



Aruba RF Plan™ For Windows v2.0.3 User's Guide

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Preface

This preface includes the following information:

- A list of related documentation for further reading
- A key to the various text conventions used throughout this manual
- Aruba Wireless Networks support and service information

Related Documents

The following items are part of the complete documentation for the Aruba system:

- *Aruba AirOS User's Guide*
- *Aruba RF Director Starter's Guide*

Text Conventions

The following conventions are used throughout this manual to emphasize important concepts:

TABLE 1 Text Conventions

| Type Style | Description |
|--------------------------|---|
| <i>Italics</i> | This style is used to emphasize important terms and to mark the titles of books. |
| System items | This fixed-width font depicts the following: <ul style="list-style-type: none">● Sample screen output● System prompts● Filenames, software devices, and certain commands when mentioned in the text. |
| Commands | In the command examples, this bold font depicts text that the user must type exactly as shown. |
| <i><Arguments></i> | In the command examples, italicized text within angle brackets represents items that the user should replace with information appropriate to their specific situation. For example: # send <i><text message></i> In this example, the user would type “send” at the system prompt exactly as shown, followed by the text of the message they wish to send. Do not type the angle brackets. |
| [Optional] | In the command examples, items enclosed in brackets are optional. Do not type the brackets. |
| { Item A Item B } | In the command examples, items within curled braces and separated by a vertical bar represent the available choices. Enter only one choice. Do not type the braces or bars. |

Contacting Aruba Wireless Networks

Web Site

- Main Site <http://www.arubanetworks.com>
- Support <http://www.arubanetworks.com/support>

E-mail

- Sales sales@arubanetworks.com
- Support support@arubanetworks.com

Telephone Numbers

- Main 408-227-4500
- Fax 408-227-4550
- Sales 408-754-1201
- Support In the U.S.: 800-WI-FI-LAN (800-943-4526)
International: 408-754-1200

The Aruba RF Plan Tool

RF Plan is a three-dimensional wireless deployment modeling tool that enables Network Administrators to design an efficient Wireless Local Area Network (WLAN) for their corporate environment, optimizing coverage and performance, and eliminating complicated WLAN network setup.

RF Plan provides the following critical functionality:

- Defines WLAN Coverage
- Defines WLAN environment security coverage
- Assesses equipment requirements
- Optimizes radio resources
- Creates an exportable WLAN profile that may be imported into an Aruba switch and be used to configure and deploy the WLAN.

RF Plan provides a view of each floor, allowing Network Administrators to specify how Wi-Fi coverage should be provided. RF Plan then provides coverage maps and AP/AM placement locations.

Unlike other static site survey tools that require administrators to have intricate knowledge of building materials and other potential Radio Frequency (RF) hazards, RF Plan calibrates coverage on the fly through a sophisticated RF calibration algorithm. This real-time calibration lets administrators characterize the indoor propagation of RF signals in order to determine the best channel and transmission power settings for each AP. Real-time calibration can be automatically programmed or manually undertaken at any time in order to quickly adapt to changes in the wireless environment.

Getting Started

System Requirements

Aruba RF Plan requires the a PC with the following:

- Intel Pentium® III 800Mhz (minimum) or equivalent
- 128MB RAM
- 10MB available hard drive space
- Windows 2000 or Windows XP
- Microsoft Internet Explorer 6.0 (or higher)
- Macromedia Flash 6.0 (of higher) plug-in for Internet Explorer

Installing RF Plan

To install RF Plan, use the following procedure.

NOTE—RF Plan only runs on Windows 2000 and Windows XP.

- 1 Locate the file named *Aruba RF Plan.zip*.
- 2 Unzip the file.
- 3 Launch *setup.exe*.

The installer will automatically place the files in the following directory:

C:\Program Files\Aruba RF Plan

Launching RF Plan

Launching RF Plan is like any other Windows program installed on your PC. From the desktop taskbar, select the following:

Start > All Programs > Aruba Offline RF Plan > Aruba RF Plan

RF Plan Basics

Page Summary

The following is a summary of the functionality of each of the pages in RF Plan.

- **Building List Page** The Building List is the first page displayed when RF Plan is launched. This page provides a list of buildings that you have created and saved. You may use this page to add or delete buildings from your saved database. You may also import or export buildings here.
- **Building Specifications Overview Page** The Building Specifications Overview page allows you to see all the dimensional data and modeling parameters for your buildings.
- **Building Specification Page** Specify the dimensions of your building and name it in the Building Specifications page.
- **AP Modeling Page** Specify the AP Modeling parameters on this page.
- **AM Modeling Page** Specify the AM Modeling parameters on this page.
- **Import and Export** Use this page to import and export building database files.
- **Planning Floors Page** The Planning Floors page allows you to see approximate coverages of APs and AMs, as well as any floor plans you may have imported as background images.
- **Floor Editor Page** Use this page to upload background images for each floor, name the floor and delete floors.
- **Area Editor Page** Use this page to specify areas on each floor where coverage is not desirable or where Access Points/Air Monitors may not be physically deployed.
- **Access Editor Page** Use this page to manually create, position, or configure Access Points or Air Monitors.
- **AP Plan** The AP Plan page is used to initialize the position of Access Points and launch RF Plan's positioning algorithm.
- **AM Plan** The AM Plan page is used to initialize the position of Air Monitors and launch RF Plan's positioning algorithm.

Screen Layout

When RF Plan is started, the browser window will show the default RF Plan page. For ease of navigation, all of the pages in the RF Plan tool have a similar page structure. For example, as shown on the Building Overview page:

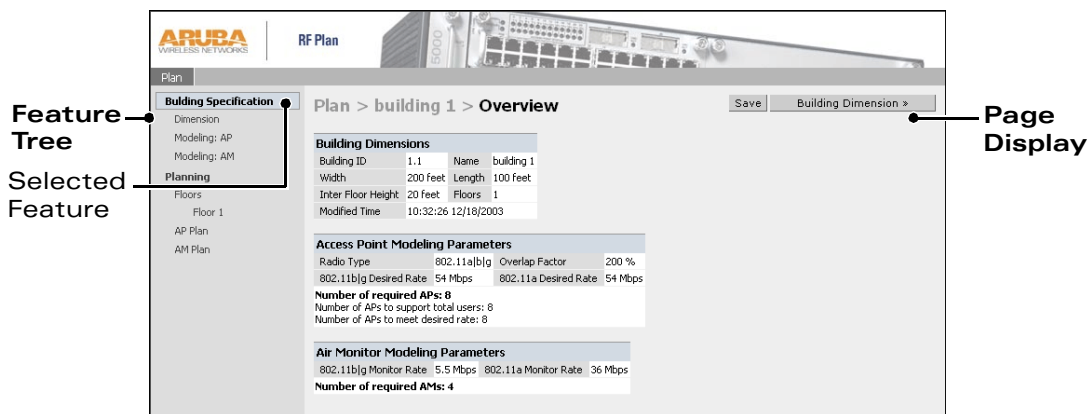


FIGURE 1 RF Director Page Elements

- **Feature Tree**—Each feature has its own information or configuration pages and sub-pages. The feature tree lists all of the available features. You can navigate to any of the listed features by clicking on the feature name.
- **Selected Feature**—The name of the currently selected feature is highlighted in the feature tree.
- **Page Display**—This area displays all the information and/or input fields relevant to the selected feature.

Page Fields

Each tool in the RF Plan has its own unique information or configuration pages, each with specialized data and control fields. Some of the page items appear on multiple pages and provide a similar navigation or configuration function in each.

- **Information Fields**—These fields are used only for displaying information. The data in these fields cannot be edited directly on the displayed screen.
- **Data Entry Fields**—Boxed text fields contain user-configurable data. To enter or edit the information, click inside the field box.

- Pull-down Menus—These fields allow you to select an item from a preset list. The currently selected item is displayed in the box. When the arrow button is selected, a list of available options will appear. You can change the current selection by clicking on any item in the options list.
- Scrolling Menus—These fields allow you to select an item from a preset list. Use the scroll arrows to view the available options. To select a specific item from the list, click on the item when displayed.
- Check Boxes—These fields are represented as small squares in front of the item text. These fields allow you to turn items on or off by clicking on the check box. A feature or option will be turned on, selected, or enabled (as appropriate) when the box is checked. A feature or option will be turned off, unselected, or disabled when the box is empty.
- Radio Buttons—These fields are represented as small circles in front of the item text. When a group of these items appears together, only one can be selected at any given time. An item is selected when its circle is filled. An item is unselected when the circle is empty.

Applying and Saving

When you edit information on any of the RF Plan pages you need to apply that information before it is effective. However, applying the information doesn't save it to your hard drive. You must click on the Save button to permanently save the information.

The following buttons are generally available on configuration pages.

- Apply—Accept all configuration changes made on the current page (does not save changes).
- Save—Save all applied configuration changes made since during this configuration session to a database file. Unsaved configuration changes will be lost when the RF Plan tool is exited.

Important Tip

NOTE—Always Apply. If you advance to the next step without clicking on the Apply button the information will be lost.

Next Step Button

RF Plan will sequence you through all the pages as you setup your WLAN. When you have finished entering the information for each page, click on the Next Step button located in the upper right-hand portion of the page.

Using RF Plan

Task Overview

Before you begin, review the following points. These points outline the general steps to create a building model and to plan the WLAN for it.

- Gather information about your building's dimensions and floor plan
- Determine the level of coverage you want for your Access Points and Air Monitors
- Create a new building and add its dimensions
- Enter the parameters of your Access Point coverage
- Enter the parameters of your Air Monitor coverage
- Add floors to your building and import the floor plans
- Define special areas
- Generate suggested AP and AM tables by executing the AP/AM Plan features
- Export the building

Planning Requirements

You should collect the following information before beginning to plan your network. Having the information below readily available will expedite your planning efforts.

- Building Dimensions
- Number of floors
- Distance between floors
- Number of users and number of users per AP
- Radio type(s)
- Overlap Factor
- Desired data rates for access points
- Desired monitoring rates for air monitors
- Areas of your building(s) that you don't necessarily want coverage
- Areas of your building(s) where you don't want to, or cannot, deploy an AP or AM
- Any area where you want to deploy a fixed AP or AM

| Building Dimensions | |
|---------------------|--------|
| Height: | Width: |
| Number of Floors: | |

| User Information | |
|------------------|---------------|
| Number of Users: | Users per AP: |
| Radio Types: | |
| Overlap Factor: | |

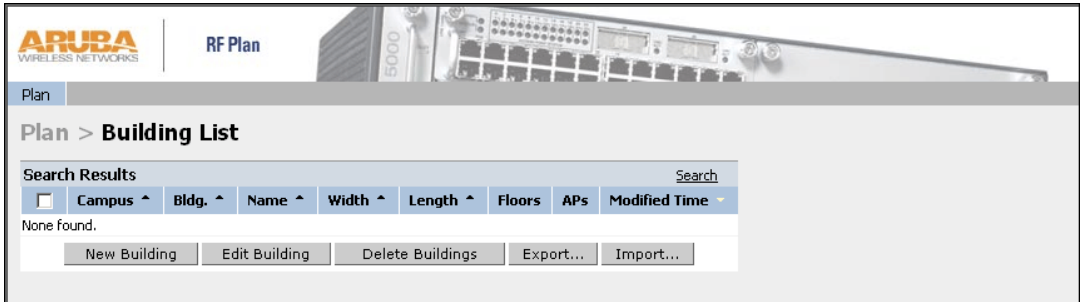
| AP Desired Rates | |
|------------------|----------|
| 802.11b g: | 802.11a: |
| AM Desired Rates | |
| 802.11b g: | 802.11a: |

| Don't Care/Don't Deploy Areas |
|-------------------------------|
| |
| |
| |

Building Pages

Building List Page

The Building list is the first page you see when you start RF Plan. This list contains all the buildings you have defined using the RF Plan software. The first time you run the application, there should be no buildings in the list.



You may add, edit, and delete buildings using this window. You may also import and export buildings. This page includes the following buttons:

- **New Building** Use this button to create a new building. See [“Building Specifications Overview Page” on page 9.](#)
- **Edit Buildings** Use this button to edit existing buildings in the building list. See [“Building Specifications Overview Page” on page 9.](#)
- **Delete Buildings** Use this button to delete existing buildings in the building list.
- **Export** Use this button to export a database file with all the specifications and background images of a selected building(s) in the building list. See [“Import and Export” on page 16.](#)
- **Import** Use this button to import database files defining pre-existing buildings into the RF Plan building list. See [“Import and Export” on page 16.](#)

Building Specifications Overview Page

The Overview page shows the default values for your new or existing building, most of which you can change in the following pages.

The screenshot shows the Aruba RF Plan tool interface. The top left features the Aruba logo and 'RF Plan' text. The main content area is titled 'Plan > building 1 > Overview'. On the left, there is a sidebar with 'Building Specification' selected, showing options for Dimension, Modeling (AP, AM), and Planning (Floors, Floor 1, AP Plan, AM Plan). The main area contains three sections: 'Building Dimensions', 'Access Point Modeling Parameters', and 'Air Monitor Modeling Parameters'. The 'Building Dimensions' section includes a table with fields for Building ID, Name, Width, Length, Inter Floor Height, Floors, and Modified Time. The 'Access Point Modeling Parameters' section includes a table for Radio Type, Overlap Factor, and Desired Rates for 802.11b/g and 802.11a, along with the number of required APs. The 'Air Monitor Modeling Parameters' section includes a table for Monitor Rates for 802.11b/g and 802.11a, along with the number of required AMs. A 'Save' button and a 'Building Dimension >' button are located in the top right corner of the main area.

| Building Dimensions | | | |
|---------------------|---------------------|--------|------------|
| Building ID | 1.1 | Name | building 1 |
| Width | 200 feet | Length | 100 feet |
| Inter Floor Height | 20 feet | Floors | 1 |
| Modified Time | 10:32:26 12/18/2003 | | |

| Access Point Modeling Parameters | | | |
|----------------------------------|-------------|----------------------|---------|
| Radio Type | 802.11a b g | Overlap Factor | 200 % |
| 802.11b g Desired Rate | 54 Mbps | 802.11a Desired Rate | 54 Mbps |

Number of required APs: 8
Number of APs to support total users: 8
Number of APs to meet desired rate: 8

| Air Monitor Modeling Parameters | | | |
|---------------------------------|----------|----------------------|---------|
| 802.11b g Monitor Rate | 5.5 Mbps | 802.11a Monitor Rate | 36 Mbps |

Number of required AMs: 4

The Overview page includes the following:

- Building Dimensions: Your building's name and dimensions
- Access Point Modeling Parameters
- Air Monitor Modeling Parameters
- Building Dimensions button (in the upper right-hand corner of the page). Click on this button to edit the building dimensions settings.

Building Specification Page

The Building Specification Page allows you to specify the identity of your building and its dimensions. To access this page, click on the Building Dimension button in the upper right-hand corner of the Building Specifications Overview page.

The screenshot shows the Aruba RF Plan interface. At the top left is the Aruba Wireless Networks logo. The page title is 'RF Plan'. Below the logo is a navigation menu with 'Plan' selected. The main content area is titled 'Plan > building 1 > Specification'. On the right side of this area are 'Save' and 'AP Modeling Spec. >' buttons. The 'Edit' form contains the following fields:

| | | | | | |
|--------------------|-----|---|--------|------|------------|
| Building ID | 1 | . | 1 | Name | building 1 |
| Width | 200 | | Length | 100 | |
| Inter Floor Height | 20 | | Unit | feet | |
| Floors | 1 | | | | |

An 'Apply' button is located at the bottom of the form.

Naming Your Building

Naming your building is as simple as entering the correct values in the text boxes in the Dimension window.

- **Building ID** This consists of two decimal numbers separated by a dot. The first is the campus ID. The campus ID will always be “1” if there is only one campus. The second is the building number.

The valid range for these fields is any integer from 1 to 255.

- **Building Name** Enter a user friendly name for the building.

The Building Name may be an alpha-numeric string up to 64 characters in length.

Dimensioning Your Building

Entering the correct values in the text boxes in the Dimension window.

- **Width & Height** Enter the rectangular exterior dimensions of the building.

The valid range for this field is any integer from 1 to a value corresponding to 1×10^{12} .

If your building has an irregular shape, the width and height should represent the maximum height and width of the overall footprint of the building as seen from above. For example:



When height and width are specified, RF Plan creates a rectangular area in the Planning feature pages that represent the overall area covered by the building. You will need to import an appropriate background image (see [“Floor Editor Page” on page 20.](#)) to aid you in defining areas that don’t require coverage or areas in which you do not wish to deploy Access Points and Air Monitors (see [“Area Editor Page” on page 21.](#))

- **Inter-floor Height** This is the distance between floor surfaces in the building.

The valid range for this field is any integer from 1 to a value corresponding to 1×10^{12} .

NOTE—This is *not* the distance from floor to ceiling. Some buildings have a large space between the interior ceilings and the floor above.

- **Floors** Enter the number of floors in your building here.

The valid range for this field is any integer from 1 to a value corresponding to 1×10^{12} .

- **Units** Specify the units of measurement for the dimensions you specified on the page. The choices are feet and meters.

AP Modeling Page

The AP Modeling page allows you to specify all the information necessary for RF Plan to determine the appropriate placement of your APs.

The screenshot displays the Aruba RF Plan interface for configuring AP modeling parameters. The left sidebar shows a navigation tree with 'Modeling: AP' selected. The main panel, titled 'Plan > Mad House 1 > AP Modeling Parameters', features an 'Edit' section. In this section, the 'Radio Type' is set to '802.11a|b|g' and the 'Overlap Factor' is '200 % High'. Under the 'Design Model' section, the 'Coverage' radio button is selected. The 'Total Users' field is set to 50, and 'Users / AP' is set to 1.2. The '802.11b|g Desired Rate' is set to 54 Mbps, and the '802.11a Desired Rate' is also set to 54 Mbps. The 'APs' field is currently empty. A summary below these fields indicates 'Number of required APs: 8', with sub-totals for total users and desired rate. An 'Apply' button is located at the bottom of the form.

Controls on this page allow you to select or control the following functions, each of which is described in further detail in the following sections:

- **Radio Type** Use this pull-down menu to specify the radio type.
- **Overlap Factor** Use this field and pull-down to specify an overlap factor.
- **Design Model** Use these radio buttons to specify a design model to use in the placement of Access Points.
- **Rates** Use this pull-down to specify the data rates desired on Access Points.
- **Users** Use this field to specify the number of users on your WLAN.

Radio Type

Specify the radio type(s) of your APs using the pull-down Radio Type menu on the Modeling Parameters page. Available Radio Type Choices:

- **801.11a** 5GHz, Orthogonal Frequency Division Multiplexing (OFDM) with data rates up to 54Mbps.
- **802.11b** 2.4GHz, Direct Spread Spectrum (DSSS) multiplexing with data rates up to 11Mbps.
- **802.11g** 2.4GHZ, OFDM/CCK (Complementary Code Keying) with data rates up to 54Mbps.

Overlap Factor

The Overlap Factor is the amount of signal area overlap that you want when the APs are operating. Overlap is important if an AP fails. It allows the network to self-heal with adjacent APs powering up to assume some of the load from the failed device. Although there may be no holes in coverage in this scenario, there will likely be a loss of throughput. Increasing the overlap will allow for higher throughputs when an AP has failed and will allow for future capacity as the number of users increases.

The valid range of values for the overlap factor are from 100% to 1000%.

Design Models

Three radio buttons on the page allow you to control the kind of model which will be used to determine the number and type of APs.

Design Model Radio Button Options:

- Coverage Use this option to let RF Plan automatically determine the number of APs based on desired data rates and the configuration of your building.
- Capacity Use this option to let RF Plan determine the number of APs based on the total number of users, ratio of users to APs, and desired data rates.
- Custom Use this option to simply specify a fixed number of APs.

The desired rate is selectable from 1 to 54 Mbps in both the Coverage and Capacity models.

Users

NOTE—The Users text boxes are active only when the Capacity model is selected.

Enter the number of users you expect to have on your WLAN in the Users text box. Enter the number of users per access point you expect in the Users/AP text box.

The numbers entered in the these two text boxes must be no-zero integers between 1-255 inclusive.

Rates

NOTE—The Rate pull-down menus are active only when the Coverage or Capacity design models are selected.

Select the desired data rates from the pull-down menus for 802.11b/g and 802.11a.

High data transmission rates will require an increased number of AP to be placed in your building. You should carefully evaluate your user's data rate needs.

AM Modeling Page

The AM Modeling page allows you to specify all the information necessary for RF Plan to determine the appropriate placement of your AMs.

The screenshot shows the Aruba RF Plan interface. The top left has the Aruba logo and 'RF Plan' text. Below it is a 'Plan' tab. The main content area is titled 'Plan > Headquarters > AM Modeling Parameters'. On the left, there is a sidebar with 'Building Specification' (Dimension, Modeling: AP, Modeling: AM) and 'Planning' (Floors, Floor 1, AP Plan, AM Plan). The main area has an 'Edit' section with radio buttons for 'Coverage' (selected) and 'Custom'. It includes two dropdown menus for '802.11b/g Monitor Rate' (5.5 Mbps) and '802.11a Monitor Rate' (36 Mbps), a text input for 'AMs' (0), and a 'Number of required AMs: 4' display. An 'Apply' button is at the bottom.

Controls on this page allow you to select or control the following functions, which are explained in more detail in the sections that follow:

- **Design Model** Use these radio buttons to specify a design model to use in the placement of Air Monitors.
- **Monitor Rate** Use this pull-down menu to specify the desired monitor rate for your Air Monitors.
- **AMs** Use this field to manually specify the number of Air Monitors to deploy (Custom Model only).

Design Models

Two radio buttons on the page allow you to control the kind of model which will be used to determine the number and type of APs.

Design Model Radio Button Options:

- Coverage Use this option to let RF Plan automatically determine the number of AMs based on desired monitor rates and the configuration of your building.
Desired rate is selectable from 1 to 54 Mbps in the Coverage model.
- Custom Use this option to simply specify a fixed number of AMs. When the AM Plan portion of RF Plan is executed, RF Plan will make an even distribution of the AMs.

NOTE—The monitor rates you select for the AMs should be less than the data rates you selected for the APs. If you set the rate for the AMs at a value equal to that specified for the corresponding PHY type AP, RF Plan will allocate one AM per AP. If you specify a monitor rate larger than the data rate, RF Plan will allocate more than one AM per AP.

Monitor Rates

Use the drop down menus to select the desired monitor rates for 802.11b/g and 802.11a air monitors.

NOTE—This option is available only when the coverage design model is selected.

Import and Export

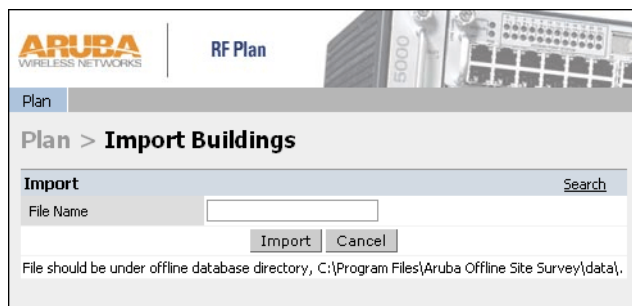
RF Plan allows you to import and export files that define the parameters of your buildings. The files that you import and export are XML files and depending on how many floors your buildings have, and particularly how many background images you have for your floors, the XML files may be quite large. (See “Background Images” on page 20.)

Buildings exported from RF Plan will be imported into an Aruba switch and used by the version of RF Plan that is integrated into the RF Director Software. The exported building file contains all the data about the building(s) you created using RF Plan. The integrated RF Plan in RF Director gives you the ability to automatically configure the APs and AMs that are actually connected to the switch using the Suggested AP and Suggested AM tables created by RF Plan. (See “AP Plan” on page 24 and “AM Plan” on page 27.)

Import Buildings

The Import Buildings page allows you to import configuration information from an existing Aruba switch so you can modify it for use on another switch or in an another building.

Only XML files exported from an Aruba switch or from Aruba RF Plan may be imported into RF Plan.



ARUBA WIRELESS NETWORKS | RF Plan

Plan

Plan > Import Buildings

Import Search

File Name

Import Cancel

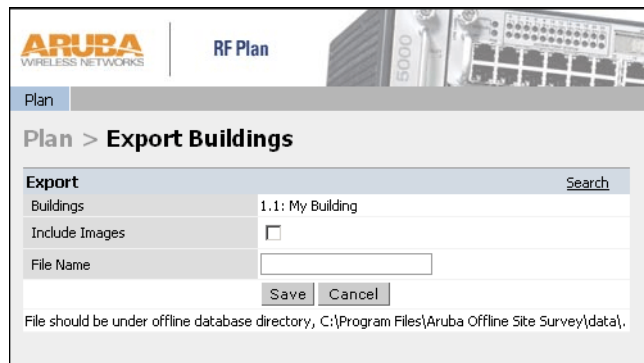
File should be under offline database directory, C:\Program Files\Aruba Offline Site Survey\data\.

NOTE—Importing any other file, including XML files from other applications, may result in unpredictable results.

Any file you wish to import must be in the *C:\Program Files\Aruba RF Plan\data* path. You can not specify any other path in the RF Plan Import Buildings dialog.

Export Buildings

The Export Buildings page allows you to export the configuration of the WLAN you just created so that it may be imported into and used to automatically configure your Aruba switches.



The screenshot shows the 'Export Buildings' page in the Aruba RF Plan tool. The page has a header with the Aruba logo and 'RF Plan' text. Below the header is a breadcrumb trail 'Plan > Export Buildings'. The main content area is titled 'Export' and contains a search bar, a 'Buildings' field with the value '1.1: My Building', an 'Include Images' checkbox, and a 'File Name' input field. At the bottom of the form are 'Save' and 'Cancel' buttons. A note at the bottom of the page states: 'File should be under offline database directory, C:\Program Files\Aruba Offline Site Survey\data\.'

Files exported from RF Plan will be placed in the following directory on your hard drive:

`C:\Program Files\Aruba RF Plan\data\`

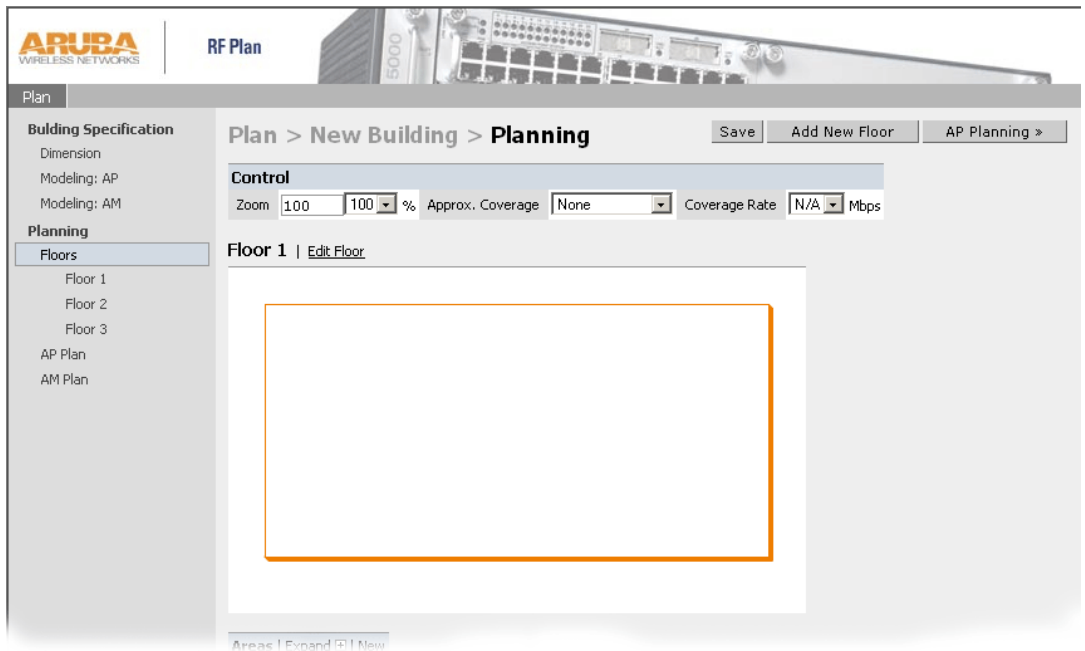
When exporting a building file it is recommended that you check the Include Images check box.

When naming your exported file, be sure to give the file the *.XML* file extension.

Example: *My_Building.XML*

Planning Pages

Planning Floors Page

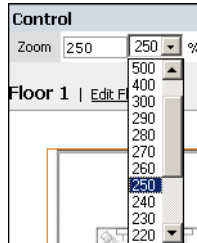


The Planning Floors page enables you to see what the footprint of your floors look like. You can select or adjust the following features on the Planning Floors Page.

- **Zoom** Use this pull-down menu or type a zoom factor in the text field to increase or decrease the size of the displayed floor area.
- **Approximate Coverage Map (select radio type)** Use this pull-down to select a particular radio type for which to show estimated coverage.
- **Coverage Rate** Use this pull-down to modify the coverage areas based on a different data rate.
- **Floor Editor** Click on this link to launch the Floor Editor. See [“Floor Editor Page” on page 20.](#)
- **Area Editor** Click on this link to launch the Area Editor. See [“Area Editor Page” on page 21.](#)
- **Access Point Editor** Click on this link to launch the Access Point Editor. See [“Access Editor Page” on page 22.](#)

Zoom

The Zoom control sets the viewing size of the floor image. It is adjustable in finite views from 10% to 1000%. You may select a value from the pull-down zoom menu or specify a value in the text box to the left of the pull-down. When you specify a value, RF Plan adjusts the values in the pull-down to display a set of values both above and below the value you typed in the text box.



Coverage

Select a radio type from the Coverage pull-down menu to view the approximate coverage area for each of the APs that RF Plan has deployed in AP Plan or AM Plan. Adjusting the Coverage values will help you understand how the AP coverage works in your building.

NOTE—You will not see coverage circles displayed here until you have executed either an AP Plan or an AM Plan.

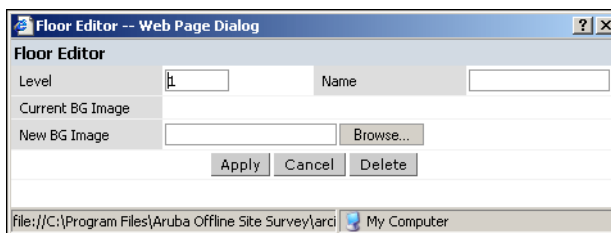


Coverage Rate

Adjusting the coverage rate will also affect the size of the coverage circles for AMs. Adjusting the rate values will help you understand how the coverage works in your proposed building.

Floor Editor Page

The Floor Editor allows you to specify the background image, and name the floor. The Floor Editor is accessible from the Floors Page by clicking on the *Edit Floor* link.



Naming

You may name the floor anything you choose as long as the name is an alpha-numeric string with a maximum length of 64 characters. The name you specify will appear just to the right of the Floor Number displayed just above the background image in the Planning view.

Background Images

A background image (floor plan image) may be imported into RF Plan for each floor. A background image is extremely helpful when specifying areas where coverage is not desired or areas where an AP/AM is not to be physically deployed.

Select a background image using the Browse button on the Floor Editor Dialog.

- File Type and Size

Background images must be JPEG format and may not exceed 2048 X 2048 pixels in size. Attempting to import a file with a larger pixel footprint than that specified here will result in the image not scaling to fit the image area in the floor display area.

NOTE—Because the background images for your floors are embedded in the XML file that defines your building you should strongly consider minimizing the file size of the JPEGs you use for your backgrounds. You can minimize the file size by selecting the maximum compression (lowest quality) in most graphics programs.

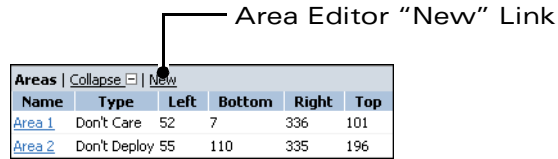
- Image Scaling

Images are scaled (stretched) to fit the display area. The display area aspect ratio is determined by the building dimensions specified on the Dimension page.

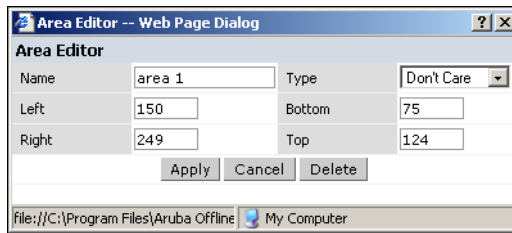
Area Editor Page

The area editor allows you to specify areas on your buildings floors where you either do not care about coverage, or where you do not want to place an AP or AM.

Open the Area Editor by clicking on the *New* link in the Areas field just below the area where the background image is displayed.



You specify these areas by placing them on top of the background image using the Area Editor.



Naming

You may name an area using an alpha-numeric string of characters with a maximum length of 64 characters. You should give areas some meaningful name so that they are easily identified.

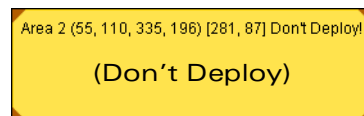
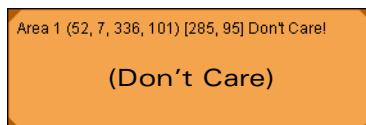
Locating and Sizing

You may specify absolute coordinates for the lower left corner and upper right corner of the box that represents the area you are defining. The datum for measurement is the lower left corner of the rectangular display area that represents your building's footprint. The coordinates of the upper right-hand corner of the display area are the absolute (no unit of measure) values of the dimensions you gave your building when you defined it with the dimension feature.

NOTE—The location is zero-based. Values range from 0 to (height - 1 and width - 1). For example: If you defined your building to be 200 feet wide and 400 feet long, the coordinates of the upper right-hand corner would be (199, 399).

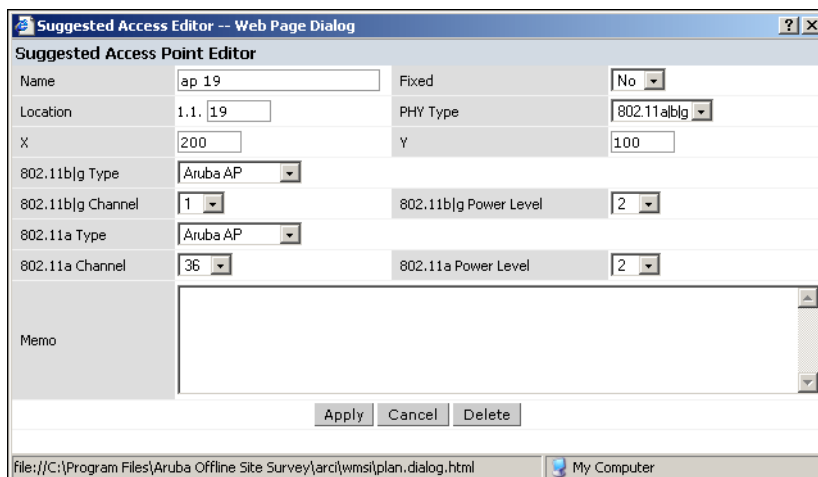
You may also use the drag and drop feature of the Area Editor to drag your area to where you want it and resize it by dragging one or more of the handles displayed in the corners of the area.

Don't Care areas are displayed as orange rectangles and Don't Deploy areas are displayed as yellow



Access Editor Page

The Access Editor allows you to manually create or modify a suggested access point.



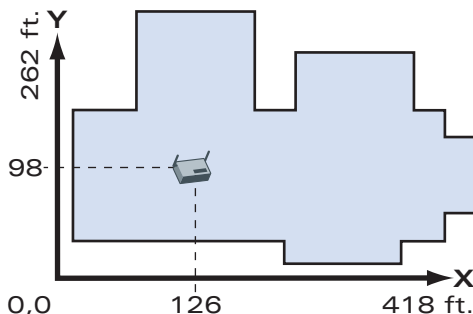
Naming

RF Plan automatically names APs using the default convention “ap number”. It assigns the number starting at 1 and increasing by one for each new AP. When you manually create an AP that new AP is then assigned the next “ap” number in sequence and added to the bottom of the suggested AP list.

You may name an Access Point anything you wish. The name must be comprised of alphanumeric characters and be 64 characters or less in length.

Location

The physical location of the AP is specified by X-Y coordinates beginning at the lower left corner of the display area. The numbers you specify in the X and Y text boxes are whole units. The X coordinates increase as a point moves up the display and the Y coordinates increase as they move from left to right across the display.



Fixed

Fixed APs don't move when RF Plan executes the positioning algorithm.

NOTE—You might typically set an AP as fixed when you have a specific room, such as a conference room, in which you want saturated coverage. You might also want to consider using a Fixed AP when you have an area that has an unusually high user density.

Choose Yes or No from the drop down box. Choosing Yes will lock the position of the AP as it is shown in the coordinate boxes of the Access Editor. Choosing No will allow RF Plan to move the AP as necessary to achieve best performance.

PHY Types

The PHY Type drop down menu allows you to specify what radio mode the AP will use. You may choose from one of the following:

- 802.11a/b/g
- 802.11a
- 802.1 b/g

802.11 Types

The 802.11 b/g and 802.11a Type drop down boxes allow you to choose the mode of operation for the access point. You may choose to set the mode of operation to access point (Aruba AP) or Air Monitor.

802.11 Channels

The 802.11a and 802.11b/g channel drop down menus allow you to select from the available channels.

NOTE—The available channels will vary depending on the regulatory domain (country) in which the device is being operated.

802.11a channels begin at channel 34 at a frequency of 5.170 MHz and increase in 20MHz steps through channel 161 at 5.805 Mhz.

802.11b/g channels begin at 1 and are numbered consecutively through 14. The frequencies begin at 2.412 MHz on channel 1 and increase in 22 MHz steps to Channel 14 at 2.484 MHz.

802.11 Power Levels

The power level drop down menus allow you to specify the transmission power of the access point. Choices are OFF, 0, 1, 2, 3, and 4. A setting of 4 will apply the maximum Effective Isotropic Radiated Power (EIRP) allowed in the regulatory domain (country) in which you are operating the access point.

Memo

The Memo text field allows you to enter notes regarding the access point. You may enter a maximum of 256 alpha-numeric characters in the Memo field.

AP Plan

The AP Plan feature uses the information entered in the modeling pages to locate access points in the building(s) you described.

The screenshot displays the Aruba RF Plan software interface. At the top left is the Aruba Wireless Networks logo. The main title is "RF Plan". Below the title, there is a navigation bar with "Plan" and "New Building > AP Planning". To the right of the navigation bar are buttons for "Add New Floor", "Save", and "AM Planning »".

The interface is divided into several sections:

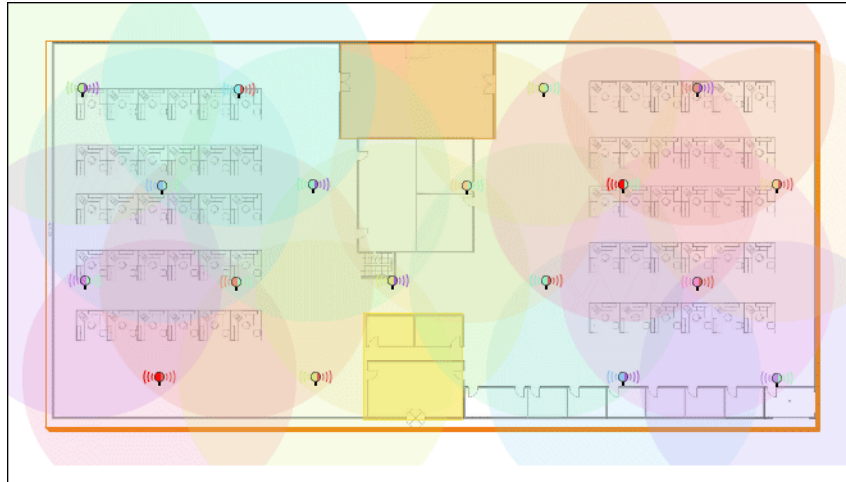
- Building Specification:** Includes "Dimension", "Modeling: AP", and "Modeling: AM".
- Planning:** Includes "Floors" with "Floor 1" and "Floor 2". The "AP Plan" option is selected and highlighted.
- Control:** Contains a "Zoom" field set to 150, an "Approx. Coverage" dropdown set to "AP - 802.11a", and a "Coverage Rate" field set to 36 Mbps. Below this, it displays "Number of required APs: 30", "Number of APs to support total users: 30", and "Number of APs to meet desired rate: 21". There are "Initialize", "Start", and "Stop" buttons.
- Floor 1:** A section labeled "Floor 1 | Edit Floor" containing a floor plan diagram. The diagram shows a rectangular building footprint with an orange-shaded area at the top and a yellow-shaded area at the bottom. The floor plan is populated with numerous small icons representing access points.

Initialize

Initialize the Algorithm by clicking on the Initialize button. This makes an initial placement of the access points and prepares RF Plan for the task of determining the optimum location for each of the APs. As soon as you click the Initialize button you will see the AP symbols appear on the floor plan. Access points are represented by this symbol.



Colored circles around the AP symbols on the floor plan indicate the approximate coverage of the individual AP and the color of the circle represents the channel on which the AP is operating. The circles appear when you select an *approximate coverage* value on one of the Floors pages. You may also use click on an AP icon and drag it to manually reposition it.



Start

Click on the Start button to launch the optimizing algorithm. You will see the AP symbols moving on the page as RF Plan finds the optimum location for each.

The process may take several minutes. You may watch the progress on the status bar of your browser. The algorithm will stop when the movement is less than a threshold value calculated based on the number of APs. The threshold value may be seen in the status bar at the bottom of the browser window.

Viewing the Results

The results of optimizing algorithm may be viewed two ways: graphically and in a table of suggested APs. You may obtain information about a specific AP by placing the cursor over its symbol. An information box will appear containing information about the exact location, PHY type, channel, power, etc.

Suggested AP Information
 Name: **Suggested AP: 1.12**
 Location: **1.1.12**, PHY Type: **802.11ag**
 X: **183**, Y: **121**
 .g Type: **soft-ap**, .g Channel: **6**, .g Power Level: **2**
 .a Type: **soft-ap**, .a Channel: **40**, .a Power Level: **2**
 Memo: **null**

The Suggested AP Table lists the coordinates, power, location, power setting, and channel for each of the APs that are shown in the floor plan.

| Suggested Access Points Collapse <input type="checkbox"/> New Clear | | | | | | | | | |
|---|------------------------|--------------------|-----|-----|-------------|---------------|----------|-----------|--|
| Fixed | Loc. | Name | X | Y | .b g Type | .b g Ch/Pow | .a Type | .a Ch/Pow | |
| No | 1.1.1 | Suggested AP: 1.1 | 59 | 25 | Aruba AP | 1 / 2 | Aruba AP | 161 / 2 | |
| No | 1.1.2 | Suggested AP: 1.2 | 139 | 24 | Aruba AP | 11 / 2 | Aruba AP | 36 / 2 | |
| No | 1.1.3 | Suggested AP: 1.3 | 300 | 24 | Aruba AP | 11 / 2 | Aruba AP | 56 / 2 | |
| No | 1.1.4 | Suggested AP: 1.4 | 379 | 24 | Aruba AP | 6 / 2 | Aruba AP | 64 / 2 | |
| No | 1.1.5 | Suggested AP: 1.5 | 20 | 74 | Aruba AP | 6 / 2 | Aruba AP | 153 / 2 | |
| No | 1.1.6 | Suggested AP: 1.6 | 99 | 75 | Aruba AP | 6 / 2 | Aruba AP | 44 / 2 | |
| No | 1.1.7 | Suggested AP: 1.7 | 179 | 74 | Aruba AP | 11 / 2 | Aruba AP | 40 / 2 | |
| No | 1.1.8 | Suggested AP: 1.8 | 259 | 75 | Aruba AP | 1 / 2 | Aruba AP | 48 / 2 | |
| No | 1.1.9 | Suggested AP: 1.9 | 339 | 74 | Aruba AP | 1 / 2 | Aruba AP | 153 / 2 | |
| No | 1.1.10 | Suggested AP: 1.10 | 60 | 124 | Aruba AP | 6 / 2 | Aruba AP | 60 / 2 | |
| No | 1.1.11 | Suggested AP: 1.11 | 139 | 125 | Aruba AP | 11 / 2 | Aruba AP | 52 / 2 | |
| No | 1.1.12 | Suggested AP: 1.12 | 183 | 121 | Aruba AP | 6 / 2 | Aruba AP | 40 / 2 | |

AM Plan

The AM Plan feature calculates the optimum placement for your air monitors (AMs).

Initialize

Initialize the Algorithm by clicking on the Initialize button. This makes an initial placement of the air monitors and prepares RF Plan for the task of determining the optimum location for each of the AMs. As soon as you click the Initialize button you will see the AM symbols appear on the floor plan. Air Monitors are represented by this symbol.



Start

Click on the Start button to launch the optimizing algorithm. You will see the AM symbols moving on the page as RF Plan finds the optimum location for each.

The process may take several minutes. You may watch the progress on the status bar of your browser. The algorithm will stop when the movement is less than a threshold value calculated based on the number of AMs. The threshold value may be seen in the status bar at the bottom of the browser window.

Viewing the Results

Viewing the results of the AM Plan feature is similar to that for the AP Plan feature.

The results of optimizing algorithm may be viewed two ways: graphically and in a table of suggested AMs. You may obtain information about a specific AP by placing the cursor over its symbol. An information box will appear containing information about the exact location, PHY type, channel, power, etc.

Suggested AP Information
Name: **Suggested AM: 2.1**
Location: **1.2.1**, PHY Type: **802.11ag**
X: **100**, Y: **50**
.g Type: **air-monitor**, .g Channel: **6**, .g Power Level: **2**
.a Type: **air-monitor**, .a Channel: **64**, .a Power Level: **2**
Memo: **null**

The Suggested AP Table lists the coordinates, power, location, power setting, and channel for each of the APs that are shown in the floor plan.

| Suggested Access Points Collapse <input type="checkbox"/> New Clear | | | | | | | | |
|---|-----------------------|-------------------|-----|-----|-------------|---------------|-------------|-----------|
| Fixed | Loc. | Name | X | Y | .b g Type | .b g Ch/Pow | .a Type | .a Ch/Pow |
| No | 1.2.1 | Suggested AM: 2.1 | 100 | 50 | Air Monitor | - / - | Air Monitor | - / - |
| No | 1.2.2 | Suggested AM: 2.2 | 232 | 50 | Air Monitor | - / - | Air Monitor | - / - |
| No | 1.2.3 | Suggested AM: 2.3 | 366 | 49 | Air Monitor | - / - | Air Monitor | - / - |
| No | 1.2.4 | Suggested AM: 2.4 | 167 | 149 | Air Monitor | - / - | Air Monitor | - / - |
| No | 1.2.5 | Suggested AP: 2.5 | 40 | 25 | Aruba AP | 1 / 2 | Aruba AP | 149 / 2 |
| No | 1.2.6 | Suggested AP: 2.6 | 120 | 24 | Aruba AP | 11 / 2 | Aruba AP | 157 / 2 |

RF Plan Tutorial

This section will guide you through the process of creating a building and populating it with access points and air monitors using RF Plan.

You can use the RF Plan portion of RF Director or you can use the stand-alone Aruba RF Plan product.

NOTE—If you haven't yet installed RF Plan, you should do so now. See [“Installing RF Plan” on page 2](#).

To Launch RF Plan, select Start > All Programs > Aruba Offline RF Plan > Aruba RF Plan.

Our Sample Building

We have filled in the planning table with the information we will use in this tutorial.

| Building Dimensions | |
|----------------------------|-------------------|
| Height: <i>100</i> | Width: <i>100</i> |
| Number of Floors: <i>2</i> | |

| User Information | |
|--------------------------------------|--------------------------|
| Number of Users: | Users per AP: <i>N/A</i> |
| Radio Types: <i>a, b, g</i> | |
| Overlap Factor: <i>Medium (150%)</i> | |

| AP Desired Rates | |
|-----------------------------|-------------------------|
| 802.11b g: <i>48 Mbps</i> | 802.11a: <i>48 Mbps</i> |

| AM Desired Rates | |
|-------------------------|--------------------|
| 802.11b g: <i>24</i> | 802.11a: <i>24</i> |

| Don't Care/Deploy Areas | |
|--|--|
| <i>Shipping & Receiving = Don't Care</i> | |
| <i>Lobby = Don't Deploy</i> | |

Create A Building

In this section we will create a building using the information supplied in the planning table.

- 1 Click the **New Building** button.

The Overview page appears.

- 2 Click **Save**.
- 3 Click the **Building Dimension** button.

The Specification page appears.

ARUBA WIRELESS NETWORKS RF Plan

Plan > building 1 > Specification

Save AP Modeling Spec. >

Building Specification

Dimension

Modeling: AP

Modeling: AM

Planning

Floors

Floor 1

AP Plan

AM Plan

Edit

Building ID 1 . 1 Name building 1

Width 200 Length 100

Inter Floor Height 20 Unit feet

Floors 1

Apply

- 4 Type the following information in the text boxes.

| Text Box | Information |
|----------------------|-------------|
| ● Building ID | 1.1 |
| ● Building Name | My Building |
| ● Width | 100 |
| ● Length | 100 |
| ● Inter Floor Height | 20 |
| ● Units | Feet |
| ● Floors | 2 |

- 5 Click on **Save**.
- 6 Click on **Apply**.

Notice that each time you click on the Apply button RF Plan automatically moves to the next feature in the list. In this case RF Plan moves to the AP Modeling Parameters page.

Model the Access Points

You will now determine how many access points are required to cover your building with a specified data transfer rate and overlap.

In this example we will use the Coverage Model and make the following assumptions about the performance of our WLAN.

- Radio Types: a/b/g
- Overlap factor: Medium (150%)
- 802.11a desired rate: 48 Mbps
- 802.11b desired rate: 48 Mbps

- 1 Select “801.11 a | b | g” from the Radio Type pull-down box.
- 2 Select “Medium” from the Overlap Factor pull-down box.

Notice that the percentage show at the left of the pull-down box changes to 150%.

- 3 Select “48” from the 802.11 b | g Desired Rate pull-down box.
- 4 Select “48” from the 801.11 a Desired Rate pull-down box.

Notice that the number of required APs has changed to 5.

- 5 Click Save, then Apply.

Model the Air Monitors

You will now determine how many air monitors are required to provide a specified monitoring rate. In this example we will continue to use the Coverage Model and make the following assumptions:

- 802.11 b | g monitor rate: 48 Mbps
- 802.11 a monitor rate: 48 Mbps

- 1 Select “24” from the 802.11 b | g Monitor Rate pull-down box.
- 2 Select “24” from the 802.11 a Monitor Rate pull-down box.

Notice that the number of required AMs is now 2.

- 3 Click Save, then Apply.

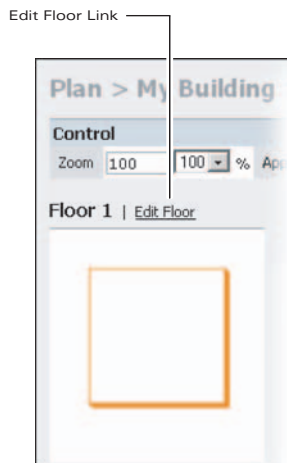
Add and Edit a Floor

You will now add floor plans to your floors and specify “Don’t Deploy” and “Don’t Care” areas for each floor.

In this section you will:

- Add a background image floor plan for each floor.
- Name the floors.
- Specify any Don’t Deploy and Don’t Care areas.

- 1 Click on the Edit Floor link at the right of the Floor 1 indicator.



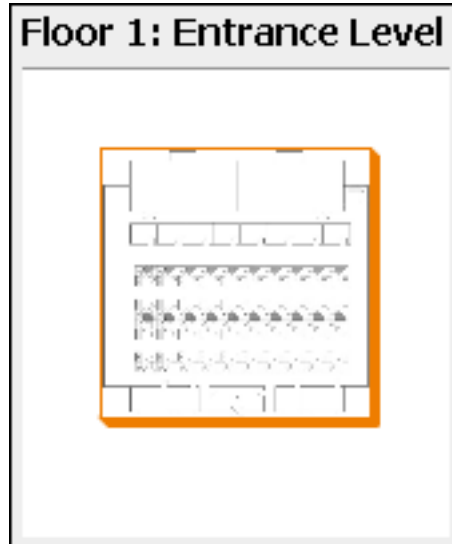
- 2 Type *Entrance Level* in the Name box of the Floor Editor Dialog.
- 3 Use the Browse button to locate the background image for the 1st floor.

The file will be located in the following directory:

C:\Program Files\Aruba RF Plan\tutorial\tutorial floor 1.jpg

- 4 **Click Apply.**

You should see the following type of image:



Repeat the process above for Floor 2.

- 5 **Click on the Edit Floor link at the right of the Floor 2 indicator.**
- 6 **Type *Second Level* in the Name box of the Floor Editor Dialog.**
- 7 **Use the Browse button to locate the background image for the 1st floor.**

The file will be located in the following directory:

C:\Program Files\Aruba RF Plan\Tutorial\tutorial floor 2.jpg

- 8 **Click Apply.**
- 9 **Click Save in the Planning window.**

Defining Areas

Before you advance to the AP and AM Planning pages you will want to define special areas.

In this section you will learn how to define areas where you either do not want to physically deploy (Don't Deploy) an AP, or where you don't care if there is coverage or not.

In this exercise we will assume that we:

- Don't care if we have coverage in the Shipping and Receiving areas.
- Don't want to deploy APs or AMs in the Lobby Area

Create A Don't Care Area

- 1 Go back to the AP Planning page.**

Click on AP Plan in the Feature Tree at the left side of the browser window.

- 2 Click the “New” link in the Areas box.**

The link is located below the lower left corner of the floor plan in the AP Planning window. This opens the Area Editor.

- 3 Type Shipping and Receiving in the Name text box in the Area Editor.**

- 4 Select “Don't Care” from the Type pull-down menu box.**

- 5 Click the Apply button.**

Notice that an orange box appears near the center of the floor plan.

- 6 Use your mouse (or other pointing device) to place the cursor over the box.**

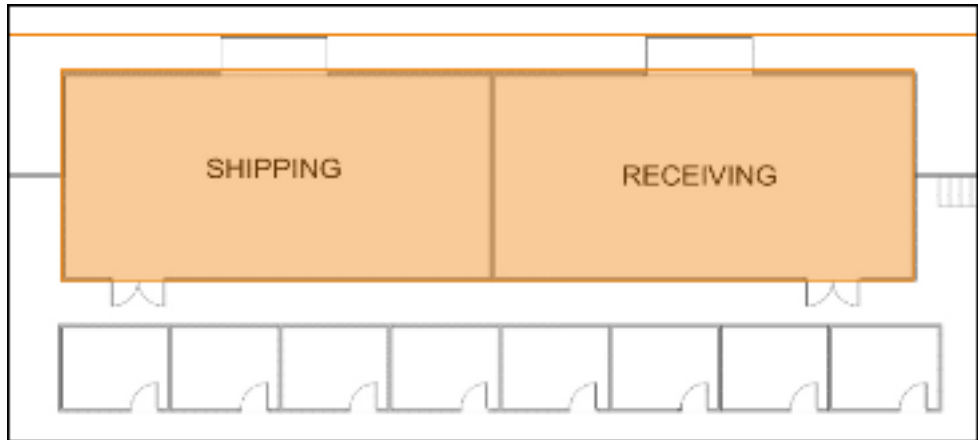
Notice that the information you typed in the editor appears in the box. You will see the name and type of area, as well as the coordinates of the lower left corner and upper right corner of the box.

NOTE—The $x = 0$ and $y = 0$ coordinates correspond to the lower left corner of the layout space.

- 7 Using your mouse, left-click and drag the box over the Shipping and Receiving area.**

Drag one corner of the box to a corresponding corner of the Shipping and Receiving area and using one of the corner handles of the box, stretch it to fit exactly over the Shipping and Receiving area.

Your floor plan with the Don't Care box should look similar to this:



- 8 Click Save.

Create A Don't Deploy Area

- 1 Click the “*New*” link in the Areas box located below the lower left corner of the floor plan in the AP Planning window.
- 2 Type *Lobby* in the Name text box in the Area Editor.
- 3 Select “*Don't Deploy*” from the Type pull-down menu box.
- 4 Click the Apply button.

Notice that an yellow box appears near the center of the floor plan.

- 5 Use your mouse (or other pointing device) to place the cursor over the box.

Notice that the information you typed in the editor appears in the box. You will see the name and type of area, as well as the coordinates of the lower left corner and upper right corner of the box.

NOTE—The $x = 0$ and $y = 0$ coordinates correspond to the lower left corner of the layout space.

- 6 Using your mouse, left-click and drag the box over the Lobby area on the floor plan.

- 7 Drag one corner of the box to a corresponding corner of the lobby and using one of the corner handles of the box, stretch it to fit exactly over the lobby area.

Your floor plan with the Don't Deploy box should look similar to this:



- 8 Click Save.
- 9 When you are finished defining area in the Floors page, click the AP Planning button to advance to the next step in the process (AP Plan page).

Running the AP Plan

In this section you will run the algorithm that searches for the best place to put all your access points.

You might want to zoom in on the floor plan. Zoom using the Zoom pull-down near the top of the AP Planning page, or type a zoom factor in the text box at the left of the pull-down and press the enter key on your keyboard.

Try entering a zoom factor of 400.

Notice that the number of required APs is 5, the same value that you saw when you modeled your APs above. Notice, also, that none of the APs show on the floor plan yet.

1 Click the Initialize button.

You will see a total of 5 AP symbols appear on the two floor diagrams, 3 on Floor 1 and 2 on Floor 2. You will also notice that the Suggested Access Points tables below each floor diagram have been populated with information about the suggested APs for each corresponding floor.

2 Click the Start Button.

After you Initialize the APs you must start the algorithm. You will see the APs move around on the floor plans as the algorithm is running.

The algorithm will stop when the movement is less than a threshold value calculated based on the number of APs. The threshold value may be seen in the status bar at the bottom of the browser window.

NOTE—To see the approximate coverage areas of each of the APs, select an AP type from the Approx. Coverage pull-down box and select a rate from the Coverage Rate pull-down box.

3 Click Save, then click the AM Planning button.

Running the AM Plan

Running the AM Plan algorithm is exactly like running the AP Plan above.

1 Click on Initialize.

2 Click on Start.

The algorithm will stop when the movement is less than a threshold value calculated based on the number of AMs. The threshold value may be seen in the status bar at the bottom of the browser window.

3 Click Save.