



Beetle

manual version 1.3



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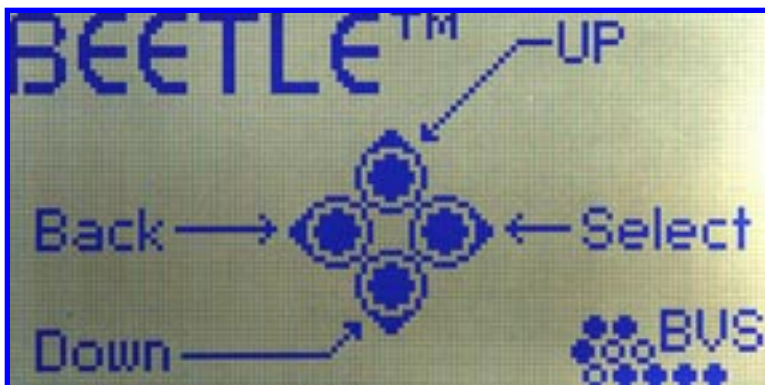
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BEETLE DATA SHEET	

Beetle™ is a handheld, wireless receiver designed specifically for installing, sweeping and optimizing Local Area Networks. The instrument measures coverage of direct sequence CDMA networks which operate on the **IEEE 802.11b** standard allowing the user to measure and determine the AP (Access Point), PER (Packet Error Rate), and RSSI signal levels aiding in locating the hub and access points throughout a building. **Beetle** detects and differentiates from narrow-band multipath interferences such as microwave ovens and frequency hopping systems and features a built-in display, directional keypad and removable battery pack for true portability.

Beetle uses common AA battery cells found in any convenience store. Ni-Cad, Alkalines, Ni-MH and Li-Ion cells may all be used. **Beetle** does require 4 AA cells with at least 1500 mAh per cell. BVS supplies 2 battery packs complete with 8 Ni-MH battery cells to get users working right out of the box. Ni-MH cells are recommended for best performance from your **Beetle**.

Beetle also includes a simple 2.4 GHz threaded antenna that screws right into the top of the unit. Additional antennas may be ordered from BVS through BVS.

At the top of the **Beetle** rest the power switch and antenna connector. The power switch is a simple two way toggle switch. The antenna connector (middle) is an SMA Female 50 ohm. The provided antenna easily screws and unscrews from this connector. Be sure to unscrew antenna when transporting the **Beetle**.



GETTING STARTED

Operation of the **Beetle** is straightforward. Insert 4 fresh battery cells into removable pack. Close back up and power on the **Beetle**. The **Beetle** will instantly display the

legend screen for controlling the instrument with its built-in keypad. Use the up/down arrows to scroll through menu selections. Push the right arrow button to make a selection and push the left button to move back one previous screen.

BEETLE ACCESSORIES

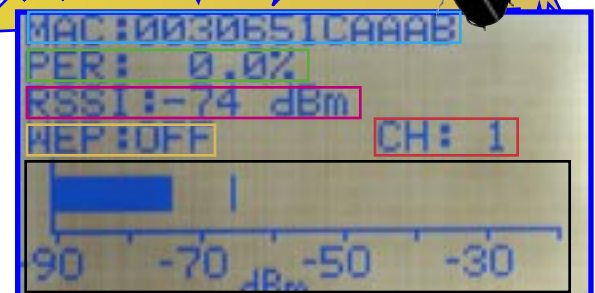
Your Beetle includes all basic operational accessories including the following: antenna, battery pack charger (Ni-MH), spare battery pack (Ni-MH) and AC/DC power cable. Simply insert depleted batteries into charger and plug charger into AC outlet. See charger for LED status indicator lights. Approximate charging time for included Ni-MH battery pack is just over one hour. Run time using these same batteries is just over two hours.

NOTE: The included charger may only be used to charge the included Ni-MH batteries or other AA Ni-MH batteries. 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. Contact BVS for new Ni-MH battery packs. Expect over 500 cycles from each Ni-MH pack.

MAIN MEASUREMENT SCREEN

This is the main measurement screen used for monitoring APs or Access Points. The window to the upper right displays the received signal multipath in realtime of the currently selected AP. Any AP listed under the AP Address window is recognized as an IEEE 802.11b address. Multiple addresses may be listed and monitored simultaneously here. Use the UP/DOWN ARROW keys to toggle between all of these selections and ENT to choose one.



MAC: indicates current MAC selected

PER: indicates Packet Error Rate of current AP

RSSI: indicates signal strength in dBm

WEP: detects WEP encryption on selected AP

CH: indicates channel being scanned

graphical signal strength bar with peak hold in dBm
(RIGHT ARROW key resets peak hold marker)

SIGNAL METER SCREEN

Push the the UP ARROW while in the Main Measurement Screen to enter this signal meter screen. This screen is useful for more precise measurements needed for antenna alignments (an antenna alignment kit is now available for the Beetle). The needle at the bottom shows the current signal level in dBm. The lighter needle image to the right of the needle indicates signal strength peak hold. Push the RIGHT key to reset the peak hold. Push any other key to move back to other menus.



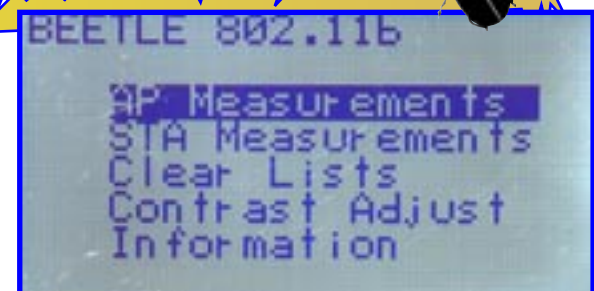
AP INFO SCREEN

Push the the UP ARROW while in the Signal Meter Screen to enter this AP info screen. This screen is a non-graphical real-time measurement screen of the selected access point. Unlike the other measurement screens, this screen also provides the SSID of the selected access point. Note: this screen is only accessed through the AP Measurements selection and not from STA Measurements.



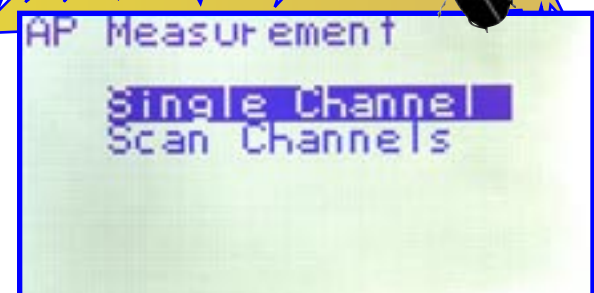
MAIN MENU SCREEN

After the startup screen, press any key or wait and you will see this Main Menu Screen. Use the ARROW keys to scroll up and down through the list and the RIGHT arrow key to make a selection.



AP MEASUREMENTS

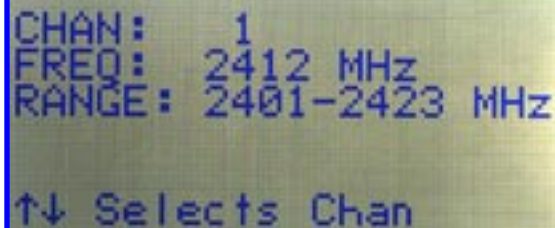
This selection allows the user to scroll through any of the 14 802.11b channels. The channel screen indicating all available channels and their corresponding frequencies. Refer to channel chart towards the end of this manual. Use the UP/DOWN keys to toggle between the desired channels and the press the



RIGHT key to choose the channel. Press the LEFT key at any time to back up to previous screen.

SINGLE CHANNELS

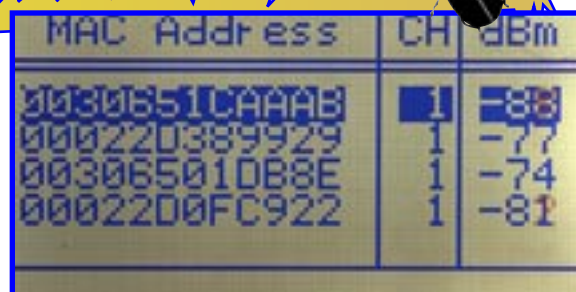
The Single Channel selection under AP Measurement displays this screen allowing the user to choose the channel they wish to scan. Note that choosing STA measurements under the Main Menu screen will bypass this screen.



CHAN: 1
FREQ: 2412 MHz
RANGE: 2401-2423 MHz
↑↓ Selects Chan

SCAN CHANNELS

This selection scans all 14 channels for active APs. Up to 64 APs, their respective channel and dBm will be listed on this screen. Use the UP/DOWN keys to toggle between the desired channels and the press the RIGHT key to choose the channel. Press the LEFT key at any time to back up to previous screen. Note that this screen will not include the CH (channel) column when the user is measuring in STA Measurement mode.



MAC Address	CH	dBm
0030B51CAAAB	1	-88
000220389929	1	-77
003065010B8E	1	-74
0002200FC922	1	-81

CLEAR LISTS

This selection clears the Beetle's memory of any list of APs that have been detected since a scan has occurred. Press the LEFT key at any time to back up to previous screen.



Lists Cleared.

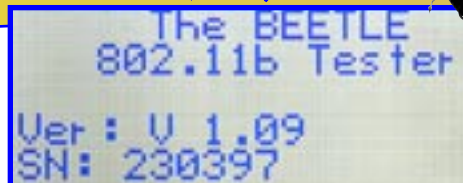

CONTRAST ADJUST

This screen allows the user to adjust the LCD's contrast ratio in 16 steps. Use the UP and DOWN keys to increase and decrease contrast. Press the LEFT key at any time to back up to previous screen.



INFORMATION

This screen indicates the firmware version of the particular Beetle and its serial number. These screens are necessary should any upgrades or repair be necessary to the Beetle.

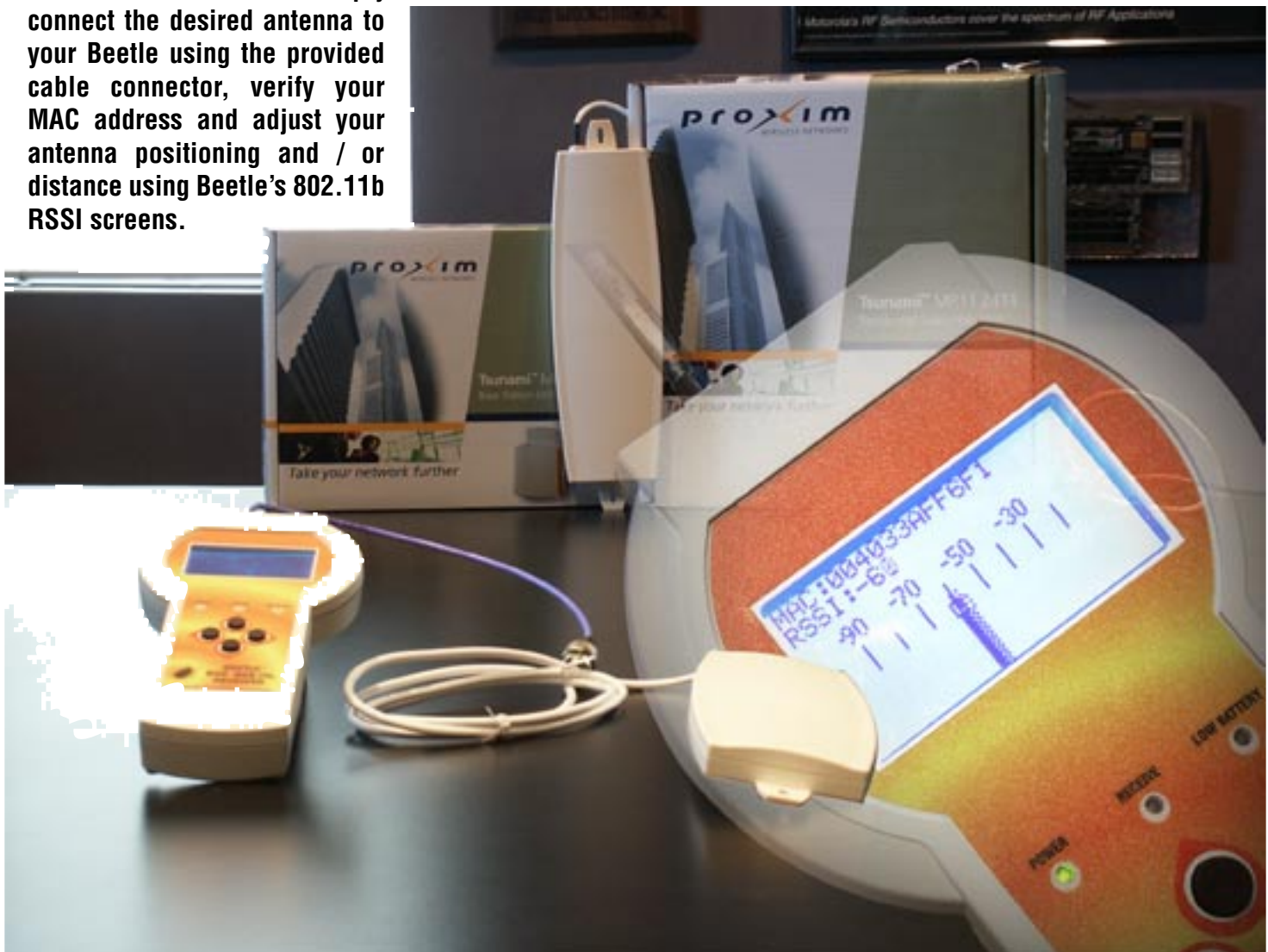


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The BEETLE
802.11b Tester

Ver: V 1.09
SN: 230397
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ANTENNA ALIGNMENT USING BEETLE

Berkeley's Beetle has expanded functionality to allow for antenna alignment of many point to multi-point solutions including Proxim's Tsunami MP.11™ 802.11b base station and subscriber unit. Simply connect the desired antenna to your Beetle using the provided cable connector, verify your MAC address and adjust your antenna positioning and / or distance using Beetle's 802.11b RSSI screens.



Networking Basics

Packets and traffic

Information travels across a network in chunks called “packets.” Each packet has a header that tells where the packet is from and where it’s going, similar to what you write on the envelope when you send a letter. The flow of all these packets on the network is called “traffic.”

Hardware addresses

Your PC “listens” to all of the traffic on its local network and selects the packets that belong to it by checking for its hardware address in the packet header or MAC (Media Access Control). This address is a number unique to your computer. Every hardware product used for networking is required to have a unique hardware address permanently embedded in it.

IP addresses

Since the Internet is a network of networks (connecting millions of computers), hardware addresses alone are not enough to deliver information on the Internet. It would be impossible for your computer to find its packets in all the world’s network traffic, and impossible for the Internet to move all traffic to every network, your PC also has an IP (Internet Protocol) address that defines exactly where and in what network it’s located. IP addresses ensure that your local Ethernet network only receives the traffic intended for it. Like the hierarchical system used to define zip codes, street names, and street numbers, IP addresses are created according to a set of rules, and their assignment is carefully administered.

Put another way, the hardware address is like your name; it uniquely and permanently identifies you. But it doesn’t offer any clues about your location, so it’s only helpful in a local setting. An IP address is like your street address, which contains the information that helps letters and packages find your house.

Rules for Sending Information (Protocols)

A protocol is a set of rules that define how communication takes place. For instance, a networking protocol may define how information is formatted and addressed, just as there’s a standard way to address an envelope when you send a letter.

Networking Devices:

Bridges

A bridge joins two networks at the hardware level. This means that as far as other protocols are concerned, the two networks are the same.

Routers

A router connects two IP networks. In contrast to a bridge, which joins networks at the hardware level, a router directs network IP traffic based on information stored in its routing tables. A routing table matches IP addresses with hardware addresses. The router stamps each incoming IP packet with the hardware address that corresponds to that IP address. As a result, the packet can be picked up by the right computer on the hardware network.

DNS (Domain Name Server)

Networks (domains) on the Internet have names that correspond to their IP addresses. A Domain Name Server maintains a list of domain names and their corresponding addresses. This is why you can go to Berkeley’s Web site by entering www.bvsystems.com, instead of the IP address.

Networking Terms:

TCP/IP (Transport Control Protocol/Internet Protocol)

TCP/IP is a collection of protocols that underlies almost every form of communication on the Internet.

DHCP (Dynamic Host Control Protocol)

DHCP is a method of automatically assigning IP addresses. Instead of assigning addresses to individual users, addresses are assigned by the DHCP server when clients need them. This means that instead of entering several fields of long addresses, users need only to select DHCP as their configuration method for IP networking.

PPP (Point-to-Point Protocol)

PPP is the most common protocol for providing IP services over a modem.

NAT (Network Address Translation)

NAT is used to share one IP address among several computers. A device set up as a NAT router uses a collection of “private” IP addresses (in the range 10.0.1.2 to 10.0.1.254) to allow several computers to access the Internet using one “public” IP address. When a computer using a private IP address requests information from the Internet, the NAT router keeps a record of the computer making the request, and sends the information to the Internet using its own IP address. When the response comes back from the Internet, the NAT router forwards the packet to the appropriate computer.

Channel Number	Frequency GHz	North America	Europe	Spain	France	Japan MKK
1	2.412	X	X			
2	2.417	X	X			
3	2.422	X	X			
4	2.427	X	X			
5	2.432	X	X			
6	2.437	X	X			
7	2.442	X	X			
8	2.447	X	X			
9	2.452	X	X			
10	2.457	X	X	X	X	
11	2.462	X	X	X	X	
12	2.467		X		X	
13	2.472		X		X	
14	2.483					X

DSSS INTERNATIONAL CHANNEL CHART

Glossary of Acronyms

AC	Alternating Current
A/D	Analog to Digital converter
AGC	Automatic Gain Control
AP	Access Point
Applet	a small Application
BER	Bit Error Rate
BPSK	Binary Phase Shift Keying
BSS	Basic Service Set
BW	Band Width
CDMA	Code Division Multiple Access (spread spectrum modulation)
DC	Direct Current
D/A	Digital to Analog
dB	decibel
dBm	decibels referenced to 1 milliwatt
DOS	Digital Operating System
DSP	Digital Signal Processing
DSSS	Direct Sequence Spread Spectrum
ESS	Extended Service Set
FIR	Finite Impulse Response
GHz	GigaHertz
IF	Intermediate Frequency
I and Q	In phase and Quadrature
IBBS	Independent Basic Service Set
kHz	kiloHertz
LCD	Liquid Crystal Display
LO	Local Oscillator
MAC	Medium Access Control
Mbits	Megabits
MHz	MegaHertz
NIC	Network Interface Card
OFDM	Orthogonal Frequency Domain Multiplexing (802.11a)
PC	Personal Computer
PCS	Personal Communications Service (1.8 to 2.1 GHz frequency band)
PER	Packet Error Rate
PN	Pseudo Noise
QPSK	Quaternary Phase Shift Keying, 4-level PSK
RF	Radio Frequency
RSSI	Receiver Signal Strength Indicator
SSID	Service Set IDentification
UCT	Universal Coordinated Time
VAC	Volts Alternating Current
VGA	Video graphic
WLAN	Wireless Local Area Network

IMPORTANT SAFETY INSTRUCTIONS

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

- 1) Read and understand all instructions.
- 2) Follow all warnings and instructions marked on the product.
- 3) Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- 4) Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool.
- 5) Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
- 6) Slots and openings in the cabinet and the back or bottom are provided for ventilation, to protect it from overheating these openings must not be blocked or covered. The openings should never be blocked by placing the product on the bed, sofa, rug or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.
- 7) This product should be operated only from the type of power source indicated on the appliance. If you are not sure of the type of power supply to your home, consult your dealer or local power company.
- 8) Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.
- 9) Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.
- 10) Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock. Never spill liquid of any kind on the product.
- 11) To reduce the risk of electric shock, do not disassemble this product, but take it to a qualified service facility when some service or repair work is required. Opening or removing covers may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the appliance is subsequently used.
- 12) Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - A) When the power supply cord or plug is damaged or frayed.
 - B) If liquid has been spilled into the product.
 - C) If the product has been exposed to rain or water.
 - D) If the product does not operate normally by following the operating instructions. Adjust only those controls, that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.
 - E) If the product has been dropped or the cabinet has been damaged.
 - F) If the product exhibits a distinct change in performance.
- 13) Avoid using the product during an electrical storm. There may be a remote risk of electric shock from lightning.
- 14) Do not use the telephone to report a gas leak in the vicinity of the leak.

INSTALLATION INSTRUCTIONS

1. Never install telephone wiring during a lightning storm.

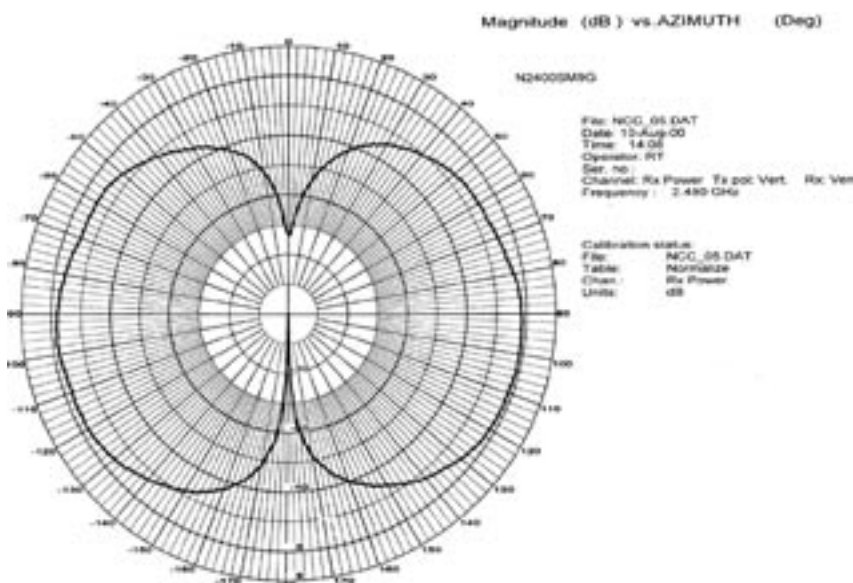
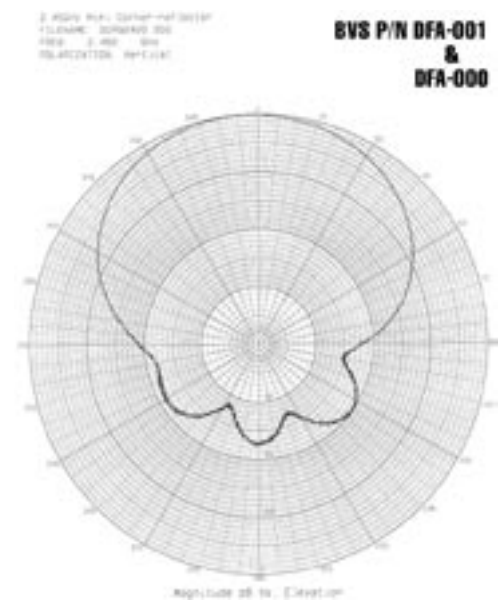
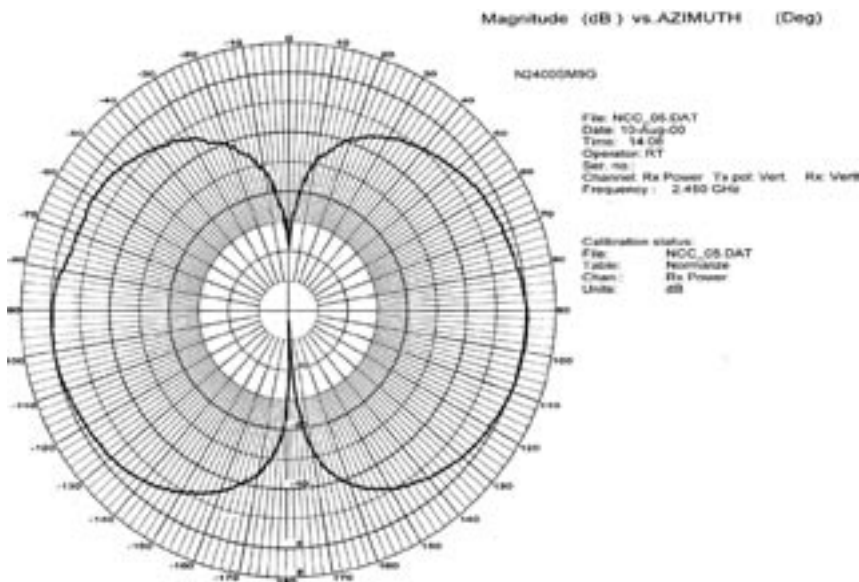
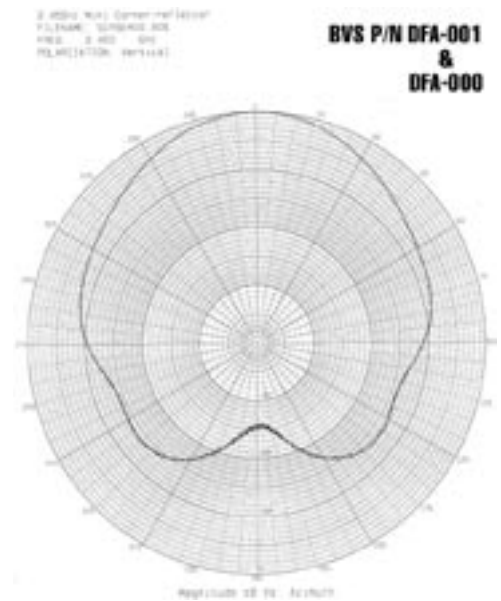
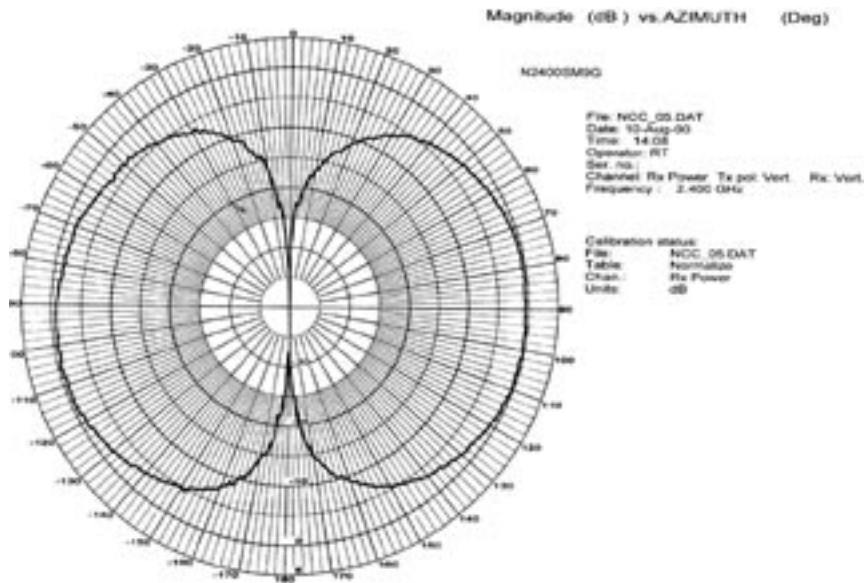
2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
4. Use caution when installing or modifying telephone lines.

INSTRUCTION FOR BATTERIES

CAUTION: To Reduce the Risk of Fire or Injury to Persons, Read and Follow these Instructions:

1. Use only the type and size of batteries mentioned in owner's manual.
2. Do not dispose of the batteries in a fire. The cells may explode. Check with local codes for possible special disposal instructions.
3. Do not open or mutilate the batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.
4. Exercise care in handling batteries in order not to short the battery with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.
5. Do not attempt to recharge the batteries provided with or identified for use with this product. The batteries may leak corrosive electrolyte or explode.
6. Do not attempt to rejuvenate the batteries provided with or identified for use with this product by heating them. Sudden release of the battery electrolyte may occur causing burns or irritation to eyes or skin.
7. When replacing batteries, all batteries should be replaced at the same time. Mixing fresh and discharged batteries could increase internal cell pressure and rupture the discharged batteries. (Applies to products employing more than one separately replaceable primary battery.)
8. When inserting batteries into this product, the proper polarity or direction must be observed. Reverse insertion of batteries can cause charging, and that may result in leakage or explosion. (Applies to product employing more than one separately replaceable primary battery.)
9. Remove the batteries from this product if the product will not be used for a long period of time (several months or more) since during this time the battery could leak in the product.
10. Discard "dead" batteries as soon as possible since "dead" batteries are more likely to leak in a product.
11. Do not store this product, or the batteries provided with or identified for use with this product, in high-temperature areas. Batteries that are stored in a freezer or refrigerator for the purpose of extending shelf life should be protected from condensation during storage and defrosting. Batteries should be stabilized at room temperature prior to use after cold storage.

Below are Radiation Patterns for the included N2400SMA1G Antenna (left) and BVS' optional DF corner reflector (right). The Antenna Under Test was measured against a 1/2 Wave Dipole, therefore; The Gain is measured in dBd (0 dBd = 2.14 dBi).



BEETLE™ 2.4 GHz SCANNER

IEEE 802.11b WLAN INSTALLER

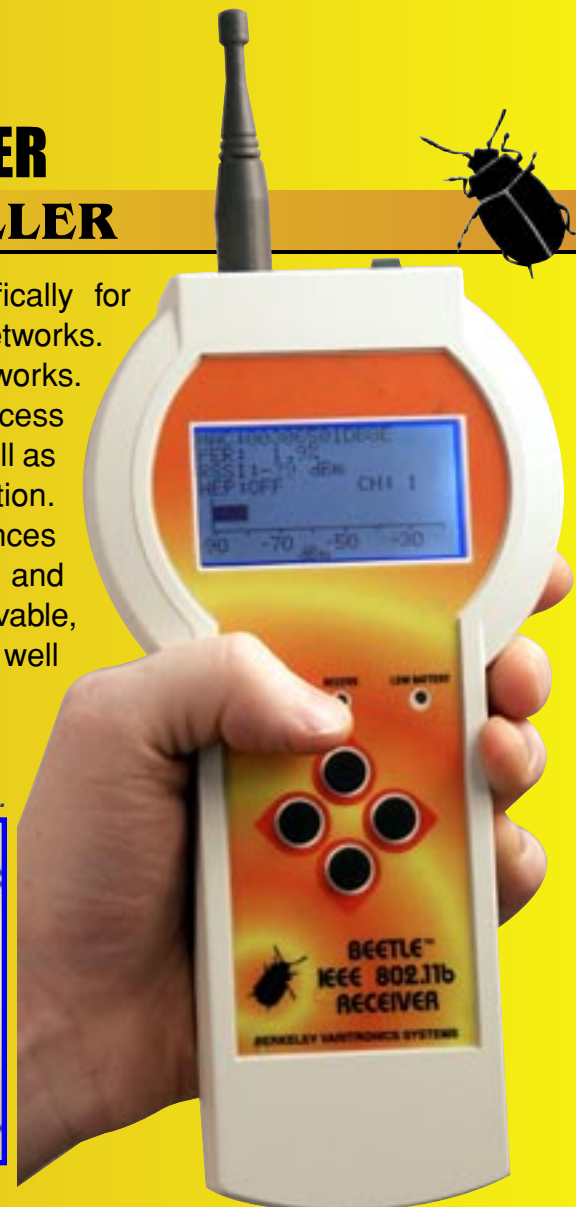


Beetle™ is a handheld, wireless receiver designed specifically for sweeping, installing and optimizing Wireless Local Area Networks. The instrument measures coverage of DSSS **IEEE 802.11b** networks. **Beetle™** measures and displays signal strength of ALL APs (Access Points) on ALL 14 DSSS channels, ALL MAC addresses as well as PERs (Packet Error Rates), SSID and WEP encryption detection. **Beetle™** detects and differentiates from narrow-band interferences such as microwave ovens and frequency hopping systems and features a built-in display, menu navigation keypad and removable, rechargeable batteries for true portability. Perfect for installs as well as antenna alignments and other optimizations.



Beetle will measure and display ANY 802.11b Access Point (up to 64) on ANY channel (1-14).

MAC Address	CH	dBm
00306510A9A8	1	-88
000220389929	1	-77
00306501DB8E	1	-74
0002200FC922	1	-81



FEATURES:

- Measure coverage of all 14 channels for direct sequence (DSSS) wireless networks (wideband IF 22 MHz)
- Tests ALL 2.4 GHz DSSS networks (base stations & STAs) complying with **IEEE 802.11b** standard
- Measures correlated signal strength using a custom, calibrated receiver
- Low-cost instrument that any field technician can afford
- Measures Packet Error Rate for base stations or client cards
- Measures and displays power across 22 MHz channel of individual stations total channel power
- SSID Identification and WEP security encryption detection
- Light-weight, portable and rugged design ideal for realtime network analysis
- Removable battery power (4 AA Ni-MH cells with 4 extra batteries & charger included)
- Built-in 128 x 64 Graphic backlit LCD with simple menu interface and navigation

The Beetle is just one of many exceptional design solutions from Berkeley Varitronics.
 Call us today for more information:
 (732) 548-3737 / Fax: (732) 548-3404
 Internet: www.bvsystems.com
 E-mail: info@bvsystems.com



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BEETLE™ 2.4 GHz SCANNER

IEEE 802.11b WLAN INSTALLER



BANDS SUPPORTED

ISM: 2.400-2.485 GHz

RF SENSITIVITY (Wide Band)

-20 to -90 dBm

RSSI MEASUREMENT (Narrow Band)

-30 to -90 dBm @ 687.5 kHz resolution bandwidth

TUNING INCREMENTS

Tunes 11 USA channels & 3 international channels

PACKET PREAMBLE DEMODULATOR and ANALYZER:

Multipath Measurement and Graphical Display

POWER MEASUREMENTS:

AP Power Measurement

RATIO

-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:

4 button keypad

Warm Up Time:

< 3 minutes

Power:

Internal battery pack (4 AA Ni-MH batteries)

Weight:

Under 2 lbs.

Dimensions:

2" H x 4" W x 9" L (water resistant, high impact ABS plastic case)



Beetle includes 8 AA Ni-MH batteries, fast-charger, straight 3dBi 2.4 GHz antenna (SMA Female 50 ohm) and belt holster.