Condor

manual version 1.5

Contents

ABOUT YOUR CONDOR

The CONDOR™ is a portable, dual band PN scanner used to measure and record Ec/Io IS-95 coverage of CDMA base stations. Condor 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 Condor 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. Condor includes internal GPS receiver for LAT and LON recording, but does not require GPS acquisition for operation.

CONDOR SIDE PANEL

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

CONDOR TOP PANEL

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

POWER ON

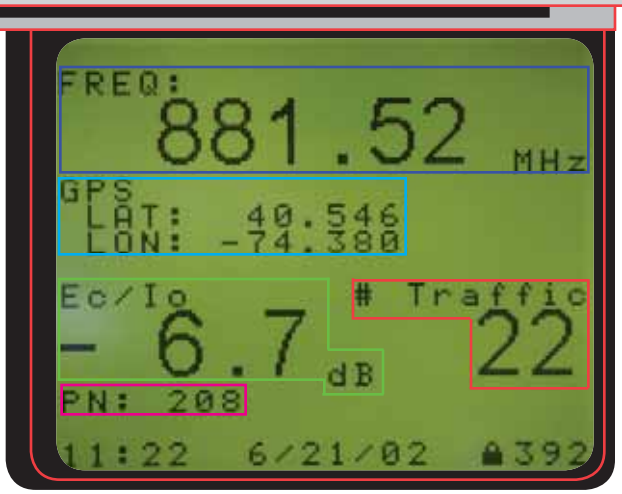
Upon powering up the CONDOR, the user will first see the startup screen displaying the Condor text logo. After a few seconds, this screen will disappear and the main Ec/Io display will appear.

MAIN DISPLAY

This is the Condor's main signal strength display screen.

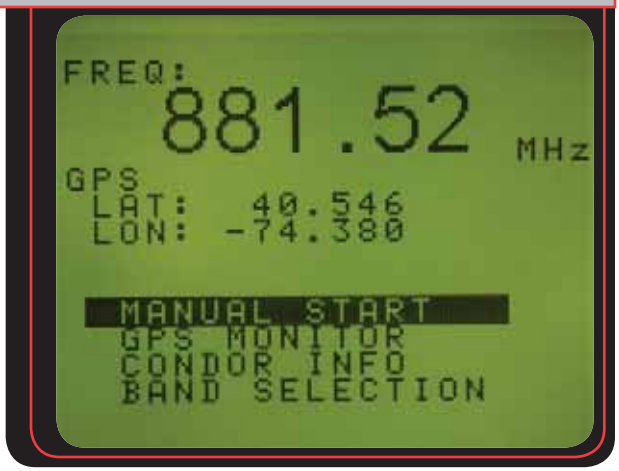
FREQ: current scanning frequency in Megahertz
GPS: current Latitude and Longitude coordinates of Condor
Ec/Io: true correlated signal strength in decibels
PN: actual PN of Ec/Io signal strength which is shown above
TRAFFIC: current number of traffic channels

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



MENU DISPLAY

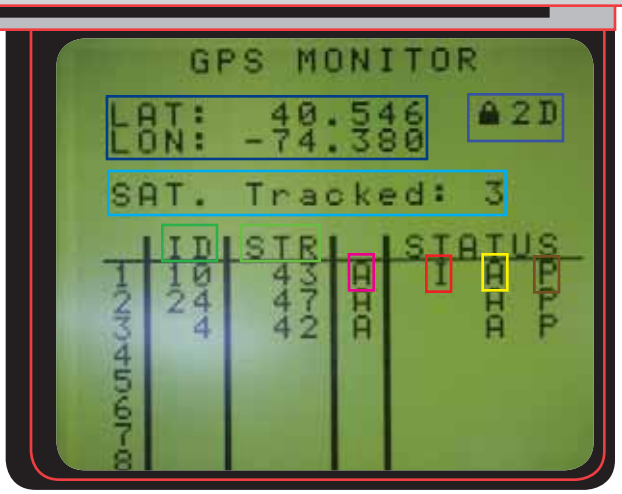
This is the Condor's simple menu interface screen on the unit's LCD display. For advanced user settings and parameters, the Condor scanner may be accessed and controlled through the USB or RS-232 ports via any laptop PC using the included software application. Turn the knob to highlight a selection. 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 Condor
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 Condor is operating under. This number only refers to the Condor hardware version. It does not reflect the Condor 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.

Condor Data Logger Adendum

Use Chameleon 3.90 or higher with Condor Data Logger 1.0 or higher.

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

The first way is by using Condor 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 Condor 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/Me/2000
Condor interface: 1 free serial port or USB port:

Introduction

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

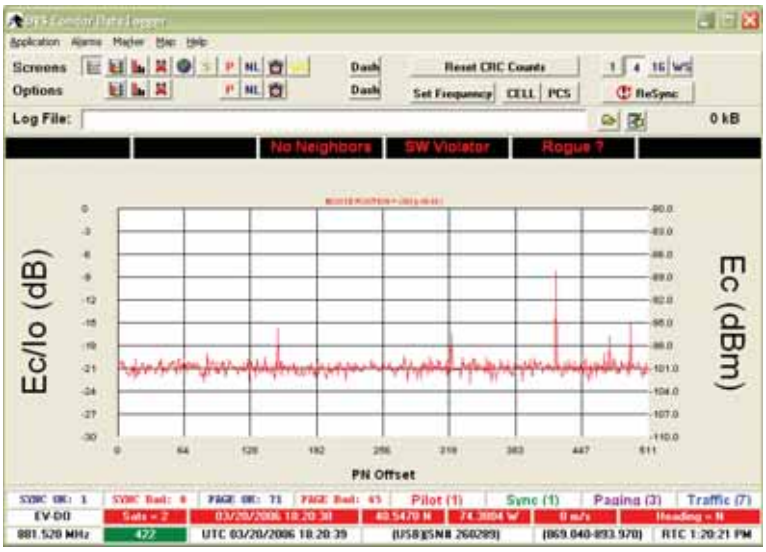


Figure 1 – Condor Main Screen

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 CDL 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 Condor DL box and follow the install prompts. When finished, repeat the procedure to install the USB Drivers and Condor WD from the BVS Application Installation sceen.

Application Overview

CDL 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 Condor 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 Condor. 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 Condor DL (CDL). 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.

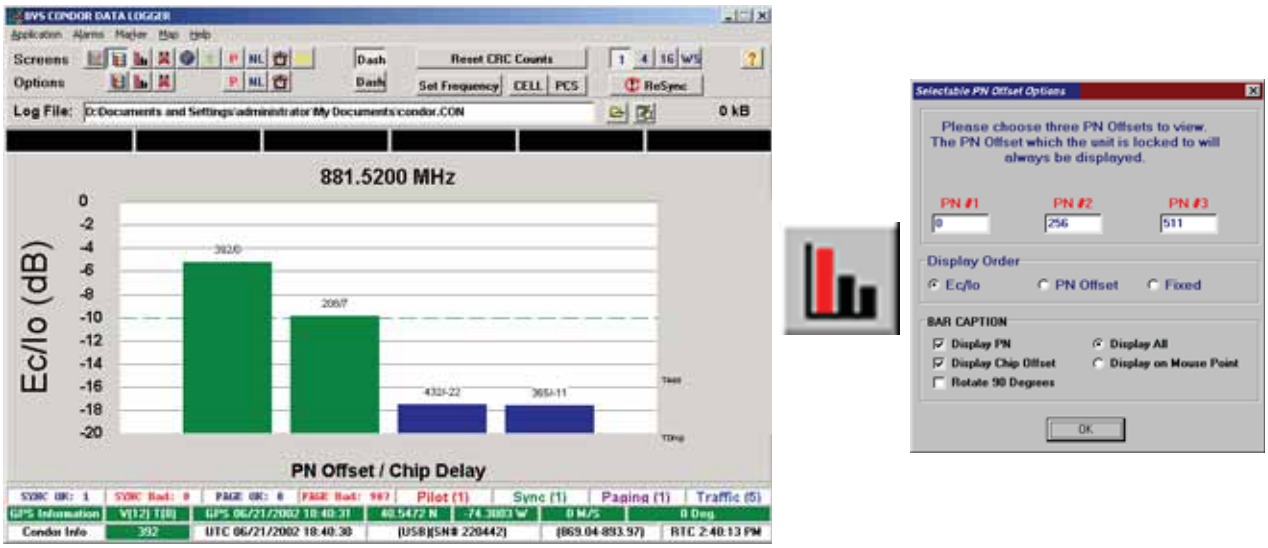


Figure 2 - Condor Top PN Offsets and Options Screen

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.

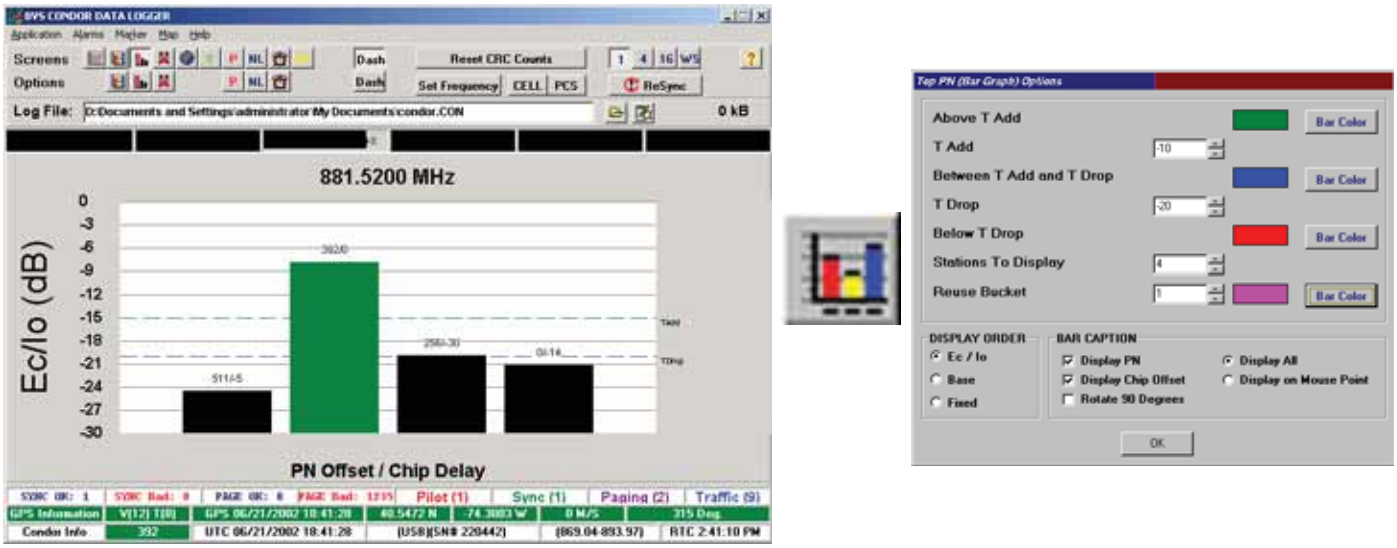


Figure 3 – Condor Bar Screens and Options Screen

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..

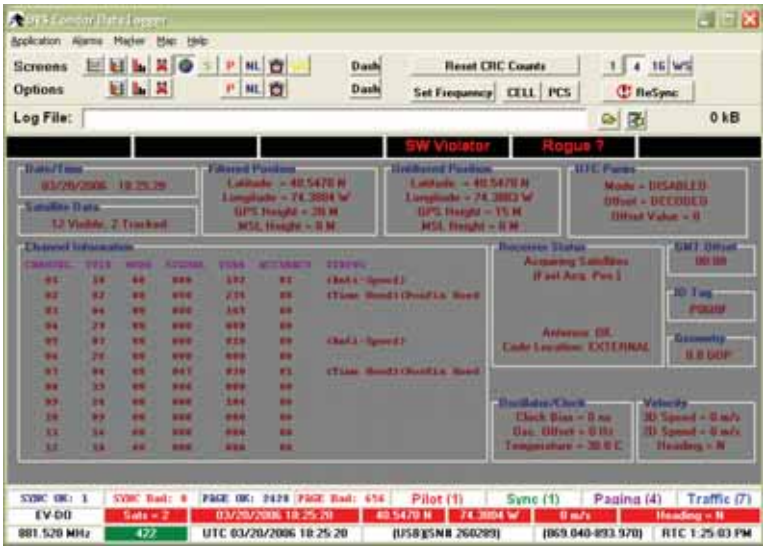


Figure 4 – Condor GPS Screen

SYNC CHANNEL DISPLAY

This screen is updated whenever the Condor 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..

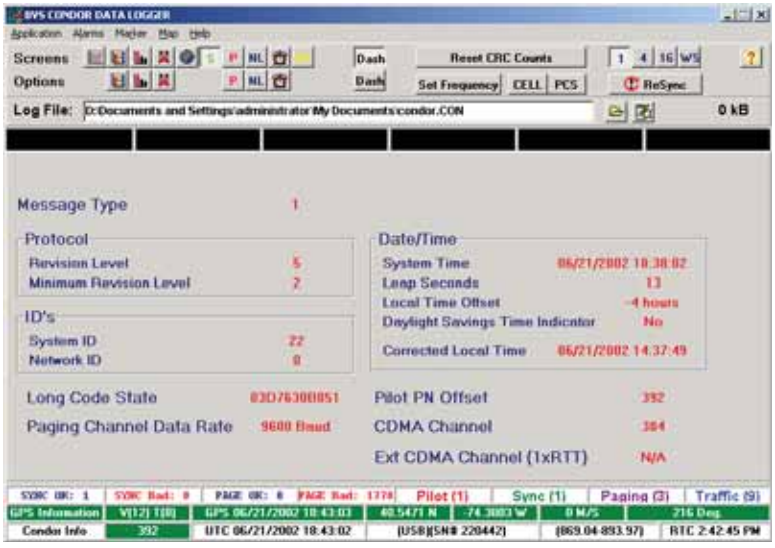


Figure 5 – Condor SYNC Screen

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.

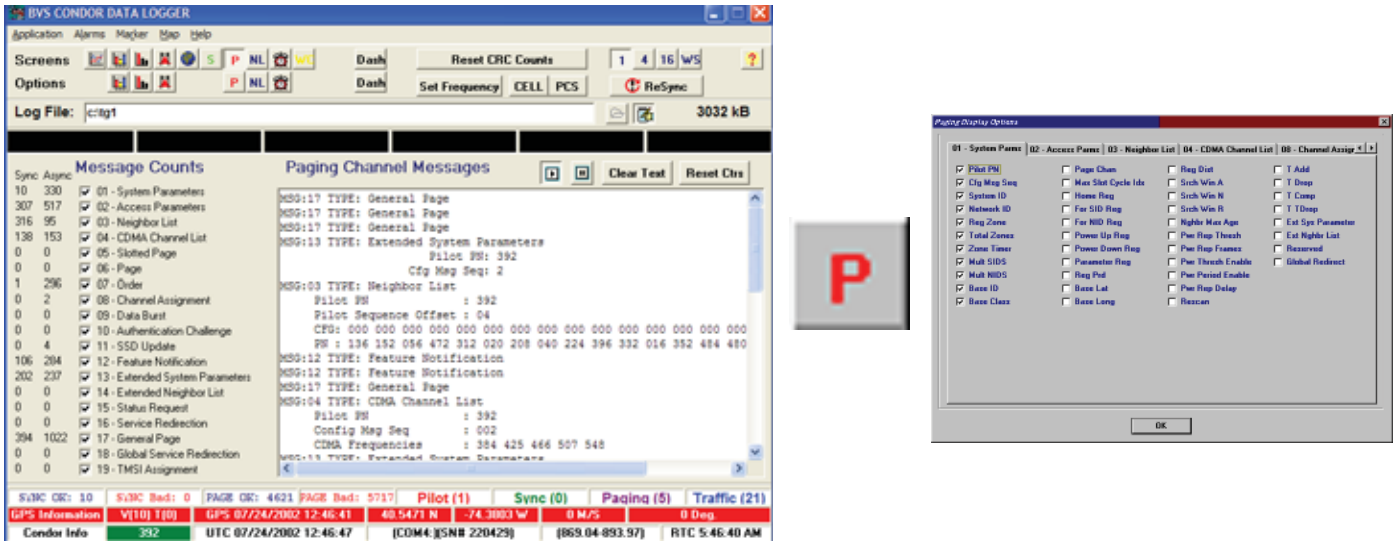


Figure 6 – Condor Paging Message Screen and Options Screen

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.

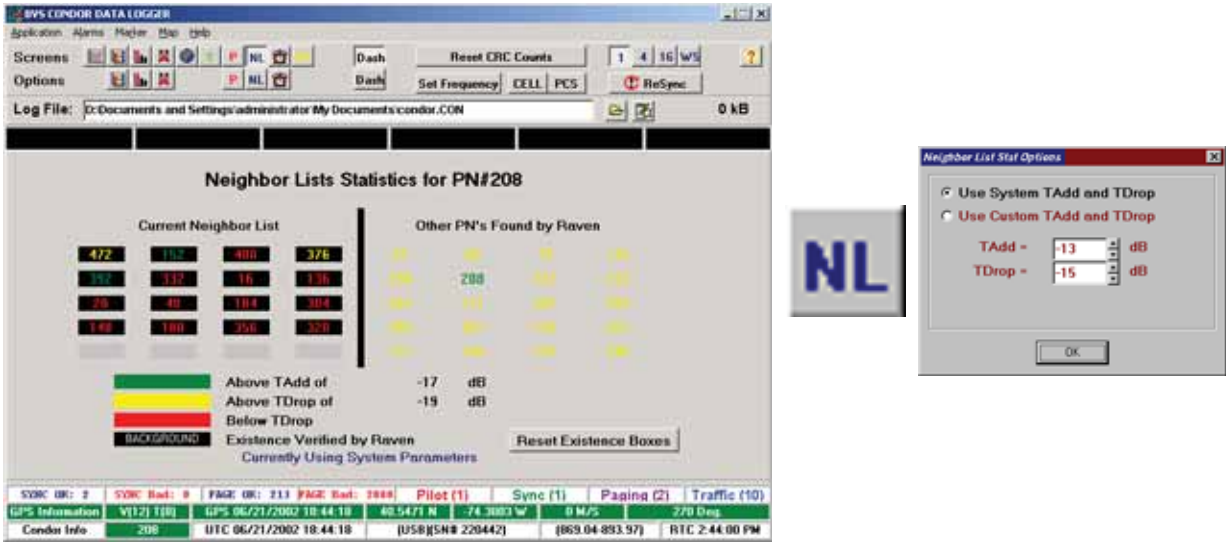


Figure 7 – Condor Neighbor List and Options Screen

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.

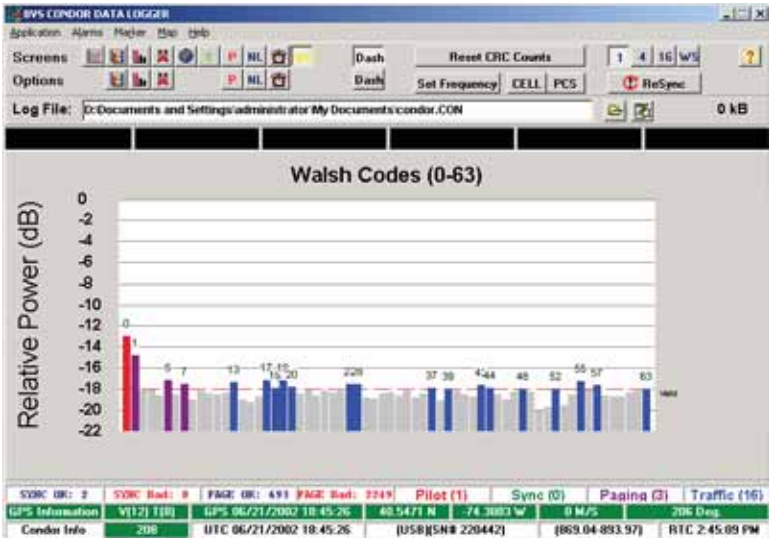


Figure 8 – Active Walsh Codes

This screen displays the color-coded power distribution of the 64 Wlash codes for the PN offset that Condor 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 Condor Data Logger.

Figure 9 – Alarms Menu and Options Screen

The alarm alerts the user if communication has been lost with the Condor.
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 CDL tries to retrieve Condor 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).

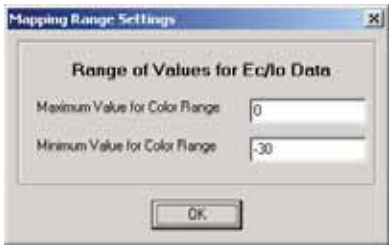


Figure 10 – Dolphin Mapping Options Screen

This option window allows the user to set values used in mapping software such as Berkeley's Dolphin Real-time Mapping software.

BVS Dolphin Real-Time Mapping Tool
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.

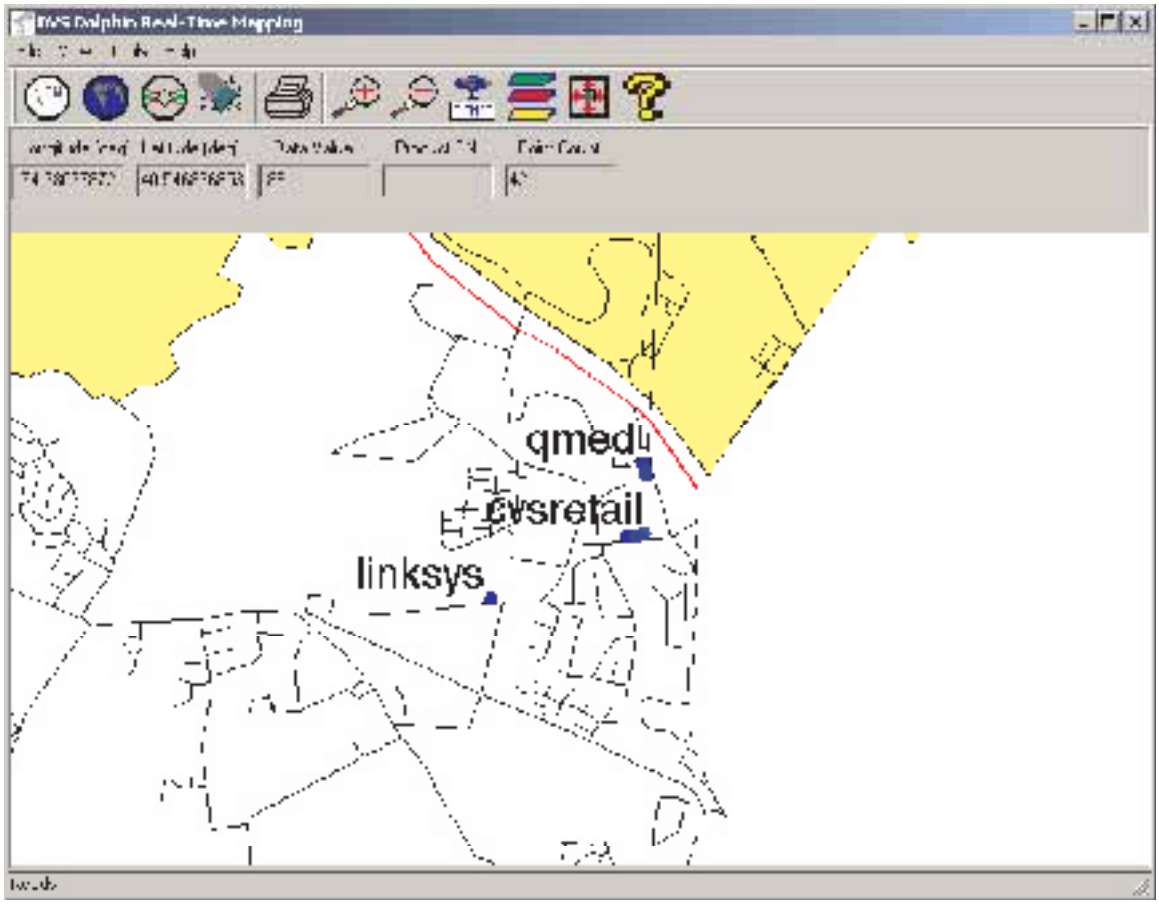


FIGURE 1 – BVS DOLPHIN

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.

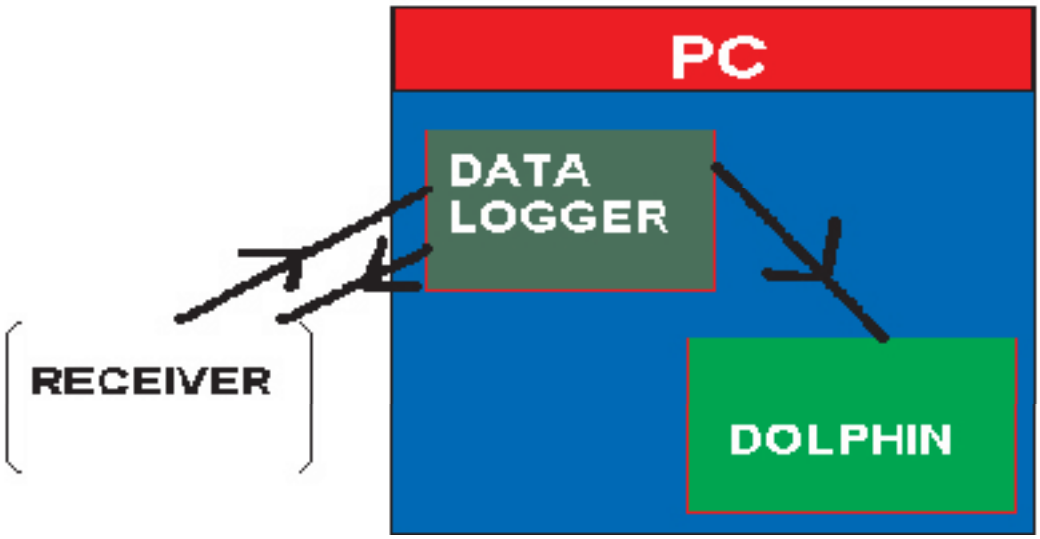


FIGURE 2 – DOLPHIN DATA FLOW

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

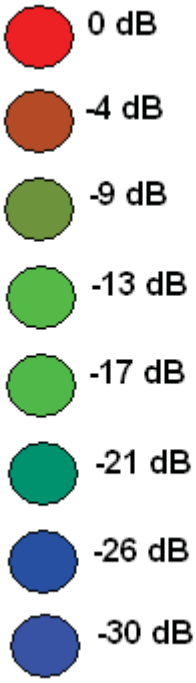
The layer dialog is used to add or remove layers from the geoset. Layers can include landmarks, streets, water, etc. Choose the layers for the appropriate driving area from the maps that were purchased for use with the Dolphin.

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 / Condor Signal Strength Legend



Introduction

The Chameleon CDMA application software is the universal data conversion and filtering tool for BVS CDMA receivers. 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.

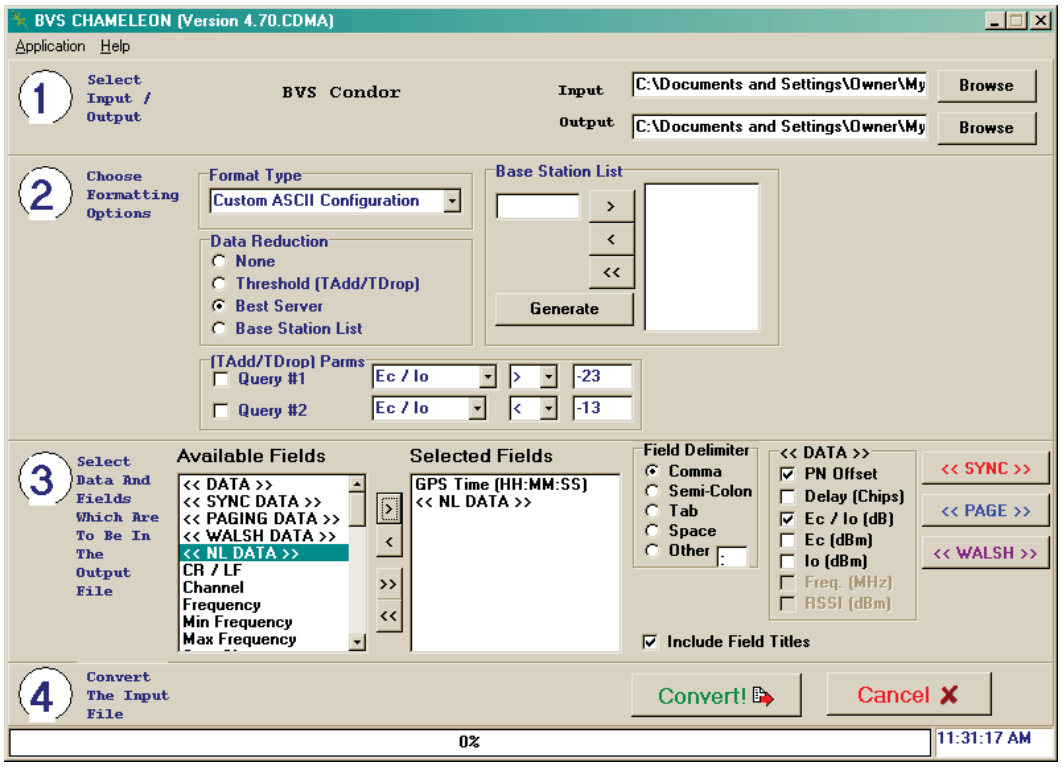


FIGURE 1 – Chameleon CDMA Main Screen

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.

Data Conversion

There are four steps involved in converting BVS proprietary binary data into readable ASCII or other formats. These are detailed in the following paragraphs.

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 section contains various formatting and data reduction options.

Format Type

Choose the output format. It may be ASCII delimited or any of a number of post-processing package output formats (such as MapInfo).

Data Reduction

This section contains various filters that can be used to reduce the amount of information being converted into the output file.

Choose the Data Reduction Type. If "NONE" is selected, all of the data will be converted. If "BEST SERVER" is chosen, only data from the strongest PN will be converted.
If the "Threshold (Tadd/Tdrop)" option is chosen, settings in the Tadd/Tdrop group box will be used. Here data will be converted based on the range of certain values such as Ec/Io. Two different data requirements can be set for this option.

If the "Base Station List" option is chosen, only PN's from the base station group box will be converted.

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 "<< DATA >>" group box, 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.

<< DATA >>

Each of the fields selected in the <<DATA>> group box will be displayed per row when <<DATA>> is selected from the available fields.

<< SYNC DATA >>

When <<SYNC DATA>> is selected, sync channel fields will be displayed per row. The fields that are displayed are chosen by pressing the <<SYNC>> button to reveal selectable fields.

<< PAGE DATA>>

When <<PAGE DATA>> is selected, paging channel fields will be displayed per row. The fields that are

displayed are chosen by pressing the <<PAGE>> button to reveal selectable fields.

<< WALSH DATA >>
When <<WALSH DATA>> is selected, certain Walsh code fields will be displayed per row. The fields that are displayed are chosen by pressing the <<WALSH>> button to reveal selectable fields.

<< NL DATA>>

Selecting this field will provide a cross section of current PN versus PN Ec/Io readings in its neighbor list. There will be a column for every PN included in any neighbor list message while logging data.

However, Ec/Io's will be shown per row based on the current PN. Whatever the current PN is, Ec/Io will be shown for each PN in its neighbor list.

For example, PN's 1,2, and 3 are in PN 422's list. 4,5, and 6 are in the neighbor list for PN 384. You might see:

Current PN	1	2	3	4	5	6
422	-12	-15	-18			
422	-11	-15	-17			
384				-18	-14	-9
384				-18	-14	-10

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

Condor Dead Reckoning Optional Software

The Condor Dead Reckoning (DR) version allows you to choose which navigation data to use. The navigation data can come either from the internal GPS on the Condor or from an external Blaupunkt TravelPilot. The DX-V or EX-V versions are supported.

IMPORTANT!!! ALWAYS TURN THE Condor'S GPS POWER OFF WHEN USING THE TRAVELPILOT!

The TravelPilot will feed data into the Condor DR via an additional serial port (RS-232).
The opening screen (Figure 1) will let you choose between the internal GPS and a port for the TravelPilot.

If choosing the TravelPilot, The Condor DR will continuously ask the TravelPilot for its version information. Once that is received, it will continuously ask for updated latitude and longitude information.

When logging a file, the TravelPilot position information will be coupled with current date and time from the computer running the Condor DR software.

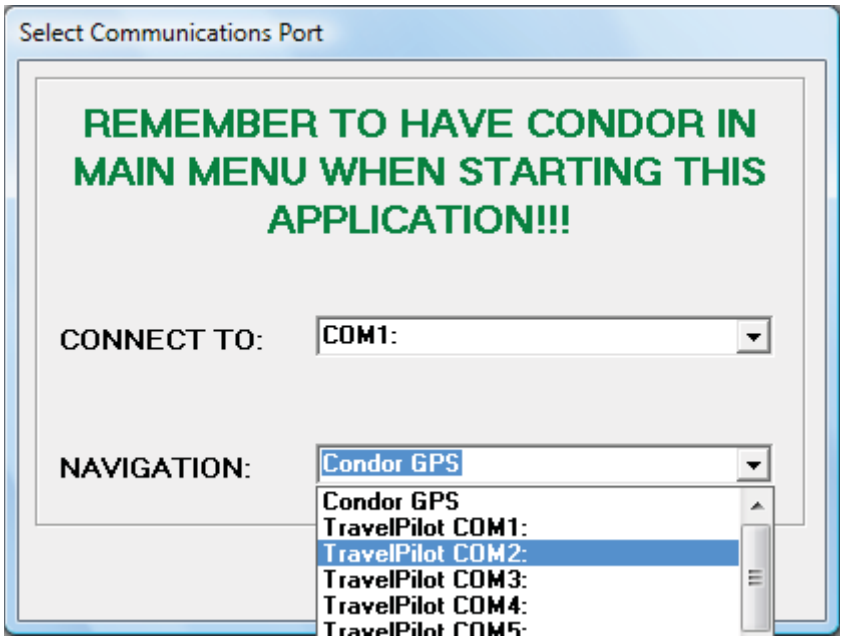


Figure 1 – Condor Port Selection Screen

The information from the TravelPilot will continuously be displayed in the lower right-hand portion of the main screen. The TravelPilot data will be successfully received if the version information is there and the update count continues to increase.

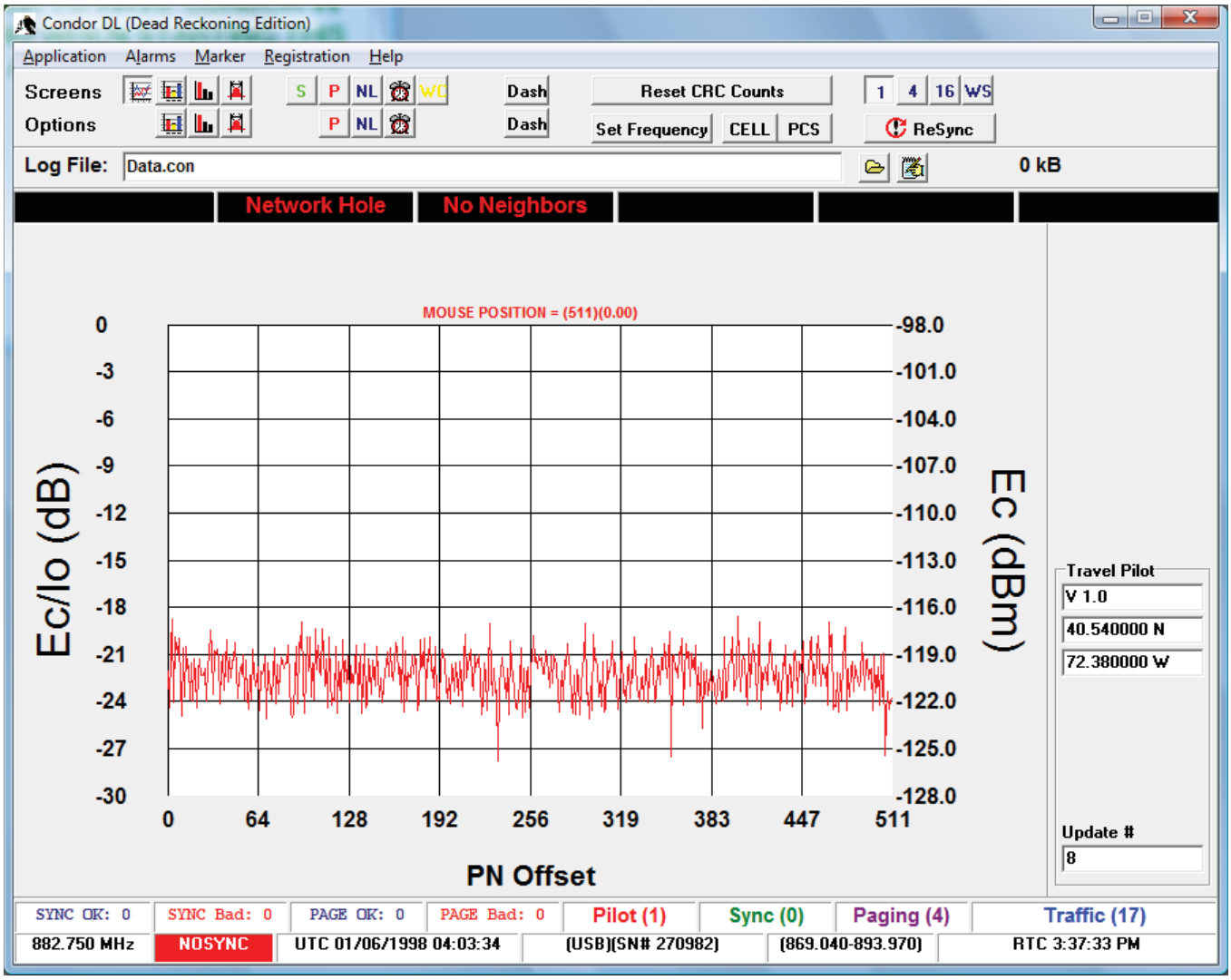


Figure 2 – CondorDR Main Screen

The logged data can be used as GPS data in Chameleon, Sieve, and/or Forecaster for post-processing.

There are 4 extra fields to choose from for a Condor log file with dead reckoning. They will be on the bottom of the list and include:

TP_Latitude – TravelPilot Latitude in decimal degrees
TP_Longitude – TravelPilot Longitude in decimal degrees
TP_Date – MM/DD/YY from the computer on which the Condor DR is running.
TP_Time – HH:MM:SS from the computer on which the Condor DR is running.

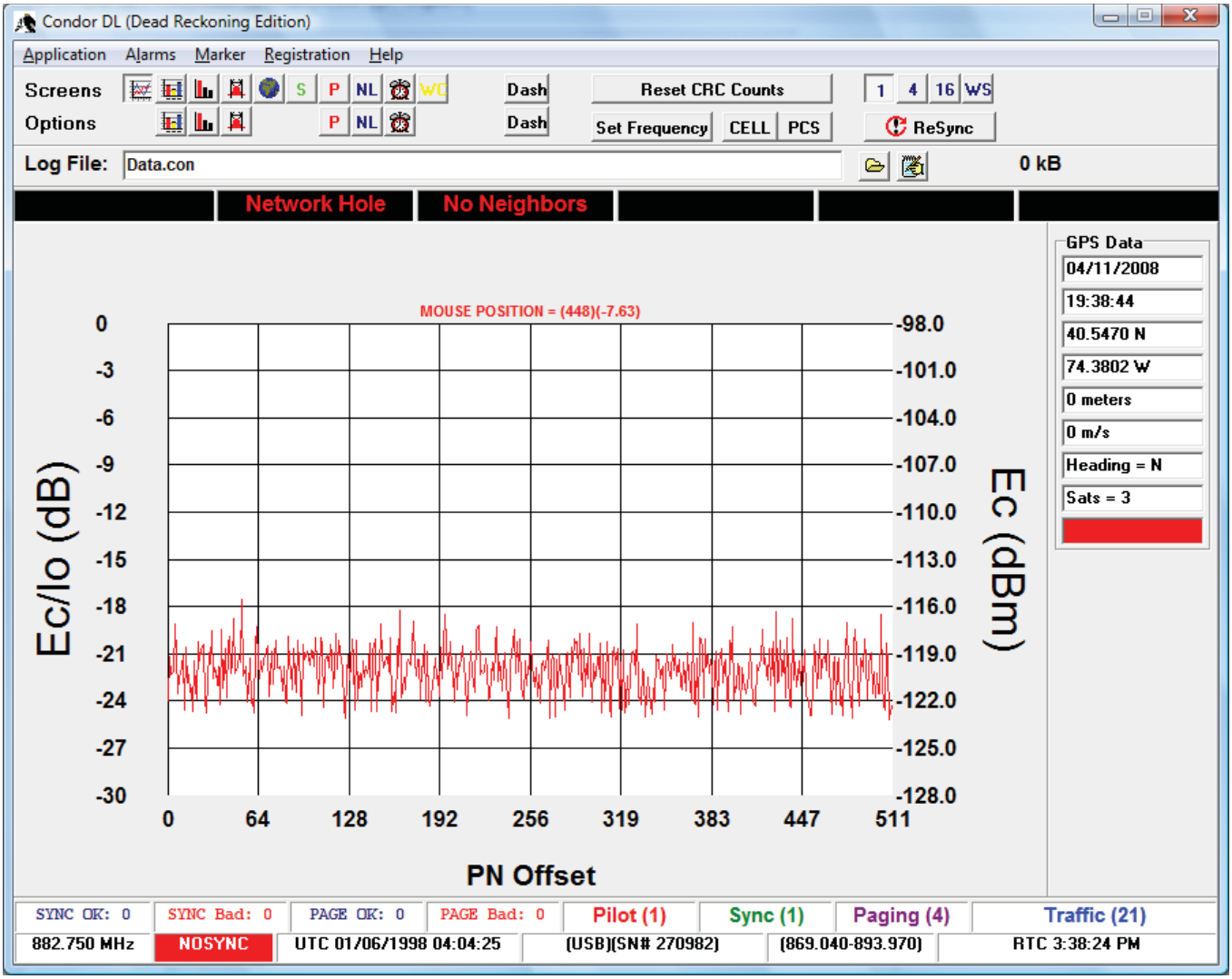


Figure 3 – TravelPilot GPS Data

This screen displys all received GPS data from the TravelPilot.

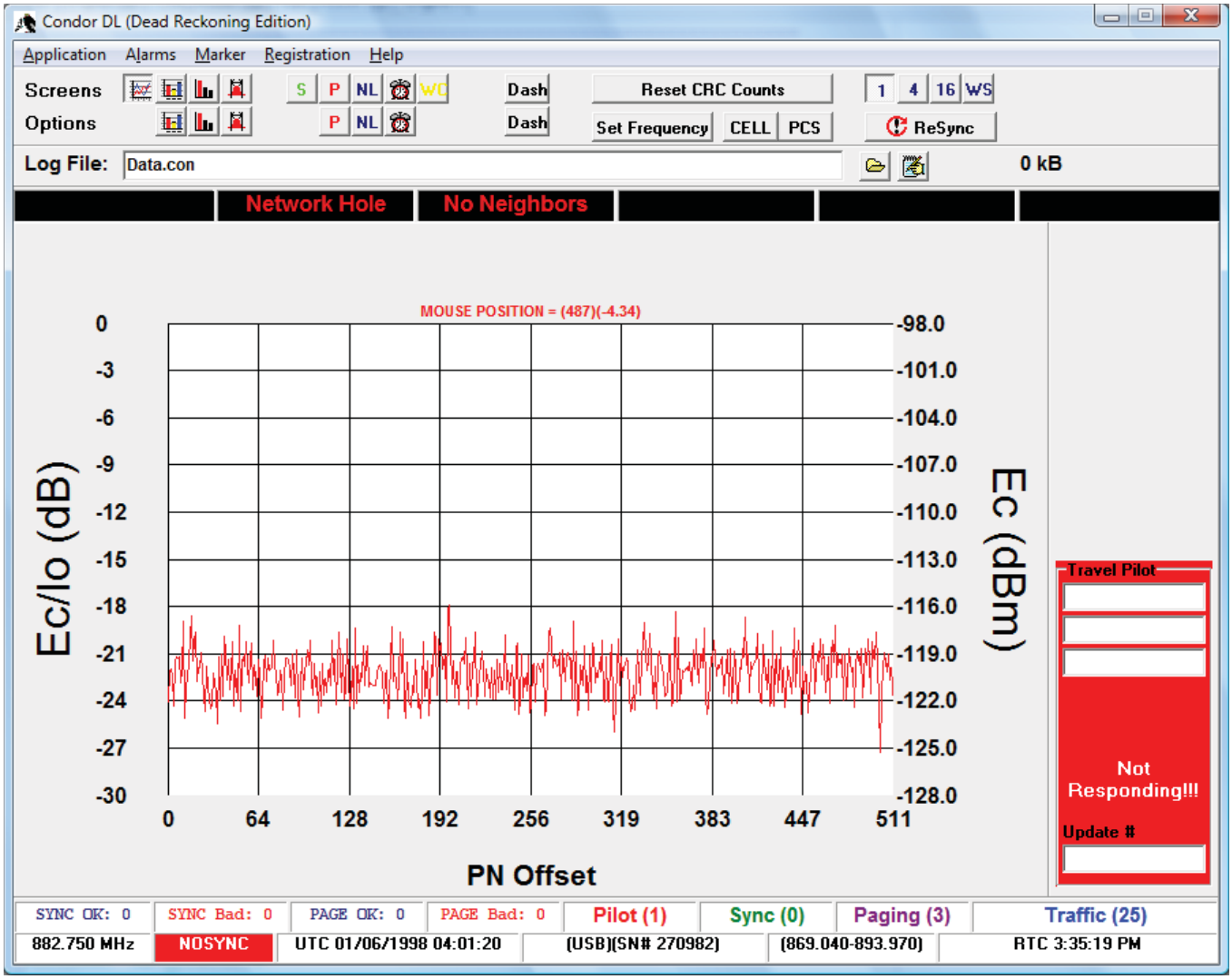


Figure 5 – TravelPilot Data Not Being Received

This shows TravelPilot has been selected. The GPS data fields will not display on the main screen. This picture shows TravelPilot data not being received.

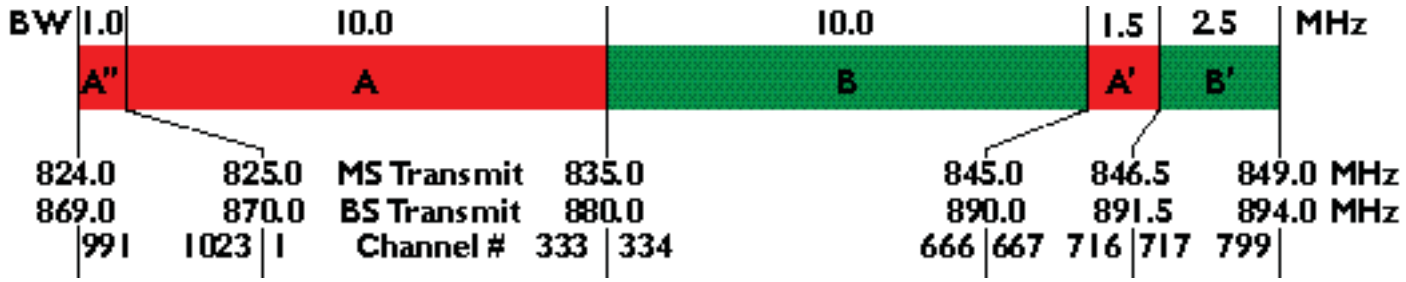
Glossary of Acronyms

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

Frequency Plans

Cellular (IS-95A)

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

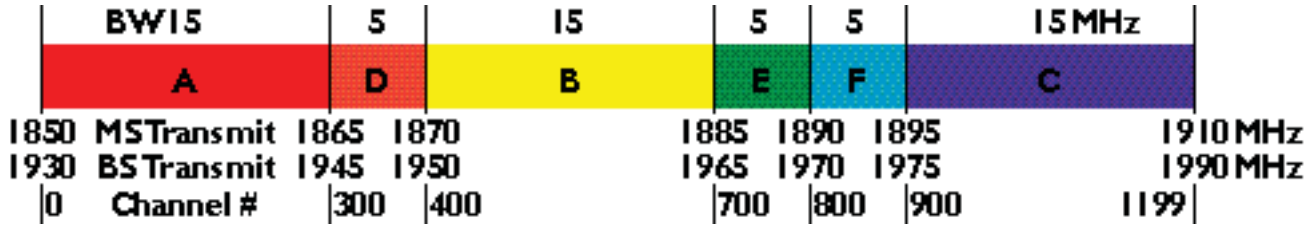


Consecutive AMPS channels are spaced by 30 kHz. CDMA stations are permitted to operate on any AMPS channel, except for guard bands at the edges of the allocations. CDMA stations, of course, would normally be assigned channel at least 1.25 MHz apart (about 42 channels). The mobile station transmit frequency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



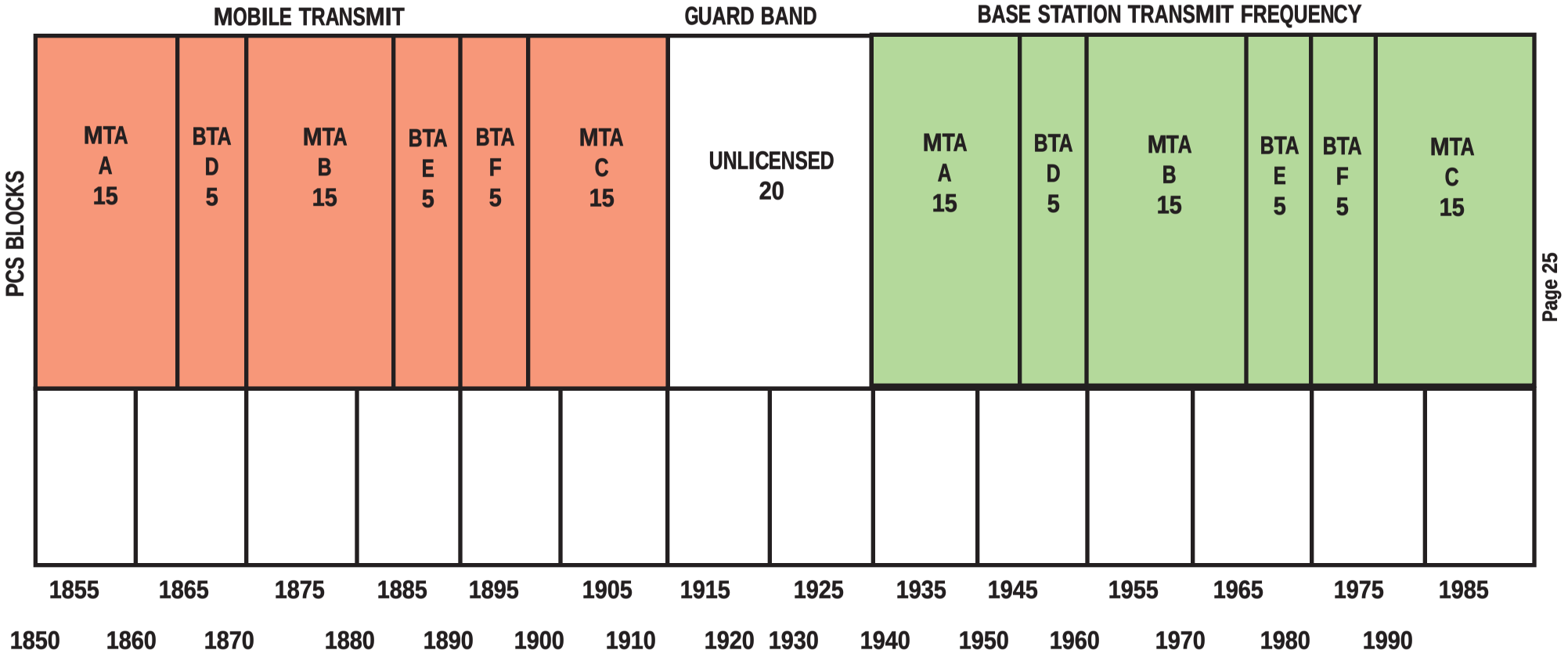
Consecutive frequency assignments are spaced by 50 kHz. Assignments near band edges are conditional, depending on whether the neighboring bands are held by the same operator. Operation near the edges of the service is forbidden in 1.2 MHz guard bands.

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:

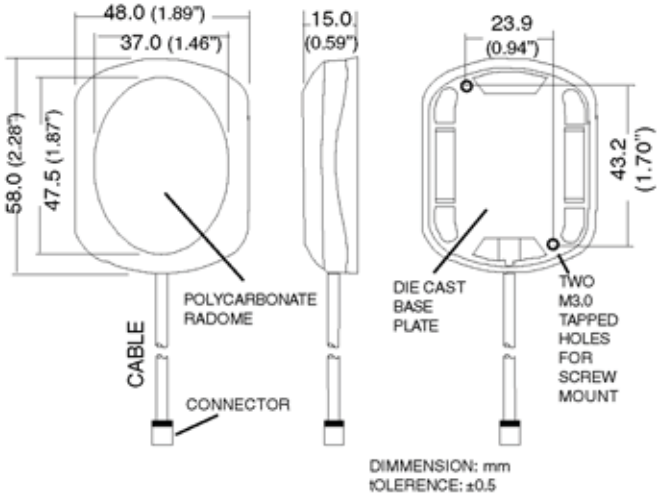
PHYSICAL	
Construction:	Dark gray Polycarbonate-radome at top, die-cast shell at bottom/ rubber gasket for water seal in between
Dimension:	58mm (L) x 48mm (W) x 14mm (H)
Weight:	65 grams (excluding cable & connector)
Standard Mounting:	Magnet mount with two magnets
ANTENNA ELEMENT	
Center Frequency:	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

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 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.