Beetle 802.11a

manual version 1.1

Contents

Beetle™ 802.11a receiver is a handheld, wireless receiver specifically designed for installing access points (APs), monitoring network coverage and aligning WISP antennas. The instrument captures 802.11a beacon packets and provides the measured signal strength, the MAC address, SSID and WEP encryption status. The **Beetle™ 802.11a** receiver operates on all twelve 802.11a channels in the lower, middle and upper U-NII bands. It can demodulate beacon packets from APs, bridges and client cards in ad-hoc mode.

Important Note: APs and bridges must be configured to transmit beacon packets at 6 Mbps to be detected with the **Beetle™ 802.11a** receiver.

The **Beetle™ 802.11a** receiver is powered with four AA batteries. Two sets of batteries (eight batteries) and a charger are provided with the instrument. Ni-MH battery cells are recommended. Other AA batteries can be used, but should be at least 1500mAh per cell.

A 5 GHz detachable antenna is also included with the **Beetle 802.11a** receiver. This connects to a 50-ohm female SMA connector (with normal threads) on the top of the instrument. To prevent damage to the instrument, the antenna should be removed when the unit is transported. Additional antennas may be ordered from BVS.

GETTING STARTED

Before using your Beetle 802.11a receiver for the first time, insure that the batteries are completely charged and correctly installed in the instrument. Connect the provided 5 GHz antenna to the female SMA connector located on the top of the instrument. Turn the power switch, located on the top of the instrument, to the on position. The LCD display will light up and a splash screen showing the functions of the keypad buttons will appear. After two seconds or if any key is pressed, the main menu will be displayed.

To start using your Beetle 802.11a receiver immediately, use the up/down arrows to highlight the **AP MEASUREMENTS** choice on main menu and press the right button to select that choice. On the **AP MEASUREMENTS** menu, select **SCAN CHANNELS** to scan through all twelve of the 802.11a channels and display nearby APs, bridges and clients in ad-hoc mode.

As the instrument scans, the channel number in the upper left will change as well as the progress indicator in the upper right. Nearby 802.11a channels with stations that are producing beacons will appear in the list on the screen, along with their signal strength and channel number. If there are more stations than will fit on the screen, the UP/DOWN keys can be used to scroll. The UP/DOWN keys are also used to select stations for individual display.

Using the UP/DOWN keys, highlight one of the stations displayed in the list and press the right arrow. This will place the unit in the main measurement screen. Pressing the UP/DOWN keys in this key will scroll through the main measurement, SSID and antenna alignment screens.

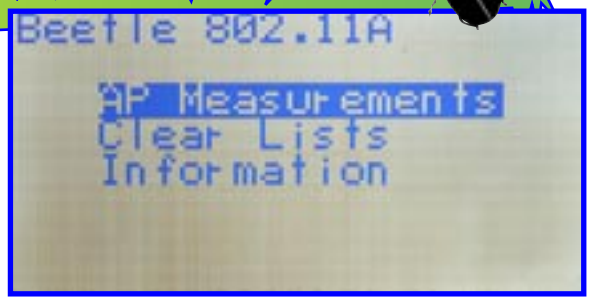
Beetle 802.11a ACCESSORIES

Your Beetle 802.11a receiver includes all of the basic operational accessories, including a 5 GHz antenna, eight Ni-MH batteries (2 sets), one battery charger and an AC/DC power adaptor. See the instructions included with the charger for proper charging of the batteries and important safety information. The approximate charging time for depleted batteries is just over an hour. The run time for fully charged batteries is just over two hours.

Note: Batteries that are warm or hot to the touch (from constant usage or high ambient temperature) will take longer to charge than batteries of normal temperature. Contact BVS for new Ni-MH batteries. Expect over 500 cycles from each Ni-MH battery.

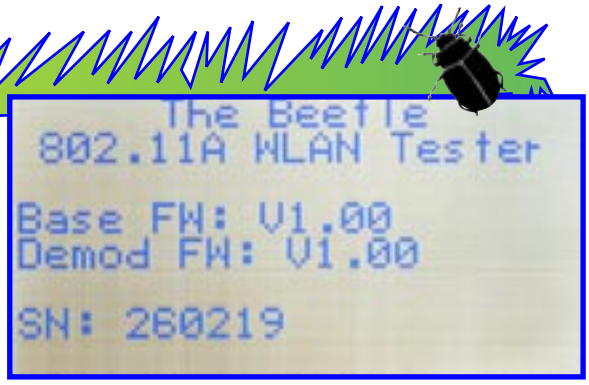
MAIN MENU SCREEN

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.



INFORMATION

This screen indicates the firmware versions of the particular Beetle 802.11a and its serial number. These screens are necessary should any upgrades or repair be necessary to the Beetle 802.11a.

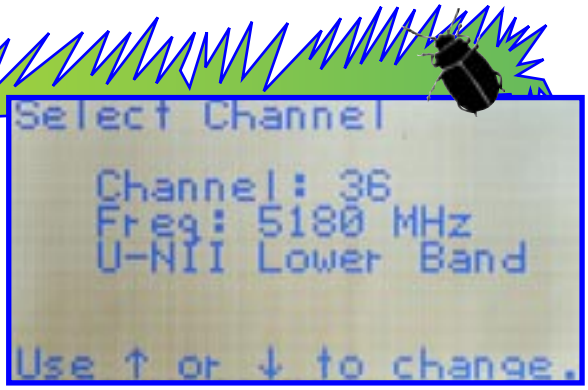


AP MEASUREMENTS

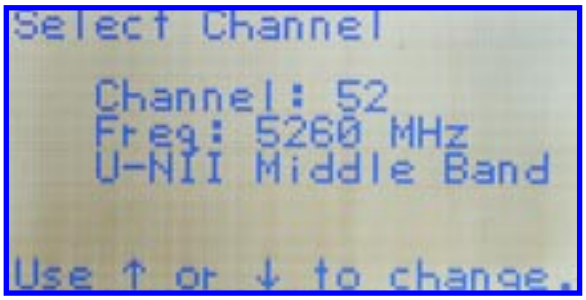
This selection allows the user to scroll through any of the 12 802.11a channels. The channel screen indicating all available channels and their corresponding frequencies. 802.11a channels are sorted into 3 different U-NII bands: lower band (5180-5240 MHz), middle band (5260-5320 MHz) and upper band (5745-5805 MHz) 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.

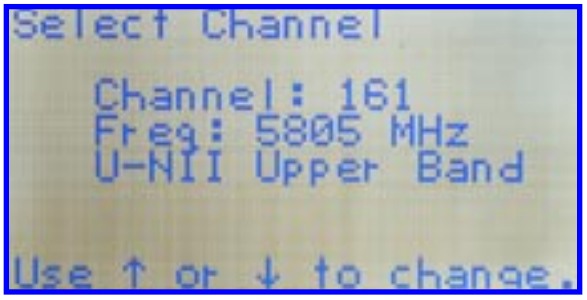
SINGLE CHANNEL SELECTION

The Single Channel selection under AP Measurement displays this screen allowing the user to choose the channel they wish to scan. Notice the 802.11a frequency (5.150-5.825 GHz) and channels (36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161) are broken into 3 distinct U-NII bands (lower, upper and

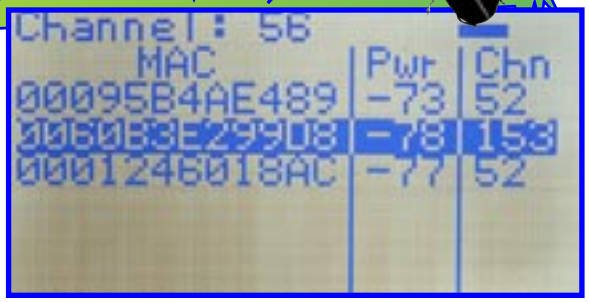


middle).



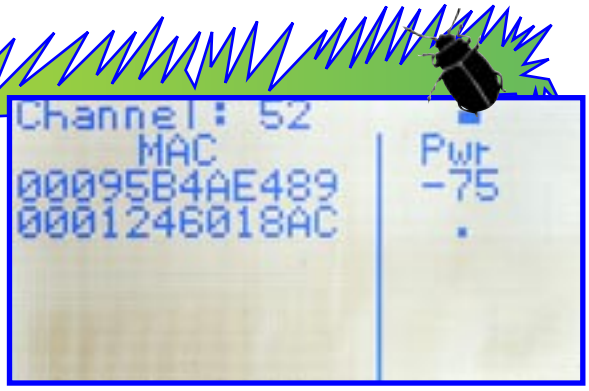


SCAN ALL CHANNELS



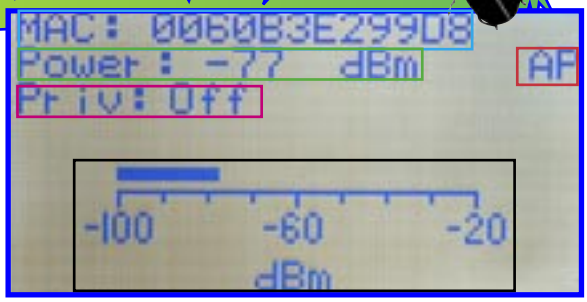
This selection scans all 12 channels for active APs. Up to 64 APs, their respective channel and power in dBm will be listed on this screen. Use the UP/DOWN keys to toggle bewteen the desired channels and the press the RIGHT key to choose the channel. Press the LEFT key at any time to back up to previous screen.

SCAN SINGLE CHANNEL



This selection scans all 12 channels for active APs. Up to 64 APs, their respective channel and power in dBm will be listed on this screen. Use the UP/DOWN keys to toggle bewteen 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.

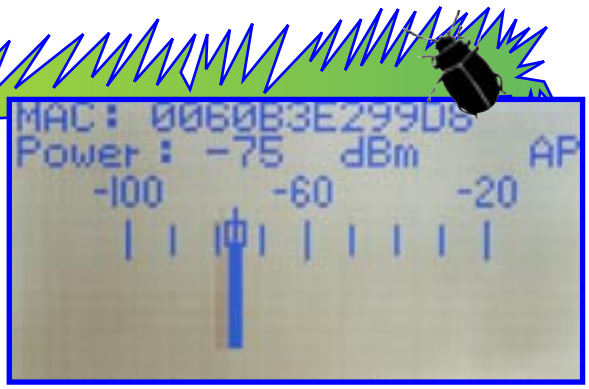
MAIN MEASUREMENT SCREEN



This is the main measurement screen used for monitoring APs or Access Points. Once an AP is detected and selected, it will be displayed here. From this screen, all other measurements and useful screens may be accessed with the touch of a button. Remember that only measurements for the currently selected MAC will be displayed here. Use the UP/DOWN ARROW keys to toggle between all of these selections and ENT to choose one.

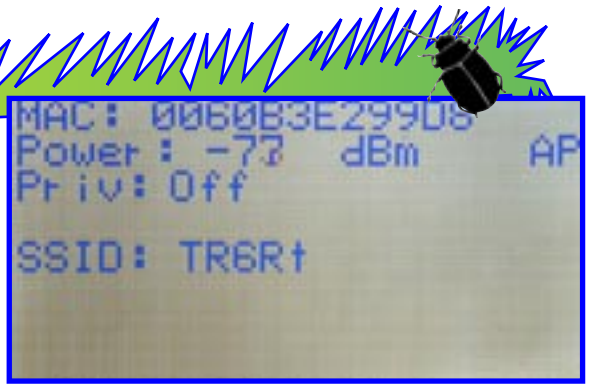
MAC: indicates current MAC selected
Power: indicates signal strength in dBm
Priv: indicates WEP status on selected AP or NIC
AP: indicates if signal is from access point or IBSS (indicates client card in ad-hoc mode)
Graphical signal strength bar with peak hold in dBm
(RIGHT ARROW key resets peak hold marker)

SIGNAL METER SCREEN



Push the the DOWN 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 802.11a). The needle at the bottom shows the current signal level in dBm. A 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.

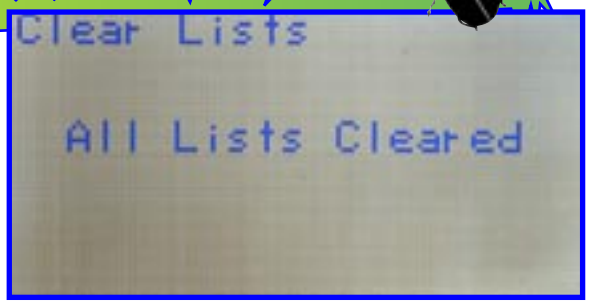
AP INFO SCREEN



Push the the DOWN ARROW while in the Signal Meter Screen to enter this AP info screen. This screen is a non-graphical realtime measurment screen of the selected access point. Unlike the other measurement screens, this screen also provides the SSID and WEP status of the selected access point.

CLEAR LISTS

This selection clears the Beetle 802.11a'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.



Beetle 802.11a Channel/Frequency Ranges

Channel	Frequency (MHz)
36	5180
40	5200
44	5220
48	5240
52	5260
56	5280
60	5300
64	5320
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700
149	5745
153	5765
157	5785
161	5805

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.

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
IBSS	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 FOR ALL BVS ELECTRONIC PRODUCTS

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 facil4 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.

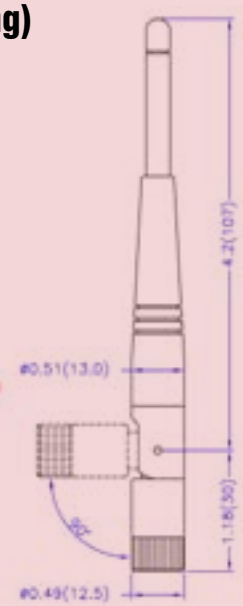
5 GHz Omni-Directional (5.5” long)

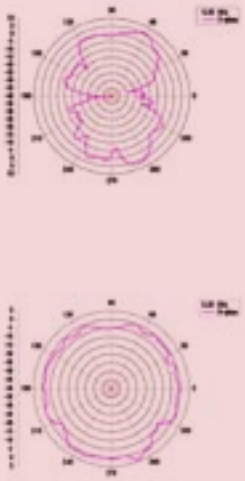
Electrical Properties:

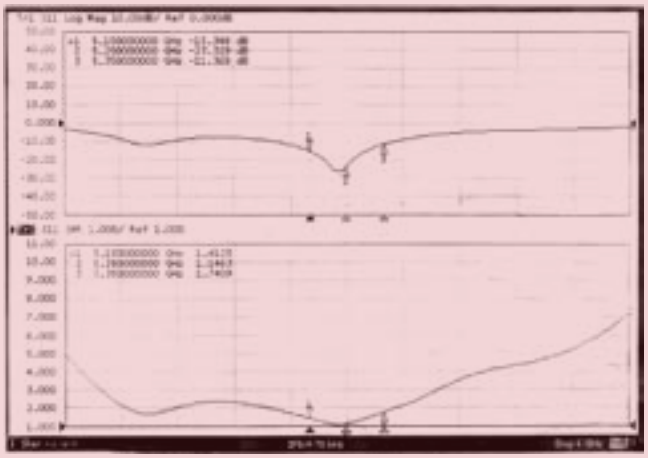
Frequency Range:	5.15~5.35 GHz
Impedance:	50Ω nominal
VSWR:	<2.0:1
Gain:	5 dBi
Radiation:	Omni
Polarization:	Vertical

Mechanical Properties:

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





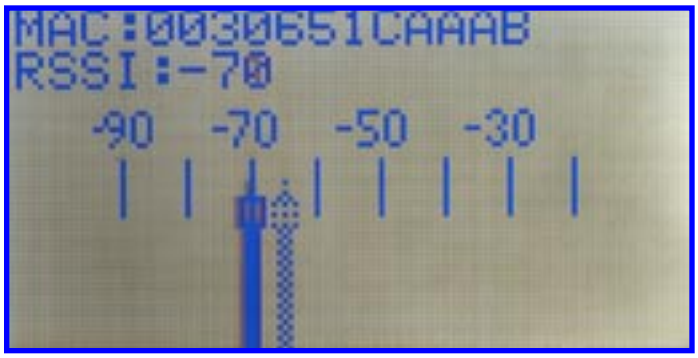


5 GHz Omni-Directional Frequency Response

BEETLE™ 5 GHz SCANNER

IEEE 802.11a Wi-Fi INSTALLER

Beetle™ is a handheld, low-cost wireless instrument designed specifically for installing and maintaining 802.11a Wi-Fi networks. The calibrated receiver measures a wide range of RF spectrum from 5.150 GHz through 5.825 GHz (low, middle and upper U-NII band). Beetle™ measures and demodulates beacon packets from any 802.11a OFDM access point, bridge or client card in ad-hoc mode and provides stats like MAC, SSID and signal strength as well as WEP encryption status. Beetle's frequency range makes it ideal for wireless IT network technicians looking to install, verify, optimize and even align their 5.8 GHz antennae for point-to-point, point-to-multipoint and network backhaul. Beetle™ is a passive, wireless tester so that users may study all nearby 802.11a networks "invisibly" and accurately for true wireless measurements and features a built-in display with keypad button interface for portable, PC-independent operation anywhere.



Beetle's signal meter screen is ideal for aligning all of your 802.11a WISP antennae.

FEATURES:

- Numerical and graphical RSSI - perfect for WISP antenna alignment
- Tests ALL 802.11a 5 GHz APs, bridges or ad-hoc client cards on or off your network
- Calibrated reciever measures and reports RSSI, MAC, SSID & WEP
- Low-cost instrument that any field technician can afford
- 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 LCD and keypad navigation for PC-free operation

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

wireless products
BERKELEY VARITRONICS SYSTEMS

BEETLE™ 5 GHz SCANNER

IEEE 802.11a Wi-Fi INSTALLER

BANDS SUPPORTED	U-NII lower band (5.150 - 5.250 GHz) (channel numbers 36,40,44,48)
	U-NII middle band (5.250 - 5.350 GHz) (channel numbers 52,56,60,64)
U-NII upper middle band (5.500 - 5.700 GHz) (channel numbers 100, 104, 108, 112, 116,120, 124, 128, 132, 136, 140)	
	U-NII upper band (5.725 - 5.825 GHz) (channel numbers 149, 153, 157, 161)
RF SENSITIVITY (Wide Band)	-20 to -80 dBm
TUNING INCREMENTS	All 12 OFDM channels (36,40,44,48,52,56,60,64, 149, 153, 157, 161)
POWER MEASUREMENTS:	
AP Power Measurement	-20 dBm to -80 dBm

RECEIVER GENERAL SPECIFICATIONS

IF Bandwidth:	Wideband 20 MHz
Stability:	± 2.5 PPM Temp range 32 to 120 degrees
Antenna:	SMA Female 50 ohm
Power:	Internal battery power (4 AA rechargeable Ni-MH batteries)
Controls:	4 button keypad
Warm Up Time:	< 3 minutes
Weight:	2 lbs.
Dimensions:	1”H x 4.5”W x 9”L (water resistant, high impact ABS plastic case)





Beetle includes 8 AA Ni-MH batteries, fast-charger, omni adjustable 3dBi 5 GHz antenna, SMA cable connector adapter, hard protective travel case and and soft protective holster case.

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