YELLOWJACKET® PLUS

manual version 2.5 for all YJ & YJ PLUS models

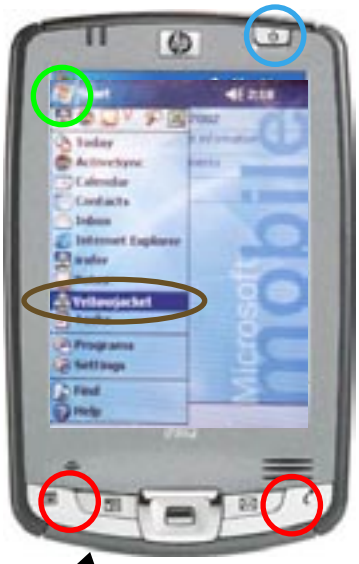
Contents

INTRODUCTION

The **Yellowjacket™** is an 802.11b Analysis System. It consists of a an HP iPAQ PocketPC® coupled with custom hardware and software by BVS. This system contains a variety of features to analyze 802.11b networks including spectrum analysis over all 14 channels (2.401 – 2.495 GHz), a list of AP's and/or stations over all 14 channels, multi-path and packet-error rate information for each individual MAC address. The Yellowjacket also contains a "Geiger-counter" feature to locate a single AP/ STAtion via audio/visual aids and a security feature to warn the user of possible unauthorized AP/ STAtions in the area based on a list of authorized MAC addresses. The data from a Yellowjacket may be logged into resident memory for transfer to a desktop PC at a later time and then be converted from binary to ASCII using "Chameleon WLAN".

Yellowjacket receiver (top view) has an SMA male connector for the supplied antenna. This manual contains operational procedures to get the user up-and-going right out of the box. For any details regarding the iPAQ, users should read all materials from HP and contact them.

The top angle shows the removable antenna connection, stylus, GPS antenna connection (optional), IrDA port, Compact Flash slot and SD card slot. Always keep the IrDA port clean and clear of obstacles for data transmission.



Reset button located on bottom left side of iPAQ 2415

STARTING UP YELLOWJACKET

Power up your Yellowjacket by pushing power button in upper right corner of unit. This power will automatically power up the Yellowjacket receiver also. When you power down the iPAQ, (push the power button on the upper right quickly-holding this button will also toggle the backlight on and off) your Yellowjacket receiver will also shut down. Connect the included antenna to the SMA connector and remove the stylus by pushing down on it. Use your stylus to tap onto the Windows® icon in the upper left corner. Choose Yellowjacket in the pull-down menu. Data may be transferred to a PC via the IrDA window or USB or serial connection. Install Yellowjacket software by connecting your iPAQ to your PC and inserting included BVS software CD-ROM into PC to begin installation. You may also use the provided Compact Flash Installer card. Be sure to turn off any internal WLAN or Bluetooth in your iPAQ before using your Yellowjacket.

Your iPAQ can be reset using 2 different methods. If Yellowjacket software loses communications with Yellowjacket hardware, perform a soft reset with your stylus by pressing the reset button on the back left corner just below the battery door. Perform a hard reset by holding in the two outer buttons for at least 10 seconds while performing a soft reset. **Warning!** Hard reset erases all RAM data from iPAQ so be sure to backup all data and re-install your Yellowjacket application software after a hard reset.

WARNING FOR USERS WITH BUILT-IN WIRELESS
(you must disable your iPAQ's Bluetooth and WLAN)

1. Press the START button on the upper left hand side of the touch screen.
2. Click on the "iPAQ Wireless" folder.
3. Click on the "Wireless Control" program.
4. Click on "All wireless features OFF". The icons for Bluetooth and WLAN will have red backgrounds when disabled.

YELLOWJACKET ACCESSORIES

Your Yellowjacket includes the following accessories: antenna, 2 sets of AA (Ni-MH) removable batteries (8 total). Approximate charging time for 4 Ni-MH batteries is just over one hour. Run time is just over two hours. Yellowjacket uses common AA battery cells found in any convienence store. Ni-Cad, Alkalines, Ni-MH and Li-Ion cells may all be used. Yellowjacket does require 4 AA cells with at least 1500 mAh per cell. BVS supplies 2 battery sets (8 Ni-MH battery cells total) to get users working right out of the box. Ni-MH cells are recommended for best performance from your Yellowjacket.

YELLOWJACKET POWER

The Yellowjacket has 2 independent power systems. The 4 AA Ni-MH receiver batteries may only be charged using the supplied fast charger or another comparable Ni-MH charger. The supplied AC power transformer powers both the iPAQ and Yellowjacket receiver simultaneously. It will also charge the iPAQ's battery. Yellowjacket receiver batteries must be removed and charged in the supplied Ni-MH AA battery charger. The iPAQ internal battery may be charged through either the supplied iPAQ power adapter or the iPAQ data/power/charging cradle power connector. The Yellowjacket receiver may be continuously powered through the slimmer power connector.

Recommended iPAQ 4700/4705 model shown with Yellowjacket receiver

Starting Up Your Yellowjacket

Unpack and assemble your Yellowjacket unit as shown. Slide the iPAQ case onto the Yellowjacket and slide your iPAQ computer into the iPAQ case. Remove the Compact Flash cover and install the Compact Flash serial cable. The Compact Flash serial cable is the communication link between the Yellowjacket receiver and the iPAQ. Connect both the Yellowjacket and iPAQ to external power as shown with the "Y" power cable.

Power up the iPAQ by pushing the power button in the upper right corner of the iPAQ. Connect the appropriate frequency antenna to the SMA male antenna input. iPAQs shipped by BVS are optimized for the Yellowjacket. If you are using your own iPAQ, see the optimization section to set up your iPAQ.

iPAQs supplied by BVS have the Yellowjacket software pre-installed. If you need to install the Yellowjacket software, see the software installation/re-installation section.

Tap the windows Start icon in the upper left corner and then choose Yellowjacket in the pulldown menu. If the Yellowjacket does not appear in the pulldown menu, tap on the "Programs" folder. Tap on the Yellowjacket icon.

Running the Yellowjacket software will power the Yellowjacket receiver.

If the Yellowjacket software loses communication with the Yellowjacket, perform a soft reset by pressing the iPAQ's reset button. If communications problems persist, perform a hard reset by holding down the two outer buttons on the front of the iPAQ while holding in the soft reset button. Remember, hard resets erase all data collected and software installed so backup all data and see software installation for details.

Optional iPAQ 2210/2215 model shown

Optional iPAQ 2415/2410 model shown

Getting Started

To start the YellowJacket 802.11b software:

1. Press the Start button on the iPAQ.
2. Press the PROGRAMS option.
3. Press the "Yellow Jacket B" icon (usually at the bottom of the alphabetized list).
4. Tap anywhere on the screen when the splash screen appears as shown.

YellowJacket Main Screen

The YellowJacket main screen allows access to all software menus. Use the stylus or the joystick to make a selection. You can back up and access the main screen anytime by pressing the toolbar button that looks like three different colored circles.

There are six menu options from the main menu. They are: Spectrum mode, MAC List mode, Security Options, Channel utilization screen, the Channel usage screen, and (for PLUS units only) the GPS screen.

Note that the firmware and serial number on the bottom appears indicating serial connection between the iPAQ and the YellowJacket receiver.

Toolbar

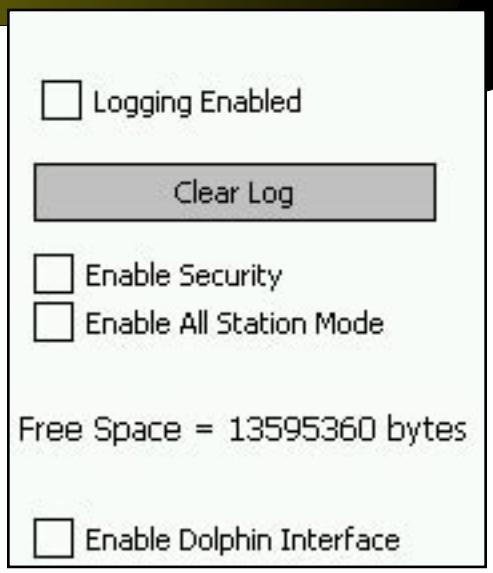
The toolbar at the bottom of the screen provides various functions. The first icon (three colored circles) will bring the user back to the main menu.

The second and third buttons are the record and stop buttons for log files. The fourth button is a camera icon and allows the user to take a JPEG snapshot of the current screen.

The fifth and sixth buttons are used in the MAC screen for maneuvering up and down through the MAC address list. The

seventh button is to enter the options screen. The eighth button is the marker button and the last button displays the about box.

YellowJacket Options Screen



Press the ABCD button on the toolbar to access this options screen. Here, you may enable security, enable all station mode and enable the Dolphin™ Mapping Interface.

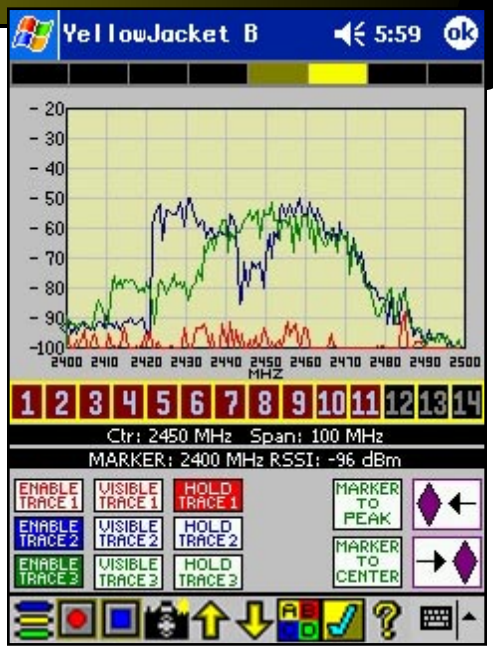
Logging mode will only log data from the screen (multipath, spectrum, utilization, etc.) you are currently running.

Security mode should only be enabled after the user has set the authorized MAC addresses in the security screen. Otherwise, all APs detected will be seen as 'unauthorized' and set off the security alarm until it is disabled.

All Station mode allows Yellowjacket to see all all Client Cards as well as all Access Points.

Note: Dolphin Real-time Mapping software requires YellowJacket PLUS' internal GPS receiver option and a laptop with an IR connection. Do not enable this option unless you have the appropriate software, hardware and want to map your 802.11b study in real-time.

Spectrum Analysis



The spectrum analysis feature of the YellowJacket allows a user to view any RF signals that is received by the receiver. It uses frequency for the X-axis and RSSI (received signal strength indicator) in dBm on the Y-axis.

Both the full spectrum and the single channel screens have the same options for the most part. There are three available traces, red, blue, and green traces. Only one trace can be active at any one time.

Each of the three traces can be made visible by pressing their respective "visible" buttons. The active trace can be peak held by pressing it's "hold trace" button.

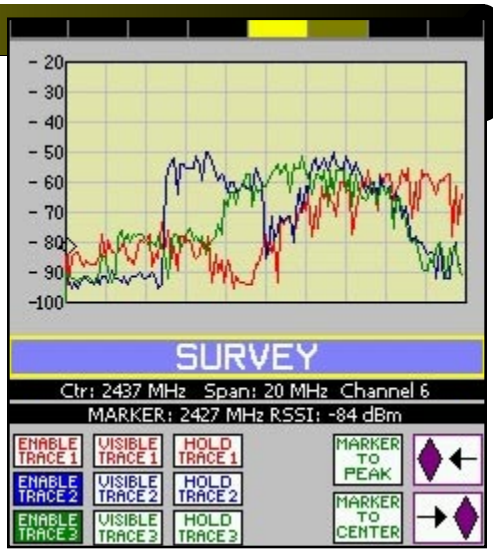
Use the "marker to peak" button to move the diamond marker

to the current highest dBm valued point. Use the “marker to center” button to move the diamond marker to the center of the currently displayed section.

There are also buttons for moving the diamond peak mark to the left or right in the currently displayed screen.

Each spectrum screen displays information regarding the center frequency of the screen as well as the span in MHz. The current marker position and value is also displayed.

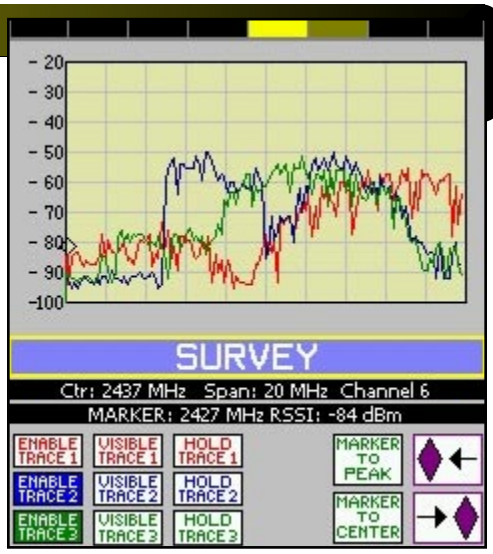
Full Spectrum



The full spectrum screen is the first one entered when going into the spectrum analysis option. This screen shows RF energy in dBm over all 14 channels seen by the receiver. Each vertical section represents 10 MHz.

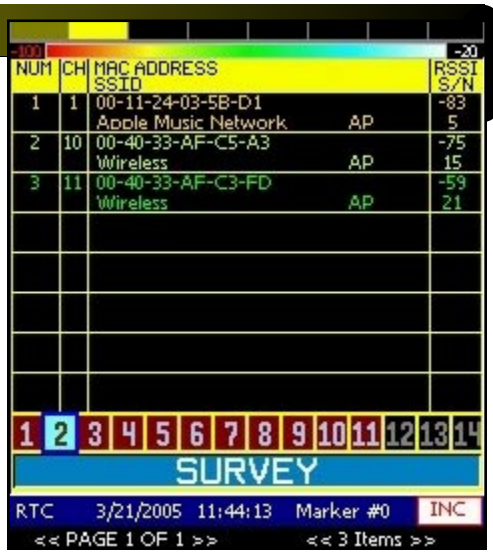
To “zoom in” on a single channel, simply tap one of the numbered boxes. For example, clicking on the channel 4 box will zoom in to channel 4.

Single Channel Spectrum



The single channel screen displays RSSI valued data within the channel specified. To return to the full spectrum mode, press the “SURVEY” button.

NOTE: 802.11b traffic will be seen in bursts on the spectrum screen. The energy will only rise as packets are transmitted. You will see a constant RSSI level in the AP screens because the RSSI measurement is synchronous with the reception of the packet. The spectrum screen is sweeping the frequency band because it is looking for ALL 2.4GHz energy, not just 802.11b packets. In this way, interferers will also appear. It sweeps as fast as it can, but if a packet is transmitted while the sweep is at another frequency, the energy will not be seen.



MAC List

The MAC list is shown on the main access point list screen. This list shows each of the MAC's seen and other information on each of them. This information includes such fields as the channel number associated with each access point, the MAC address and SSID of the access point, as well as the RSSI value in dBm of the access points. The signal/noise ratio is shown underneath the RSSI. If the signal/noise ratio is absent, a noise reading could not be obtained for that channel.

A note on the channel number. If the particular MAC address is a client, the channel number will be what the receiver is set to at the time. If the receiver sees the access point to which the client is talking, the channel will be readjusted to the proper transmitting channel. A gray background box signifies that the channel number is that which was observed. The lack of the gray background denotes that it is the actual channel that the client is on.

The RSSI value may appear as a couple of dashes (--) if:

1. The MAC address is an access point.
2. The channel that the access point is truly on has not been reached in the survey yet.

The YellowJacket will only report RSSI values from access points when it is from the actual channel from which the AP's are transmitting.

There is an indicator signifying whether or not this particular MAC address is related to an access point.

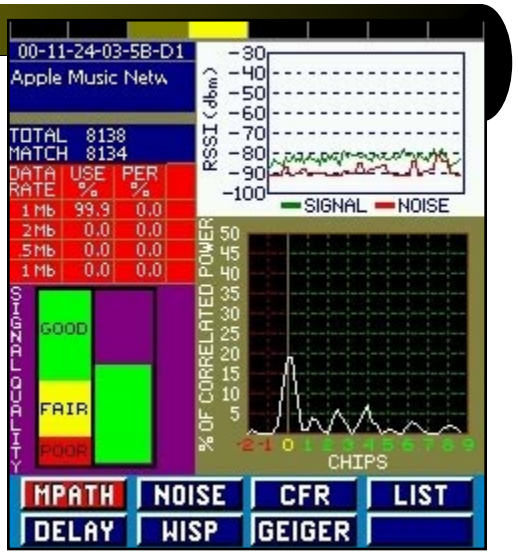
The color of the information text for each access point will change as the RSSI value increases and decreases. The scale of the colors is shown on the top of the list. White is the strongest value while red is the weakest. It is loosely based on the colors of stars, white being the hottest and red being the coolest.

Also, there may be multiple pages of the MAC list. To flip between pages, use the up and down arrows provided on the bottom of the screen in the toolbar.

To look at one particular MAC address, simply tap on the box containing the MAC address of interest. This will bring you directly to the Geiger screen. Use the submenu below the display to move between the different single MAC screens. These screens include:

MULTIPATH
DELAY SPREAD
NOISE
WISP ANTENNA ALIGNMENT
CHANNEL FREQUENCY RESPONSE
GEIGER DIRECTION-FINDING

Multipath / Signal Quality Indicator ("Q" Factor)



The bar graph on the lower left hand side of the multipath and the delay spread screens is known as the 'Q' factor graph. This graph uses a formula to determine the quality of the direct path and reflections of the signal by determining the 'fatness' of the main peak compared to the height of the direct path component.

As the direct path gets stronger and sharper, the 'Q' factor goes up. As the path gets weaker and fatter, the 'Q' factor drops, signaling a possible multipath interference concern.

The right portion of the multipath screen displays the power of multipath components versus their time of arrival. Each multipath components is expressed as a percentage of its power relative to the entire channel power. Time of arrival is expressed in chips, 91 ns, where a chip is equal to the reciprocal of the chip rate, 22 MHz. The multipath components are calculated by a hardware Barker correlator running at 4X, 44 MHz, oversampling.

The upper-right part of the screen shows the RSSI value of the MAC address over time. It also shows the noise level on this channel over time.

Delay Spread Screen

The left of this screen shows the same information as the multipath screen. The upper right hand side of the delay spread screen shows a running total and current delay spread in nanoseconds. The next graph below the running total graph is the cumulative delay spread graph (count vs. spread). The X axis is also in nanoseconds. The spread is cumulative and can be rest using the provided button.

Noise

The noise screen shows the signal, noise (for the channel), and the signal/noise ratio (in dB) for the selected MAC address. A plot is available over-time as well as a bar plot of the current point.

WISP Antenna Alignment

The user will see a screen with a gauge that shows current signal strength and allows for a peak hold. This peak hold can be reset at any time using the "RESET PEAK" button.

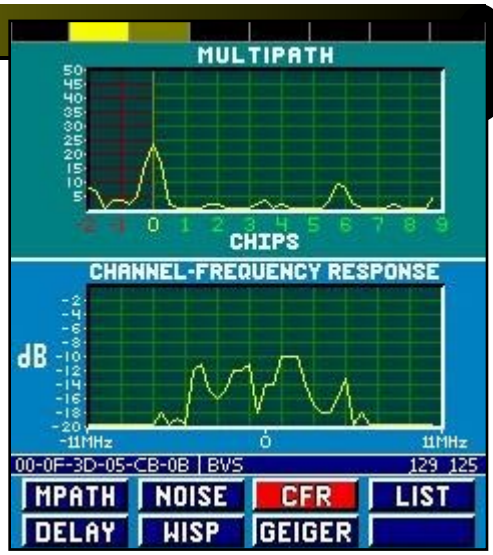
Also, the temporal and bar RSSI displays are on the bottom of the screen. Using a direction-finding antenna with this screen is a fast way of locating the direction of the required signal from the MAC in question.

Channel Frequency Response

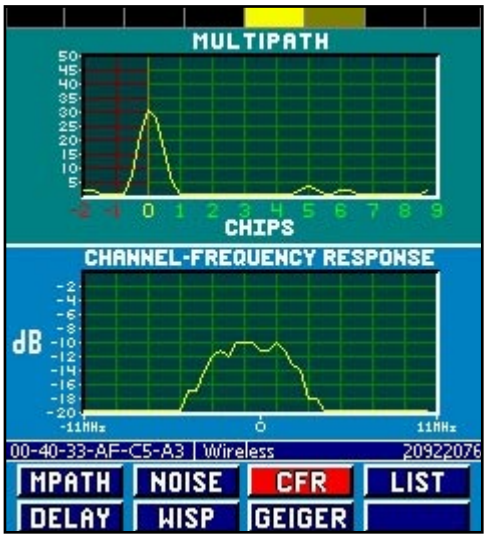
The top of the Channel Frequency Response screen displays multipath components as previously described under the Multipath screen.

The bottom of the screen displays the channel frequency response. The multipath display data is transformed to the frequency domain by a Discreet Fourier Transform (DFT).

The first example screen clearly displays two multipath components in the time domain, and frequency selective fading (due to multipath) in the frequency domain.

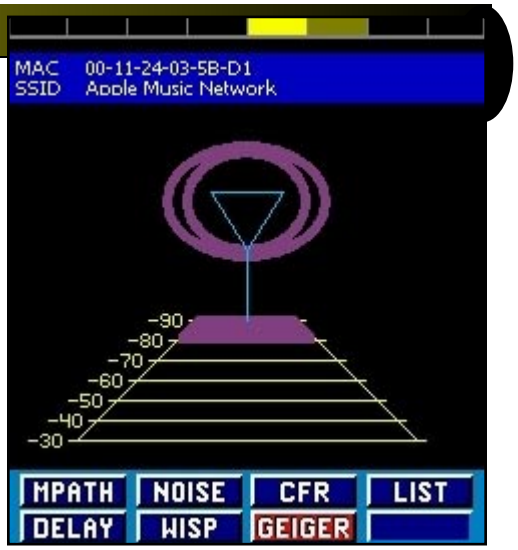


The second example screen clearly displays a single multipath component in the time domain, and a typical frequency response.



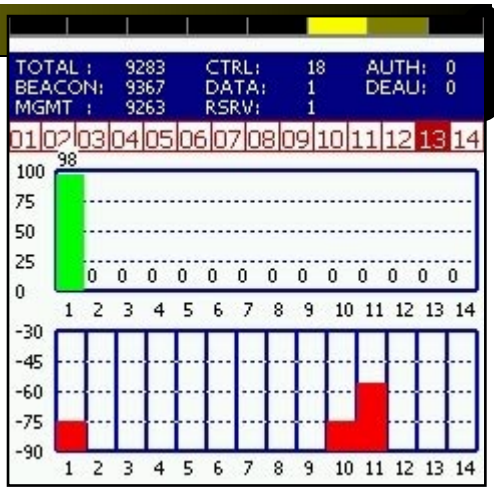
"Geiger-Counter" Mode

The colors will approach white when nearing and/or pointing directly at an AP or station. The Geiger counter sound will also get stronger with more frequency.



Usage Screen

The usage screen displays the percentage of packets being seen by YellowJacket in channels 1 through 14. The graph at the bottom shows RSSI bars for MAC's detected and is arranged by channel number. Note that the more MAC's that occupy each channel, the thinner the vertical RSSI bars will become (each bar represents a single AP). The PER/USAGE calculations are now based on a rolling average over the last number (1024) points.



Security

The security screen allows for entering and maintaining of authorized and unauthorized access point lists. This is a feature that is used for determining if there are rogue/hostile access points within striking distance of the network.

Checking the "check for unauthorized AP's" option in the option screen enables the security feature.

Authorized List

The authorized list is a list that contains the MAC addresses of access points that are authorized to broadcast in the area to be concerned. This list can be created one of three ways. The first way is by entering MAC addresses in the topmost edit field on the security screen. Then the "ADD" button is pressed to add the address to the list. The next method is to retrieve a previously saved list or a list that has been created on a PC or laptop.

The final method is by pressing the "GENERATE AUTHORIZED LIST" button. This may be pressed after leaving the YellowJacket in the access point screen for a period where all access points have been seen. All of these MAC addresses will be moved into the authorized list.

This list can be saved to RAM by pressing the "SAVE" button. This list can be cleared by pressing the "CLR" button next to the list box.

Unauthorized List

The unauthorized list is populated when the security feature is turned on via the option screen. Any MAC addresses seen and demodulated by the receiver which are not in the current authorized list will be flagged and inserted into the unauthorized MAC address list.

Items in this list can be saved or retrieved to/from RAM by pressing the "SAVE" or "RETRIEVE" buttons.

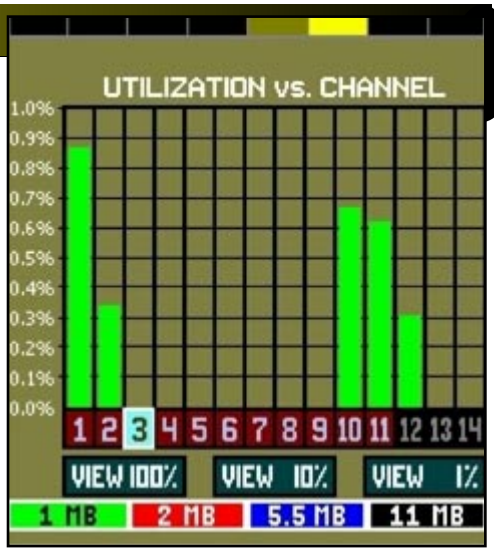
If the MAC addresses in the unauthorized list are wished to be authorized, simply select the entry in the list box and press the "AUTH" button.

This list can be cleared by pressing the "CLR" button next to the list box.

Unauthorized Warning

When Yellowjacket detects any AP that is not included in the Authorized list, an ALERT! screen will appear and audible warning beep will be heard. Press OK to close the ALERT! screen. Remember that Yellowjacket will continue to sound off the alarm each time any unauthorized AP is detected until it is placed in the Authorized list by the user. Check your Options Screen (press joystick right in Main Screen) to turn this security alert ON or OFF.

Network Utilization



The Network Utilization screen shows the utilization seen by the YellowJacket for each of the 14 channels. The view can be switched from 0-100% to 0-10% to 0-1%.

Data Recording

When the "record" button icon is pressed from the toolbar at the bottom of the screen, the user will be prompted for a file-name. This filename will be used to store collected data for later conversion by Chameleon WLAN.

The data is stored in a compact proprietary binary format. The YellowJacket will store data as it received from the hardware, depending on the currently active screen. If the spectrum screen is currently active, spectrum data will be stored. If the access point screen is currently active, access point information will be stored.

To save the collected data, press the "stop" button icon. To view the size of the log file while still logging, simply return to the main menu screen.

WARNING! : Make sure that the "stop" button is pressed to avoid the loss of data saved.

Markers

There is a marker number associated with logged data records. When the checkmark button is pressed on the toolbar, this marker number is incremented. This can be useful when needing to mark a specific point in time for later post-processing.

Snapshots

When the camera icon is pressed from the toolbar at the bottom of the screen, a snapshot of the currently viewable display is taken. The snapshot can be saved as a JPEG format picture (just like a digital camera) for viewing at a later time or for importing into documents and reports. As an example, the images of the YellowJacket screens shown in this section of the manual were saved using this option.

Data Conversion using Chameleon (YellowJacket Edition)

Data that has been logged by the YellowJacket is stored in a proprietary binary format. It can be transferred to a PC or lap-

top. Once on the PC or laptop, the Chameleon (YellowJacket Edition) utility application can be used to convert the binary data into an ASCII-readable format that can be imported into spreadsheet applications such as MS Excel or other applications that accept ASCII-delimited data.

Yellowjacket PLUS GPS Option

The GPS screen of the Yellowjacket Plus provides position and timing information from the Global Positioning System of satellites. The Motorola GPS receiver provides accurate information after synchronizing with at least 3 of the 24 satellites.

The Yellowjacket Plus must have a clear view of a good portion of the sky in order to communicate with the GPS satellites. The GPS receiver should lock within a few minutes. The only exception is when the unit is turned on in a new area. If the receiver was last turned on in California and now in New Jersey, the GPS receiver could take up to an hour to lock.

The status bar at the bottom of the Yellowjacket Plus screen shows the current date and time (Greenwich Mean) as well as the current latitude and longitude in decimal degrees. There is also a separate GPS screen which shows satellite information.

The GPS information is stored in the log file when enabled for later conversion by Chameleon. Each record will be tagged with GPS information if so desired.

If you require GPS time-stamping with your 802.11b measurements and Yellowjacket PLUS does not display the GPS screen or the main menu screen does not show a bottom GPS data line similar to this:

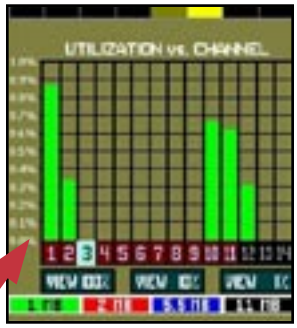
We recommend you send in your Yellowjacket PLUS to be upgraded with the internal GPS option. See accessories page in this manual or contact BVS for more information.

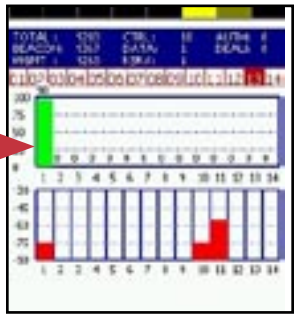
GPS screen will only display satellite information in the YellowjacketPLUS with an internal BVS factory installed GPS receiver.

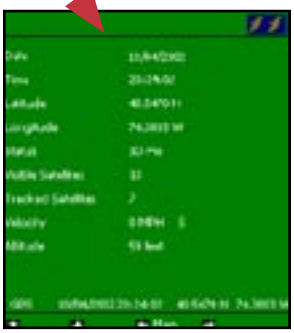
RTC MARKER MODE

If there is no GPS module attached, the YellowJacket system uses the internal real-time clock of the iPAQ for timing. In addition, there is a marker that starts at 0. By pressing the button to the right of the marker value, the marker increases by 1. These values are stored in any log files created for later conversion by Chameleon. The screen above shows Yellowjacket with an internal GPS receiver detected. The screen below shows the RTC window when no GPS receiver is detected.

Yellowjacket
Pocket PC Software Flow Chart







This screen may only be accessed using a YellowjacketPLUS with the internal GPS receiver option installed.

TROUBLESHOOTING

IPAQ AND Yellowjacket POWER ISSUES

Your Yellowjacket and your HP iPAQ have independent power systems. Each system is described below:

Yellowjacket Spectrum Analyzer Power System

1. May be powered via the 4 internal NiMH batteries or external power.

2. Internal NiMH batteries must be removed and charged with the separate NiMH Charger.

3. The Yellowjacket's internal batteries are not discharged when the Yellowjacket software is not running on the iPAQ.

4. A "Battery Low" message will be displayed by the Yellowjacket Software when the Yellowjacket's internal batteries are low.

5. The Yellowjacket may be powered by an external +5v source supplied with your Yellowjacket. Always close the Yellowjacket software before changing between internal or external power sources.

iPAQ Power System

1. The iPAQ may be powered via its internal batteries or external power.

2. The internal iPAQ batteries are charged internally when the iPAQ is powered externally.

3. The iPAQ's internal batteries are discharged when the iPAQ is "off" to maintain its memory. Keep the iPAQ charged! Charge it at least once a week!

4. An "iPAQ Battery Low" message is will be displayed by operating system when the iPAQ's internal batteries are low.

5. If the iPAQ's batteries are completely discharged, it will need several hours of charging before it can be powered on or even flash the charging (yellow) LED. Once the iPAQ is charged it may need to be soft or hard reset before powering on. The Yellowjacket software must be re-installed from: The folder stored on the iPAQ (iPAQ File Store\Yellowjacket), SD card or download via ActiveSync.

HARDWARE CONNECTION ISSUES

When the Yellowjacket software is started, the following screen will appear if the software was unable to detect the hardware. The following may cause this:

1. Loose connection to CF serial cable. The serial cable may not be fully seated in the CF slot on the iPAQ. Check the connection. A soft boot of the iPAQ may be required. Soft booting is accomplished by pressing the recessed reset button on the iPAQ with the stylus.

2. Low batteries. Test this by running off of A/C power using the supplied 'Y' cable to connect power to both the Yellowjacket and the iPAQ. The charge (Yellow) LED on the iPAQ should be flashing if the cable is connected correctly and the Yellowjacket green power LED should be on.

3. COM port is held open. Soft boot the iPAQ to clear out the possibility that the serial port is being held open by a previously running copy of the Yellowjacket software.

SOFTWARE INSTALLATION/RE-INSTALLATION

The Yellowjacket software can be installed/re-installed in three ways.

CD installation

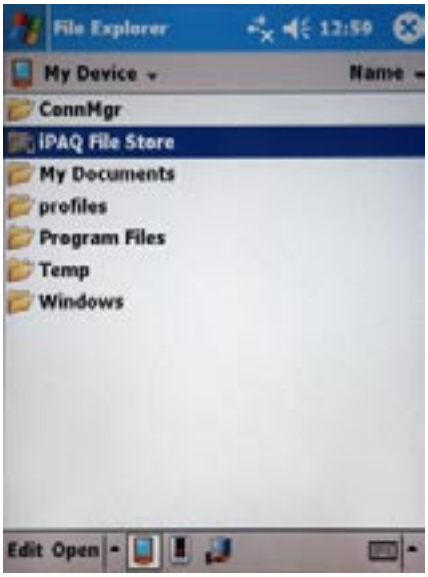
1. Connect the iPAQ to the PC by connecting through ActiveSync. Note that ActiveSync needs to be installed on the PC. It is preinstalled on the iPAQ.
2. Insert the CD. If the installation program does not appear after a few seconds, run autorun.exe from the root directory of the CD.
3. Choose the Yellowjacket software button.
4. Follow the installation instructions.
5. Software is now installed on the user's iPAQ.

SD (secure digital) card installation

1. The Yellowjacket shipped with an SD card that contains a copy of the Yellowjacket software.
2. Insert the SD card into the SD slot on the iPAQ.
3. Go to File Explorer on the iPAQ. Proceed to the SD Card folder off of the root directory ("My Device").
4. Run install.exe.
5. Choose the model of your iPAQ and press the install button.
6. Software should now be installed on your iPAQ.

iPAQ File Store reinstallation

1. A copy of the Yellowjacket software is stored on the iPAQ after original CD installation.
2. Using File Explorer on the iPAQ, go to the 'iPAQ File Store' folder off of the root directory ("My Device")
3. There will be a Yellowjacket folder. Open the folder.
4. Run the reinstall program. This will reinstall the application.

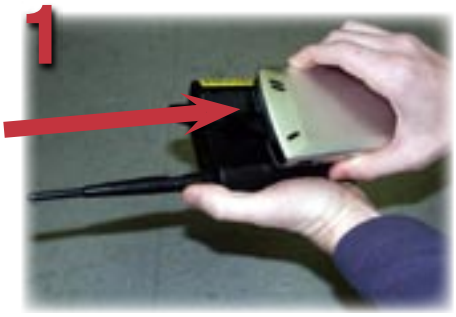


DRIVER INSTALLATION/RE-INSTALLATION

The 24xx model iPAQ needs an updated driver for the Quatech serial card which interfaces to your BVS product. The driver installation program can be found in the "driver" directory of your product CD. Run this executable from your PC while the iPAQ is connected via ActiveSync. After installation, soft boot the iPAQ. This is only necessary if the iPAQ has lost its Yellowjacket software and drivers due to a dead battery. Symptoms of an iPAQ needing this driver include loss of communication in a high-speed data transfer mode (such as spectrum screen).

Replacing Batteries

If your Yellowjacket has difficulty connecting or collecting data and you have verified the iPAQ is fully charged, then you may need to change your AA Ni-MH batteries out for fresh ones. To access batteries under iPAQ:



1. Slide iPAQ back and away from antenna end of receiver. Be sure not to pull too hard on the cable in any way. NEVER remove the Compact Flash connector from the iPAQ sled unless troubleshooting for connectivity issues.

2. Flip over iPAQ exposing the battery compartment on the top of the Yellowjacket receiver.

3. Change 4 Ni-MH AA batteries for fresh Ni-MH batteries and repeat steps above in reverse order.

4. When troubleshooting connectivity issues, be sure to GENTLY remove the Compact Flash serial adapter card from the iPAQ. Slowly slide the card out holding it by the very top of the card and NOT the cable. Be sure it is seated properly and slowly slide it back into the iPAQ's CF housing.

OPTIMIZATION

Remember that your iPAQ comes from the BVS factory optimized for powerful spectrum analysis right out of the box, but sometimes these optimized settings can be lost (back to HP's factory defaults) when the iPAQ's battery completely drains. The following are procedures for:

Disabling Bluetooth and 802.11 on an iPAQ

It is essential when running your Yellowjacket software that you do not have either 802.11b or Bluetooth running on the same iPAQ. This will interfere with Yellowjacket measurements in the 2.4 GHz band.

Turning Off Bluetooth

HP iPAQ 22xx series:
From the main screen on the iPAQ, select the Bluetooth icon in the lower right-hand portion of the screen. Then choose "Turn Bluetooth Off" from the menu.

HP iPAQ 47xx series:
From the main screen on the iPAQ, select the antenna icon in the lower right-hand portion of the screen. Then choose the Bluetooth button to turn off Bluetooth.

The blue LED on the iPAQ should not be flashing when the radio is off.

Turning Off 802.11b

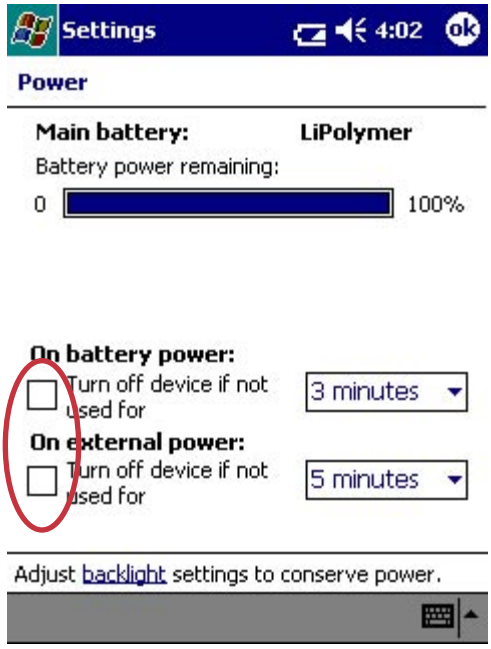
HP iPAQ 47xx series:
From the main screen on the iPAQ, select the antenna icon in the lower right-hand portion of the screen. Then choose the Wi-Fi button to turn off 802.11b.

Battery Settings

NOTE: In order to prevent the Ipaq from freezing when running Yellowjacket software, make sure to:

1. ALWAYS leave the checkboxes in the SETTINGS/SYSTEM/POWER screen unchecked. Power-save mode will lock up the application due to the fact that the application is stopped while communicating with the hardware..

2. Make sure that the battery level on the Ipaq remains above 40%. The serial card interface may cease to operate when the battery level is under 40%.



In the PocketPC's OS, choose Settings and then choose System settings at the bottom. Select the battery icon for Power Settings to access this screen. These power settings come unchecked from the BVS factory to ensure Yellowjacket software runs optimally. Power must remain on during logging or else data might be corrupted.

To resolve the freeze, simply press the soft reset button on the iPAQ with the stylus.

Disabling Screen Saver on an iPAQ

DockWare (by default) runs a screen saver with a calendar on any new iPAQ (47xx series). This could interfere with the operation of Yellowjacket software. To disable:

1. Tap on the Windows icon in the upper-left corner of the iPAQ screen.

2. Tap "Programs" in the menu.

3. Tap on "DockWare".

4. Once running, tap-and-hold on the screen.

5. Uncheck "Start Automatically".

6. Now tap the upper right corner of the screen to terminate DockWare (where the 'X' would usually be).

7. DockWare is now disabled. It will need to be disabled again if the batteries completely discharge on the iPAQ.

SOFTWARE INSTALLATION

YELLOWJACKET SOFTWARE INSTALLATION FROM A SECURE DIGITAL (SD) CARD

Yellowjacket software comes pre-installed on your iPAQ, but as a courtesy, BVS includes an SD card containing a Yellowjacket software installer should you provide your own iPAQ or lose the factory installed files. This SD card may be used to store Yellowjacket data or other data.

Remember you must switch "lock" tab on side of SD card to "unlock" before storing or erasing any data.

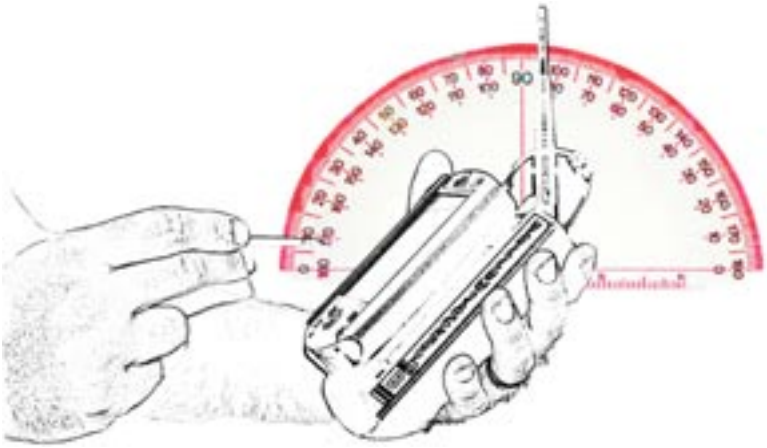
To install the YellowJacket application from the SD card provided in the YellowJacket package, complete the following steps:

1. **Insert SD card into the SD slot on the top of the iPAQ.**
2. **Using the stylus, tap on the "Start" button on the top of the screen.**
3. **Tap on "Programs" near the bottom of the menu.**
4. **Tap on the "File Explorer" folder.**
5. **Make sure that the shaded area on the top of the File Explorer says "My Device". If not, use the upside-down triangle next to the text to choose "My Device".**
6. **Tap on "SD Card".**
7. **Make sure that the shaded area on the top of the File Explorer says "SD Card". If not, use the upside-down triangle next to the text to choose "SD Card".**
8. **Choose your Yellowjacket receiver and iPAQ model for installation and tap on "install".**
9. **When the message "Installation is Complete" appears, you have successfully installed the application.**

The YellowJacket application will be accessible by tapping on "Start" and then "Programs". Scroll down to the bottom and the YellowJacket application icon will appear.

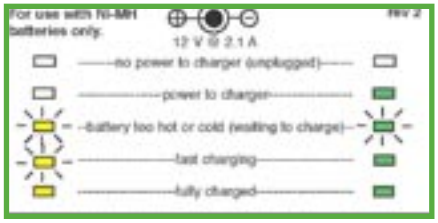
SURVEYING

While surveying, Yellowjacket achieves the most accuracy when the supplied omni-directional antenna is at a vertical 90 degree angle and completely perpendicular to the ground or floor as shown below.



YELLOWJACKET PLUS BATTERY CHARGING INSTRUCTIONS

Please observe the two different battery status lights. When the amber status light on the iPAQ blinks, it is being charged and when it is on solid, it is fully charged. When there is no status light on iPAQ, there is no charge current. The charger status lights (label on back of charging station) only indicate the status of the Ni-MH battery pack inserted into the charger itself. Batteries may be charged using the charger station but NOT ALL AT THE SAME TIME. Insert battery pack (pull tab up) into charger only when charging the battery pack itself. A battery pack must NOT be inserted into charger when trying to power or charge the iPAQ's internal battery or the YellowjacketPLUS' internal battery pack. The included charger may only be used to charge the included Ni-MH battery pack. NOT Ni-CAD batteries. Batteries that are warm or hot to the touch (from constant usage or warm ambient temperatures) will take longer to charge than batteries of a normal temperature. Only use Ni-MH batteries with 1600 mAH or more rating. Expect over 500 cycles from each Ni-MH pack. Below are some popular charging configurations.



Configuration 1 - charging YellowjacketPLUS removable battery pack and iPAQ internal battery

When the charger is plugged in and has power to it, this setup will power the Yellowjacket PLUS and simultaneously charge the iPAQ and internal battery pack (pack inside Yellowjacket PLUS unit).

Configuration 2 - charging removable battery pack inside charger

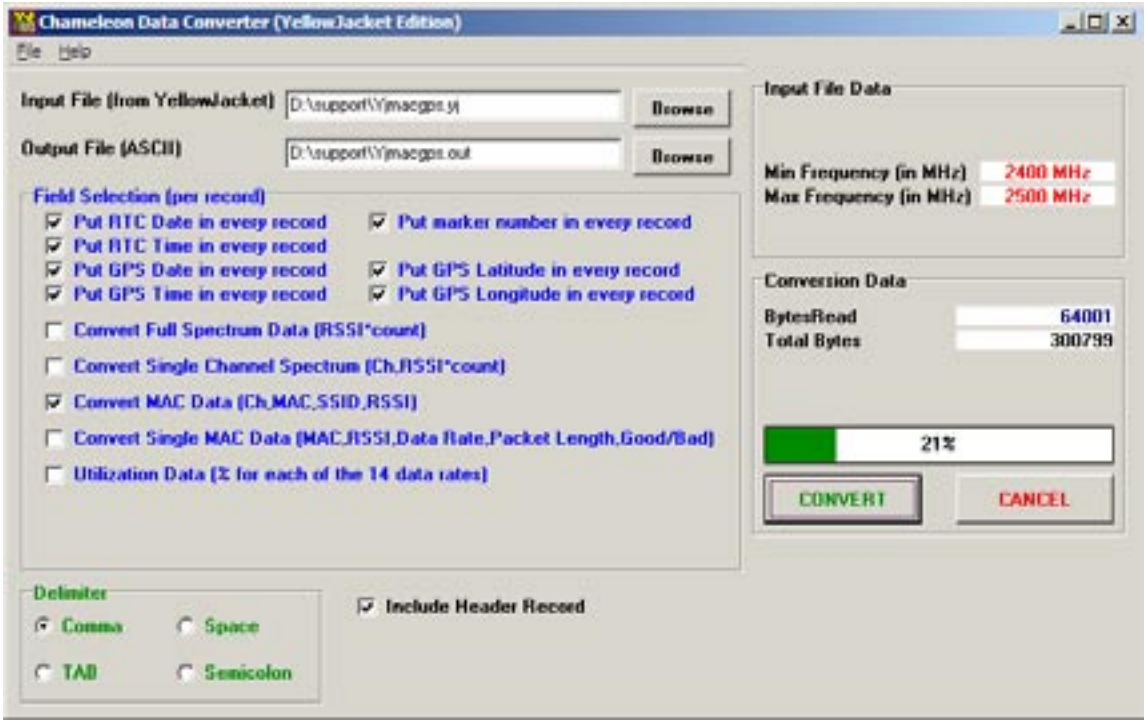
When the charger is plugged in and has power to it, this setup will only charge the battery pack inside the charger station. The Yellowjacket PLUS will operate in this configuration but will receive NO current for power or charging internal battery in iPAQ or internal battery pack (inside Yellowjacket PLUS).

Avoid this configuration as it will charge only one battery pack (pack inside charger) and nothing else.

Chameleon (YellowJacket Edition)

PC Application

The Chameleon application converts data logged by the YellowJacket into an ASCII delimited file for use in post-processing. The data converted is based on correlation records collected in the measurement mode of the iPAQ YellowJacket Receiver Interface.



To convert a file, use the following steps:

1. **Copy the log file off of the iPAQ and onto your desktop or laptop.**
2. **Run the Chameleon application.**
3. **Click BROWSE on the Input File line to choose a file to convert.**
4. **A default output filename will be created. Change if needed.**
5. **Choose which fields you wish to have in the output file.**
6. **Choose the delimiter to place between fields.**
7. **Choose whether or not you would like a header record with titles for each column.**
8. **Press the CONVERT button.**

The progress bar will monitor the progress of the conversion.

BVS Dolphin Real-Time Mapping Tool (Yellowjacket PLUS model only)
User Manual

Minimum System Requirements
Pentium II
500 MHz
64MB RAM
100MB free on Hard Drive
Operating System: Windows 95, 98, ME, 2000
BVS GPS receiver interface: 1 free serial port:

INTRODUCTION

The Dolphin real-time mapping tool is used as a companion to a BVS Receiver with GPS. This tool is used to display scanned points on a map at the location(s) scanned. The tool receives data from a BVS data logger that communicates with the BVS receiver.

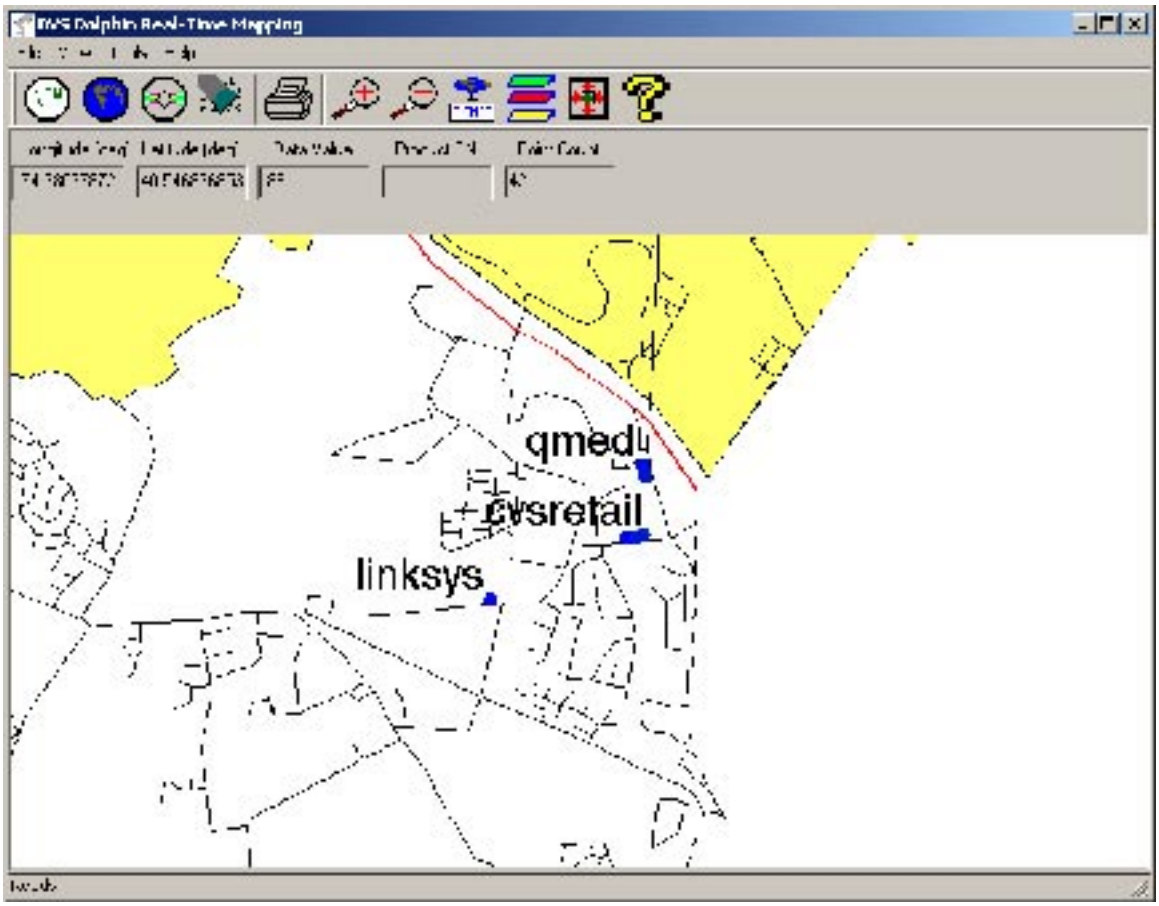


FIGURE 1 – BVS DOLPHIN

OVERVIEW

The Dolphin software receives data from the data logger for the individual product (see Figure 2). For example, if the Fox is the product, it would talk to the Fox Data Logger running on the PC. At the same time, the Dolphin software would also be running on the PC.

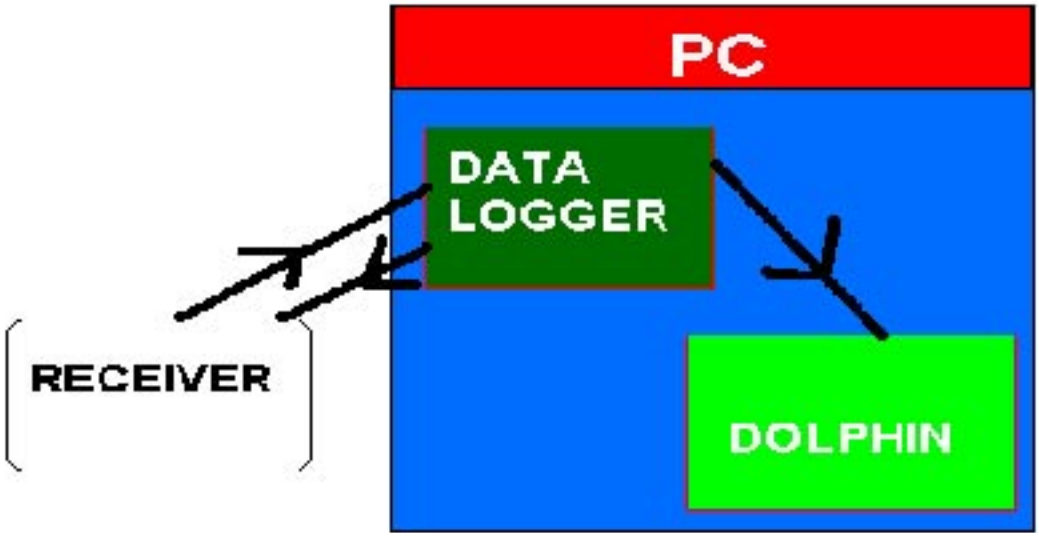


FIGURE 2 – DOLPHIN DATA FLOW

The Fox Data Logger would send data in a Windows message that includes information wished to be stored on the map as well as the GPS coordinates last stored by the data logger from the unit.

The information received would then be displayed on the Dolphin screen in the form of a colored circle. If text were also passed, it would be displayed next to the circle. The color of the circle represents the level of the data value (usually RSSI).

This process continues until the data logger or the receiver is terminated.

QUICK START

The following steps will guide you through setup and use of the Dolphin tool.

1. Make sure you have the product (e.g. Fox) connected to a serial port or USB port and turned on.

2. Make sure the GPS antenna is attached and GPS mode is enabled.

3. Start the Dolphin software. When using the Dolphin for the first time with this product, you must enter the registration code in order to receive data. See 'REGISTRATION' below.

4. Open an existing geoset or create a new geoset. See 'CREATING A GEOSET' or 'OPENING A GEOSET'.

5. Add layers to your geoset corresponding to the appropriate maps of the area that you are surveying.

6. Start the data logger for the product. Make sure any necessary steps to enable Dolphin connectivity from the data logger have been taken. Some products don't require any steps but others have an option to check for Dolphin connectivity.

7. You should now see data populating the maps. Some products output data at different rates. Some 802.11b products only produce data when a new AP is found.

REGISTRATION

When using Dolphin with a product for the first time, the product must be registered with Dolphin. There is a registration letter that ships with Dolphin that shows the registration code to use to work with the product purchased. This code is matched against the serial number of the unit for verification. Use the TOOLS/

PRODUCT REGISTRATION menu option to enter the correct code. This only needs to be done once and is stored in a file for recall on future uses.

DISPLAY FIELDS

Certain fields are displayed as data records come into the Dolphin system. These fields are (from left to right):

Longitude (in decimal degrees)
Latitude (in decimal degrees)
Data Value (usually RSSI in dBm)
Product Serial Number
Point Count (current count of points plotted on the map)

These always reflect the last data record to come into the Dolphin system.

CREATING/OPENING A GEOSET

When starting up the Dolphin system, a Geoset must be open in order for the data points coming in to be properly attached to map layers. You can open an existing geoset or create a new geoset.

An existing geoset will have the map layers already set up. When creating a new geoset, the layer dialog will appear. Choose layers from the maps that were purchased for use with the Dolphin. There will already be a 'DOLPHIN' layer. DO NOT REMOVE this layer. This is needed to store the data points.

After choosing the map layers, the geoset is now ready to accept points.

NOTE: The maps may not be visible until the first data point comes in to center the coordinates.

SAVING A GEOSET

Pressing the toolbar button that looks like a spinning CD allows you to save the geoset loaded. Save it to any filename for use in later Dolphin sessions.

NOTE: Data points will not be saved. Only the map layers.

CLEARING DATA POINTS

If you wish to clear the existing data from the geoset at any time, use the toolbar button that appears to be an eraser wiping off data. The next point taken in will be considered the first point again.

PRINTING A MAP

You may print out a copy of the map by pressing the printer icon on the toolbar.

ZOOM MODE

You may zoom in or out on the map by selecting the magnifying glass icon with a '+' sign for zooming in or a '-' sign for zooming out. This will turn the cursor into the appropriate magnifying glass. Simply click on the area to zoom in/out on and the map will adjust accordingly.

SAVE AS BITMAP

The map may be exported to a bitmap format by selecting the icon on the toolbar with a globe on the top and the word 'BITMAP' on the bottom.

LAYER DIALOG

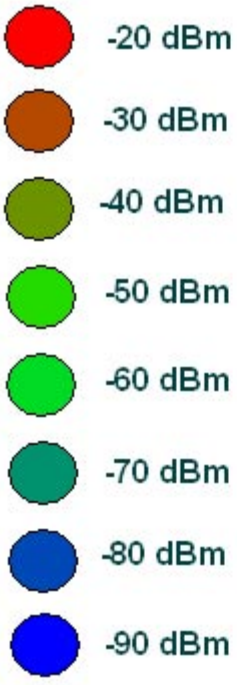
The layer dialog is used to add or remove layers from the geoset. Layers can include landmarks, streets, water, etc. Choose the layers for the appropriate driving area from the maps that were purchased for use with the Dolphin.

RECENTERING FREQUENCY

The re-centering frequency icon looks like four arrows heading in from a square on the toolbar. This lets you choose how often you would like the map re-centered on the current point.

Depending on the rate of data coming into the Dolphin, the re-centering of the map may start to slow down the system and/or cause flicker. This option allows you to limit the number of times the screen is recentered.

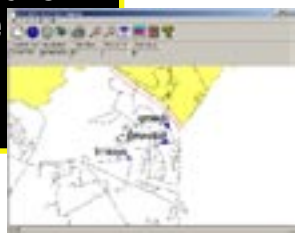
Dolphin / Yellowjacket PLUS Signal Strength Legend



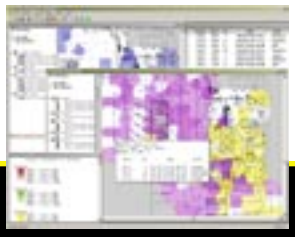
Accessories for your YELLOWJACKET™

2.4 GHz Antenna
adjustable angle
SMA connector
$ 25.00

Dolphin Realtime GPS
Mapping Software
P/N 0038-DOLP
$ Call for Pricing



Rugged Carrying Case
ABS Plastic
P/N P-CASE
$ 100.00



Hive Indoor Mapping Software
P/N 0075-BEA
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DC PowerCable Pack
Cigarette Lighter Adaptor
P/N 002NIMH
$ 50.00

Direction Finding Antenna
with mounting bracket,
cable & type N SMA male
9 dBi gain
P/N DFA-001
$ 250.00

GPS Antenna
GPS magmount active antenna
with SMC male connector
P/N GPS-SMC
$ 45.00

GPS Receiver
Internal 12-channel
GPS receiver
(BVS factory installed)
P/N YJP-GPS
$ 1000.00

2.4 GHz Direction Finding
Antenna with mounting brack-
et, cable & type N SMA male
9 dBi gain
P/N DFA-001
$ 250.00

Ni-MH Fast-Charger
4 AA 6 V
P/N NIMH-001
$ 55.00

IrDA USB Interface
wireless data transfer Adaptor
P/N IRDA-000
$ 125.00

Ni-MH Battery Charger with
switching transformer
P/N NIMH-000
$ 105.00

Ni-MH Battery Pack
5 AA 7.5 V
P/N NIMH-005
$ 45.00

Hive™

Yellowjacket Indoor 802.11 Wi-Fi Mapping Software

Hive™ is powerful mapping software that works with Berkeley's Yellowjacket 802.11 (B, A or B/G) Wi-Fi receiver system. ***Hive™*** runs on an iPAQ® Pocket PC® allowing site surveys to be handheld and performed completely **INDOORS** or outdoors using real-time mapping coverage technology. No GPS reception needed. First, import AutoCAD files into ***Hive™*** Site Initiator and scale your rooms and walls for measurement overlays. Walk through an office space, warehouse or multi-floor building - any interior space that needs to be surveyed - and take Access Point measurements with Site Supervisor. Then place those measurements on top of any structural floorplan to get a comprehensive, bird's eye view of any WLAN based upon MAC addresses, RSSI, SSID and more. Finally, view your Wi-Fi coverage results in table and graphical views using Site Investigator running under Windows 98, 2000, ME or XP OS.

1 Create your floorplan: Site Initiator

Create floorplan layouts from scratch or from any bitmaps

Add rooms, floors, walls, doors, windows and more

Import existing floorplans for modification and surveys

Survey floorplans on a PocketPC. Create and organize survey maps on a PC.

802.11B
802.11A
802.11G

2 Take your AP measurements: Site Supervisor

Touch-screen measurement points using PocketPC®

Customizable surveys based on MAC, RSSI, SSID

Export floorplans from AutoCAD® or any bitmap

Take floorplan survey snapshots anytime

Visible survey path throughout floorplan

3 Organize and plot your coverage: Site Investigator:

Plot and view surveys in multiple data table or graphical windows

Plot coverage by AP or AP groups

Print and export plots or table data into ASCII format for spreadsheets

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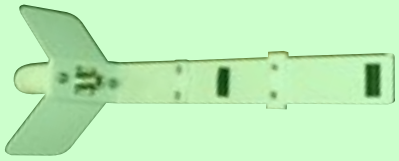
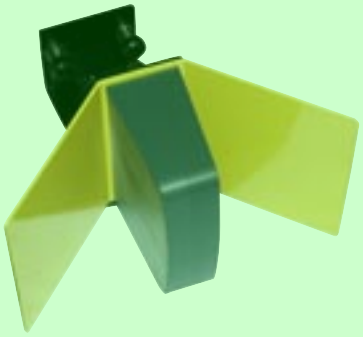
2.4 GHz Direction Finding Corner Reflector





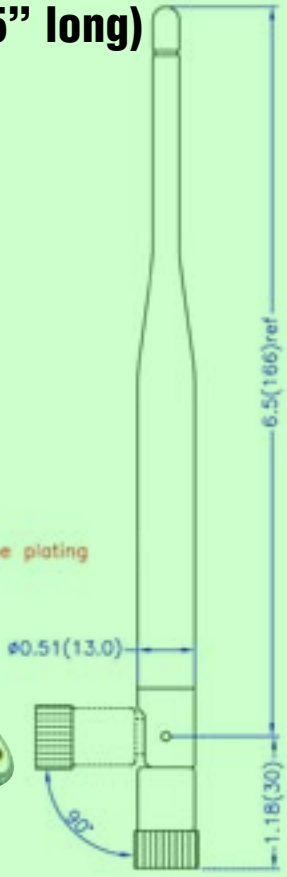
2.4 GHz Omni-Directional (7.5” long)

Electrical Properties:

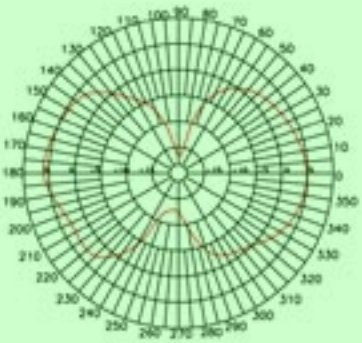
Frequency Range:	2.4~2.5 GHz
Impedance:	50Ω nominal
VSWR:	<2.0:1
Gain:	5 dBi
Radiation:	Omni
Polarization:	Vertical

Mechanical Properties:

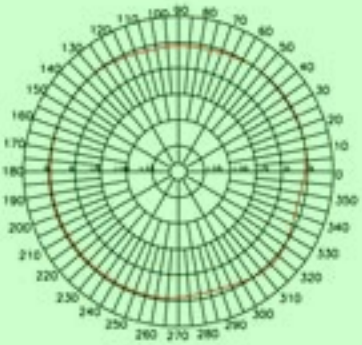
Connector:	SMA Plug(male)
Material:	
Whip:	Polyurethene(Black)
Swivel Mechanism:	Polyurethene(Black)
Connector:	Brass with black chrome plating
Operation Temp.:	-20°C to +65°C
Storage Temp.:	-30°C to +75°C



E-Plane Pattern @ 2.45GHz



H-Plane Pattern @ 2.45GHz



YELLOWJACKET™-B

with removable HP iPAQ

802.11b Wi-Fi Analysis System

Yellowjacket™ **is a wireless receiver module designed to work with HP's iPAQ® PocketPC® in sweeping, analyzing and optimizing 2.4 GHz Wireless Local Area Networks. The receiver measures all 14 DSSS network channels which operate on the *IEEE 802.11b* standard allowing the user to determine the AP (Access Point), PER (Packet Error Rate), Multipath (Ec/Io), SSID and RSSI signal levels aiding in locating the hub and access points of neighboring WLANs. *Yellowjacket™* allows those familiar with the iPAQ's PocketPC® interface a unique advantage over "software only" products currently available because *Yellowjacket™* functions as a complete WLAN analysis system combining the ubiquitous PocketPC® environment along with Berkeley's precision receiver technology.**

Berkeley's custom receiver demodulates and displays all 14 DSSS channels like a pocket-sized spectrum analyzer.

FEATURES:

- Measure 2.4 GHz coverage for direct sequence (DSSS) WLANs (IF wideband 22 MHz) within the **IEEE 802.11b** standard
- Receive, filter and process DSSS studies all in Pocket PC®
- 64K color backlit display for real-time color-coded signal analysis
- Measures RSSI in true dBm with a calibrated receiver
- Removable HP IPAQ® PocketPC® PDA
- Measures Packet Error Rate; data rate percentage breakdowns Multipath and RSSI; narrow band & total channel power
- Complex Access Point / Station list analysis including WEP, Multipath, PER, Absolute Channel, Survey Sweep and SSID
- Connection (Hot Sync) to a PC via IRDA or USB
- Removable battery power (4 AA Ni-MH cells)
- UL and FCC approved and certified

Yellowjacket Measurements:

- ✔ MAC
- ✔ SSID
- ✔ PER
- ✔ Total Channel Power
- ✔ Multipath
- ✔ Narrowband RSSI
- ✔ WEP Detection
- ✔ Survey Sweep
- ✔ AP Manufacturer's ID

Yellowjacket includes a carrying case, stylus, AC adaptor, 8 AA Ni-MH batteries, fast-charger, USB cradle and iPAQ PDA with expansion pack sled.

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E-mail: info@bvsystems.com

wireless products
BERKELEY VARITRONICS SYSTEMS

YELLOWJACKET™-B

802.11b Wi-Fi Analysis System

BANDS SUPPORTED	ISM: 2.400-2.495 GHz
RF SENSITIVITY (Wide Band)	-20 to -90 dBm
RSSI MEASUREMENT (Narrow Band)	-30 to -90 dBm @ 343.75 kHz resolution bandwidth
TUNING INCREMENTS	Tunes 11 USA channels & 3 international channels

PACKET PREAMBLE DEMODULATOR and ANALYZER:

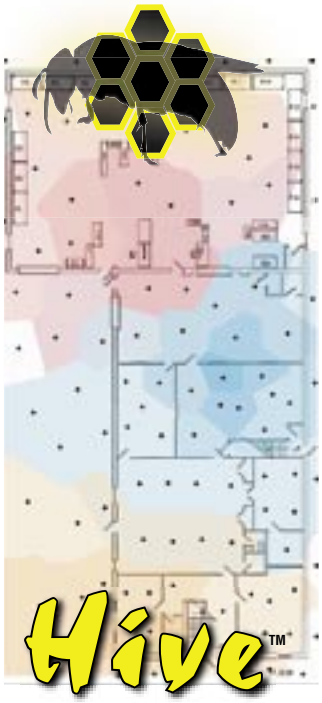
Multipath Measurement and Graphical Display

CORRELATED POWER MEASUREMENTS:

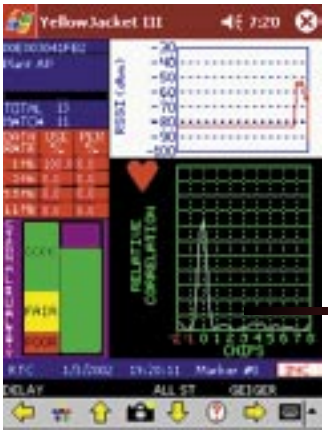
	RATIO
Correlated Power (dBm)	-30 dBm : -100 dBm
Correlated Power to Total Power Ec/Io (dB)	0 dB : -10 dB
Total Channel Power Measurement	-20 dBm : -90 dBm

RECEIVER GENERAL SPECIFICATIONS

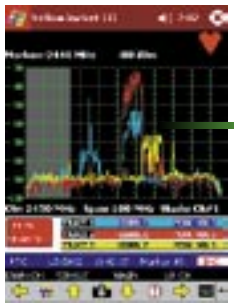
IF Bandwidth:	Wideband 22 MHz
Stability:	± 2.5 PPM Temp range 32° to 120 F°
Antenna:	SMA Female 50 ohm
Controls:	iPAQ PocketPC PDA
Warm Up Time:	< 3 minutes
Power:	Internal battery power (4 AA Ni-MH batteries in receiver)
Weight:	3 lbs.
Dimensions:	2” H x 4” W x 6” L (water resistant, high impact ABS plastic case)



Yellowjacket™ output data supports Microsoft Excel spreadsheets as well as Berkeley’s own Hive™ Real-time Indoor/Outdoor Mapping solution on iPAQ PocketPC®. No GPS required.



Yellowjacket’s optional Direction Finding Antenna pinpoints WLAN hackers and specific sources of interference.



YELLOWJACKET FEATURES:

SPECTRUM MODE:

- Full spectrum (14 channel) sweep
- Single channel zoom
- Peak Search and Hold
- 3 distinct waveform signal traces

AP ANALYSIS:

- Survey sweep of channels for all APs
- “Q” Factor signal strength quality meter
- Individual channel analysis of APs or STAs
- Absolute channel
- SSID
- AP manufacturer’s ID
- WEP detection
- RSSI for each AP/STA in true dBm
- Multipath in chips and nanoseconds
- PER breakdown/usage for 1, 2, 5.5 and 11 Mbit/Sec.
- “Geiger Mode” for direction finding individual AP/STA

NETWORK SECURITY:

- Authorize or Unauthorize up to 1000 MAC addresses
- Generate valid AP list automatically
- Upload AP list from PC
- Flag invalid APs as “suspect”

Berkeley Varitronics Systems, Liberty Corporate Park, 255 Liberty Street, Metuchen, NJ 08840
Phone 732-548-3737 • Fax 732-548-3404 • www.bvsystems.com • E-mail: info@bvsystems.com

YELLOWJACKET™ PLUS

802.11b Wi-Fi Analysis System

GPS ready

Yellowjacket™ PLUS is a wireless receiver system designed specifically for sweeping, analyzing and optimizing 2.4 GHz Wireless Local Area Networks. The instrument measures coverage of DSSS networks which operate on the ***IEEE 802.11b*** standard allowing the user to determine the AP (Access Point), PER (Packet Error Rate), Multipath (Ec/Io) and RSSI signal levels aiding in locating the hub and access points of neighboring WLANs. ***Yellowjacket™ PLUS*** functions as a complete WLAN analysis system housing both the PocketPC® Windows CE® environment along with Berkeley's precision receiver technology.

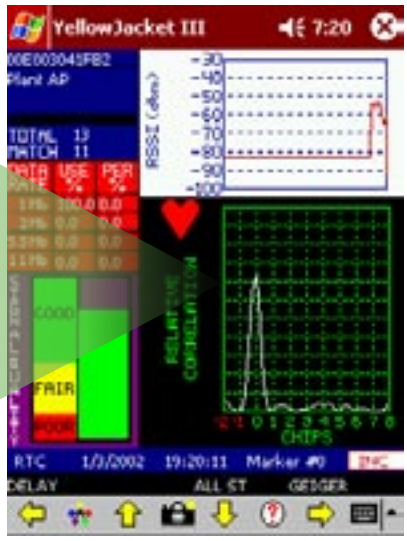
Optional Direction Finding Antenna allows YELLOWJACKET PLUS users to pinpoint any AP or Client Card.

FEATURES:

- Measure 2.4 GHz coverage for direct sequence (DSSS) WLANs (IF wideband 22 MHz) within the **IEEE 802.11b** standard
- Receive, filter and process DSSS studies all in Pocket PC®
- 64K color backlit display for real-time color-coded signal analysis
- Touch screen, Windows® PDA-like interface using a stylus pen
- Integrated HP IPAQ® PocketPC®
- Measures Packet Error Rate; data rate percentage breakdowns Multipath and RSSI; narrow band & total channel power
- Complex Access Point / Station list analysis including WEP, RSSI, Multipath, PER, Absolute Channel, Survey Sweep and SSID
- Optional internal 12-channel GPS receiver available
- Optional Dolphin™ Real-time GPS mapping software available
- Removable battery pack (5 AA Ni-MH cells) and also can be powered from 12VDC car cigarette lighter

Measurements:

MAC
SSID
PER (1,2,5.5,11Mbit)
Total Channel Power
Narrowband RSSI
Multipath in Chips
Multipath in nsec.
WEP
Survey Sweep
Absolute Channel
LAT/LONG/ALT/UTC via GPS



Call us today for more information:
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Internet: www.bvsystems.com
E-mail: info@bvsystems.com

wireless products
BERKELEY VARITRONICS SYSTEMS

YELLOWJACKET™ PLUS

802.11b Wi-Fi Analysis System

BANDS SUPPORTED	ISM: 2.400-2.495 GHz
RF SENSITIVITY (Wide Band)	-20 to -90 dBm
RSSI MEASUREMENT (Narrow Band	-30 to -90 dBm @ 343.75 kHz resolution bandwidth
TUNING INCREMENTS	Tunes 11 USA channels & 3 international channels

PACKET PREAMBLE DEMODULATOR and ANALYZER:
Multipath Measurement and Graphical Display

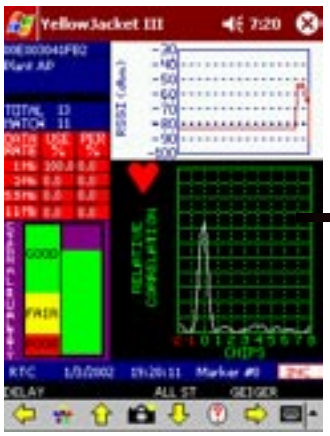
CORRELATED POWER MEASUREMENTS:

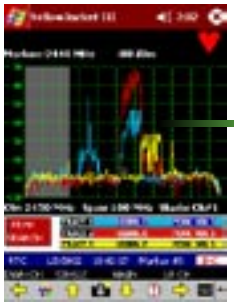
	RATIO
Correlated Power (dBm)	-30 dBm : -100 dBm
Correlated Power to Total Power Ec/Io (dB)	0 dB : -10 dB
Total Channel Power Measurement	-20 dBm : -90 dBm

GENERAL SPECIFICATIONS

IF Bandwidth:	Wideband 22 MHz
Stability:	± 2.5 PPM Temp range 32° to 120 F°
Antenna:	SMA Female 50 ohm
Controls:	touch-screen Windows CE® environment
Warm Up Time:	< 3 minutes
Power:	Internal battery pack (5 AA Ni-MH batteries)
Weight:	3 lbs.
Dimensions:	2” H x 4” W x 9” L (water resistant, high impact ABS plastic case)

When coupled with optional internal GPS receiver and Dolphin™ mapping software, Yellowjacket PLUS™ becomes a powerful, real-time 802.11 W-LAN mapping coverage tool for WISPs, Wardriving and Wi-Fi analysis. Perform drive-studies on campus, locate hacklers and time stamp sources of interference all in REALTIME all in YellowjacketPLUS™.





Yellowjacket PLUS™ includes a rugged travel case, 2.4 GHz antenna, two Ni-MH battery packs, charger base, IrDA USB communicator link and optional Direction Finding Antenna.

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