Raven

manual version 1.9

Contents

ABOUT YOUR RAVEN

The **RAVEN**™ is a portable, PN scanner used to measure and record Ec/Io IS-95 coverage of CDMA base stations. Raven measures active CDMA networks or it may be used in conjunction with CDMA transmitters such as the Crocodile™ or Gecko™ which are placed throughout an area of interest. The transmitters may be set to different different base station PN offsets and the Raven will measure and record their true Ec/Io signal. these CDMA signals are then grouped and displayed on a laptop PC via USB or RS-232 ports according to user parameters. Raven includes internal GPS receiver for LAT and LON recording, but does not require GPS acquisition for operation.

RAVEN SIDE PANEL

SERIAL IN/OUT
USB PORT
1 AMP FUSE
12 VOLT DC INPUT
RF INPUT
GPS INPUT

RAVEN TOP PANEL

Operation of the **RAVEN** is simple. Use the push button dial to make a menu selection by turning it. Push in the knob to make the selection. **RAVEN** is designed to be used in CDMA base station drive studies with a PC laptop.

POWER ON

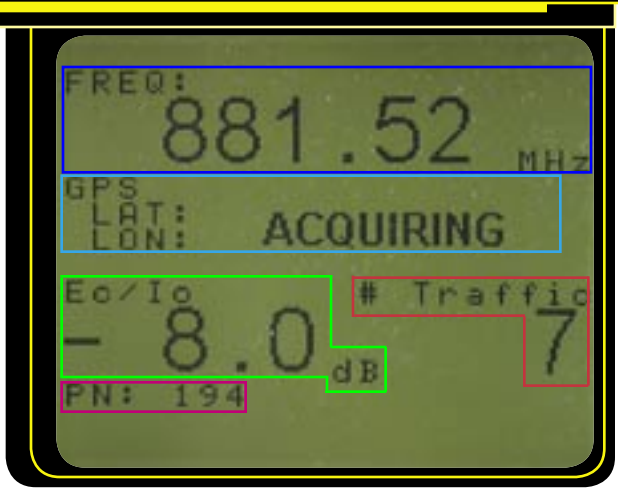
Upon powering up the **RAVEN**, the user will first see the startup screen displaying the Raven text logo. After a few seconds, this screen will disappear and the main Ec/Io display will appear.

MAIN DISPLAY

This is the **Raven's** main signal strength display screen.

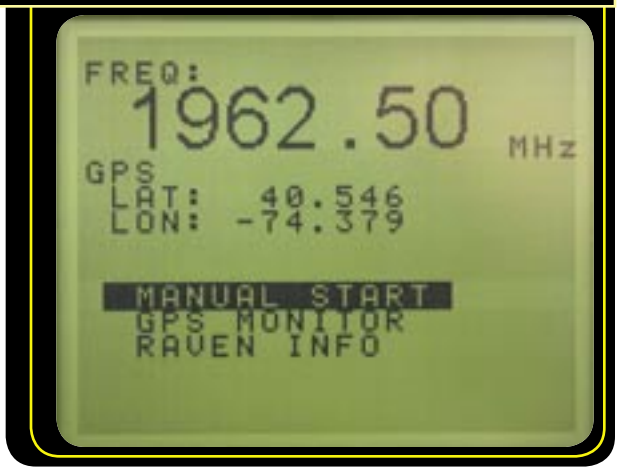
FREQ: current scanning frequency in Megahertz
GPS: current Latitude and Longitude coordinates of Raven
Ec/Io: true correlated signal strength in decibels
PN: actual PN of Ec/Io signal strength which is shown above
TRAFFIC: current number of traffic channels

Push the knob in at any time to leave this screen and enter the menu options screen.



MENU DISPLAY

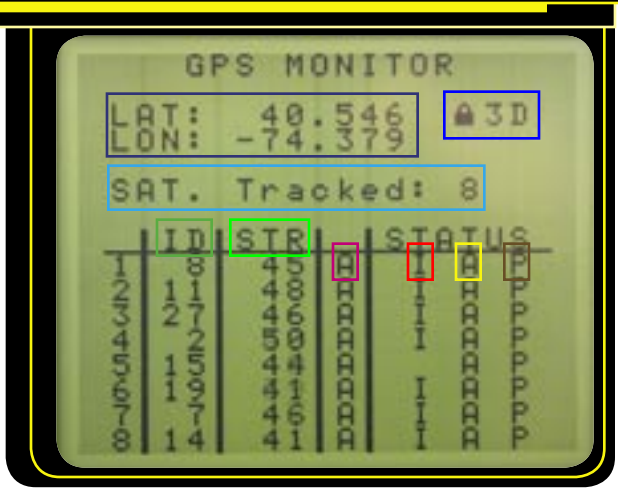
This is the **Raven's** simple menu interface screen on the unit's LCD display. For advanced user settings and parameters, the Raven scanner may be accessed and controlled through the USB or RS-232 ports via any laptop PC using the included software application. Turn the knob to highlight a selection. Push in the knob to make the selection. MANUAL START brings the user back to the MAIN DISPLAY screen.



GPS MONITOR

This screen provides the user with more detail concerning the current GPS lock. The channel numbers (8-channel GPS) of the GPS receiver are listed on the left. The GPS MONITOR screen indicates the following parameters:

LAT & LON: Latitude & Longitude of Raven
3D: indicates 3D lock
SAT Tracked: number of satellites received and tracked
ID: GPS satellite identification number between 0 and 32
STR: GPS satellite signal strength between 0 and 255
A: indicates if satellite is available for a position fix
I: indicates inaccuracy of greater than 16 meters distance
A: anti-spoof flag indicator
P: indicates position fix



This screen indicates the current version of firmware that the Raven is operating under. This number only refers to the Raven hardware version. It does not reflect the Raven Data Logger software version or the version of this manual.

NOTE:
All firmware upgrades must be performed in Berkeley labs by technicians unless otherwise indicated.
Raven Data Logger™ 4.0 User Manual

Raven Data Logger Adendum

Use Chameleon 3.90 or higher with Raven Data Logger 4.11 or higher.

There are two ways to get ASCII converted paging data, one through the Raven Data Logger and one through Chameleon CDMA.

The first way is by using Raven Data Logger. When the binary log file is being created, a secondary file with a .PAG extension is also created. This gives the user a snapshot of exactly what they saw on the Data Logger display. It is a convenient way to look at paging data on-the-fly.

The .PAG file is subject to the same restrictions of the display in that the application puts a premium on logging the binary file for later conversion by Chameleon. If the display is busy (due to operating system interruptions, etc.) when the next message is processed, the data will be logged to the binary file but not the display or .PAG file.

Chameleon CDMA (3.90 and greater) will be able to convert ALL of the data received by the Raven during logging. ASCII conversion of paging data using Chameleon will usually result in a larger output file than the .PAG file because it processes all of the messages. Chameleon is not subject to the real-time processing demands that the Data Logger encounters. Chameleon is reading data from the file at its own pace rather than collecting from the communications port at the CDMA network's pace. Use Chameleon when all of the paging messages collected are needed.

System Requirements
Pentium II
500 MHz
64MB RAM
100MB free on Hard Drive
Operating System: Windows 95/98/2000/NT
Raven interface: 1 free serial port or USB port:

Introduction
The Raven Data Logger (RDL) is the PC interface to the Raven. This application collects data from the Raven and displays the data. The RDL also logs the data to binary files.

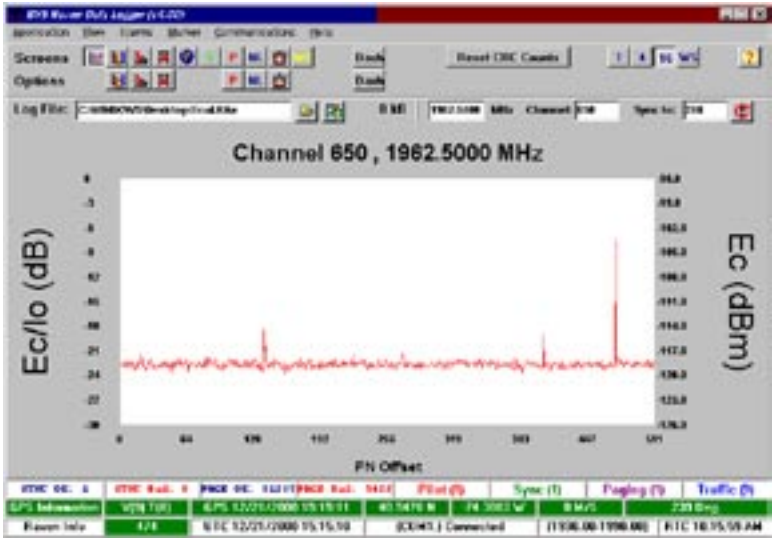


Figure 1 – Raven Main Screen

The binary data files that are created are input into BVS's Chameleon application. This application formats and filters the data so that it can be used with a variety of popular post-processing packages such as MapInfo or MSI Planet.

1. INSTALLATION

The installation of RDL can be completed in a few minutes. Place The BVS CD-ROM in the drive of your computer. The CD will autorun and display the main selection screen. Click on **PC Software**/ **Drivers**. The **BVS Application Installation** screen will now be displayed. Click on the Raven DL box and follow the install prompts. When finished, repeat the procedure to install the **USB Drivers** and **Raven WD** from the **BVS Application Installation** sceen.

Application Overview
RDL was designed to allow users to display and log scan data with relative ease. All of the controls are located in the parameter panel. A status bar is provided at the bottom of the main screen to provide important GPS and system status information.

Data being received from the Raven includes statuses as well as the latest information from the Pilot, Sync, and Paging channels.

Quick Start

To begin scanning takes only three steps. Choose the communications port to which the serial or USB cable is connected, press OK, then select the screen you wish to view.

2. PARAMETER SCREEN

Log Options

Clicking on the **Open Folder** button in the Log File group box brings up a dialog box to choose a filename and location for logging data. After a file is chosen, it will appear in the Log File caption. Clicking the **Logging Icon** begins the logging of data from the Raven. Clicking this box again stops the logging process. The size of the file is displayed next to the **Logging Icon**. Data being logged depends on the modes selected. These modes include PN data, GPS data, Sync Channel data, Paging Channel data, and network alert data.

Data Averaging

The data averaging group box allows for the averaging of data coming into the serial or USB port. The rolling averages will average the last N values, N being either 4 or 16. The weighted sum (WS) average places a higher weight on the current point. Choosing **1** simply displays the latest point. NOTE: The averaged data is not stored to the data file. The original data is stored.

Display Screens

There are many different types of displays for the Raven DL (RDL). The screen title for some screens contains the current frequency and RF channel. Many display screens have an option dialog which can be entered by selecting the appropriate option button. These dialogs have various selections to customize screens to user preferences. Below is a summary of these screens.

PN TEMPORAL SCREEN

The temporal screen contains points for all 512 PN offsets. The left side of the screen displays the Ec/Io range and the right side displays the Ec range. **Zoom In** feature is engaged by placing cursor over the signal peak and left clicking the mouse button. Right click on the mouse button zooms out.

TOP PN OFFSETS (BAR GRAPH)

The bar screen displays up to 20 PN offsets at a time. Below each bar is the PN offset followed by the chip delay from the locked PN. Clicking the OPTIONS button from the parameter screen allows different settings and colors to be chosen.

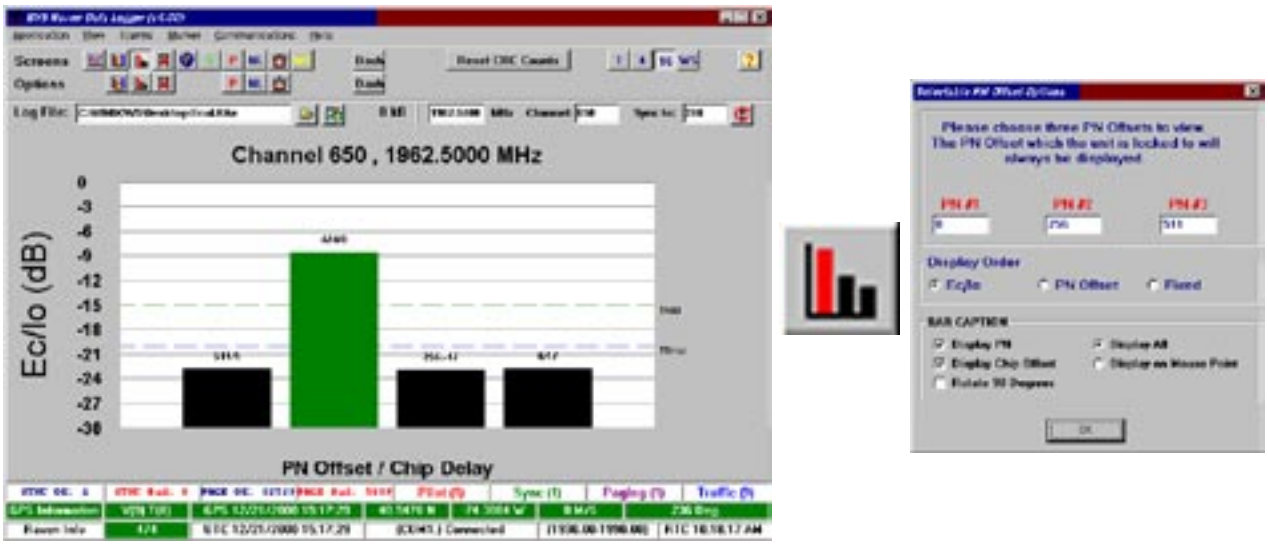


Figure 2 - Raven Top PN Offsets and Options Screen

SELECTABLE PN OFFSETS

This bar screen allows the user to select three PN offsets besides the one currently locked to for constant display. These PN offsets can be found in the OPTIONS screen.

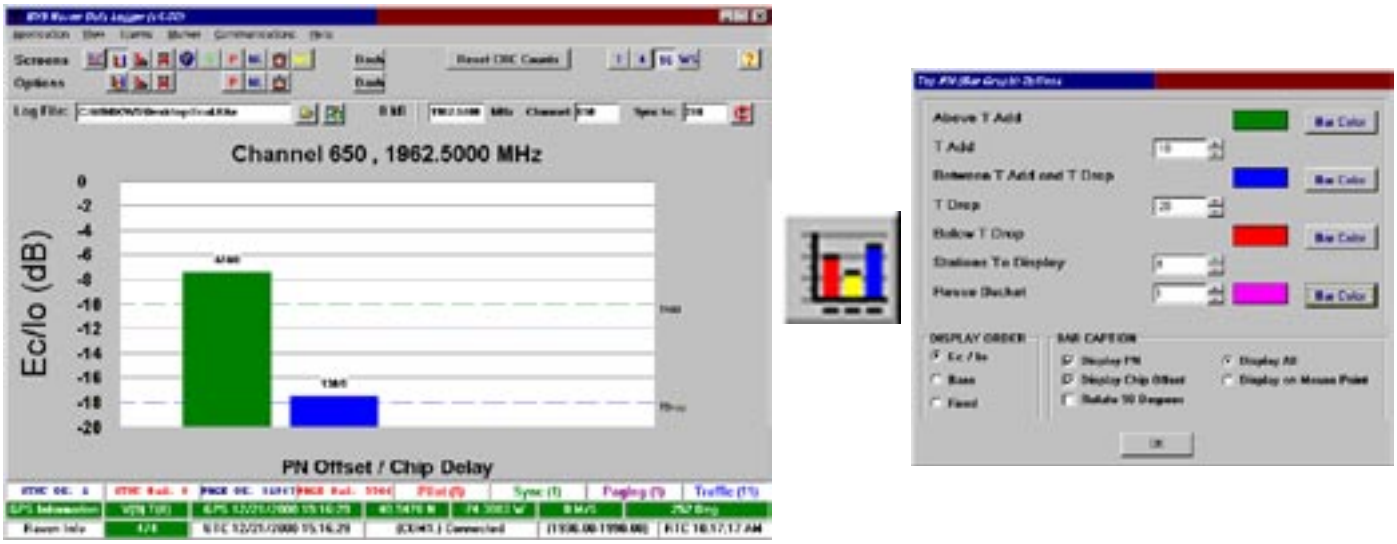


Figure 3 – Raven Bar Screens and Options Screen

TOP PN OFFSETS (SEARCH WINDOW)

This screen shows the top PN offsets and their relationship to the PN which has been locked to. Settings to simulate search window criteria can be found by pressing the OPTIONS button.

GPS SATELLITE DISPLAY

This screen shows information received through the Motorola GPS Receiver. Information includes satellite ID's, tracking statuses, signal strengths etc..

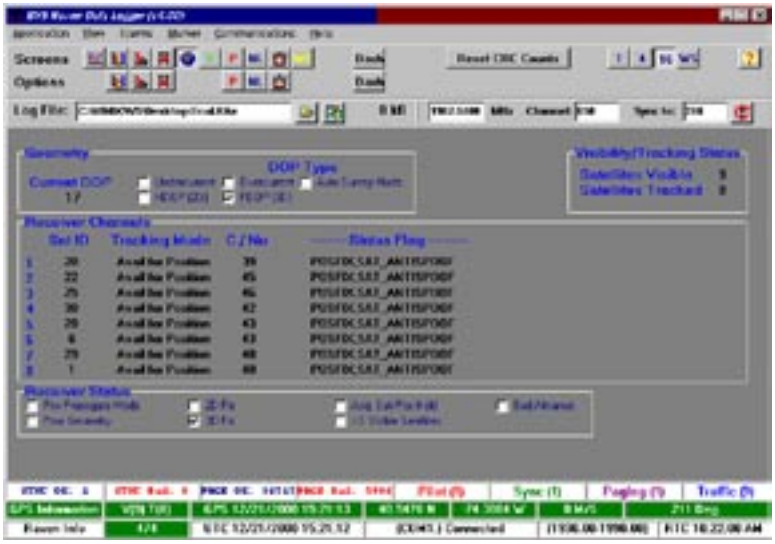


Figure 4 – Raven GPS Screen

SYNC CHANNEL DISPLAY

This screen is updated whenever the Raven sync's to a new PN offset. The fields show the information from the last sync message to be processed. Data includes Pilot PN, long code, UTC timing, system and network ID's, etc..

Figure 5 – Raven SYNC Screen

PAGING CHANNEL DATA

This screen displays the current paging messages and associated fields for each of these messages. The fields and messages may be selected and filtered using the associated options button.

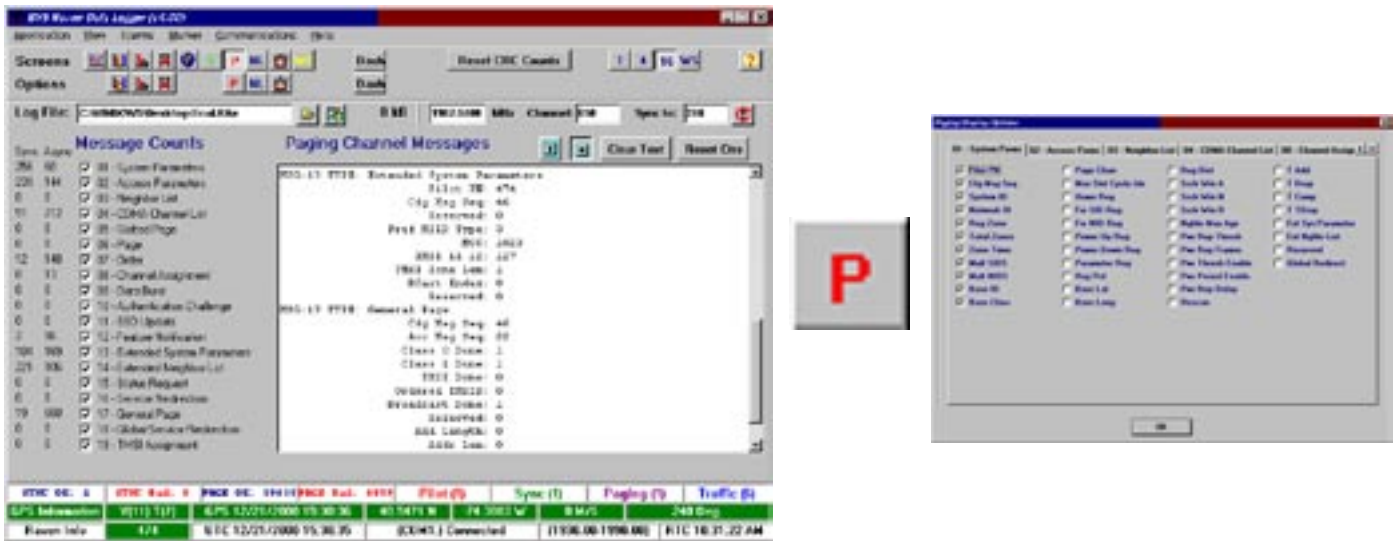


Figure 6 – Raven Paging Message Screen and Options Screen

NEIGHBOR LIST STATISTICS

This display shows the neighbor list for the current PN and signal strengths of offsets which are currently detected. The screen also shows a history of offsets found as well as offsets found which are not in the neighbor list.

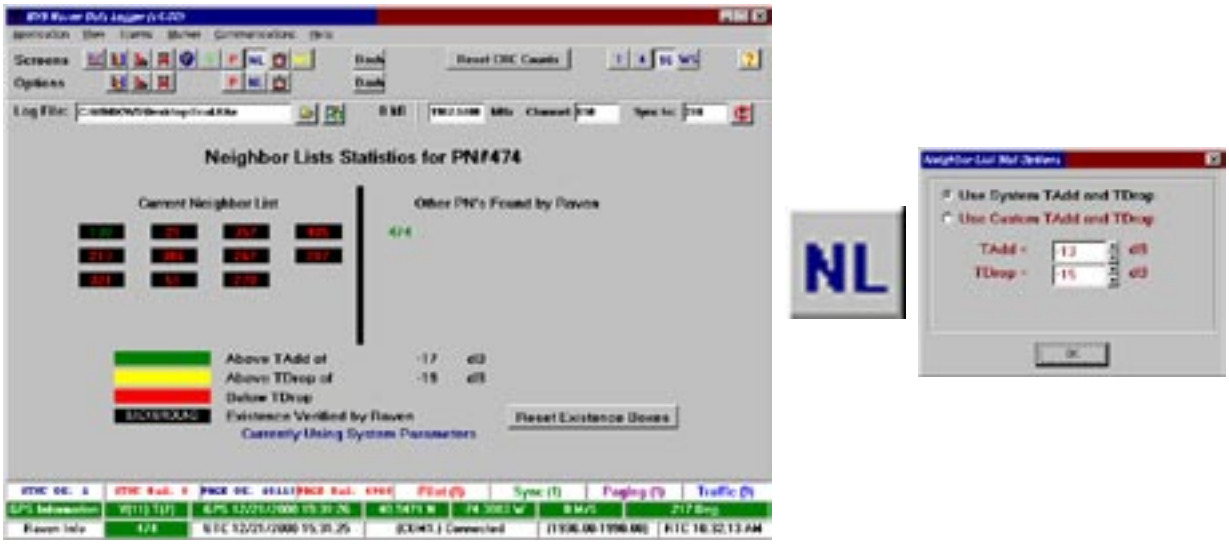


Figure 7 – Raven Neighbor List and Options Screen

NETWORK ALERT SCREEN

This screen shows the current watch conditions being violated. Conditions are set using the OPTIONS screen. These conditions include: Search Window violation, Reuse Factor violation, and the lack of a PN above a certain threshold (Network Hole). These violations can also be logged.

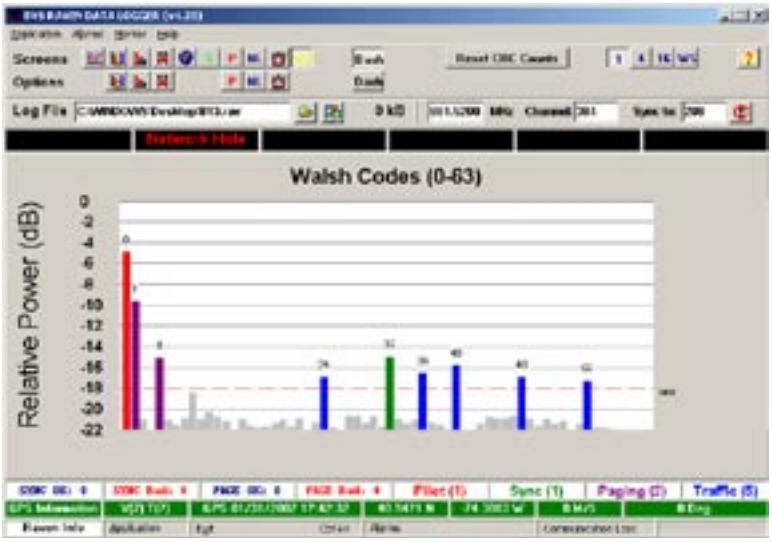


Figure 8 – Active Walsh Codes

This screen displays the color-coded power distribution of the 64 Wlash codes for the PN offset that Raven has locked onto. Pilot, Sync, Paging and Traffic signals are displayed, color-coded and updated every 800 milliseconds. This function is a realtime monitor only. The Walsh data is not logged. There will always be 1 pilot (code 0) and 1 sync channel (code 32). The paging channels will appear in code slots 1 thru 7 and traffic channels may appear in any of the remaining slots.

DASHBOARD

Below the main menu will appear a dashboard if selected which displays various “Idiot” lights to flag the user of any potential network problems such as pilot pollution and rogue PN’s. The setings for these lights can be altered using the associated option screen.

3. STATUS BARS

The status bar on the bottom of the main screen contains the GPS Time and Date received from the locked PN. The status on whether the unit is locked and/or sync’d is also displayed. If the unit is locked, the lock box will be green. Otherwise, the box will be red. The same can be said for the SYNC box. However, if the unit is sync’d, the PN offset being tracked is displayed.

Connection status is also displayed. GPS Latitude and Longitude are displayed. The number of visible (V) and tracked (T) satellites are also The frequency range of the unit and the real-time clock round out the status bar.

4. MENU OPTIONS

Application Menu

The user may exit the application from the application menu. Exiting the application this way will save all the setup selections in the Raven Data Logger.

Figure 9 – Alarms Menu and Options Screen

The alarm alerts the user if communication has been lost with the Raven.
The alarms may be set to be audible, visible, or both. These options may be selected from the Alarms menu. If the audible alarm is checked, then a system beep will repeat for as long as the condition remains present. A visible alarm will pop up a message box stating the alarm condition.

Marker Menu
The marker menu as well as F7 will place a data marker in the log file for use during data conversion.

Communications Menu
The “Port” option will launch the first screen that shows up when the application starts. Use this option to change the communications port from which RDL tries to retrieve Raven data.

Help Menu
The help menu contains the on-line version of this manual as well as the application “about box” which will display version information and disclaimer(s).

Introduction

The Chameleon application software is the universal data conversion and filtering tool for BVS Receivers. The Chameleon was designed to greatly simplify the transfer of receiver data to many popular post-processing applications such as MapInfo and MSI Planet. In addition to the ability of this application to convert data into custom formats, different filtering capabilities are available to facilitate the extraction of useful data needed for network analysis.

The following sections of this document outline the various features of the Chameleon software.

FIGURE 1 – Chameleon Main Screen

Installation

Installation of Chameleon is straightforward. Insert the CD provided with the product purchased into the computer. Wait a few seconds for the auto-run program on the CD to boot up. Choose Chameleon CW from the list of applications to install. This will load the installation program. Next, follow the steps outlined by this application. After the installation has been completed, an icon will be placed in the chosen folder (default is “BVS”).

Running the Application

After starting the application, the main screen will appear. There are four steps to conversion which are outlined in the following sections.

Main Menu

The main menu contains options to save and retrieve configurations. The “Save Configuration” option under the APPLICATION menu will save information stored in all fields on all notebook pages. This allows the user to save custom configurations for use on a number of different files. Any saved configuration can be restored using the “Open Configuration” option in the APPLICATION menu. The configuration files are stored in ASCII form. DO NOT modify these configurations manually! Any manual change to the configuration files may result in the loss of configuration information.

Step 1 – Select Input / Output

Choose the data file that is to be converted. Chameleon will automatically determine which product

created the file. Chameleon will display the product type next to the filename. A default output filename will be chosen with the .OUT extension. This may be modified to suit the users needs.

Step 2 – Choose Formatting Options
This step enables the user to specify which data is to be converted. This section also contains various filters that can be used to reduce the amount of information being converted into the output file.

Choose which receivers are to be converted. Different CW products have a different amount of receivers. Chameleon will only convert data from the receivers which are selected here.

Choose the Data Reduction Type. Either all of the data will be converted or just the data for the strongest server (RSSI), depending on the choice chosen here.

Choose the Average Type. Depending on the product, different options will be available here. Certain products will have the choice of 40 lambda averaging (Panther for example).

One of the powerful features of Chameleon is its ability to convert data into a large number of formats. By selecting the appropriate post-processing application, the correct fields will be selected and placed in the selected field box in the appropriate order. If the format selected requires information that is not ASCII-delimited, no fields will show as selected in the selected field box. The data for these non-ASCII formats is fixed thus the user will not be able to adjust the order or the number of fields to be converted.

The user may also choose a custom ASCII format of a type that is not represented by any of the supported post-processing applications. This is accomplished by choosing “Custom Configuration”. As stated above, these configurations can be saved in configuration files by using the “Save Configuration” option found in the APPLICATION menu.

Step 3 – Select Data and Fields Which Are To Be In The Output File
Select the fields that are to be placed in the output file. The delimiting character may also be chosen. Field titles may be placed in the output file by checking the appropriate box. To include data fields as specified by the “Output Filter” page, be sure to have the “<<DATA>>” field in the selected box.

When a particular post-processing format type has been chosen, fields will be displayed in the selected box. If the format chosen is a non-ASCII delimited custom format, the selection boxes will be inactive.

Step 4 – Convert The Input File
Press the CONVERT button. The progress bar will be updated as the file is being processed. The speed of conversion will vary based on the data filter chosen.

After the message appears stating that the conversion has been completed, the converted file will be ready for import into the specific post-processing application that you have chosen.

CELLULAR CHANNEL SPACING AND DESIGNATION

The Primary CDMA Channel shall be channel number 283 for System A and channel number 384 for System B.

The Secondary CDMA Channel shall be channel number 691 for System A and channel number 777 for System B.

JCDMA FREQUENCIES / CHANNEL NUMBERS

Band A device #141

Channels 1-799 f_T=860+N(0.0125) MHz
Channels 801-1039 f_T=843+(N-800)(0.0125) MHz

Band B device#142

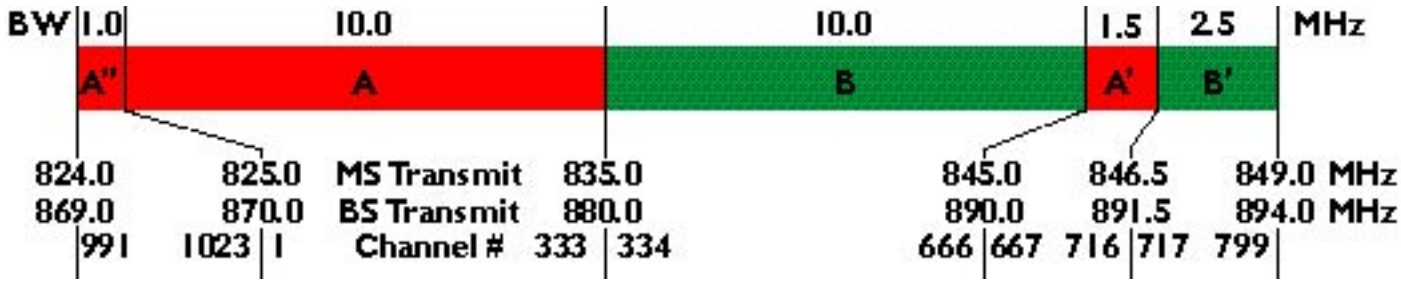
Channels 801-1039 f_T=843+(N-800)(0.0125) MHz
Channels 1041-1199 f_T=832+(N-1040)(0.0125) MHz

JCDMA phones must operate on even channels between 51-749, 851-989 and 1091-1149

Frequency Plans

Cellular (IS-95A)

CDMA cellular service is intended to share the existing AMPS spectral allocation, shown below.

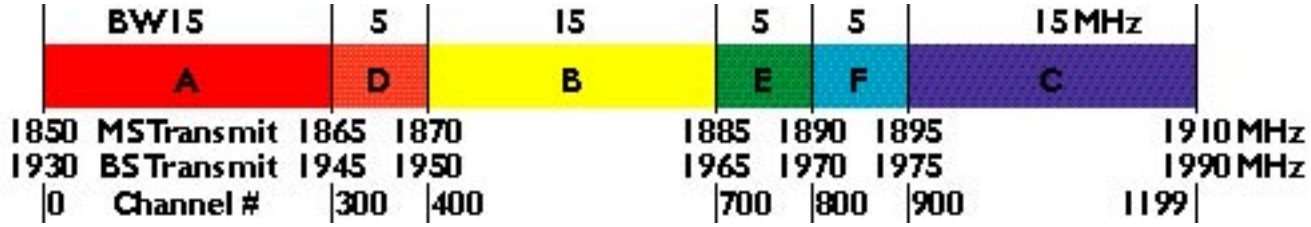


Consecutive AMPS channels are spaced by 30 kHz. CDMA stations are permitted to operate on any AMPS channel, except for guard bands at the edges of the allocations. CDMA stations, of course, would normally be assigned channel at least 1.25 MHz apart (about 42 channels). The mobile station transmit frequency is always 45 MHz lower than the base station transmit frequency.

Both A and B operators have 12.5 MHz of spectrum in each direction. Each allocation, however, is split, and the splits are not the same for the two operators, as shown in the figure. Note that the A' and B' allocations present problems, both for the RF hardware design, and for the allocation of CDMA channels. The B' band, in particular, accommodates two CDMA channels only if they are overlapped slightly, at some small loss of capacity.

PCS (J-STD-008)

PCS is allocated 60 MHz total in each direction, as three 15 MHz bands plus three 5 MHz bands, shown below.



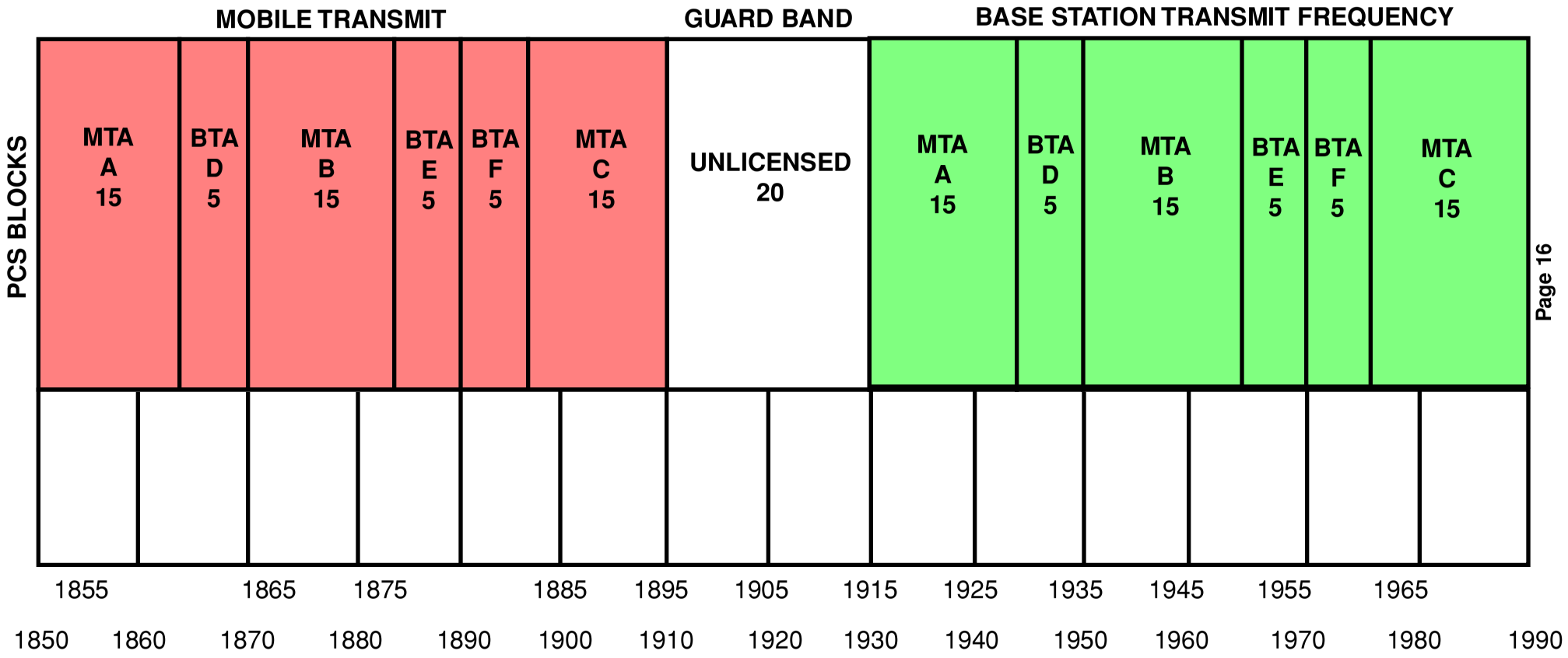
Consecutive frequency assignments are spaced by 50 kHz. Assignments near band edges are conditional, depending on whether the neighboring bands are held by the same operator. Operation near the edges of the service is forbidden in 1.2 MHz guard bands.

In contrast to the cellular service, the standard suggests particular channel numbers as preferred CDMA frequency assignments as follows.

CDMA Preferred Frequency Assignments

Band	Preferred Channels
A	25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 275
D	325, 350, 375
B	425, 450, 475, 500, 525, 550, 575, 600, 625, 650, 675
E	725, 750, 775
F	825, 850, 875
C	925, 950, 975, 1000, 1025, 1050, 1075, 1100, 1125, 1150, 1175

PCS ALLOCATION TABLE



GPS-MM Active Mobile (Magnetic Mount) GPS Antenna

General Description:

The GPS-MM is a high performance GPS patch antenna combing a state-of-the-art low noise amplifier with a low profile, compact, fully waterproof enclosure. When connected to a GPS receiver with 3-5 VDC antenna power, the GPS-MM provides excellent signal amplification in addition to out-of-band filtering & rejection.

This data sheet specifies the basic operational characteristics of the active GPS antenna module GPS-MM under a standard test condition of 3V DC at 25°C and 50% relative humidity.

Specifications:

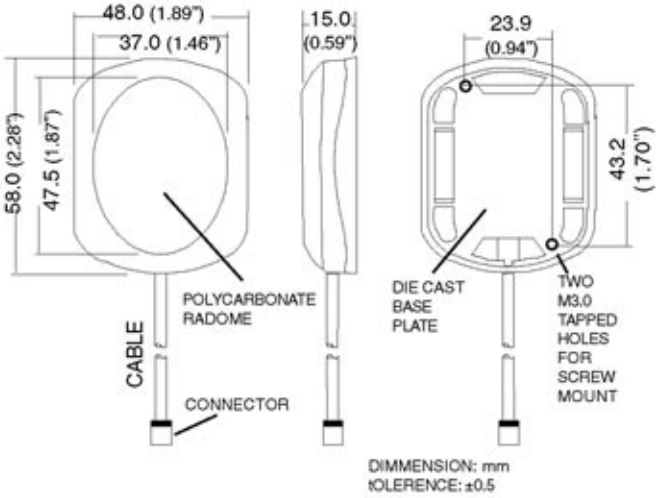
PHYSICAL	
Construction:	Dark gray Polycarbonate-radome at top, die-cast shell at bottom/ rubber gasket for water seal in between
Dimension:	58mm (L) x 48mm (W) x 14mm (H)
Weight:	65 grams (excluding cable & connector)
Standard Mounting:	Magnet mount with two magnets
ANTENNA ELEMENT	
Center Frequency:	1575.42 MHz +/- 1.023 MHz
Polarization:	R.H.C.P. (Right Hand Circular Polarization)
Absolute Gain at Zenith:	+5 dBi typically
Gain at 10o Elevation:	-1 dBi typically
Axial Ratio:	3 dB max.
Output VSWR:	1.5 max.
Output Impedance:	50 ohm
OVERALL PERFORMANCE (Antenna Element, LNA & Cable)	
Center Frequency:	1575.42 MHz
Gain:	25 dB min.
Noise Figure:	2.6 max.
Band Width:	2 MHz
Axial Ratio:	3 dB max.
VSWR:	2.0 max
Output Impedance:	50 ohm

Specifications (Continued):

LOW NOISE AMPLIFIER	
Center Frequency:	1575.42 MHz ±1.023 MHz
Gain:	25 dB typically
Band Width:	2 MHz min.
Noise Figure:	2.6 max.
Out Band Attenuation:	12dB min. @F0 ±140MHz
Supply Voltage:	3.0~5.0V DC
Current Consumption:	12 mA +/- 2 mA
VSWR:	2.0 max.
Output Impedance:	50 ohm

ENVIRONMENTAL	
Operating Temperature	-30oC~+85oC
Storage Temperature:	-40oC~+90oC
Relative Humidity:	95% non-condensing
Waterproof:	100% waterproof

Dimensional Drawing:



Ordering Information:

Model Number	Part Number
BVS-MM	10001268 with 5 m cable & R/A MMCX Plug
BVS-MMB	10001273 with 5 m cable & ST BNC Plug

Glossary of Acronyms

AC	Alternating Current
A/D	Analog to Digital converter
AGC	Automatic Gain Control
Applet	a small Application
BER	Bit Error Rate
BPSK	Binary Phase Shift Keying
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
FIR	Finite Impulse Response
GHz	GigaHertz
GPS	Global Positioning System (satellite based)
GPS diff.	GPS error correction signal which enhances GPS accuracy
IF	intermediate frequency
I and Q	In phase and Quadrature
kHz	kiloHertz
LCD	Liquid Crystal Display
LO	Local Oscillator
Mbits	Megabits
MHz	MegaHertz
modem	modulator/demodulator
PC	Personal Computer
PCS	Personal Communications Service (1.8 to 2.1 GHz frequency band)
PN	Pseudo Noise
QPSK	Quaternary Phase Shift Keying, 4-level PSK
RF	Radio Frequency
RSSI	Receiver Signal Strength Indicator
UCT	Universal Coordinated Time
VAC	Volts Alternating Current
VGA	Video graphic

MPORTANT 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 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.

Product Information Sheet

Product: ***ENERGY+*** **Brand Lithium-Ion (Li-ion) Battery Packs – All Models and Sizes**

Because all of our battery packs are defined as "articles", they are exempt from the requirements of the Hazard Communication Standard, hence an MSDS is not required. This sheet is provided as a service to our customers.

MSDS:
Material Safety Data Sheets (MSDS) are a sub-requirement of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR Subpart 1910.1200. This Hazard Communication Standard does not apply to various sub categories including anything defined by OSHA as an "article". OSHA has defined "article" as a manufactured item other that a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has. end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g. minute or trace amounts, of a hazardous chemical, and does not pose a physical hazard or health risk to employees.

The major components used in Fedco Electronics, Inc. ***ENERGY+*** brand Lithium Ion (Li-Ion) battery packs are Lithium-Ion cells made by various manufacturers, and contain the following:

Chemical Name	Weight by %	Formula	Component
Lithium Cobalt Oxide	10 - 25%	$LiCoO_2$	Positive Electrode
Graphite (Carbon)	5 - 15%	C	Negative Electrode
Ethylene Carbonate-Solvent	0 - 14%	$C_3H_4O_3$	Electrolyte
Diethyl Carbonate-Solvent	"	$C_5H_{10}O_3$	Electrolyte
Lithium Hexaflurophasphate-Salt	"	$LiPF_6$	Electrolyte
Nickel-plated steel	15 - 25%	N/A	Case
Other metal & fiber items	10 - 20%	N/A	Separators, gaskets, etc.

The overall reaction is: $Li_xC + Li_{1-x}CoO_2 \Longleftrightarrow C + LiCoO_2$

Potential Health Hazards:
Lithium-Ion batteries do not contain any free liquid electrolyte, and do not leak electrolyte under normal usage conditions. Overcharged or abused batteries may leak small amounts of electrolyte. In the case of skin exposure, wash any exposed skin with soap and copious amounts of water. It is advisable to wear gloves when handling leaking batteries.

Disposal:
Lithium Ion batteries are not defined by the federal government as hazardous waste and are safe for disposal in the normal municipal waste stream. These batteries, however, do contain recyclable materials and are accepted for recycling at the Inmetco facility in Ellwood City, PA. For more information, call Inmetco at 1-724-758-2800, or go to their web site at www.inmetco.com.

Transport:
Fedco Electronics Lithium Ion battery packs are considered to contain "dry cell" batteries and are unregulated for purposes of transportation by the U.S. Department of Transportation (DOT), International Civil Aviation Administration (ICAO), International Air Transport Association (IATA) and the International Maritime Dangerous Goods regulations (IMDG). The only DOT requirement for shipping these batteries is Special Provision 130 which states: "Batteries, dry are not subject to the requirements of this subchapter only when they are offered for transportation in a manner that prevents the dangerous evolution of heat (for example, by the effective insulation of exposed terminals)". IATA requires that batteries being transported by air must be protected from short-circuiting and protected from movement that could lead to short-circuiting.

NOTICE: The information and recommendations set forth are made in good faith and are believed to be accurate at the date of preparation. Fedco Electronics, Inc. makes no warranty expressed or implied.

Raven™

CDMA PN SCANNER

The Raven™ is a portable, PN scanner used to measure and record (Ec/Io) IS-95 coverage of CDMA base stations. Raven measures active CDMA networks or it may be used in conjunction with CDMA transmitters such as the Crocodile™ or Gecko™ which are placed throughout an area of interest. The transmitters may be set to different base station PN offsets and the Raven will measure and record their true Ec/Io signal. These CDMA signals are then grouped and displayed on a laptop PC via USB or RS-232 ports according to user parameters. Raven includes internal GPS receiver for LAT and LON recording, but does not require GPS acquisition for operation. Available in both Cellular and PCS frequencies.

KEY APPLICATIONS:

- Measures correlated signal strength (Ec/Io) of all 512 IS-95 base stations
- Verification of neighbor lists
- Optimization of Cell sites
- Verifies PN assignments
- Confirms handoff thresholds
- Analysis of coverage areas
- Measures pilot pollution

FEATURES:

- Scans all 512 base stations in less than one (1) second
- Measures CDMA correlated signal strength (Ec/Io) ±1.0 dB
- Derives Base Station ID and UTC from Sync Channel
- Demodulates Sync and Paging channels using BVS' proprietary LSI chips
- Decodes layer III messages from paging channel
- Built-in graphic LCD for display of vital parameters
- Complete data output via both USB and RS-232 ports to any laptop PC
- Includes 8-channel differential GPS receiver, however does not require GPS reception
- "Dead reckoning" navigational option available

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

wireless products
Berkeley Varitronics Systems

Raven™ CDMA PN SCANNER

SPECIFICATIONS

RAVEN™ RF PERFORMANCE:

FREQUENCY RANGE	PCS model Cellular model	1930-1990 MHz (Bands A-F) 869.04-893.97 MHz (A and B Bands)
IF BANDWIDTH	1.25 MHz	
MEASUREMENT ACCURACY	Ec/Io	± 1 dB @ 25 C° ± 2 dB (0 to 50 C°)
RECEIVER NOISE FIGURE	< 7.5 dB	
ANTENNA INPUT SENSITIVITY	> -117 dBm PCS Tracking > -120 dBm Cellular Tracking	
MINIMUM SIGNAL ACQUISITION	-110 dBm PCS Acquisition -115 dBm Cellular Acquisition	
MAXIMUM SAFE INPUT	+13 dBm	

CDMA PROCESSING:

PN GENERATOR SEQUENCES	IS-95 I and Q Pilot
MINIMUM Ec/Io	-20 dB
CORRELATION LENGTH	1024 chips (for both I and Q)
MINIMUM PILOT POWER DETECTABLE	-20 dB
BASE STATIONS SCAN RATE	< 1 sec.
DISPLAY UPDATE RATE	< 1 sec.
BASE STATION IDENTIFICATION	Direct IS-95 BS ID demodulation
TIMING ACCURACY	Absolute (derived from the sync signal)
TIMING JITTER	± 200 ns

GENERAL SPECIFICATIONS:

SOFTWARE	Raven Data Logger & CDMA Chameleon included
DATA RETENTION	PC laptop storage via USB and RS-232 ports
OPERATING TEMPERATURE RANGE	0 to 50 C°
STORAGE TEMPERATURE RANGE	-40 to 50 C°
DIMENSIONS	W=6.5” L=8.5” D=3.25”
WEIGHT	5 pounds
POWER	External 1A @ +12VDC
INTERNAL GPS (included)	Motorola 8-channel differential capable receiver

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