FIREFLY

Fixed Location 802.11 Monitoring System

manual version 1.1

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STARTUP INSTRUCTIONS FOR THE FIREFLY SYSTEM

HARDWARE SETUP

1. Connect the power to the Firefly.
2. Connect the network cable to the Firefly and a local hub or router.
3. Connect all antennas (omnidirectional or direction-finding D_FLY) using the SMA connectors on the front of the receivers.
4. Turn on the Firefly.
5. The orange LED should blink for a few seconds while checking and turning on the receivers.
6. A red LED indicates a hardware error.

SOFTWARE INSTALLATION (from the enclosed CD)

1. Install the Core application on a machine that can see the Firefly over the network.
2. Install the SET IP application and FIND FIREFLY application on the same subnet as the Firefly.
3. Install the Watcher application on a machine that can talk to the machine where the Core is running.

SYSTEM SETUP

SET IP ADDRESS OF THE FIREFLY
1. Run the SET IP program.
2. Use the MAC address stamped on the Firefly.
3. Set the IP address of the Firefly which can be reached from the Core application.

CONNECTING WATCHER TO THE CORE

1. Run the Core application.
NOTE: Write down the IP address of the machine on which the Core runs.
2. Run the Watcher program.
3. Ignore the username and password fields.
4. Enter the IP address of the Core machine.

CONNECTING THE CORE TO THE FIREFLY

1. After the lower-left hand portion of the Watcher states that it has connected to the Core, click on the Administration desk on the toolbar.
2. Click on “Add Firefly”.
3. Set the location of the Firefly (text)
4. Set the IP address of the Firefly (number you set with the SET IP program).
5. Set the X and Y coordinates (for customer use, they may be 0).
6. Click OK. Firefly entry should be added. Stop the Watcher program.
7. Stop the Core. Restart.
8. Core should have an LED which states that it is connected to a Firefly.

STARTING DATA COLLECTION

1. Restart the Watcher and then change the modes of the receivers as stated in the Watcher manual.

The Core will now start processing data from the Firefly and store it in a database. The Watcher application can be used to view this information for various reporting on the RF and Wi-Fi environment.

FIREFLY SETUP

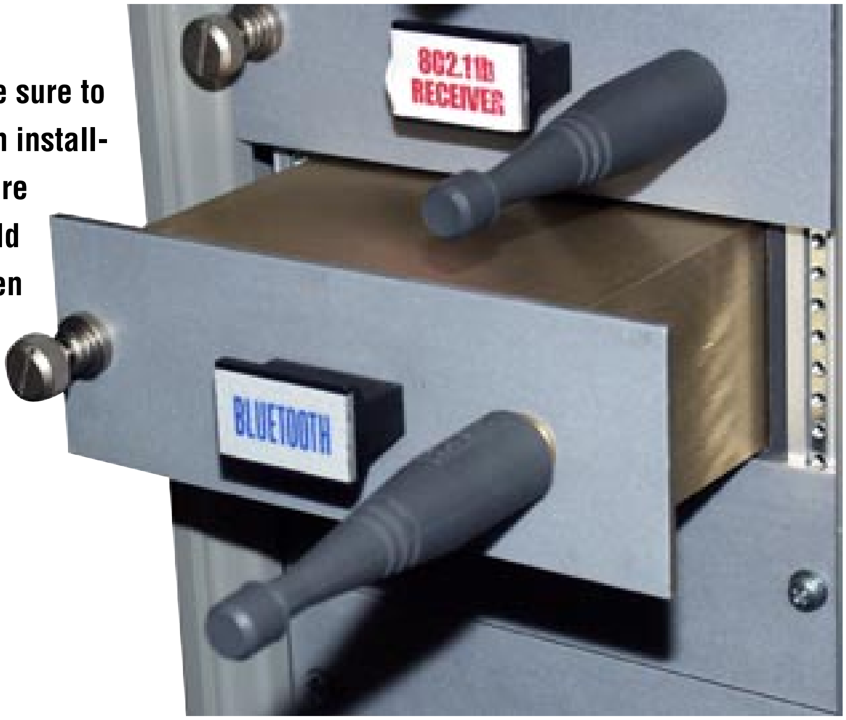
BEFORE YOU BEGIN

Overview

Firefly™ is a sophisticated 802.11 Wi-Fi analyzer that helps IT managers maintain network throughput and security by recognizing and identifying abnormalities in network traffic. Firefly's™ core application software creates relational databases of information through a wireless network of remotely configurable Fireflies™ with each Firefly™ containing up to 10 calibrated receivers. This configuration allows users to collect vital WLAN parameters such as MAC, SSID, RSSI, PER and WEP and then identify and locate failed authentication attempts, unauthorized channel usage of APs and STAs. Optional D-Fly antennae ensure continuous network scanning with simultaneous direction finding precision on a particular channel. E-mail alerts are sent directly from Firefly's™ database core directly to IT security officers anywhere in the world for immediate evaluation. Firefly's™ core database gives users real-time or time-stamped WLAN traffic security profiles for a true network footprint.

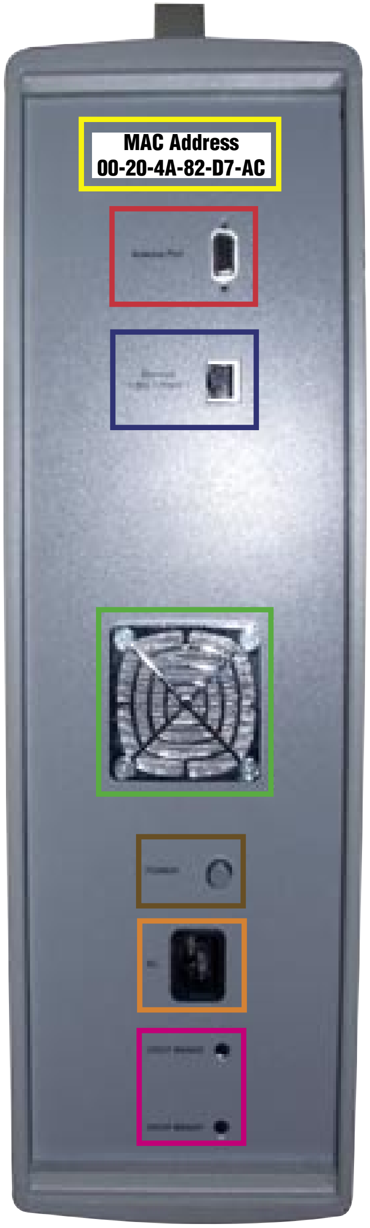
Installation

Before you power up the Firefly, always be sure to install all of your receivers properly. When installing individual receivers into Firefly, be sure to push them into place firmly. They should all be flush with the case surface. Then tighten the thumbs screws on the left completely.



Rear Panel

After installing all of your receivers into the front of the Firefly, notice the rear of the firefly and begin to attach the necessary cabling.



MAC Address - This is the MAC Address assigned to your particular Firefly. You will need this number when you initially configure and install your Firefly into the network.

Antenna Port - Connect your optional Firefly DFly antenna to this DB-9 connector.

Ethernet 10 BASE T / 100 BASE T - Connect your network cable to this ethernet RJ-45 connection.

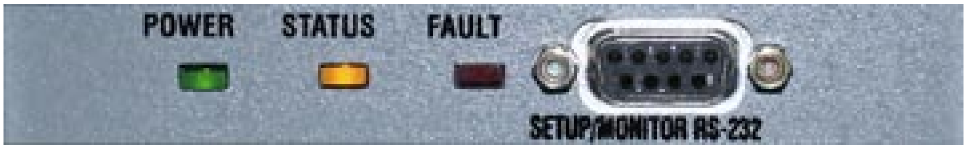
Fan - Keep this exhaust cooling fan screen free from obstructions.

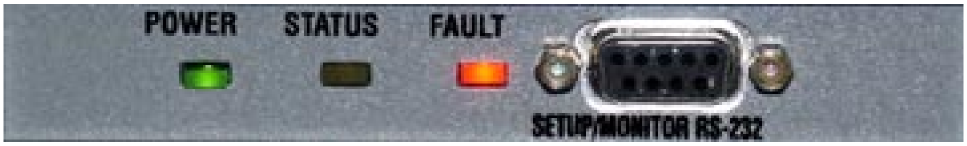
Power - Power switch.

AC - 110 Volt AC power input.

Circuit Breaker - Install or remove 2 circuit fuses here.

Status

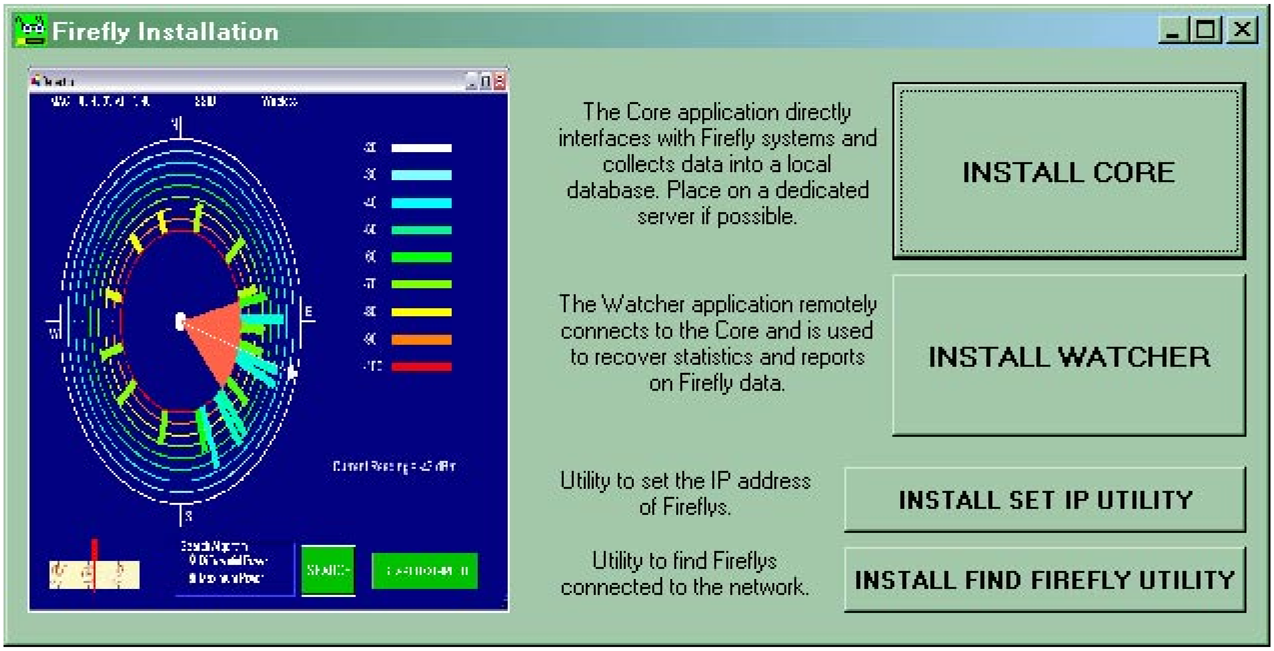




Before you can begin monitoring your network, you must verify status of Firefly. The green POWER LED will stay on solid as soon as AC power is supplied to Firefly. The amber STATUS LED will blink rapidly when the Firefly is first warming up. This is normal and should last about 30 seconds. The red FAULT LED will blink rapidly when a communication error occurs between the Firefly and one or more of its receivers. You can remedy this by checking all receivers to make sure they are installed properly. Never install or remove any Firefly receiver while the power is still on. The SETUP/MONITOR RS-232 port is for direct communication with the Firefly from a PC. Use this port when assigning an IP address to Firefly using the included setup software utility.

Installing Software

Begin configuring your Firefly by inserting the included Firefly CD-ROM disc into your PC. Note the minimum PC system requirements in this manual. It is recommended that the core application be installed on a dedicated server but all of these applications can be installed together on one PC.



The Core application directly interfaces with Firefly systems and collects data into a local database. Place on a dedicated server if possible.

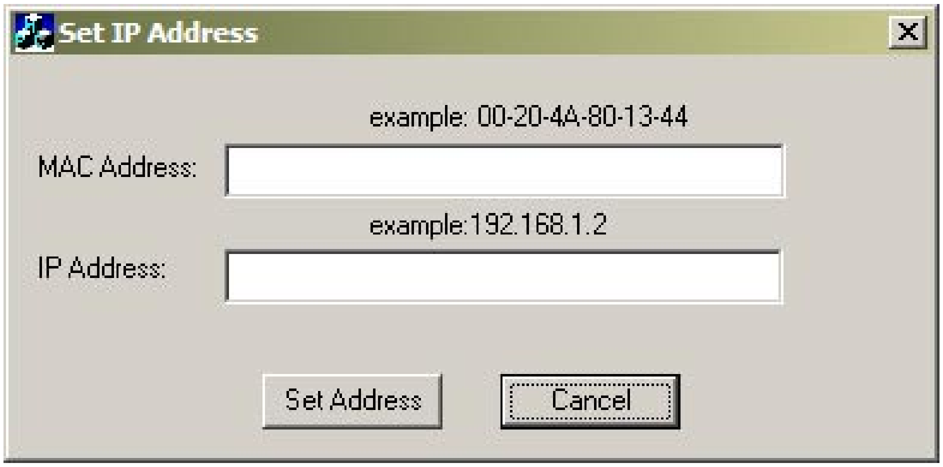
The Watcher application remotely connects to the Core and is used to recover statistics and reports on Firefly data.

Utility to set the IP address of Fireflys.

Utility to find Fireflys connected to the network.

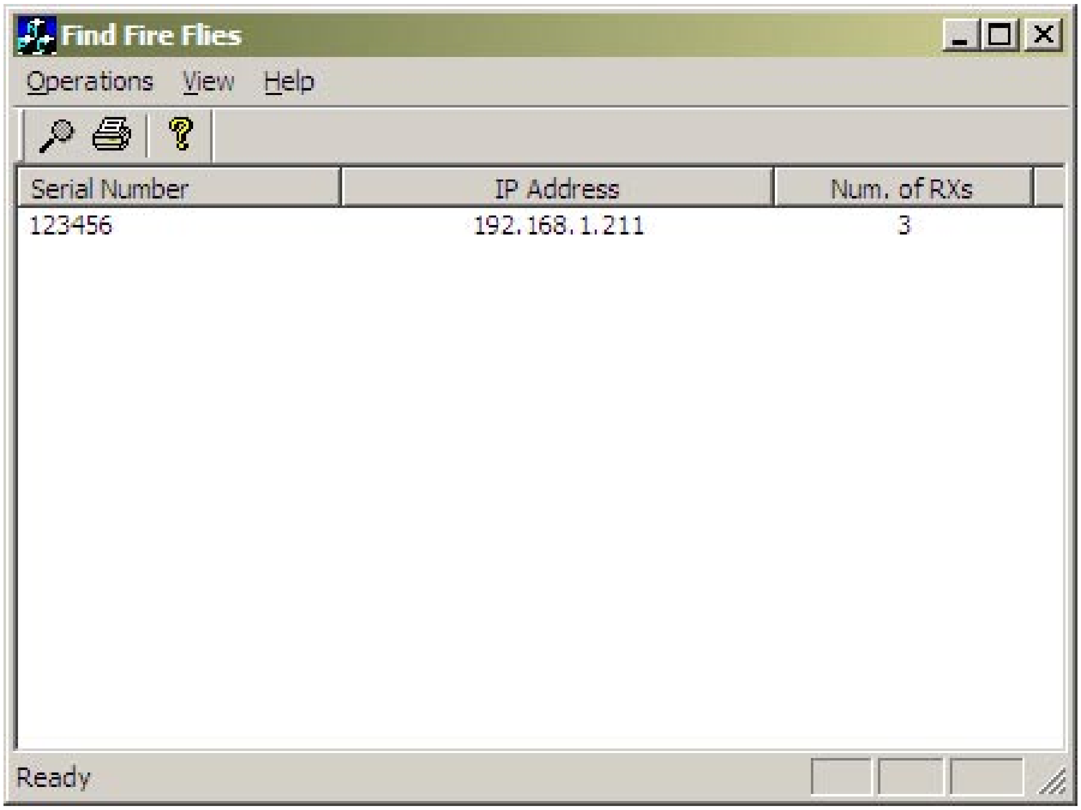
Setting IP Address

Before you can begin monitoring your network with Firefly, you need to set the IP Address. First, run the Set IP Address application on your Firefly installer CD-ROM. See the rear panel on the Firefly for the MAC Address. Set the IP Address to that the Firefly does not conflict with any other IP Addresses thatmight be on your LAN.



Finding Fireflies on the Network

Next, run the Find Fireflies application on your Firefly installer CD-ROM to verify its serial number, IP Address setting and number of active installed receivers. If you are adding multiple Fireflies to the network, power them all on, assign IP addresses to all and then run the Find Fireflies application to verify that all Fireflies are actively communicating with your network. You are now ready to begin collecting wireless data.



Serial Number	IP Address	Num. of RXs
123456	192.168.1.211	3

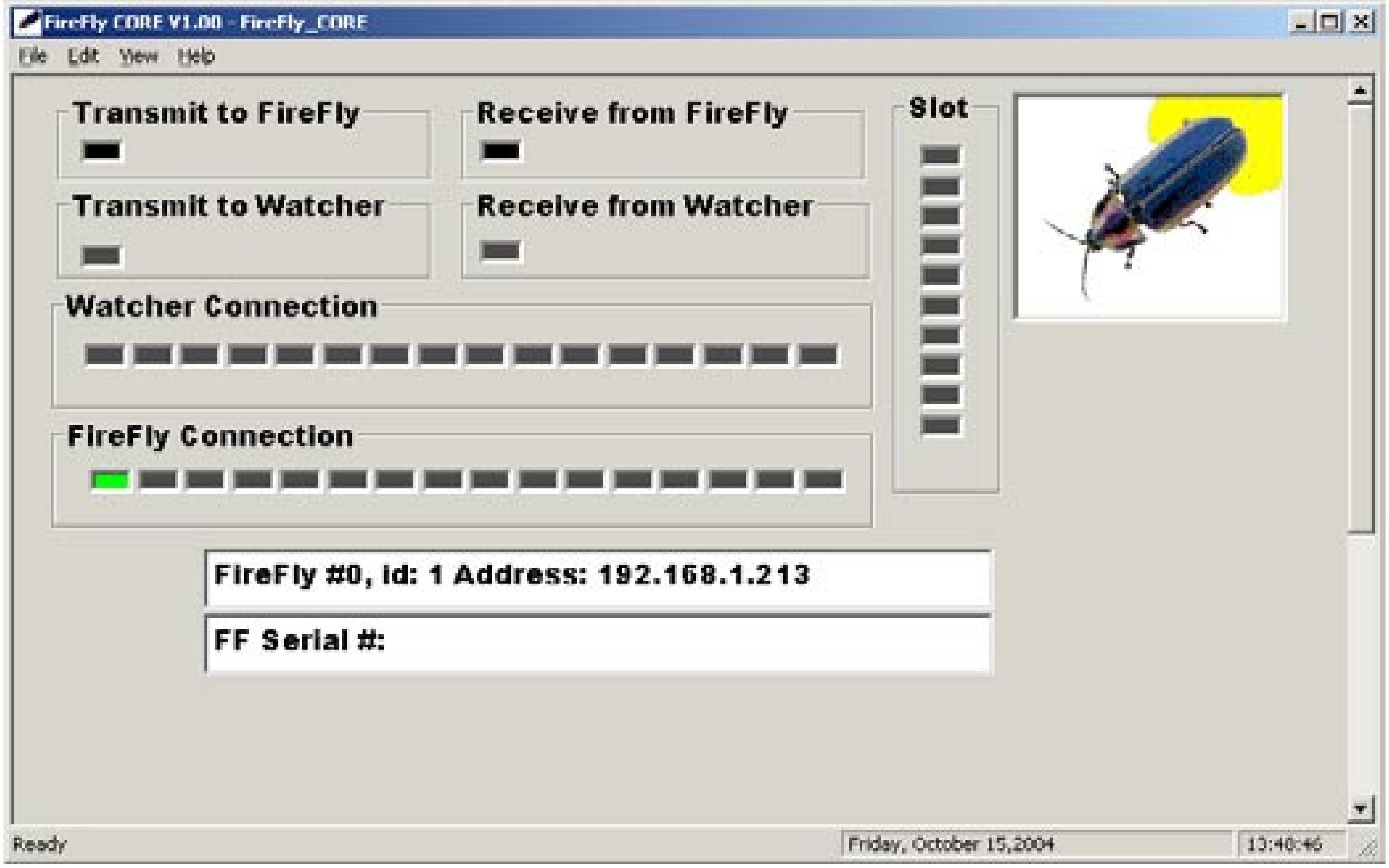
FireFly CORE Introduction

The Fire Fly CORE program collects data from receivers installed in the Fire Fly and saves this data in a data base disk file. The WATCHER program uses the data in this data base file to generate its reports and displays.

Fire Fly CORE Requirements

1. Windows 2000 or Windows XP
2. CPU > 1GHz
3. 800x600 Minimum screen size.
4. > 100 Mbyte ram
5. > 18 Gbyte hard drive

Fire Fly CORE program displays its status as shown in Figure 1. The rectangular boxes represent LED's and they are lit according to CORE/FIRE FLY/WATCHER activity.



FireFly #0, id: 1 Address: 192.168.1.213

FF Serial #:

Ready

Friday, October 15,2004

13:40:46

Figure 1-The Fire Fly CORE Screen

Holding the right mouse button down while the mouse pointer in on this screen will cause a Sub Menu to be displayed as in Figure 2.

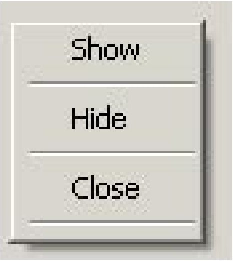


Figure 2

The same Sub Menu is displayed if the right mouse button is held down whilr the pointer is on the CORE Icon in the system tray as in Figure 3.

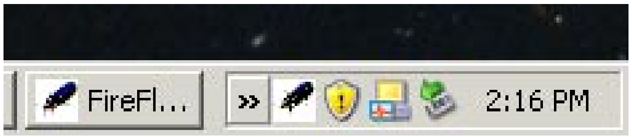


Figure 3

The tray icon is to the right of the double arrow “>>”.

__SubMenu Selections__:

Show: The CORE screen is displayed.
Hide: The CORE screen is hidden.
Close: Close out the data base, break all connections and exit.

__Fire Fly CORE Display__
__Led(s)__

__Transmit to FireFly:__
Lit when the Core sends data to the FireFly.

__Receive from FireFly__:
Lit when the Core receives data from the FireFly.

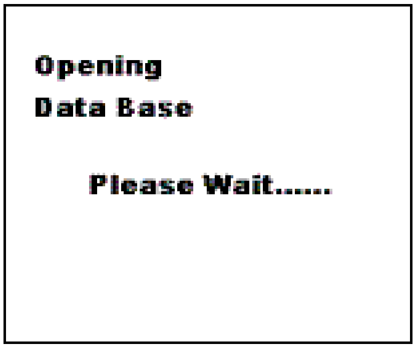
__Slot:__
Lit when data is received from a particular FireFly receiver.

__Watcher Connection__:
One LED is lit for each WATCHER connected to the CORE.

__FireFly Connection__:
One LED is lit for each FIRE FLY connected to the CORE.

The CORE Status Indicators

The upper right hand side of the screen is used to display running status. CORE system time is displayed in the status bar on the lower right of the screen. Note that ALL data saved in the data base is time tagged with this time. It is therefore VERY important that this time be set correctly.



Opening
Data Base

Please Wait......

Figure 4

When the CORE is started, the text in Figure 4 is displayed on the upper right of the screen. After the data base has been opened, any fire flies setup by the WATCHER are connected to. The bigger the data base file is, the longer this text is displayed.

Once the data base has been opened for use, the upper right of the screen displays a picture of a blinking fire fly. The blinking of this picture indicates that the CORE is running (Figure 5).

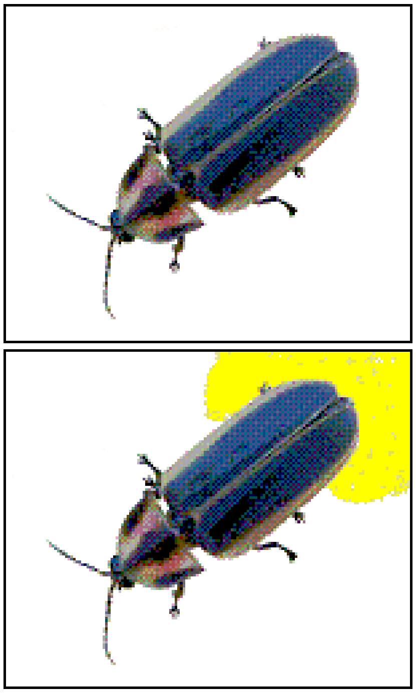


Figure 5

FIREFLY WATCHER OPERATION

BEFORE YOU BEGIN

OVERVIEW

The Firefly Watcher application is used as a tool to retrieve information from one or more Firefly monitoring systems. This information is stored over time with the Firefly Core application. This Core application is run in the background on a dedicated server and creates a database of information.

This database is used by the Watcher to provide reports on RF activity in certain frequency bands, most notably the 2.4GHz range. These reports provide summaries on the use of the band, as well as what MAC addresses and what technologies are using this bandwidth. These reports are viewable and printable.

Also, the parameters in each receiver of the Firefly(s) can be set with the administration screen of the Watcher.

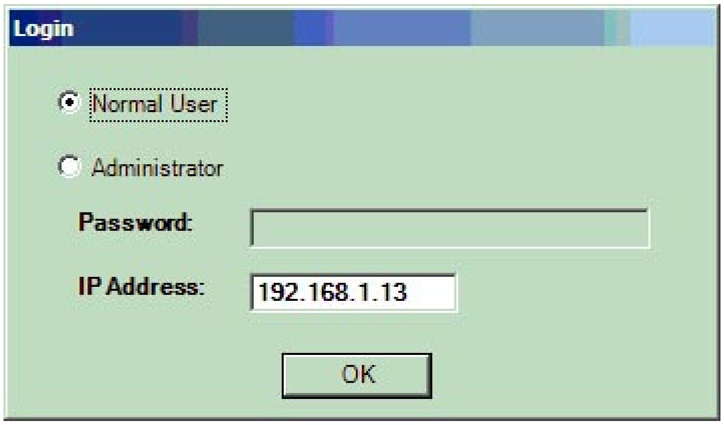
INSTALLATION

The Firefly software can be installed from the CD which came with the Firefly Monitoring system. Simply place the CD in your computer and install the Firefly Watcher. If the installation program does not automatically start, please run autorun.exe from the root directory of the CD.

WHAT YOU'LL NEED

In order for the Firefly Watcher to be used, the following must be in order:

1. A Firefly Core application must be running on a machine that can be accessed via TCP/IP.
2. The IP address of the Firefly Core machine must be known.
3. The Core application must have created a database. This is accomplished by the Core having been connected to a Firefly monitoring system and collecting data for a period of time.



Login

● Normal User

○ Administrator

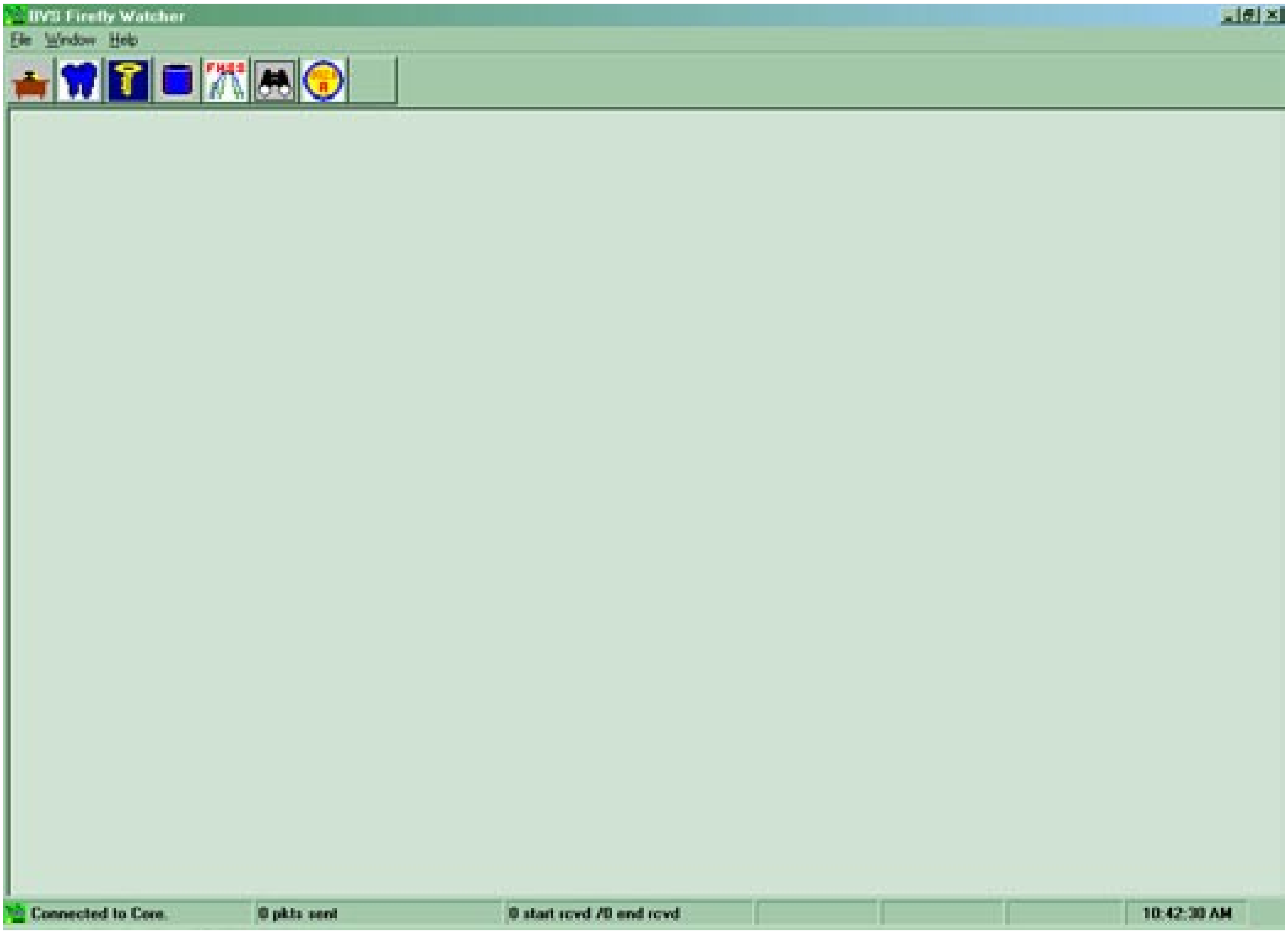
Password:

IP Address: 192.168.1.13

FIGURE 1 - WATCHER LOGIN SCREEN

GETTING STARTED

When starting the Watcher application, you will be asked to provide an IP address. This is the address of the machine where the Core application is running. After entering this address, this will be the default whenever the Watcher is opened from that point on.



Connected to Core.

0 pkts sent

0 start rcvd /0 end rcvd

10:42:30 AM

FIGURE 2 - WATCHER MAIN SCREEN

Leave the other settings (User Type and Password) as they are. After pressing OK, the main Watcher screen will appear. The bottom left of the screen should now report that there is a connection to the Core.

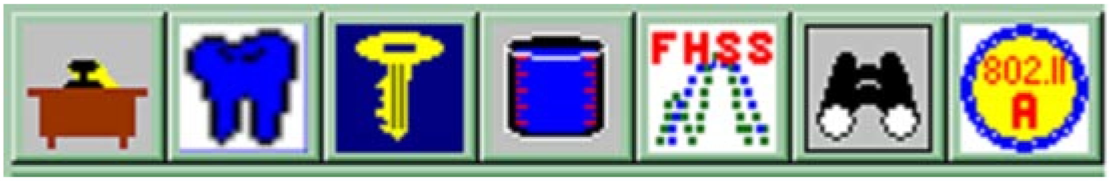


FIGURE 3 - WATCHER MAIN TOOLBAR

The status panels on the bottom of the main screen represent connection status, database requests made, database responses started, database responses finished, and the system clock.

Statistical analysis is done by accessing one of the buttons on the main toolbar. The toolbar buttons are from left to right:

1. Administration - check on status of Fireflys and change configurations of receivers.
2. Bluetooth - generate statictics on Bluetooth devices.
3. Authentication - generate authentication statistics on 802.11b devices.

4. Utilization - generate utilization statistics on 802.11b devices.
5. 802.11FHSS - generate statistics on 802.11FHSS devices.
6. Direction Finding - Locate a particular 802.11b device from its MAC address.
7. 802.11a - generate statistics on 802.11a devices.

OPTIONS

GENERAL GRAPHING OPTIONS

Each screen has general graphing options. By right-clicking the graph area, a menu will pop up. This menu lets you choose between:

1. A line chart
2. A bar chart
3. A 3-dimensional bar chart

Simply click on the chart type to change the current chart type setting.

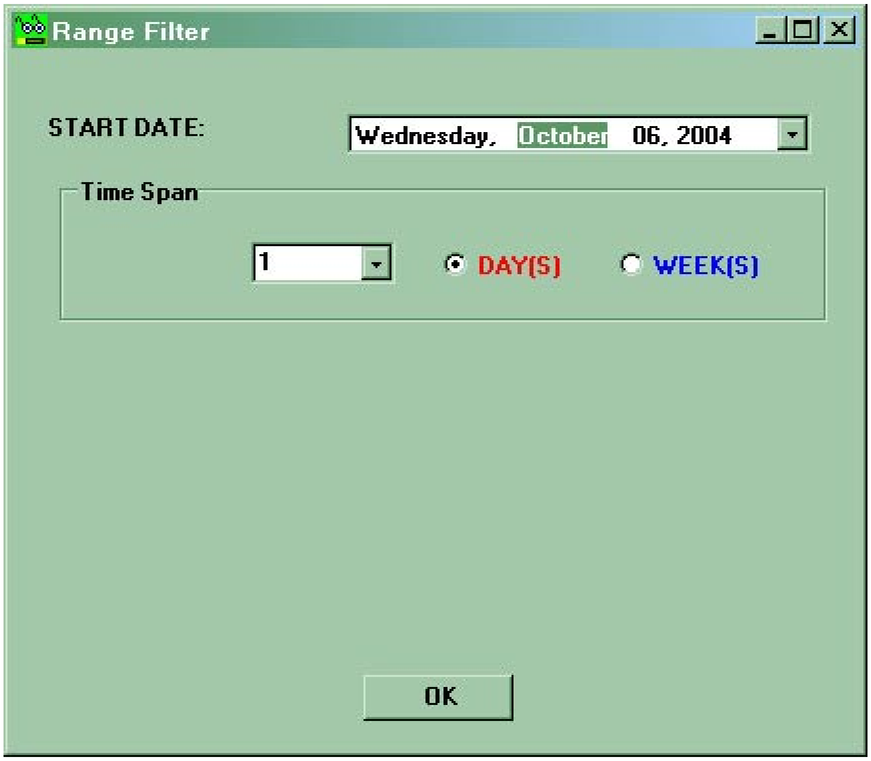
GENERAL PRINTING OPTIONS

Each screen allows printing the resulting graph. The resulting printout is WYSIWYG (what you see is what you get) and can be used for reports and filing historical data. Use the print option from the File menu when the screen you want to print has focus.

GENERAL DATE/TIME OPTIONS

You will see the button for selecting date and time on most report screens. The date/time selection dialog allows the entry of a starting date. The the user is to select a date range by choosing a number of days or weeks. If days are selected, the resulting graph will be split up into hour bins. The bins will be labeled 0-23. 0 contains data from 12:00 midnight until 1:00AM.

If a number of weeks is selected, then the bins will range from Sunday through Saturday. The Sunday bin will contain all data collected for Sunday's in the date range.



START DATE: Wednesday, October 06, 2004

Time Span

1 ● DAY(S) ○ WEEK(S)

FIGURE 4 - Date/Time Range Dialog

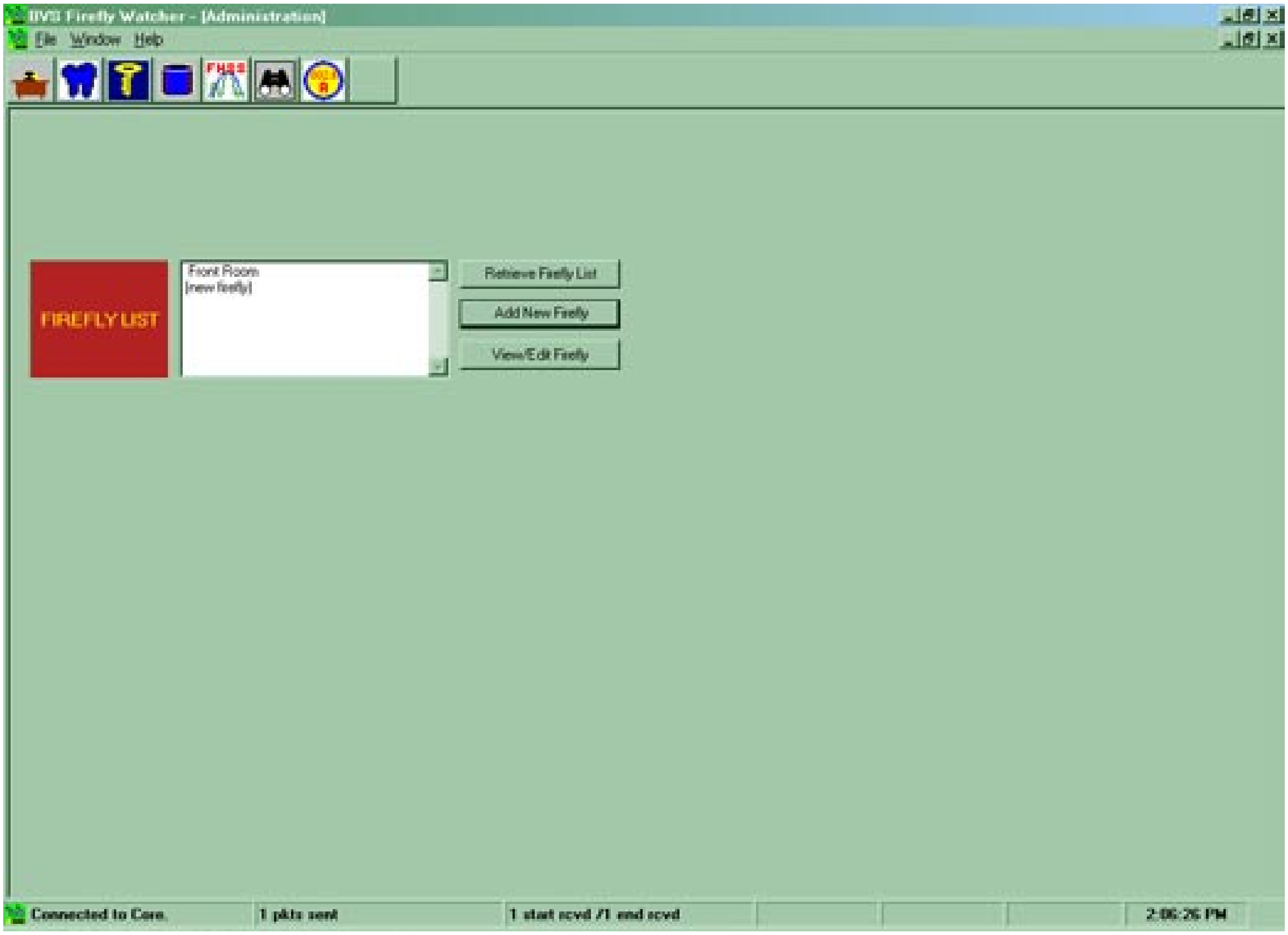
MODES

ADMINISTRATION

The administration screen allows the user to check on the status of receivers in the Firefly monitoring system and to change parameters of these receivers.

There needs to be a record in the database for every Firefly in the network. The Watcher adds new records by choosing the Add New Firefly option. First, however, retrieve the current Firefly list by choosing “Retrieve Firefly List”.

If adding a new Firefly, choose “Add New Firefly”. A new item will appear in the list. Select this item or any other item for editing. Then you must fill in the appropriate fields in the resulting dialog box. Make sure that you enter the correct IP address for this is the address that the Core application will use to try and connect to the Firefly.



Connected to Core.

1 pkts sent

1 start rcvd /1 end rcvd

2:06:26 PM

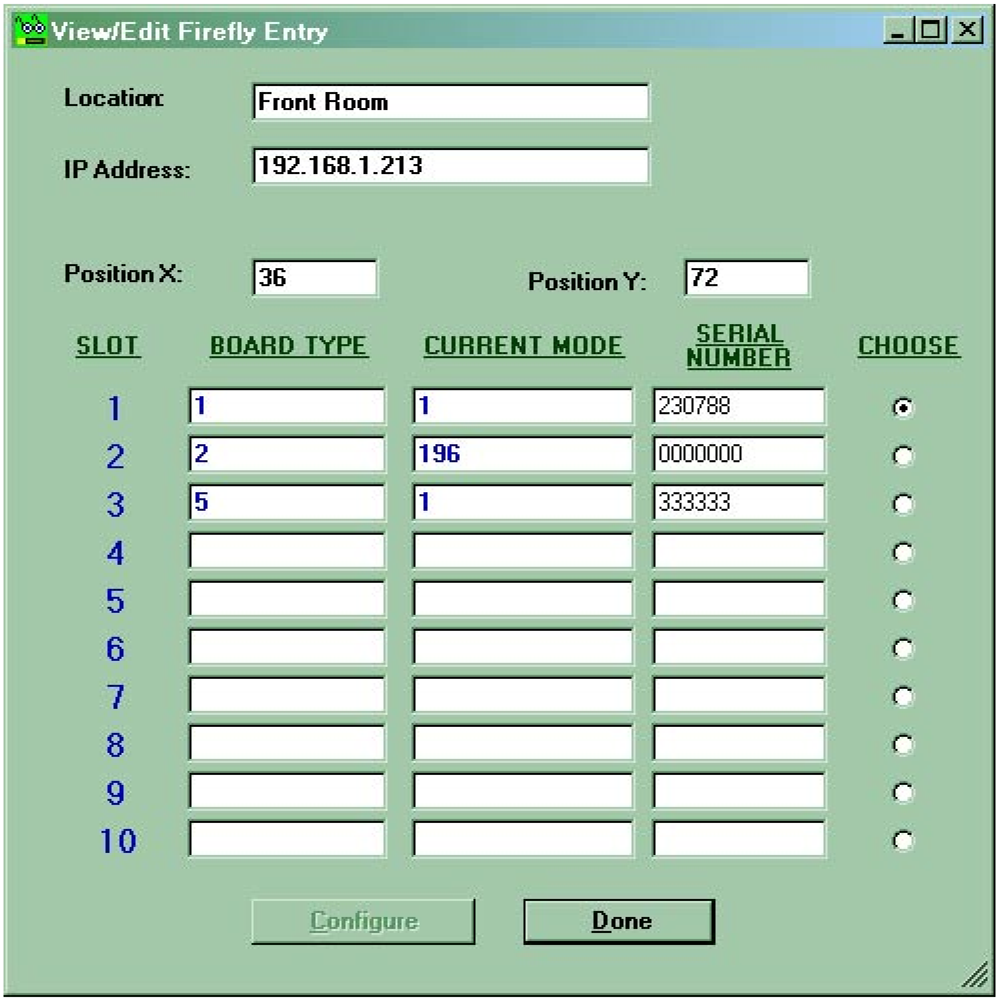
FIGURE 5 - Administration Screen

If this is a new entry, the Core application will retrieve receiver board information after you have updated the database and restarted the Core.

To modify an existing Firefly, select the Firefly in the list box after retrieving using the ‘Retrieve Firefly’ option, and then choose “View/Edit”.

You can modify Firefly parameters here. When you press “Done”, the Firefly entry in the database will be updated.

You can change the parameters of a board in this dialog by clicking on the appropriate radio button for the receiver shown.



Location: Front Room

IP Address: 192.168.1.213

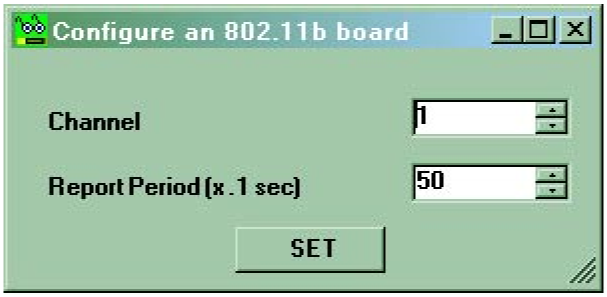
Position X: 36

Position Y: 72

SLOT	BOARD TYPE	CURRENT MODE	SERIAL NUMBER	CHOOSE
1	1	1	230788	●
2	2	196	0000000	○
3	5	1	333333	○
4				○
5				○
6				○
7				○
8				○
9				○
10				○

FIGURE 6 - Board Selection Screen

This will bring you into a dialog box which will contain parameters for updating (such as receiver mode, channel, update duration, and geocode). The receiver modes are different for each type of receiver. There may also be:



Channel: 1

Report Period (x .1 sec): 50

FIGURE 7 - Board Parameter Screen

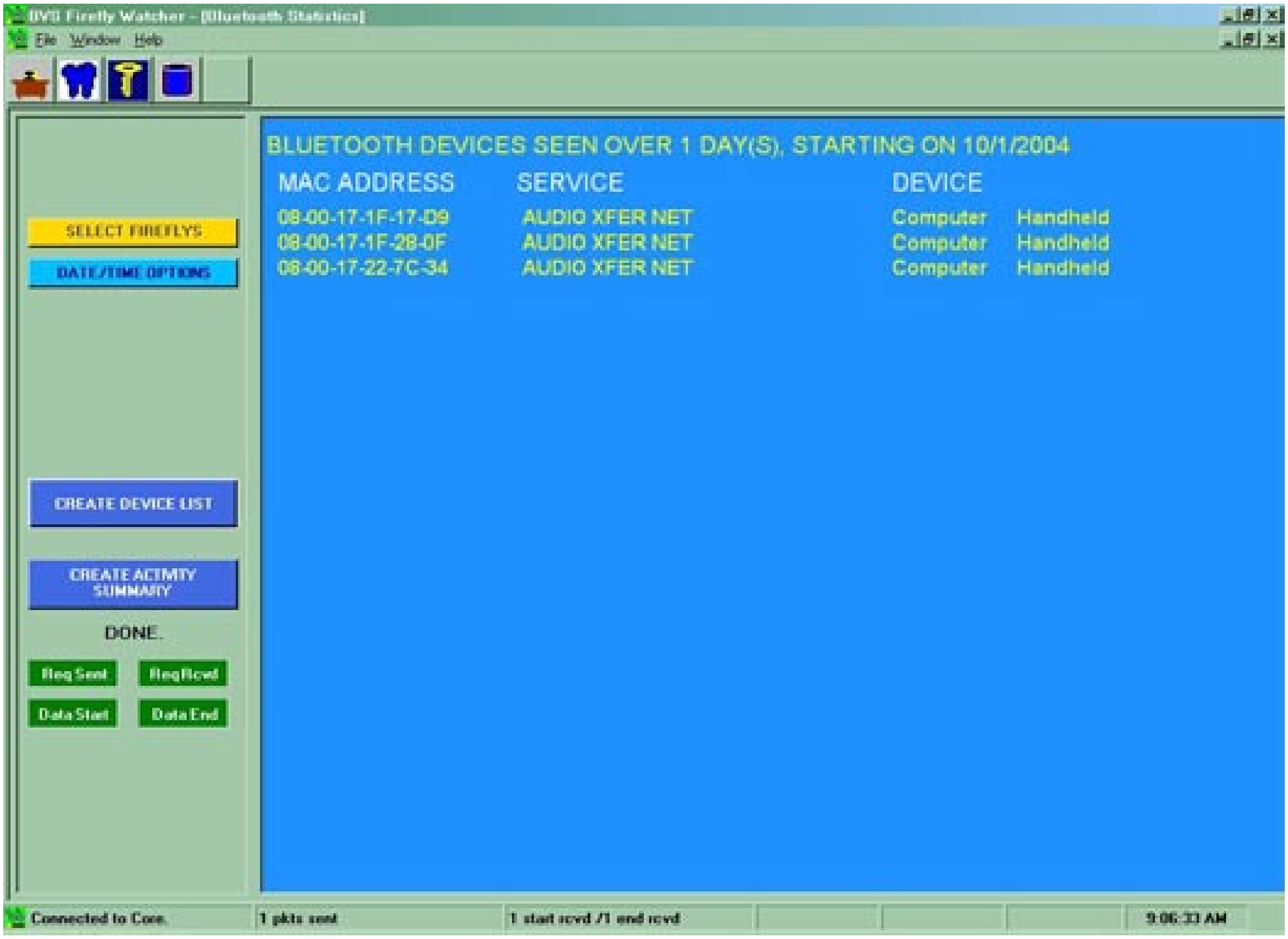
<u>Channel</u>: Channel number (receiver-dependent)
<u>Duration</u>: Amount of time data is collected on the Firefly before it is sent to the Core.
<u>Geocode</u>: Country of operation
<u>DF</u>: Check the box to tell Watcher that this receiver has the DF antenna for DF mode.

After the parameters are selected, choose “SET”. Then press “DONE” on the Firefly Edit screen. The new entries will now be sent to the Core database and will be sent to the Firefly(s).

BLUETOOTH

The Bluetooth statistics screen gives the user two different graphs to view and/or print. The first graph shows the number of devices active in a certain time period based on settings made using the Date/Time dialog.

The second graph will show a list of bluetooth devices seen in a time period and will also give its MAC address as well as information on what type of device it is (Computer, phone, etc.).



BLUETOOTH DEVICES SEEN OVER 1 DAY(S), STARTING ON 10/1/2004

MAC ADDRESS	SERVICE	DEVICE	
08-00-17-1F-17-D9	AUDIO XFER NET	Computer	Handheld
08-00-17-1F-28-0F	AUDIO XFER NET	Computer	Handheld
08-00-17-22-7C-34	AUDIO XFER NET	Computer	Handheld

DONE.

Connected to Core. | 1 pkts sent | 1 start rcvd /1 end rcvd | 9:06:33 AM

FIGURE 8 - Bluetooth Statistics Screen

AUTHENTICATION

The authentication screen gives the user a unique graph to view and/or print out as a report. This graph is a over a date/time range using the date/time selection dialog box.

The graph itself shows 802.11b authentication attempts versus the date/time bins. The authentication attempts cover the total height of the bar or line in the chart. The red sub-bar is the amount of authentication successes. The blue sub-bar is the number of authentication failures.

Devices must authenticate into the network before accessing data. If there are a lot of authentication attempts and a good number of failures, a hacker may be trying to break into your network.

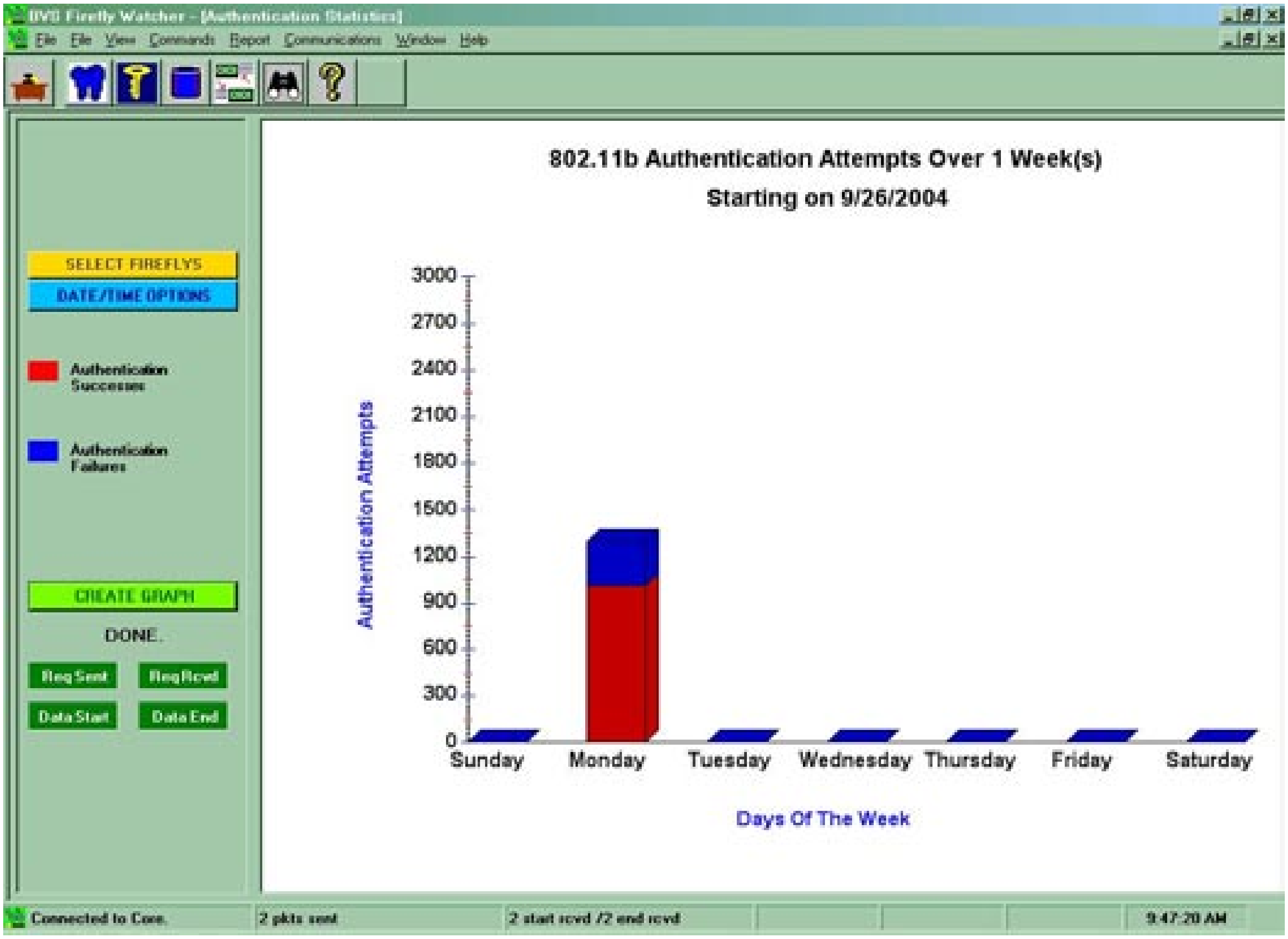


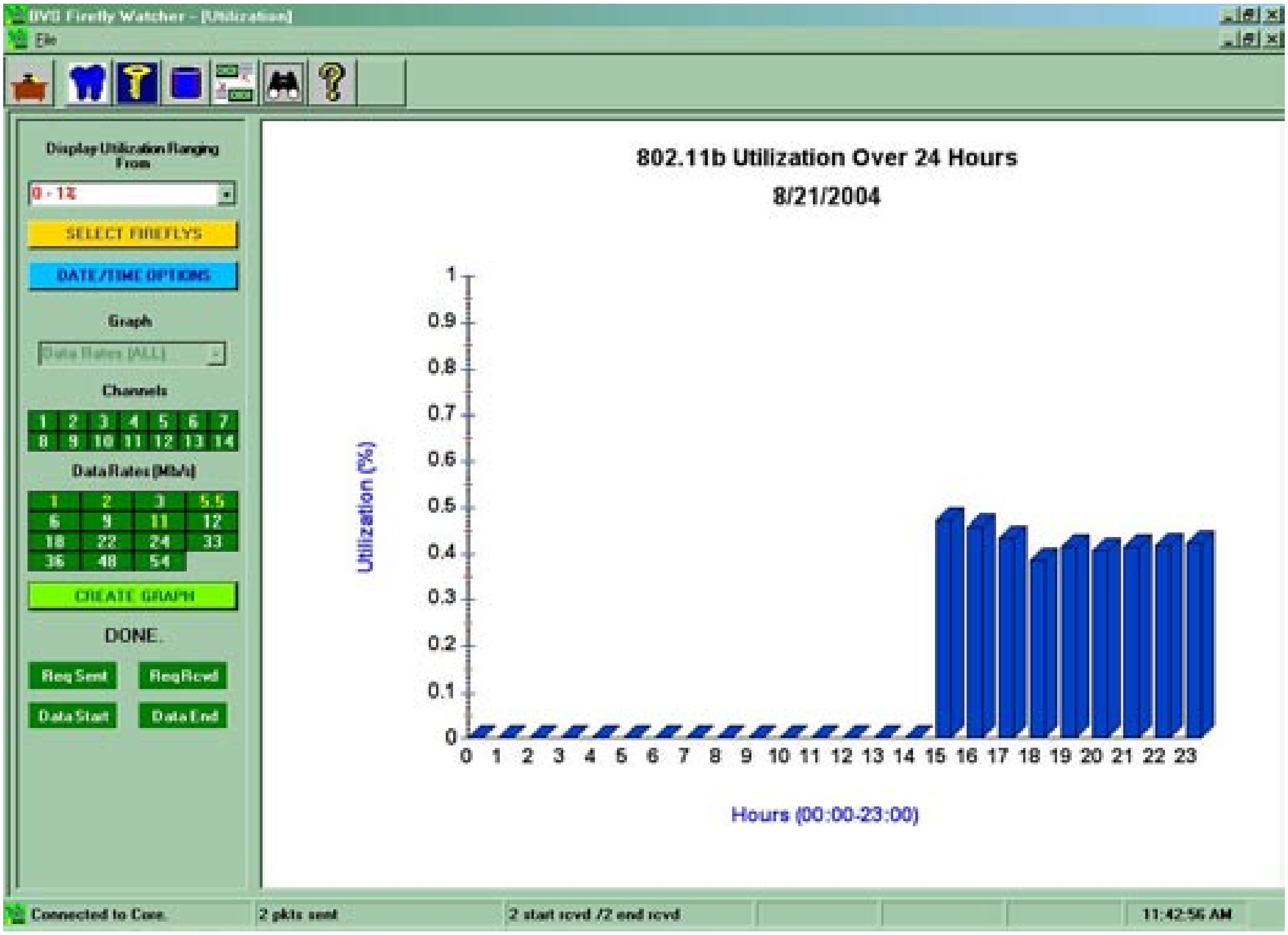
FIGURE 9 - Authentication Statistics Screen

UTILIZATION

The utilization screen will allow the user to view/print a graph which shows the network utilization of an 802.11b network. The utilization is graphed as a percentage of network bandwidth from 0% - 100%. This is over all data rates and channels (1-14) in the network.

The user must select a date/time range using the date/time selection dialog box. Then a graph will be created when the “CREATE GRAPH” button is pressed. A network that is not in use will typically show under 1% utilization. The vertical range of the graph can be altered between the following options using the combo box provided:

0-100%
0-10%
0-1%



Display Utilization Ranging From: 0 - 1%

Graph: Data Rates (ALL)

DONE.

Connected to Core. | 2 pkts sent | 2 start rcvd /2 end rcvd | 11:42:56 AM

FIGURE 10 - Utilization Statistics Screen

802.11FHSS

The 802.11FHSS statistics screen gives the user two different graphs to view and/or print. The first graph shows the number of devices active in a certain time period based on settings made using the Date/Time dialog.

The second graph will show a list of 802.11FHSS devices seen in a time period and will also give its MAC address as well as other information (average RSSI).

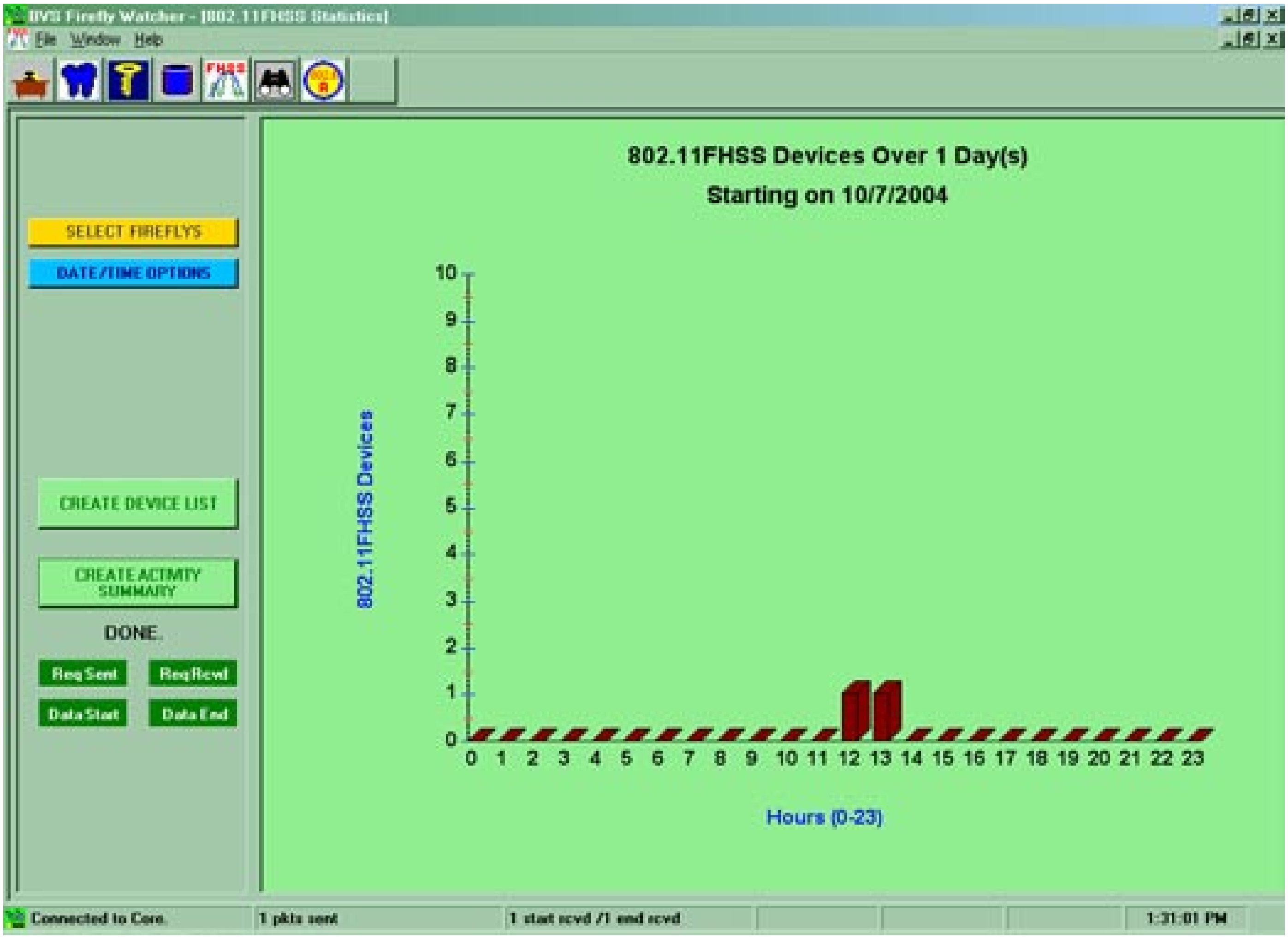


FIGURE 11 - 802.11FHSS Statistics Screen

DIRECTION FINDING (MAC LOCATION)

The direction finding screen gives the Watcher complete control over a receiver board in the Firefly system. This is accomplished through a pass-through capability in the Core. By using information stored in the database, the Watcher will know which board can be controlled.

Make sure that the directional antenna “D-FLY” is set up correctly on the Firefly. The “D-FLY” should be connected to the Firefly via the serial RS-232 connection and via the RF antenna output.

The locating of a particular MAC address can be accomplished using this screen by following these steps:

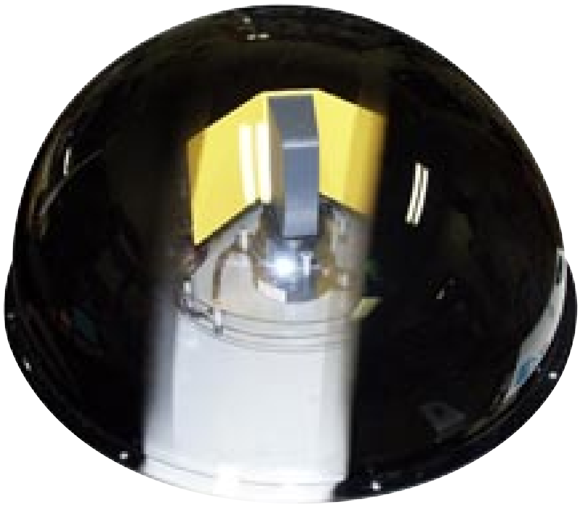
SEARCH FOR MACS

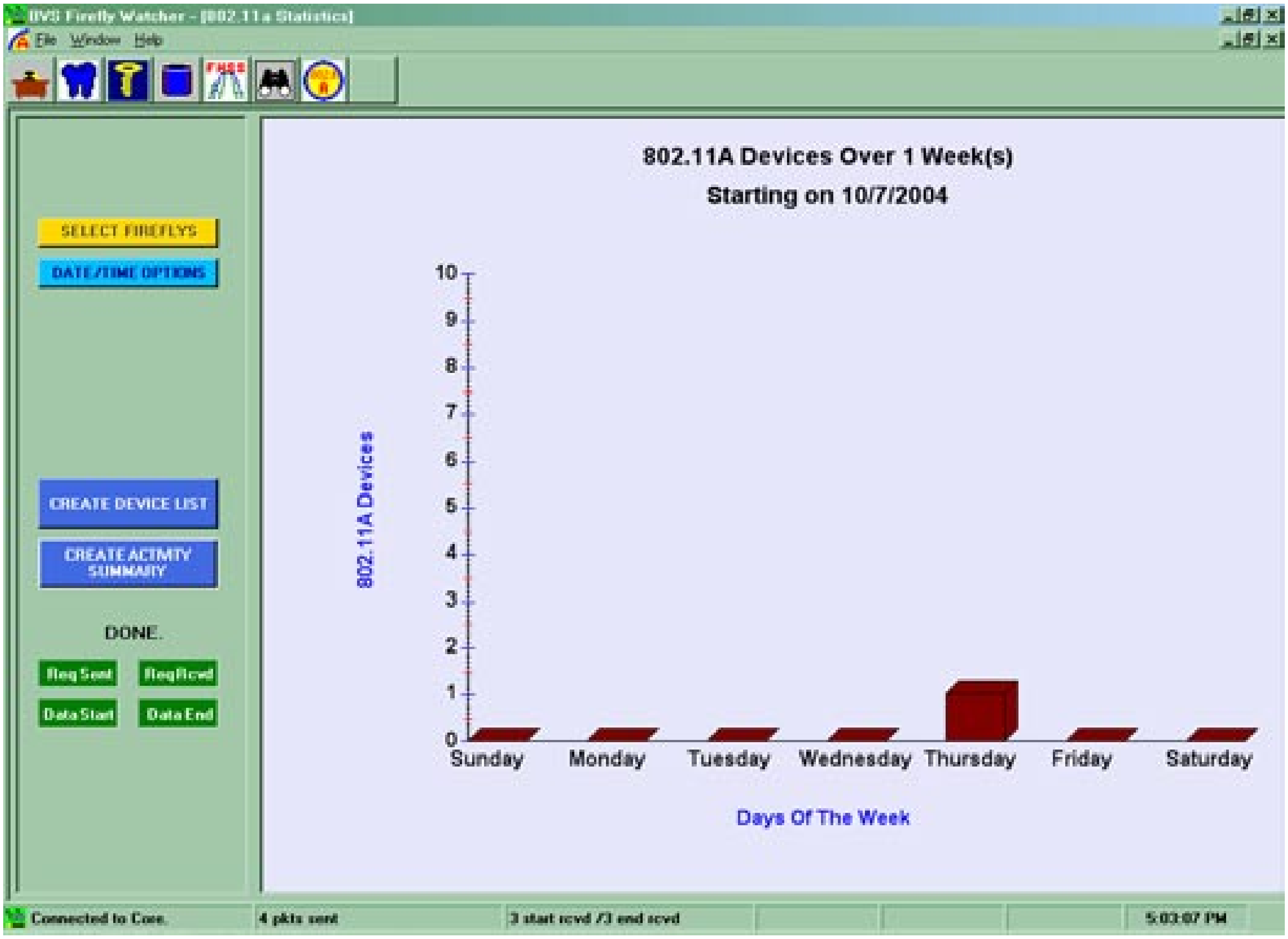
Pressing this button starts the receiver in “SEARCH” mode. This will spin the directional antenna in a continuous 360 degree sweep. Any MAC addresses seen will be added to the list. When the MAC address to be located appears in the list, press the “STOP SEARCH” button. Then you need to…

CHOOSE SELECTED MAC

Single-click on the MAC address to be located. This will place the selected MAC in the spotlight. It will appear in the edit box below the button. Then you must…
LOCATE MAC

Press the "LOCATE MAC" button. This will begin a search for the particular MAC address. When the search is completed, the screen will approximate the direction (using the D-FLY as a reference) of the MAC address in a compass-like fashion.





DVS Firefly Watcher - [802.11a Statistics]

802.11A Devices Over 1 Week(s)
Starting on 10/7/2004

DONE.

Connected to Core.

4 pkts sent

3 start rcvd /3 end rcvd

5:03:07 PM

FIGURE 12 - Direction Finding Screen

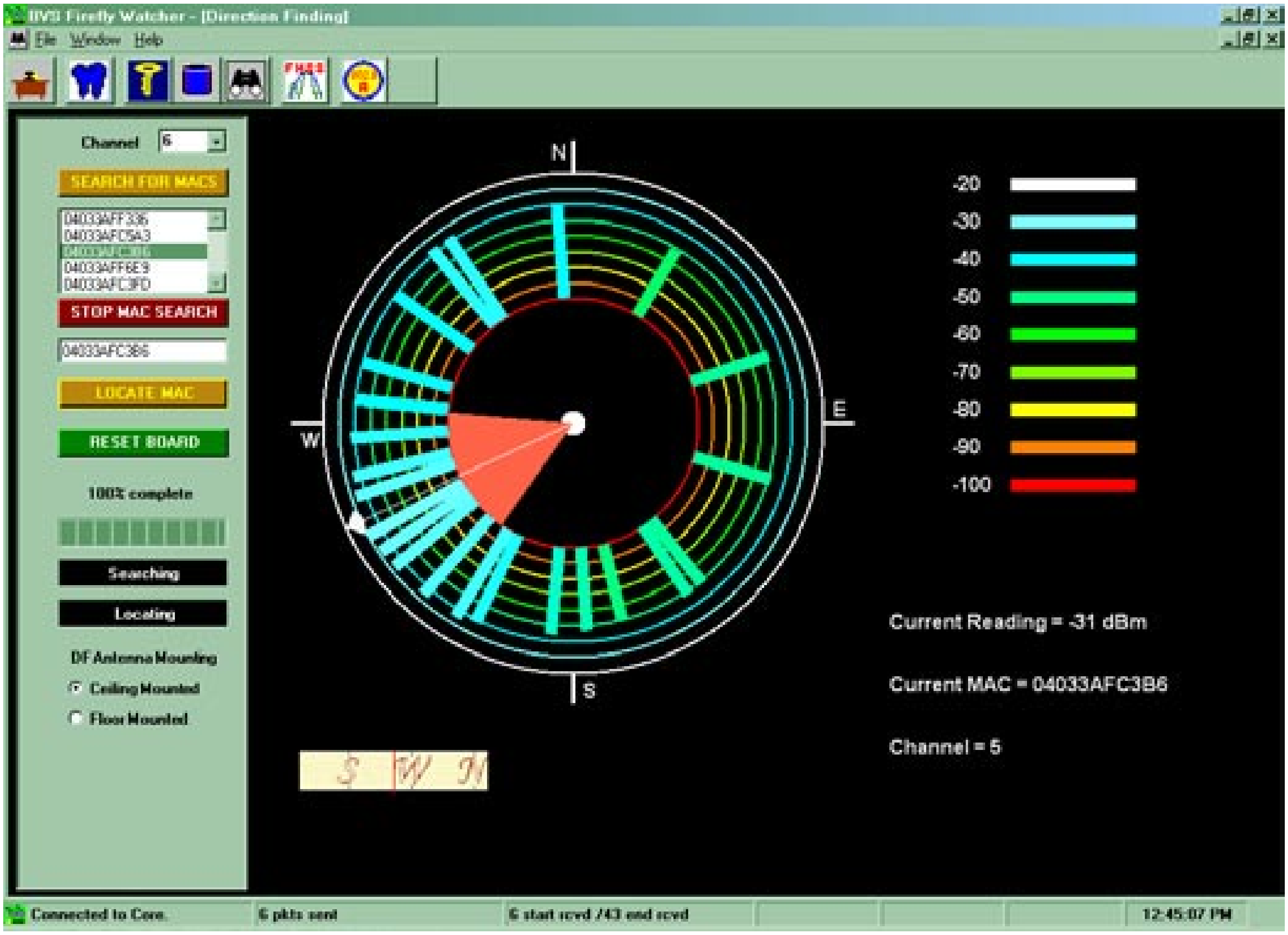
RESET BOARD

This button will reset the board into the mode it was in before attempting a search.

802.11A

The 802.11a statistics screen gives the user two different graphs to view and/or print. The first graph shows the number of devices active in a certain time period based on settings made using the Date/Time dialog.

The second graph will show a list of 802.11a devices seen in a time period and will also give its MAC address as well as other information (average RSSI).



IVS Firefly Watcher - [Direction Finding]

Channel 6

04033AFF336
04033AFC5A3
04033AFC3B6
04033AFF6E9
04033AFC3FD

04033AFC3B6

100% complete

Searching

Locating

DF Antenna Mounting
● Ceiling Mounted
○ Floor Mounted

Current Reading = -31 dBm

Current MAC = 04033AFC3B6

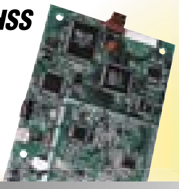
Channel = 5

Connected to Core. | 6 pkts sent | 6 start rcvd /43 end rcvd | 12:45:07 PM

FIGURE 13 - 802.11A Statistics Screen

FIREFLY™

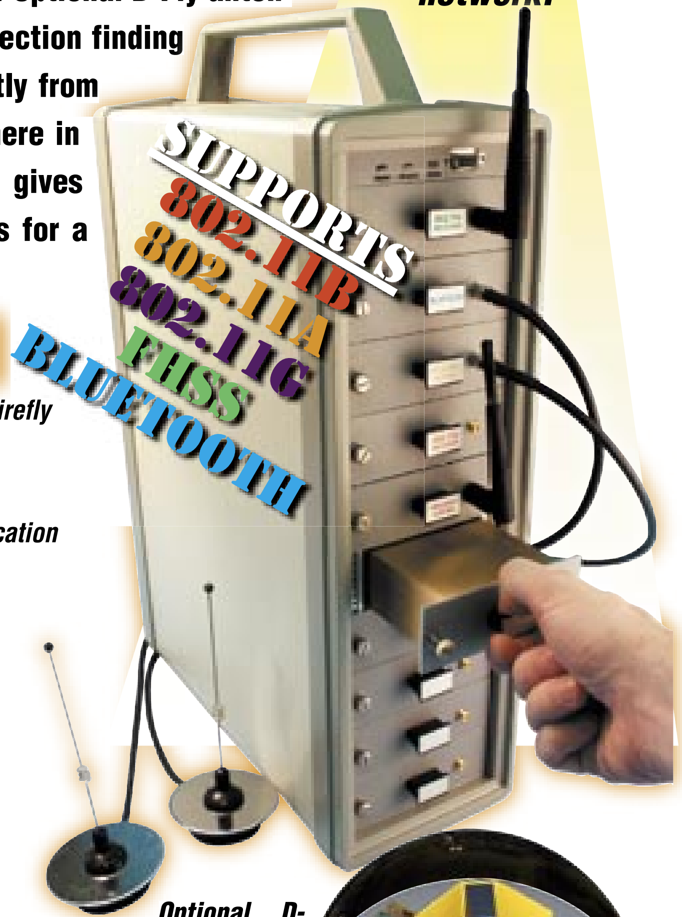
Includes up to ten 802.11b/a/g, FHSS or Bluetooth) calibrated receivers for simultaneous omni-scanning and directional pinpointing of rogue APs and STAs.



Fixed Location 802.11 Monitoring System

Shed some light on your Wi-Fi network.

Firefly™ is a sophisticated 802.11 Wi-Fi analyzer that helps IT managers maintain network throughput and security by recognizing and identifying abnormalities in network traffic. **Firefly's**™ core application software creates relational databases of information through a wireless network of remotely configurable **Fireflies**™ with each **Firefly**™ containing up to 10 calibrated receivers. This configuration allows users to collect vital WLAN parameters such as MAC, SSID, RSSI, PER and WEP* and then identify and locate failed authentication attempts*, unauthorized channel usage of APs and STAs*. Optional D-Fly antennae ensure continuous network scanning with simultaneous direction finding precision on a particular channel. E-mail alerts are sent directly from **Firefly's**™ database core directly to IT security officers anywhere in the world for immediate evaluation. **Firefly's**™ core database gives users real-time or time-stamped WLAN traffic security profiles for a true network footprint.



SUPPORTS 802.11B 802.11A 802.11G FHSS BLUETOOTH

802.11 Support

- *Up to 10 removable Wi-Fi receivers (802.11b/a/g, Bluetooth or FHSS) per Firefly*
- *Multiple Fireflies controlled via local network or over the internet*
- *On and Off-site monitoring from network machine(s) using Watcher™ application*
- *Modular software and hardware packages allow for user flexibility*
- *"Who's talking to who?" mode for determining network footprint*
- *D-Fly™ antenna option for pinpointing RF anomalies & APs*
- *Ability to detect malicious interference within network boundaries*
- *Comprehensive network statistics such as MAC, SSID, RSSI, PER, etc.*
- *E-mail alerts from core application sent immediately to IT security officers*
- *Input network floor plan for directional statistics*
- *Monitor network bandwidth availability and throughput via ethernet*
- *"Health Monitor" acts as preventive medicine for your wireless network*

Optional D-Fly™ (Direction Finding) Antenna scans all channels and/or rests on one channel to remotely survey and protect your WLAN's perimeter. A motorized antenna spins around hunting for all active APs.

*PER & WEP only supported in b & b/g receiver modules
*Failed Authentication attempts not supported in 802.11a receiver module
*STAs not supported in 802.11a receiver module

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wireless products BERKELEY VARITRONICS SYSTEMS

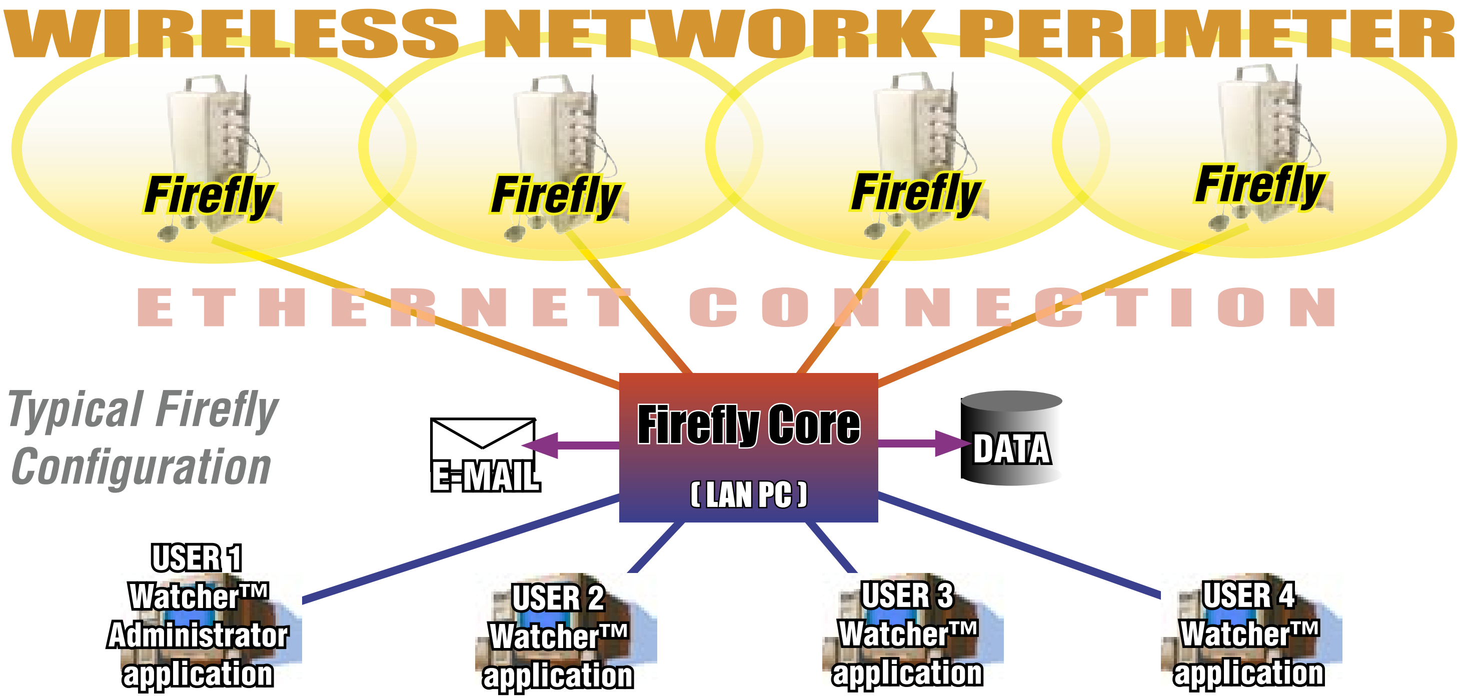
FIREFLY™

FIXED LOCATION 802.11 MONITORING SYSTEM

BANDS SUPPORTED	ISM: 2.400-2.495 GHz (802.11, 802.11b/g, Bluetooth) U-NII lower band (5.180 - 5.240 GHz) (802.11a) U-NII middle band (5.260 - 5.320 GHz) (802.11a)
RF SENSITIVITY (Wide Band)	-20 to -90 dBm
RSSI MEASUREMENT (Narrow Band 802.11b/g)	-30 to -90 dBm @ 343.75 kHz resolution bandwidth
RSSI MEASUREMENT (Narrow Band 802.11a)	-30 to -90 dBm @ 156 kHz resolution bandwidth
RSSI MEASUREMENT (Narrow Band Bluetooth)	-30 to -90 dBm @ 687.5 kHz resolution bandwidth
TUNING INCREMENTS (802.11b/g)	Tunes 11 USA channels & 3 international channels
TUNING INCREMENTS (802.11a)	Tunes 8 channels (36,40,44,48,52,56,60,64)
TUNING INCREMENTS (FHSS)	1 MHz steps (IEEE 802.11 channels)

CORRELATED POWER MEASUREMENTS (802.11b):	RATIO
Correlated Power (dBm)	-30 dBm : -100 dBm
Correlated Power to Total Power Ec/Io (dB)	0 dB : -10 dB
Total Channel Power Measurement	-20 dBm : -90 dBm

Firefly's™ custom PC software uses the most efficient search algorithm providing the fastest and most accurate scan of all APs & STAs (STAs not supported in 802.11a module) in your 802.11 network's radius. Network administrative control and monitoring via any local or internet ethernet connection assures non-stop wireless surveillance and analysis 24 hours a day.


WIRELESS NETWORK PERIMETER
Firefly
Firefly
Firefly
Firefly
ETHERNET CONNECTION
Typical Firefly Configuration
E-MAIL
Firefly Core
(LAN PC)
DATA
USER 1 Watcher™ Administrator application
USER 2 Watcher™ application
USER 3 Watcher™ application
USER 4 Watcher™ application

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