draw Walls** button again.

5. Use the mouse to move the Walls pointer to the starting point of a wall. Click and drag to the desired end point, and release the mouse button to terminate the line segment. (**Figure 49**)

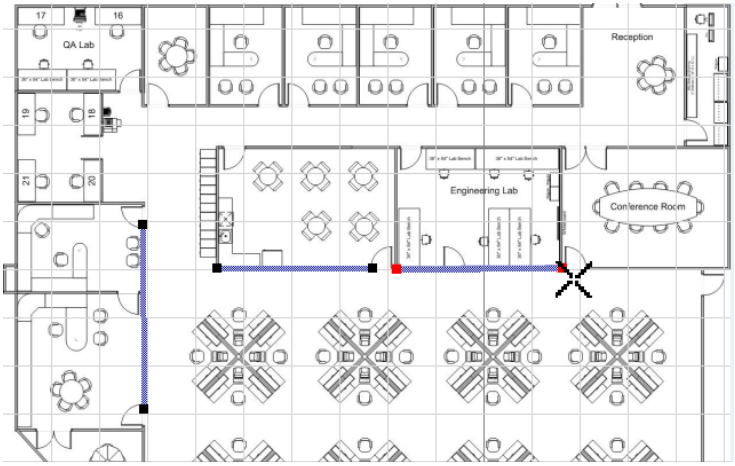


Figure 49. Drawing Walls

You may repeat this process to enter as many walls of the same material as you need. If you end a wall very close to the endpoint of another wall, they will snap together to form a corner. This snap feature is only active for connecting two endpoints.

6. To draw additional walls constructed of a different material, just change the material as explained in **Step 3**, and proceed to draw the new walls.

7. Hover the mouse pointer over a line, and the wall's construction material and path loss properties are displayed after a moment.

   Click on a wall to select it (you must be in Draw Walls mode for this, and many of the following actions). You may click on a wall's endpoint to change where the line ends by dragging the endpoint.

   Right-click anywhere on a line to display its material type, plus the menu options below. If multiple lines are selected, the right-click menu typically only applies to the line that you right-clicked.

   a. **Properties**: displays the Wall Properties dialog (**Figure 48**) so that you can change the **Material** type of the wall. See **Step 3**. If multiple walls are selected, you may edit their properties in one step. Check the **Apply to Selected Objects** checkbox to allow multiple walls to be changed.

b. **Select/Unselect**: When a wall is selected, both endpoints turn red. You may use this to select multiple walls. Note that you may also select multiple walls using ctrl+click. Use the **Select All Walls** option to select all of the walls on the floor plan.

c. **Delete**: Removes this wall. You may also use the Delete key on your keyboard to delete all selected walls. Use Ctrl+click to select multiple walls.

d. **Join Walls**: If you have already selected another wall, you may use this option to join the current wall to it. Walls will automatically join if you draw a new wall that ends near the end of another wall. You may join walls of different material types, for example, cinder block to plasterboard.

   Some notes on joining walls:

   - This action can only be applied to two walls at a time—to join a third wall, simply join it to one of the others.
   - If the walls cannot be joined, the option will not appear in the drop-down menu.
   - Walls that are joined do not actually become one line, and may be selected and edited independently.
   - Walls that intersect (cross) each other are not considered to be joined.
   - If two walls are to be joined one or both of them will be made longer to reach an intersection point. Walls are never made shorter.

8. Note that you cannot move a wall directly. You may delete it, and then draw it at the correct location. Alternatively, you may move first one end and then the other to place it in the correct location.

9. When you are done working with walls, click the **Draw Walls** button again to exit walls mode. When not in walls mode, you may still right-click a wall to display a drop-down menu that shows the construction material and allows you to **Edit** or **Delete** the wall. You may also hover the mouse over a wall to show its properties, just as in walls mode.

Select Sources

Planning a deployment involves placing one or more Arrays on the map.

Before placing any sources on the map, make sure that they will be displayed—see **"Show/Hide Ribbon Settings:" on page 34**.

Click the **Add Source** button in the Survey ribbon 

to place an Array onto the floor plan. A dialog requesting details associated with the Array will be displayed. (**Figure 50**)

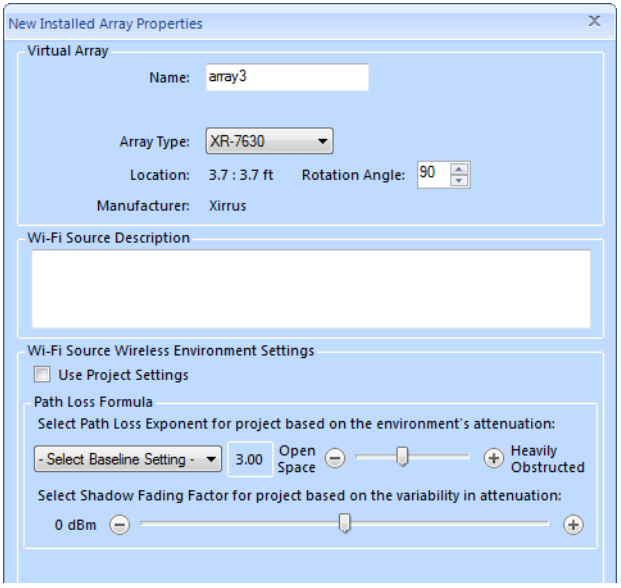


Figure 50. Planning Project—Array Properties (Showing Path Loss Exponent Override)

The floor plan may need to be scaled or scrolled to make the location visible with sufficient resolution. The location of the cursor with respect to the floor plan is updated in real time in the lower left hand corner of the window. The location of the source may be adjusted on the map later, as needed.

The Array properties are described in the following table.

Field	Usage
Name	The desired name of the Array. By default, the first Array will be named **array1**, followed by **array2**, etc.
Array Type	Selects the model of the Xirrus Array.
Location	A read only field for the location of the Array on the map.
Rotation Angle	Specify the orientation of the Array on the map, in degrees. The default is 90 degrees, which means that iap1 points to the top of the map. 0 degrees points iap1 to the right on the map.
Wi-Fi Source Description	A textual description of the particular Array.
Wi-Fi Source Wireless Environment Settings	These are a subset of the project settings described in **Creating a New Planning Project (page 60)**. The **Use Project Settings** checkbox indicates that the settings from the project are to be used, or overridden. This is the default value. You may wish to override the project settings for an Array placed in a different environment than the remainder of the floor plan. In this case, you must uncheck the **Use Project Settings** checkbox to enable using the rest of the fields Note that if most of the RF environment is specified explicitly by drawing walls, you should select **Drawing Walls** for the **Wireless Environment**. Since RF attenuation is additive, any Path Loss value specified here, such as selecting **Office (Walled)** is added to the explicit value of drawn walls. See **"Understanding Project Wireless Environment Settings" on page 15** for more information.

The new Array is placed at the upper left hand corner of the map. Move the Array to the desired location using common mouse controls, described in **"Working with Sources (Copy and Paste, Modify Properties, etc.)" on page 27**. You may create or copy additional Arrays onto the map as required.

Proceed to the next section, **Refine Radio Settings**.

Refine Radio Settings

Wi-Fi Designer allows you to specify settings for individual radios on Arrays. You may enable and disable radios, designate the monitor radio, select operating bands, and adjust transmit power. These settings will be taken into account when the project heatmap is computed. The heatmap and RSSI lines will show antenna patterns for your radio settings.

Hover the mouse over an Array to display a summary of the radio settings. (**Figure 51**) The monitor radio is indicated. For each of the other radios, the list shows the assigned band, the transmit power, and whether the radio is on or off.

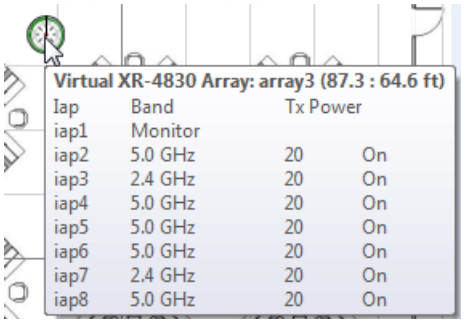


Figure 51. Array Radio List

Double-click the Array to show its Radio View. (**Figure 51**) Each radio is represented by a labeled wedge. Double-click again if you wish to toggle back to the normal view.

The wedges are displayed in the following colors:

- Blue—Radio is on and operating in the 5 GHz band. Transmit power is also shown.
- Green—Radio is on and operating in the 2.4 GHz band. Transmit power is also shown.
- White—Radio is designated as the monitor radio, and thus not available to wireless clients, or radio is off (disabled).

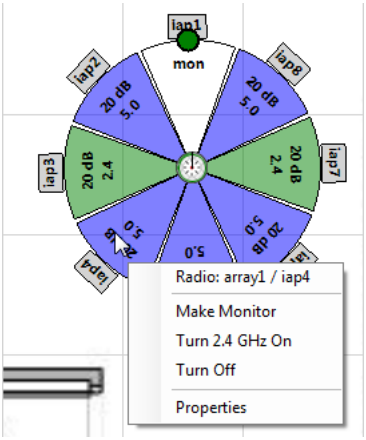


Figure 52. Array Radio View

There are several ways to change radio settings:

- Double-click on a wedge to toggle the radio on or off.
- Right-click on the wedge for the desired radio to display the drop-down menu shown above. This menu allows you to:
  - **Make Monitor**—make this IAP a monitor radio. Note that if a different radio was previously the monitor, that radio will lose its monitor status and will be switched off.
  - **Turn 2.4 GHz On / Turn 5 GHz On**—set this radio to the 2.4 GHz or 5 GHz band and turn it on.
  - **Turn Off**—disable this radio.
- To change **Tx Power** (1 to 20 dBm), right-click the wedge for the desired radio and select **Properties** from the drop-down menu shown above. This dialog box (**Figure 53**) also allows you to make the changes listed above.
- To adjust the orientation of the Array, click and hold the green dot located beneath the **iap1** label. Use it to rotate the Array until the direction that **iap1** is facing on the map is the desired direction for deployment. This generally means that the monitor radio is facing in the direction of least desired wireless coverage.

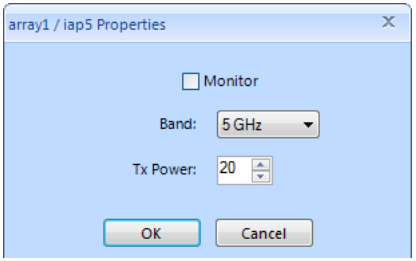
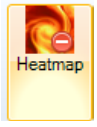


Figure 53. Array Radio Properties

Analyze the Results



Click the **Heatmap—Analyze** button to start the analysis. With the default Wi-Fi Designer settings, the heatmap might look as shown below. (**Figure 54**). At all times, make sure to select the sources to be considered in the analysis, or use the **Select All** button in the **Source** ribbon to select all Arrays.

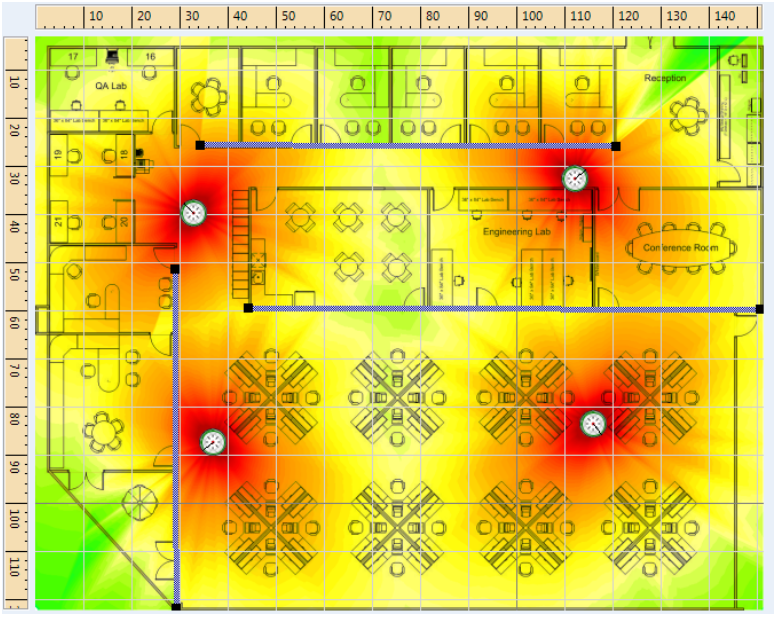


Figure 54. Planning Analysis Display (with Hollow Walls)

In the heatmap, you may double click an Array to view its radio settings. The settings may be modified as described in **"Refine Radio Settings" on page 72**. For example, in **Figure 55**, IAPs 4, 5, and 6 have been turned off. If you hover the mouse over an Array, a summary of radio settings is displayed, as described for **Figure 51**.

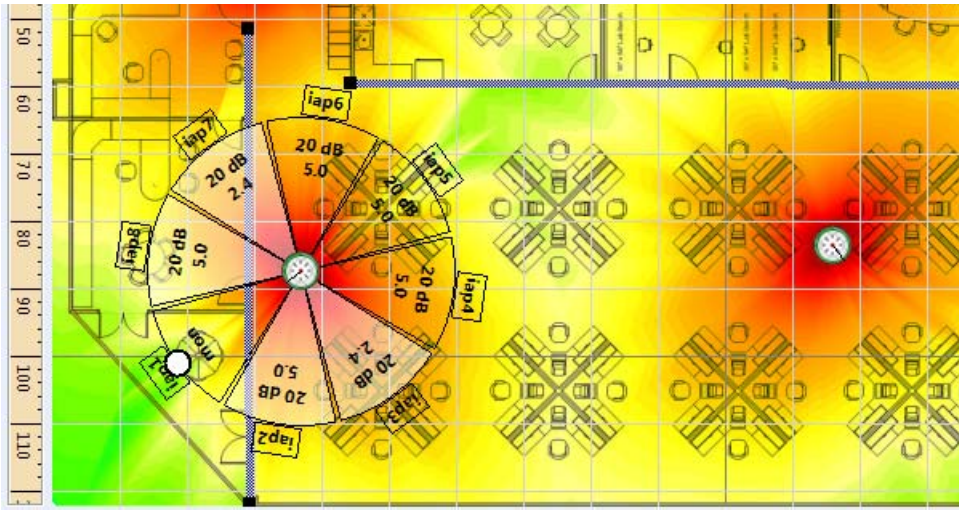


Figure 55. Planning Analysis Display with Radio Display (IAPs 4,5,6 Disabled)

The heatmap with RSSI Lines enabled is shown in **Figure 56**.

Arrays may be moved or additional Arrays placed until the desired coverage is achieved.

As in the two Site Survey modes, you may click the Settings tab on the right to open the Settings panel. (See **"Settings Panel" on page 22**.) Use this panel to:

- Lighten or darken the display of the background floor plan map.
- Display or hide the map grid lines.
- Select which bands to display—2.4 GHz, 5 GHz, or both
- Select a number of overlapped sources to check for. For example, if you select the number 4, then areas that have wireless coverage from at least 4 separate Arrays will display in the usual way. Areas that have coverage

from fewer sources are displayed in gray tones. Select **None** if you do not wish to consider how many wireless sources are available at any location (in this case the heatmap shows areas that have coverage from at least one radio).

- Click in the palette or drag the slider underneath to specify a minimum acceptable signal strength. (**Figure 57**)

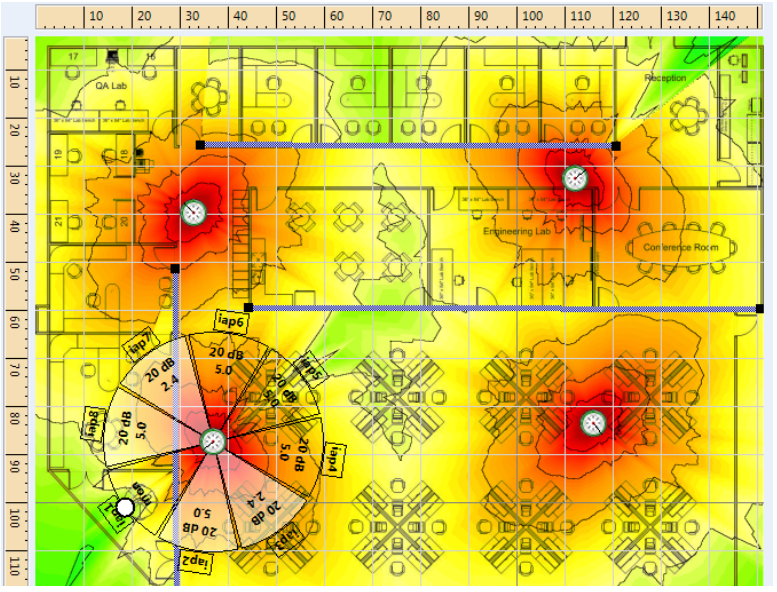


Figure 56. Planning Analysis Display with RSSI Lines

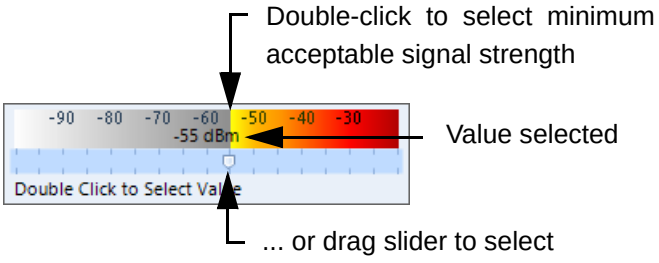


Figure 57. Minimum Acceptable Signal Strength in the Settings Panel

The map will show areas that do not meet this criterion (i.e., that have unacceptable signal strength) in gray tones. (**Figure 58**)

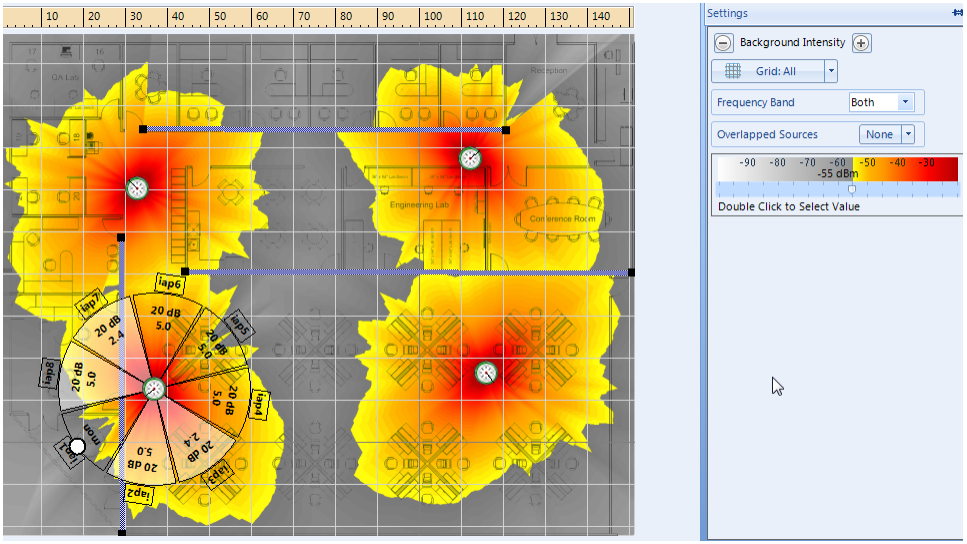


Figure 58. Planning Analysis Display Showing Unacceptable Signal Strength

Customer Support

The Xirrus Customer Support web site provides online documents and tools for troubleshooting and resolving technical issues with Xirrus products and technologies. Access to all tools on the Xirrus Customer Support Website requires a login user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at:
http://support.xirrus.com.

To request additional assistance, please contact Xirrus Customer Support via:

- Email at: support@xirrus.com.
- Live chat with one of the Xirrus Customer Support Representatives at: http://support.xirrus.com.
- Call Xirrus at the following numbers:

United States and Canada	+1.800.947.7871 (US Toll Free) or +1.805.262.1600 (Direct)
Europe, Middle East, and Africa	+44.20.3239.8644
Australia	1300.947.787 (within Australia Only)
Asia and Oceania	+61.2.8006.0622
Latin, Central, and South America	+1.805.262.1600

XIRRUS
WI-FI NETWORKS

1.800.947.7871 Toll Free in the US
+1.805.262.1600 Sales
+1.805.262.1601 Fax
2101 Corporate Center Drive
Thousand Oaks, CA 91320, USA

To learn more visit:
xirrus.com or
email info@xirrus.com

812-0092-001 RevH