FIRST® Tech Challenge

Samantha Router Configuration Guide For Teams

Rev 1- 10/15/2012

CONTENTS

Revision	Date	Details
1	10/15/2012	Initial Release

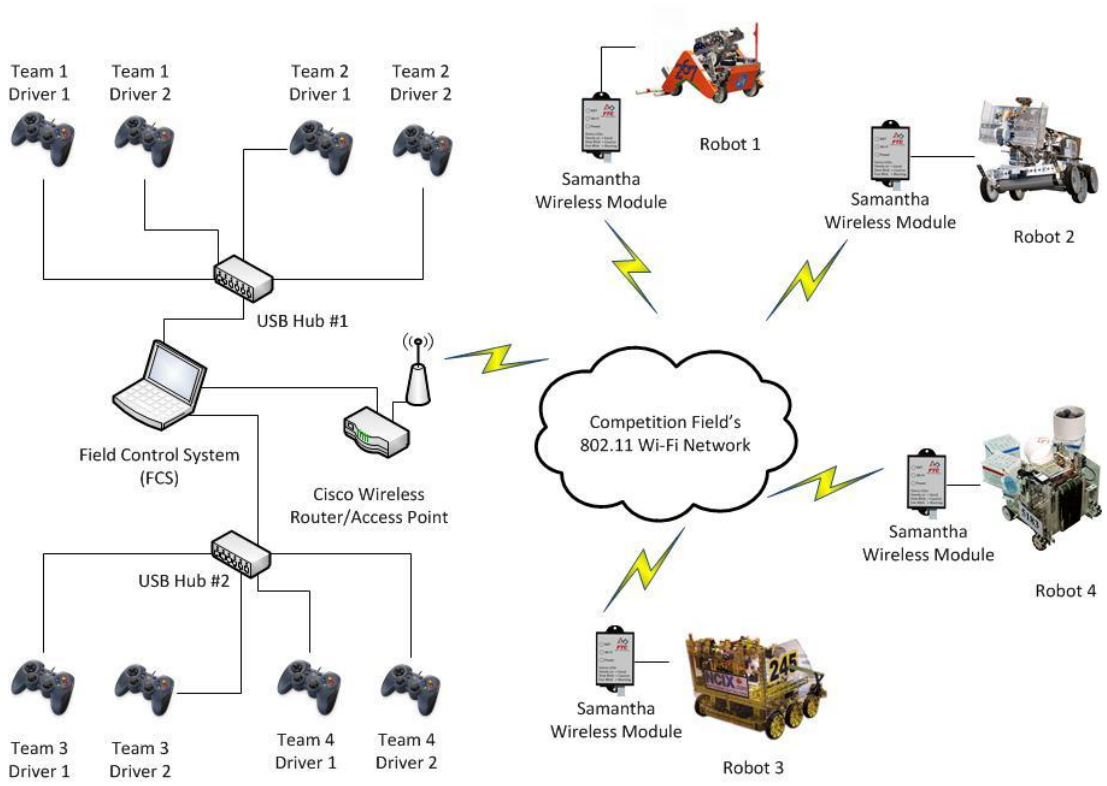
1. EQUIPMENT

The Samantha FCS Software and installation instructions from:

http://www.usfirst.org/ftc/samantha

For Competition Field (Per Field)

- **FOR FCS:**
  - One WiFi Router (Per 2 fields)
  - One laptop computer per playing field
    - A mouse (highly suggested over a track pad)
  - Ethernet cables long enough to connect the FCS Computers to the routers, and the scoring router to the FCS router (if using the optional scoring system configuration).
  - New Flash Drives (2GB recommended capacity, 4GB Max)
    - At least 3 are needed: 1 for FTA and 2 for Software Inspection It is recommended to have a few spares on hand.
  - 8 Logitech Game Controllers and spares
  - 3 externally powered USB Hubs. (2 required, 1 optional)
    - 2 hubs for game controllers
    - 1 hub from game controller hubs to the FCS computer. This hub is optional, not required if there are enough hubs on the computer to accommodate all connections, leaving at least one port free for thumb drive access.
  - USB Cables to connect the USB hubs to the FCS computer. A maximum suggested length for USB cable is 5 meters.
  - Monitor for clock display (not shown in figure below)



2. SETTING UP FCS ROUTER: FTC_FIELD

Proper operation and setup of the Field Electronics is vital for a smooth, successful event. All electronic components must be set up, and tested, well in advance of the event.

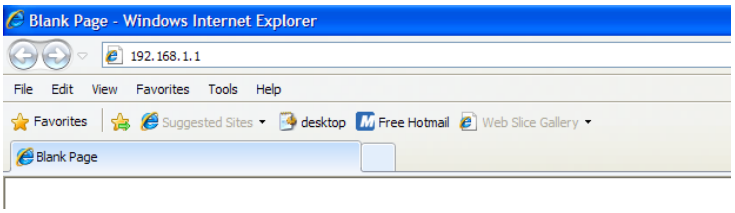
Linksys E1200 Router

These instructions are specific for the Linksys E1200 router. Note that the E3000 router has been discontinued by the manufacturer.

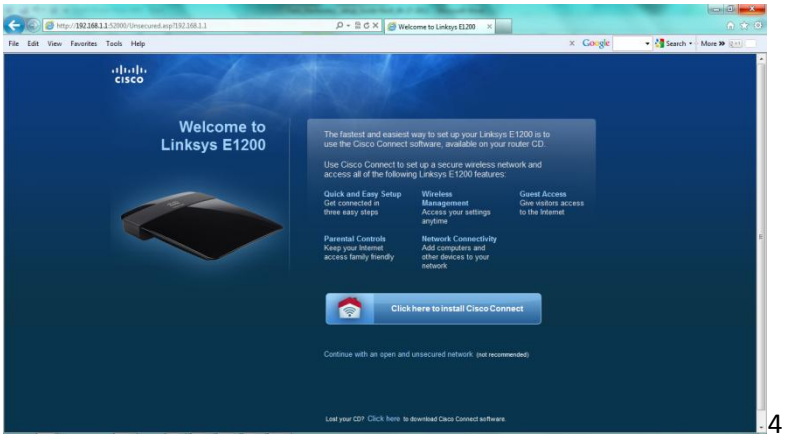
Important: DO NOT use the CISCO Connect CD that is supplied with your router for setup.

2.1. Connect an Ethernet cable from **PORT 1** (do not plug into the Internet port) on the router to the computer that will control the FCS program for your event. Be sure to turn off the wireless network adapter on your computer.

2.2. Open an Internet browser (such as Internet Explorer or Firefox) window and enter 192.168.1.1 into the address bar and hit enter. This is the default address of your router. (If nothing comes up, check to make sure you have plugged the Ethernet cable into PORT 1 and not the port labeled "Internet").



2.2.1. The router should display a Welcome screen. Do not install the Cisco Connect software. You will instead configure the router manually.



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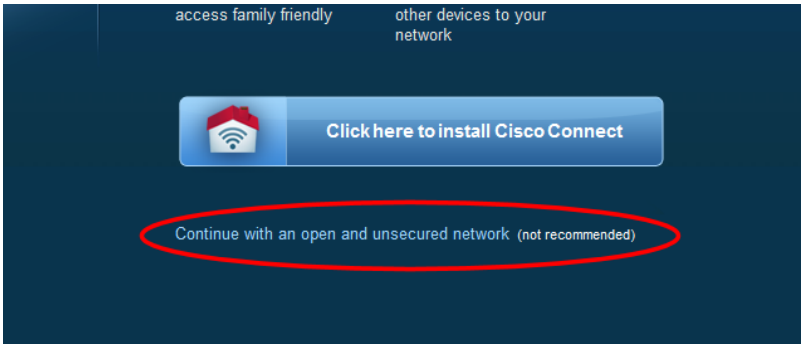
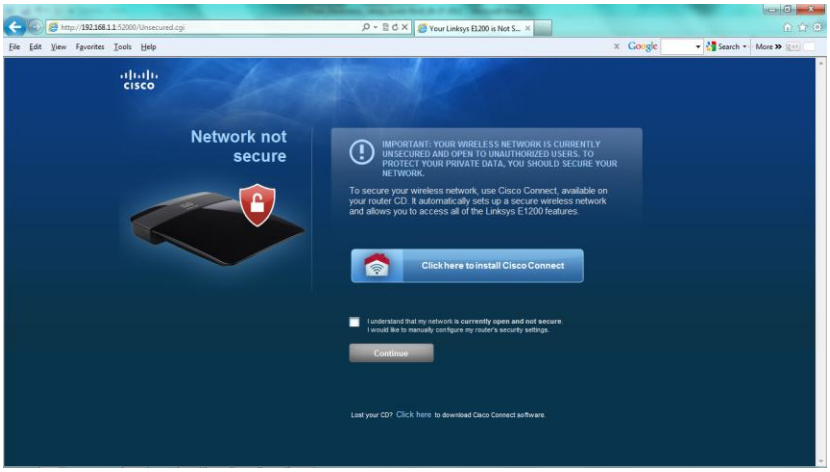
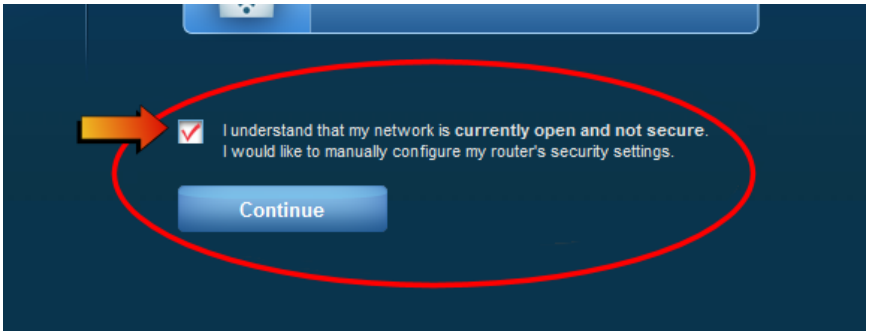
2.2.2. At the bottom of the welcome screen, click on the link that reads "Continue with an open and unsecured network(not recommend)"



2.2.3. The web browser should display another screen that indicates that the network is not secure.

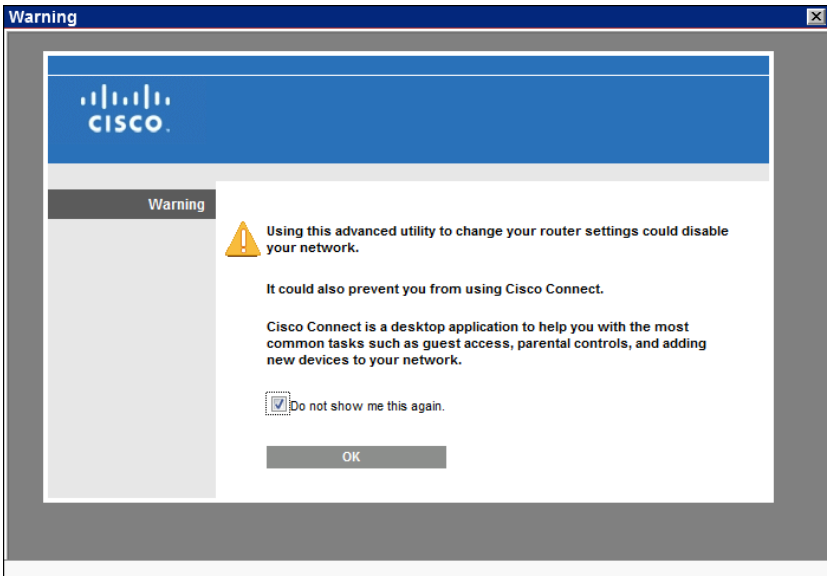


2.2.4. Check the checkbox ("I understand that my network…") and press Continue to proceed with the setup.

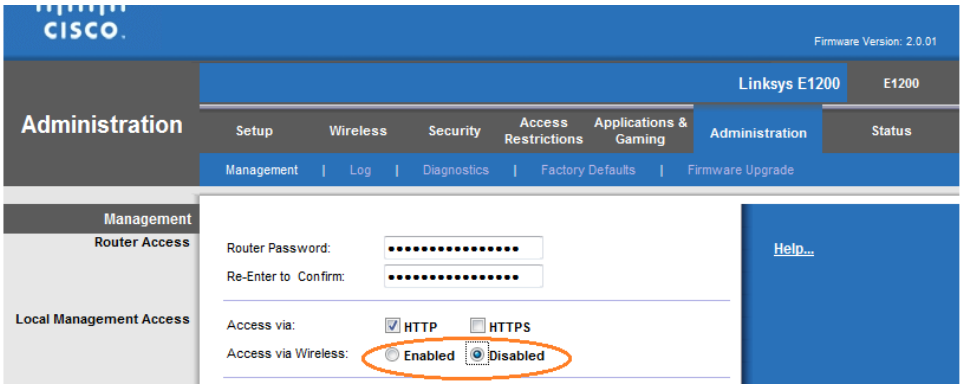


2.2.5. The router should prompt you for the router's user name and password. Enter in the default userid of **admin** and the default password of **admin** and then press the "OK" key to login. Once you've logged in, you might need to reload the page "192.168.1.1" in your browser to continue.

2.2.6. The first time you connect to you router you will see the following pop-up warning. Check the "Do not show me this again" box and then click OK to dismiss it.



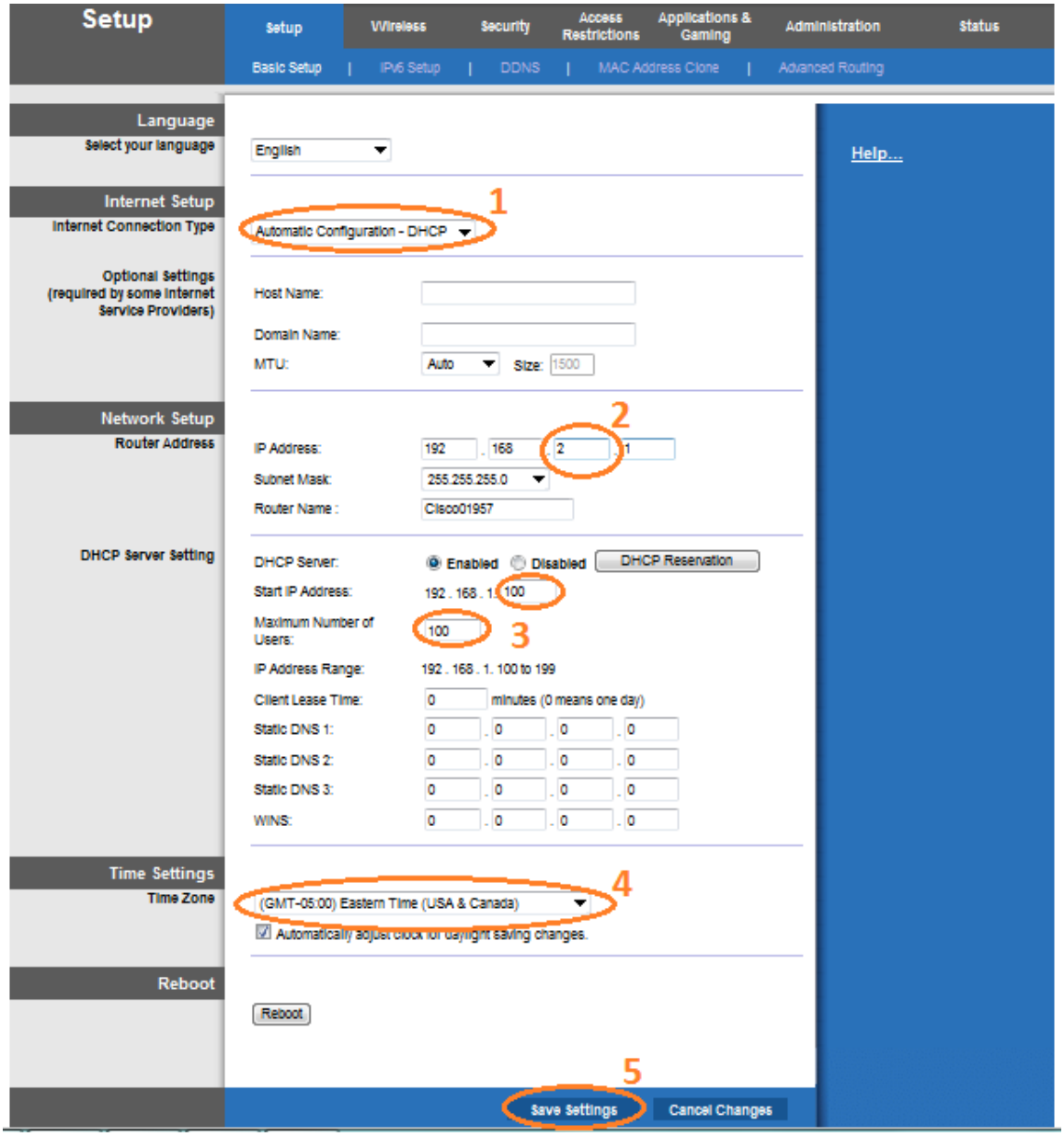
2.3. Create a secure password. Click on the administration tab to change the admin password and disable Local Management Access via Wireless. Save settings by pressing the "Save Settings" button.



After the changes have been successfully saved, hit the "Continue" button and log in with userid "admin" and the password you just defined.

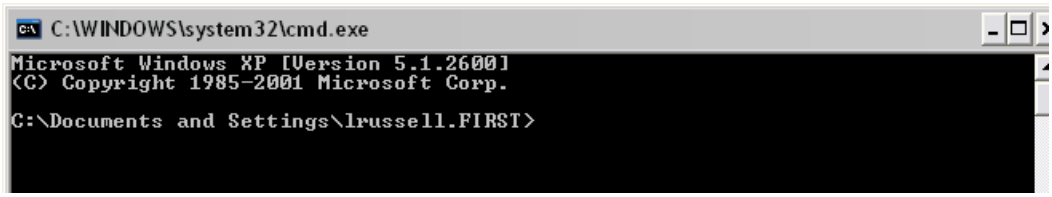
When the dialog opens, click on the Setup tab, then Basic Setup.

1. Ensure the Internet Connection Type is set to Automatic Configuration - DHCP
2. Change the IP address to 192.168.**2**.1.
3. Set the starting IP address and the max number of users to 100.
4. Set the time zone appropriately.
5. **Critical:** Save the settings. A message will appear asking you to "Continue" Click Continue to refresh the router to the new IP address setting.

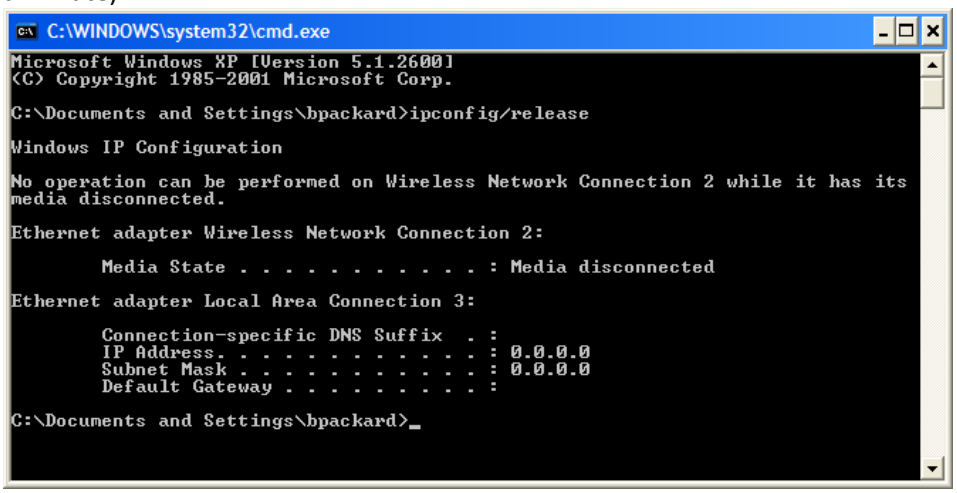


2.3. After saving settings:

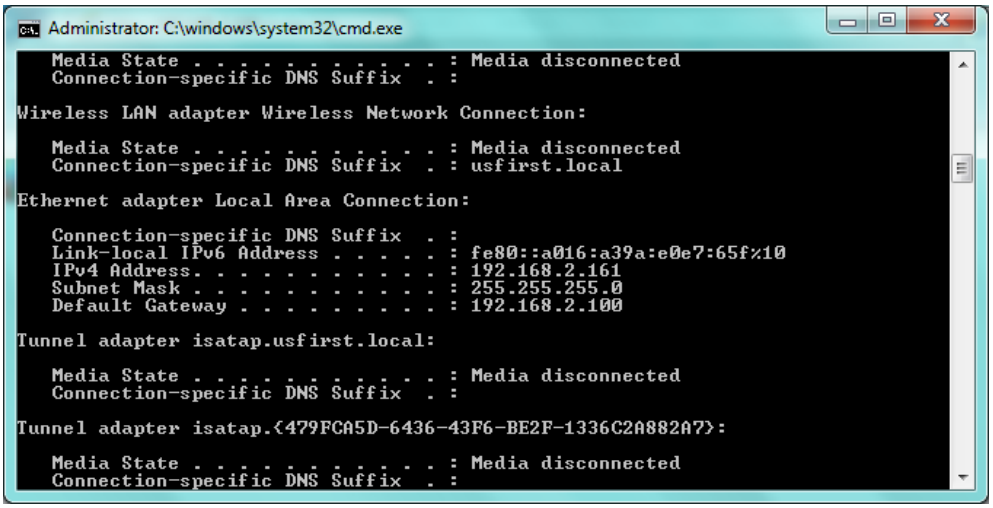
2.3.1.Open Start > Programs > Accessories and select “Command window.”



At the prompt, type:
Ipconfig /release <press enter> : The following screen should appear showing your IP address 0.0.0.0: (It may take a minute)



Ipconfig /renew <press enter> The following screen should appear showing your that your IP address is in the 192.168.2.1xx range (Note: it may take a minute for the command to complete).

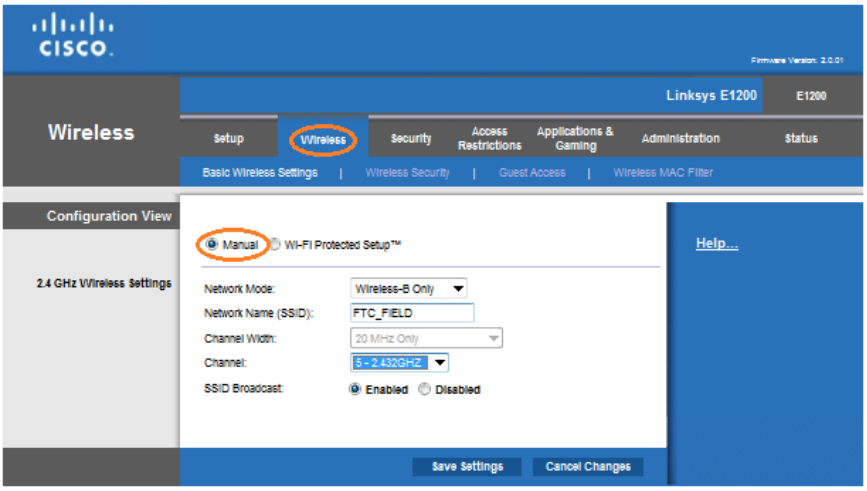


Close the command window by clicking on the X in the upper right corner.

2.4. Open an Internet browser (such as Internet Explorer or Firefox) and enter 192.168.**2**.1 into the address bar to continue configuring the router.

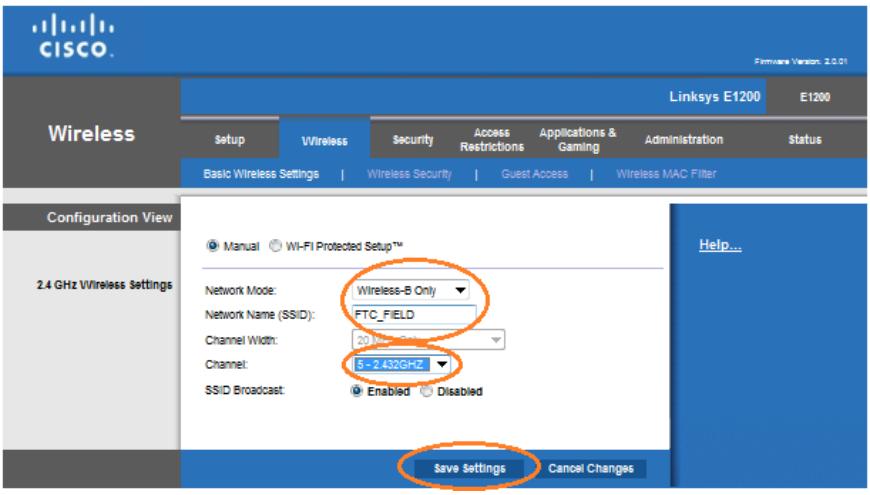
2.5. Login to the router using "admin" and the password you established.

2.5.1. The Wi-Fi Protected Setup is selected by default, so ***you must*** click on the wireless tab and select the manual setup bullet:



The E1200 is a 2.4GHz router only. Unlike with the E3000, you do not need to disable the 5GHz band for the E1200. You must, however, configure the 2.4GHz band settings for the E1200:

1. Select: "Wireless-B only" from the drop down menu next to 2.4GHZ Network Mode.
2. Enter FTC_FIELD into the Network Name (SSID): box.



3. **Use a Wifi sniffer to determine the 'quietest' channel available at your venue. (see *"Using a 'Wifi Sniffer' to Determine a Quiet Channel"* below)** Once the sniffer has determined the quietest channel, select a channel from the drop down. Note: Generally, channels 5 or 8 are good choices as they are least used channels for public WiFi networks.
4. ***Click on Save Settings***
5. Hit the "Continue" button and log in with "admin" and the password you defined.

USING A "WIFI SNIFFER" TO DETERMINE A QUIET CHANNEL.

The Linksys wireless routers are set up into 11 channels. A good analogy is 11 rooms with fairly thin walls all lined up in a row. When the router communicates on any given channel, it's like a few people having a meeting, and that meeting can be heard about 2 rooms in either direction. More routers using the same channel adds people to the party and therefore the noise that can be heard nearby. Using a WiFi sniffer can help you find the 'quietest' rooms (channels). **NOTE: FTC_FIELD and FTC_PIT must be on different channels.**

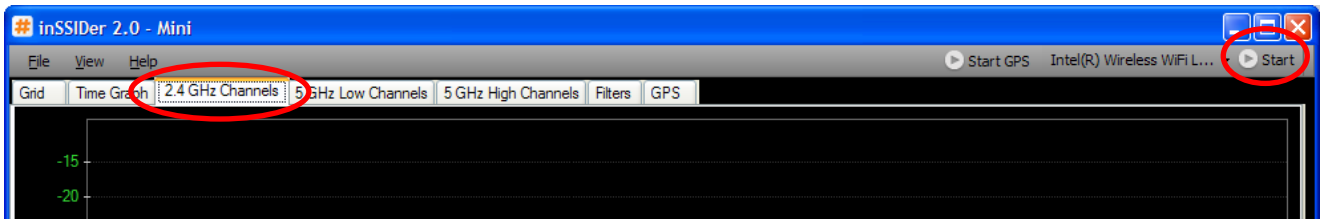
"inSSIDer" is a free program for windows machines that can detect the noise levels across the channels. It is a free, downloadable program that installed on a windows machine with an active wireless card. No other hardware is required to use this program. To download, go to: http://www.metageek.net/products/inssider

Clicking the download button will download the installer. After running the installer, go to the start menu->Programs->MetaGeek->inSSIDer 2.0.

Open the program. This screen will appear:

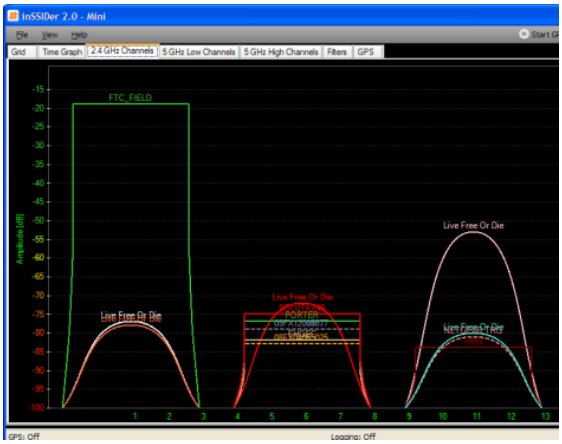
Hit F10, and the view will change to mini mode.

Click on the "2.4 GHz Channels" tab, and then "start" in the top right corner.

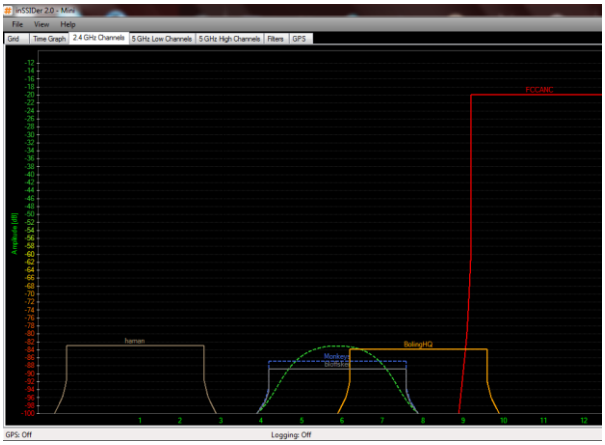


After a few seconds, data will start to populate the graph. Below are examples of a fairly noisy and fairly quiet area. ***Note the noisiest channels fall on 1, 6 and 11. A good choice for your channel would be 5 or 8.***

Noisier:



Quieter:



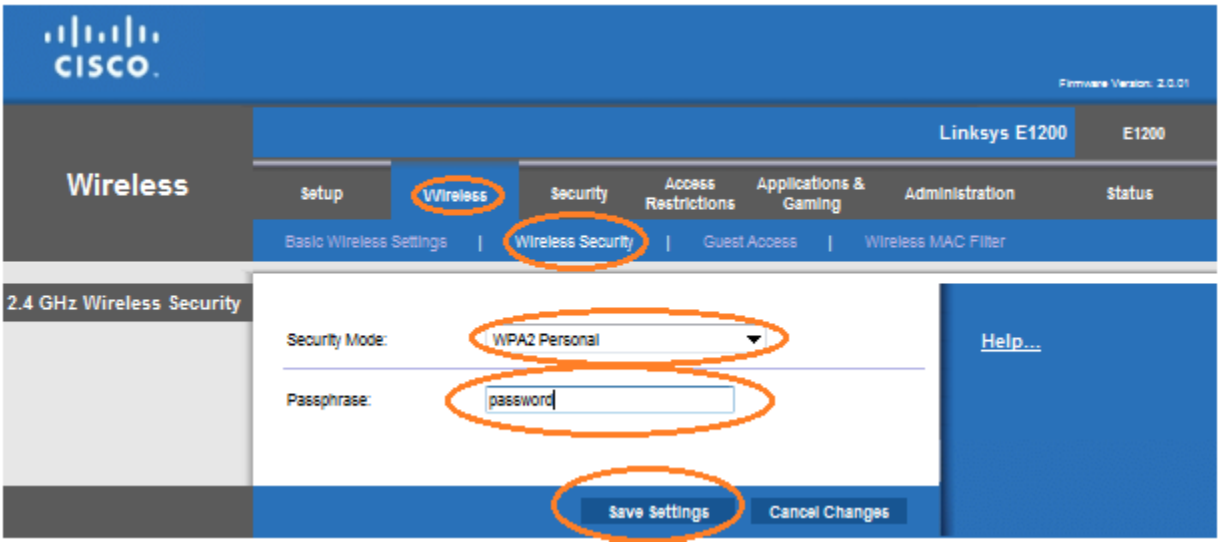
The height of the line corresponds to strength and the width is the channels it covers. The intention is to find the channel with the least amount and weakest (shortest) signals nearby. In both cases, channel 5 is a good option (in the first figure, the green line is FTC_FIELD). Channel 8 is also a good option on the first example.

2.3. Setup Security

Critical Step

Click on the wireless Security tab:

1. Change the 2.4GHz security mode to WPA2 Personal.
2. Change the passphrase to something unique and give it to the software inspectors and field tech advisor. ***Do not share*** it with the teams. ***Passphrase must be at least 8 characters and contain no spaces. For extra security, use at least one upper and one lower case alpha character, at least one number and one special character such as !@#$%^&*.***
3. ***Click on Save Settings***
4. Reboot the router one more time by returning to the Setup tab, scrolling to the bottom of the screen and clicking on "reboot".



When the router configuration file returns after rebooting, your FTC_FIELD router is ready to use.

CRITICAL STEP: Write down these settings and keep them safe for reference.

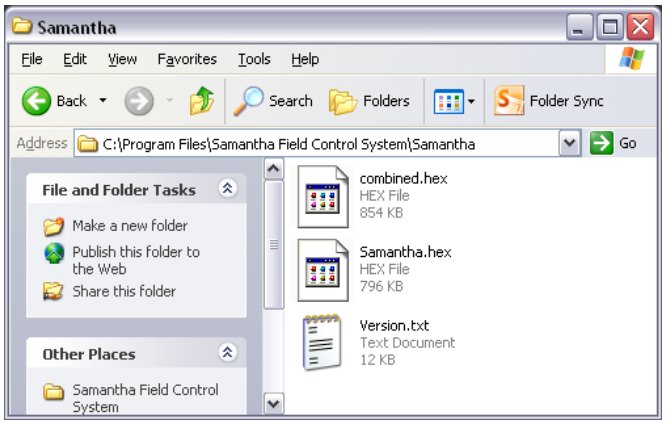
3. CREATE SAMANTHA NETWORK CONFIGURATION FLASH DRIVES

Network configuration flash drives will be used to load the router configuration network keys and Samantha firmware (Samantha.hex) onto the Samantha modules the teams will use on their robots.

6.1. Insert a USB flash drive into the FCS computer. Copy the "Samantha.Hex" file from:

C:\Program Files\Samantha Field Control System\Samantha

To the flash drive.

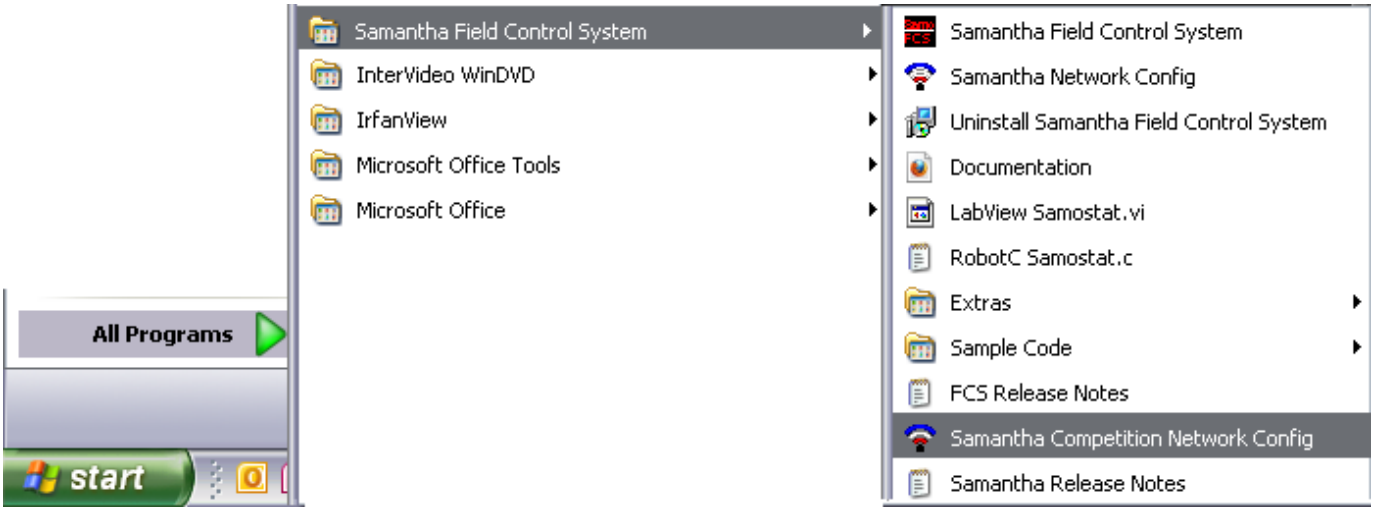


These flash drives should be made before the event, once the FCS router(s) have been configured for the competition. It is recommended that you make several copies of the flash drives.

6.2. There are two programs in the Samantha Field Control System folder that must be run to create the flash drives:

- Samantha Competition Network Config
  - Creates the primary (FTC_FIELD) network key folder FTCNTKY
- Samantha Network Config
  - Creates the secondary (FTC_PIT) network key folder: SMRTNTKY

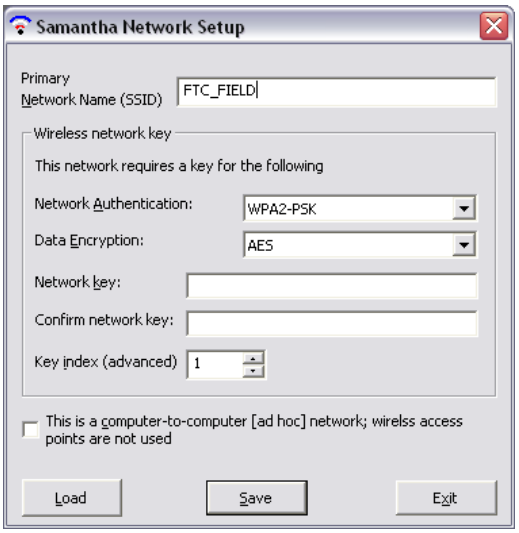
Note: If you are not using FTC_PIT, you do not need to run Samantha Network Config.



3.3. Create Primary Network Key Folder on the flash drive:

- Plug in a new 2GB flash drive
- From your Start menu choose: >***Samantha Field Control System***>***Samantha Competition Network Config***

The following dialog box will open:



Enter FTC_FIELD in the Primary Network Name (SSID) field.

Network Authentication: WPA2-PSK

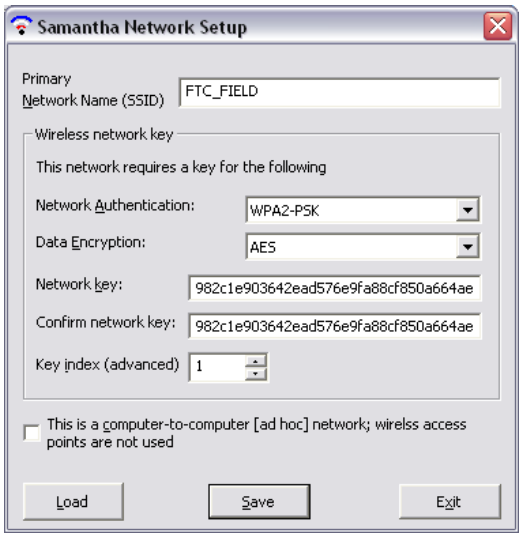
Data Encryption: AES

Network Key: Enter the secure admin password you created when you configured your router (page 10 step 2.3).

Confirm the network key and click “Save”.

The following popup will appear. Click “OK” This will encrypt the password and change it on your input screen.

The illustration shows the encrypted Network key.



Click “OK” to accept the confirmation message.

Your flash drive should now have two files: Samantha.hex and FTCNTKY.

Click “Exit” to close the Samantha Network Setup.

4. LOADING THE CONFIG FILES ONTO THE SAMANTHA MODULES

4.3. After you have configured your router and created the FLASH drives, you need to FLASH this information to the SAMANTHA modules to ensure that they have the proper information to access the field's network.

1. Ensure the Samantha is powered off.
2. Insert the flash drive into Samantha.
3. Holding the red button on the Samantha, turn the power on and let go when the LEDs light up.
4. Watch for the lights to flash red->white->blue->white->red (about 15-20 seconds) until the red (power)LED is solid, the white (WiFi) LED is blinking slowly, and the blue (NXT) LED is off. ***The LED lights will cycles once for each file that is uploaded to Samantha. Two cycles indicates that files are being uploaded (one cycle for the Samantha.hex and once for FTCNTKY and SMRTNTKY) If only one file is being uploaded then the light cycle only happens once.***
5. When all files have been uploaded, remove the flash drive and insert the USB cable from the NXT into the Samantha, and power on the NXT. The blue LED will illuminate but will not be solid. This 'heartbeat' is an indicator that the NXT is communicating properly with the Samantha.
6. When all of the above has been completed, the robot is ready to communicate with the FCS.

