

Coyote

manual version 2.3





Contents

ABOUT YOUR COYOTE.....	2
COYOTE SIDE PANEL.....	2
COYOTE TOP PANEL.....	2
POWER ON.....	2
MEASURING SIGNAL STRENGTH.....	3
MENU DISPLAY.....	3
INFORMATION SCREEN.....	3
GENERAL OPTIONS.....	4
SET TIME (RTC).....	4
CARD OPTIONS.....	4
FORMAT CARD.....	5
SINGLE CHANNEL.....	5
CHANGE MEASUREMENT FREQUENCY.....	6
GRAPHIC DISPLAY SCREEN.....	6
NUMERIC DISPLAY SCREEN.....	6
FILTER SELECTION SCREEN.....	7
RATE SELECTION SCREEN.....	7
ACQUIRING GPS.....	8
GPS LOCKED.....	8
GPS OFF.....	8
SCAN OPTIONS.....	9
CHANNEL SCAN LIST.....	9
LIST SCAN.....	9
COYOTE MECHANICAL DRAWING.....	10
COYOTE ACCESSORIES.....	11
Coyote Data Logger Software	
Introduction.....	12
Installation.....	12
Application Overview.....	12
Quick Start.....	12
Speed Button Panel.....	13
RTC/GPS Status Bar.....	13
Receiver Status Bar.....	14
Bottom Status Bar.....	14
Logging Warning.....	14
Coyote Channel Table Utility.....	15
BVS Chameleon CW User Manual.....	18
Coyote Dead Reckoning Optional Software.....	21
Optional Omni-Directional Antennae.....	26
Glossary of Acronyms.....	26
Coyote Battery Specifications.....	28
Battery/Power Safety Instructions	

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The Coyote™ is a high performance, modular receiver system providing precision, two-channel signal strength measurements using two independent receivers. It is internally powered (or may be externally) and logs measurements and displays graphically a wide assortment of built-in realtime macro measurements.

COYOTE OPERATION

- LCD SCREEN**- displays realtime data
- POWER SWITCH**- turns On/OFF Coyote
- LOW BATTERY LED**- indicates when to recharge unit
- GPS ON/OFF SWITCH**- disables GPS for indoor use
- DIRECTION ARROWS**- navigates through menus
- NUMERIC KEYPAD**- allows for direct frequency & data entry

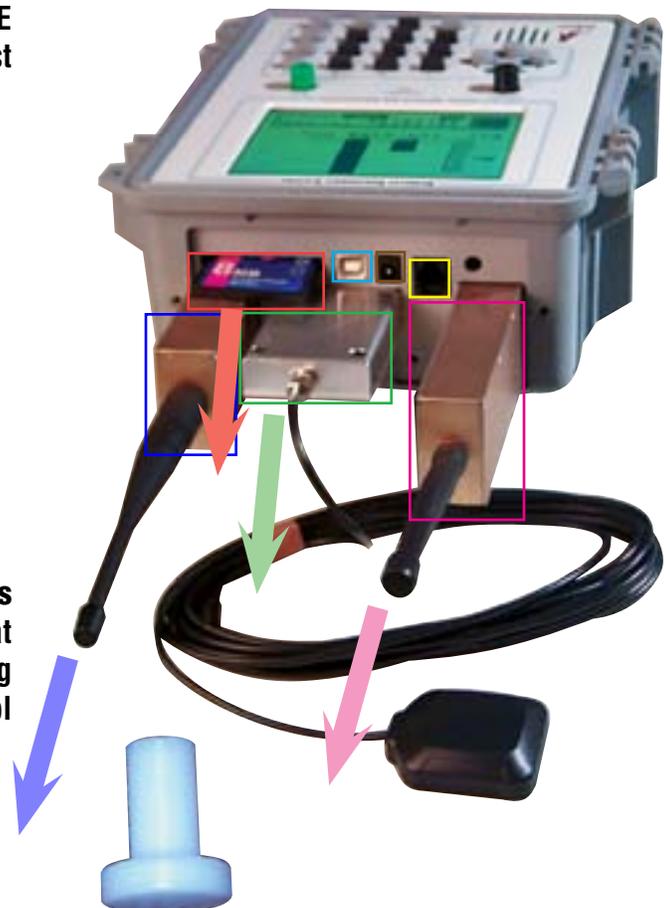
Operation of the Coyote is simple. Use the push button arrows to navigate through the menus. Coyote is designed to be used with or without a PC laptop in the field. A USB connection allows for realtime data analysis and recording from the Coyote to any USB equipped PC. Because data can be stored internally, removed and then inserted into any standard compact flash PCMCIA adaptor, COYOTE allows for flexibility in walk-about, drive studies and post processing sessions.



COYOTE BACK PANEL

- RECEIVER 1 MODULE HOST (REMOVABLE)**
- RECEIVER 2 MODULE HOST (REMOVABLE)**
- GPS RECEIVER MODULE HOST (REMOVABLE)**
- COMPACT FLASH CARD SLOT (REMOVABLE)**
- USB PORT (TYPE B)**
- POWER INPUT (12V)**
- RS-232 SERIAL PORT (RJ-11CONNECTOR)**

From this side, the user has access to all of Coyote's modular features (except for Li-Ion battery located at opposite end of Coyote). Any Coyote receivers (including GPS) may be installed or removed using the included tool shown here.





MEASURING SIGNAL STRENGTH

This is the **Coyote's** main (text) signal strength display screen.

FREQUENCY: current scanning frequency in Megahertz

STRENGTH: current received signal strength in deciBels

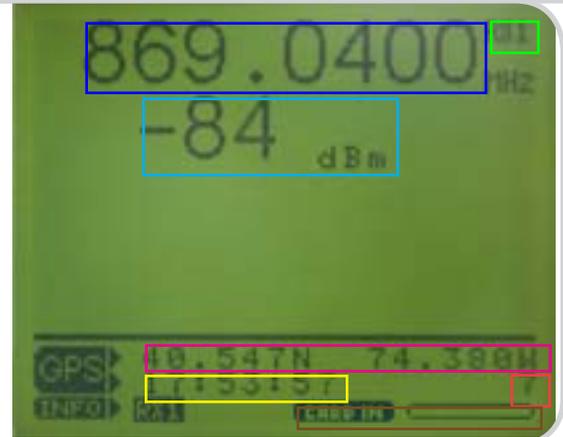
RX1: installed receiver module shown

GPS: GPS LAT and LON information

SATELLITES: number of satellites locked to GPS receiver

TIME: GPS realtime

CARD IN: indicates that compact flash card is inserted and logging storage (bar fills in from left to right as logging continues)



MENU DISPLAY

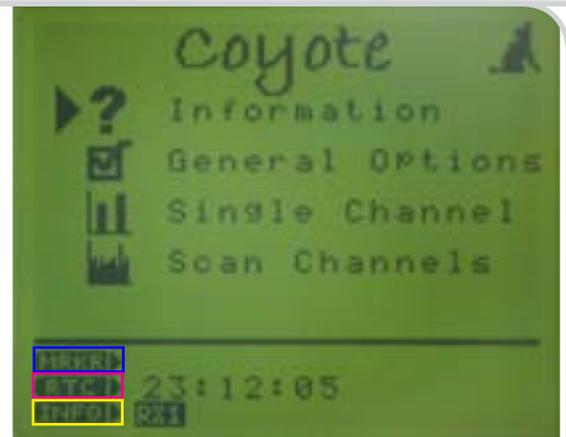
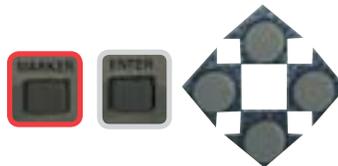
This is the **Coyote's** simple menu interface screen on the unit's LCD display. Use the ARROWS and ENTER keys on this screen to access general parameters on your **Coyote** unit. Press the MAIN key while in any screen to return to this screen.

MRKR: Current marker number indicator

*Note: The marker number is incremented by pressing the **MARKER** button on the Coyote's keypad and only works when the RealTime Clock mode is active. Marker will not work under GPS mode.*

RTC: RealTime Clock

INFO: Indicates installed receiver



INFORMATION SCREEN

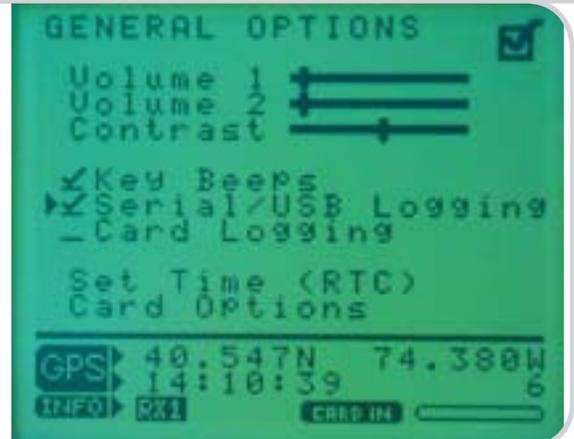
This screen provides information on **Coyote's** installed receivers, step size, bandwidth, firmware and all currently locked GPS data. Use the ESC key to exit this screen.





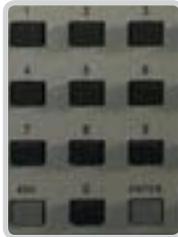
GENERAL OPTIONS

This screen allows the user to adjust various display and audio settings. The user may also access time, date and compact flash card settings in this menu. Use the ARROW keys to scroll up and down. Press ENTER to check off the desired selection.



SET TIME (RTC)

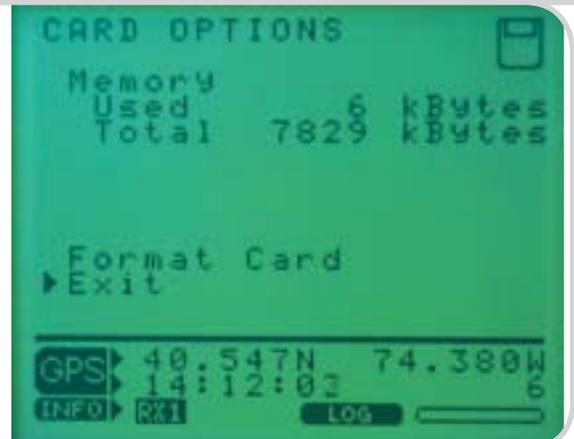
This screen allows the user to edit and modify time and date settings manually. The user also has the option to set the time using GPS satellite reference. Use the ARROW keys to scroll up and down through settings.



CARD OPTIONS

This screen allows the user to view the amount of data stored on the compact flash card. From here, the user can format the card for use in the Coyote.

NOTE: USER MUST EXIT THIS SCREEN AND ENTER MAIN MENU SCREEN BEFORE EJECTING CF CARD.

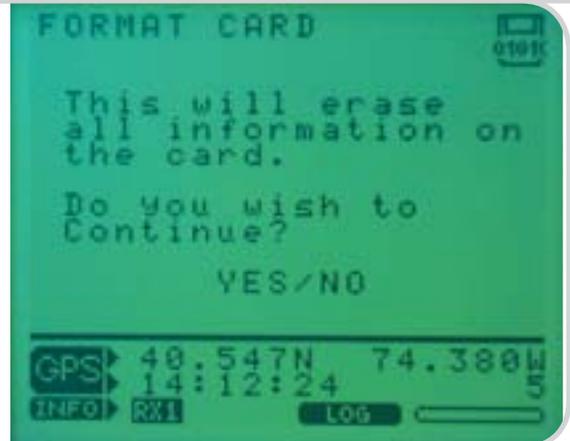




FORMAT CARD (YES OR NO)

This screen prompts the user to choose YES or NO for formatting and erasing all data on the compact flash card. Pushing the YES key on the keypad will format the card and take the user to the next screen.

NOTE: USER MUST EXIT THIS SCREEN AND ENTER MAIN MENU SCREEN BEFORE EJECTING CF CARD.



SINGLE CHANNEL SCREEN

This screen allows the user to edit and modify various frequency settings, displays and measurement filters. Use the numeric keypad to enter a frequency for measurement. Use the ARROW keys to scroll up and down through settings. Press ENTER to make a selection.





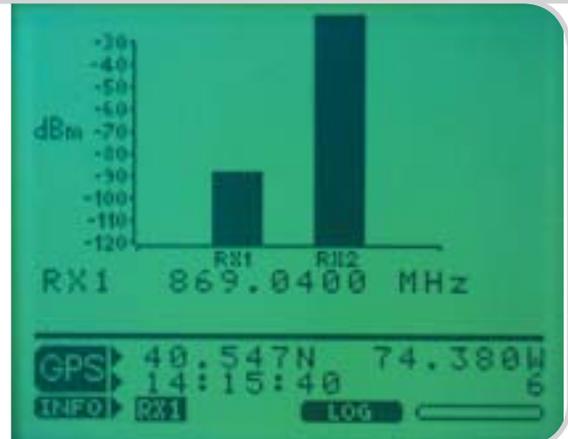
CHANGE MEASUREMENT FREQUENCY

While in the General Options screen, use the ARROW keys and numeric keypad to enter in any desired frequency for measurement. Scroll down to the Measure option at any time to view the signal strength in either graphic or numeric form.



GRAPHIC DISPLAY SCREEN

Select Graphic in the General Options screen to view signal strength in an X-Y bar graph form. Both receivers may be viewed simultaneously. Press the ESC key to return to the General Options screen.



NUMERIC DISPLAY SCREEN

Select Numeric in the General Options screen to view signal strength in a numerical text form. Both receivers may be viewed simultaneously (only one receiver is installed here). Press the ESC key to return to the General Options screen.





FILTER SELECTION SCREEN

Select Filter in the General Options screen to list the available filtering rates. Then use the ARROW keys to select the number of samples you wish to filter and record per second. Press the ESC key to return to the General Options screen.



Coyote Filtering

Chameleon CW averages 16 samples to produce one sample in the output file. This is selectable in all versions greater than 1.10. You can set the report rate to 16 times the value that you need on the Coyote for earlier versions of Chameleon CW.

The filters in Coyote are low pass digital filters and are conceptually the same as exponential filtering. This means that both filters essentially average the data in a moving time window. On Coyote, you set the time window with the "Filter" setting in the single measurement options. Note that regardless of the time constant of the filter, there is still the same number of samples per second out of the filter as there was going into the filter. The "Rate" selection in the Coyote allows you to reduce the number of reported samples after the filter.

What is confusing about this is that these two processes are often combined in other products. In this case, N samples are taken, averaged and a single data point is produced. This is equivalent to filtering with a window of length N followed by a rate reduction of 1/N. This combination provides less flexibility, but it is certainly easier to make. If you wish to do this type of filtering on the Coyote, set the filter time constant and the sampling period the same, i.e. 1 second filter and 1 report per second or 1/2 second filter and 2 reports per second.



RATE SELECTION SCREEN

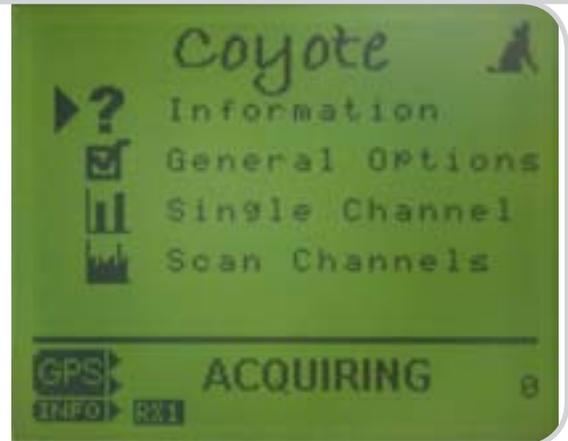
Select Rate in the General Options screen to list the available sampling rates. Then use the ARROW keys to select the number of samples you wish to measure and record per second. Press the ESC key to return to the General Options screen.





ACQUIRING GPS

Here, the **Coyote's** GPS receiver is currently locating the necessary satellites to obtain a reliable GPS lock. The number at the bottom right of the screen indicates the number of satellites located. Remember to keep the GPS antenna clear of obstructions. For best results, place it in an open area outside-clear of all buildings.



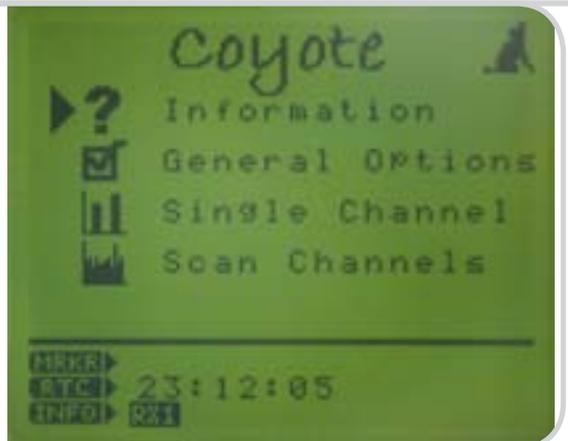
GPS LOCKED

When the GPS receiver attains a lock status, GPS latitude, longitude and time will appear with the number of satellites received.



GPS OFF

You may push the MAIN key in any screen to return to this Main screen. Notice there is no GPS information at the bottom of the screen. This is because the GPS switch is toggled off. Press down on the switch once to turn it on.





SCAN OPTIONS

While in the Main screen, select Scan Channels to access the channel scan lists for both receivers. Use the ARROW keys to select between receiver 1 and receiver 2 lists. Press ENTER to choose receivers or start scanning



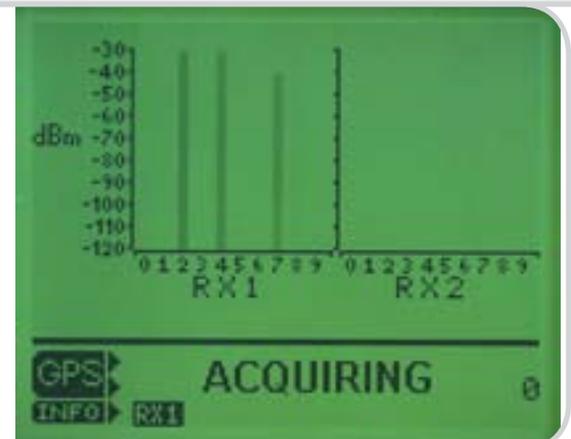
CHANNEL SCAN LIST

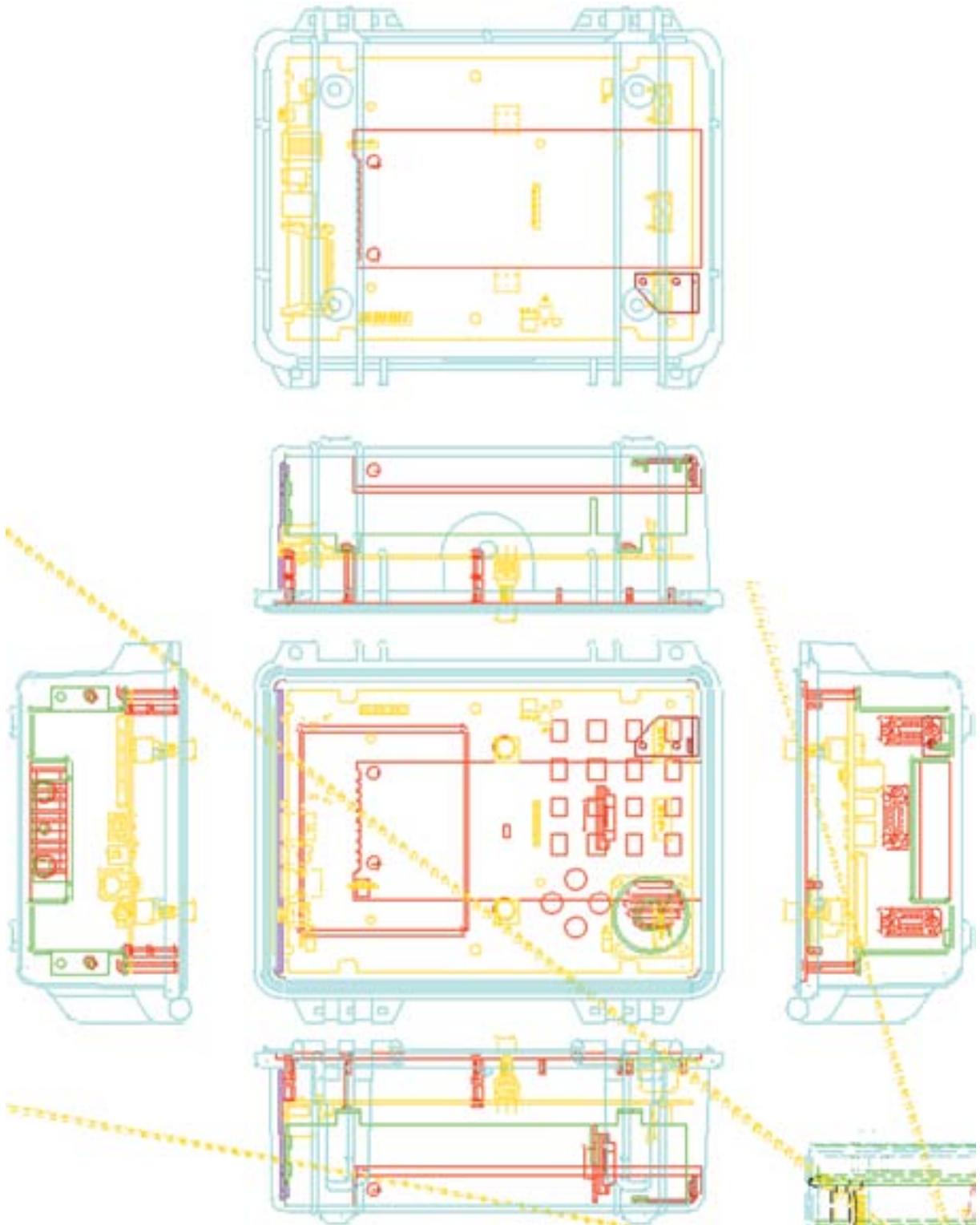
In this screen, the user may enter and up to 10 frequencies and their corresponding channels per receiver. These frequencies may all be simultaneously scanned by the Coyote during scanning.



LIST SCAN

In this screen, Coyote scans all frequencies set for all installed receivers in the scan list menu. Press the ESC key to return to the Scan Options or the MAIN key for the Main screen.





COYOTE MECHANICAL DRAWING

Accessories for your

Coyote



**GPS Module
12-Channel GPS Receiver
P/N GPS-M12
\$ 500.00**



**GPS Antenna
GPS magmount active antenna with
SMA male connector
P/N GPS-SMA
\$ 45.00**



**Antenna
SMA connector
P/N SMA-000
\$ 25.00**



**RS-232 Serial Cable
DB-9 Female to RJ-11
P/N 00002AB
\$ 25.00**



**Receiver Module
User specified frequency
P/N RX-0059
\$ 1,000.00**



**Coyote Power
Supply
12V
P/N DAU-000
\$ 25.00**



**Li-Ion Battery
10.8V @ 3600 mAh
P/N L17670-9TSP
\$ 225.00**



**Compact Flash Card
8 Megabytes
P/N 8MBATAF-C
\$ 140.00**



**Li-Ion Battery Charger
P/N C401
\$ 105.00**



**PowerCable
Cigarette Lighter Adaptor
P/N CLA-000
\$ 50.00**



**USB Cable
A to B connector
P/N USB-000
\$ 30.00**



**Dual Li-Ion Battery Charger
P/N C404
\$ 140.00**



**Coyote Calibration
Same day factory calibration
P/N 0059
\$ 175.00**

BVS Coyote Data Logger Software Operations Manual

System Requirements

Pentium II

1 GHz

128MB RAM

100MB free on Hard Drive

Operating System: Windows 2000 or XP

Coyote interface: RS-232 or USB

Introduction

The Coyote Data Logger (CDL) is the PC interface to the Coyote. This application collects data from the Coyote and displays the data. The CDL also logs the data to binary files. The binary data files, that are created, may then be used as input into BVS's Chameleon application. This application formats and filters these data so that they may be used with a variety of popular post-processing packages such as MapInfo.

Installation

The installation of CDL can be completed in a few minutes. Place the CD which came with your product in an available drive. If the BVS main screen does not come up in 30 or so, run AUTORUN.EXE from the root of the CD. Press the button for the Data Logger. You will be taken through a series of simple installation options. Select the options you wish to choose. After the installation process has been completed, an icon will be created in the folder that has been specified. This icon will launch the CDL application. (NOTE: The default directory is \BVS\COYOTE)

Application Overview

The main screen is shown in Figure 1. The CDL was designed to allow users to display and log scan data with relative ease. The controls are located in the speed button panel located just under the main menu. Two status bars are provided on the sides of the main screen to provide important GPS and Coyote status information.

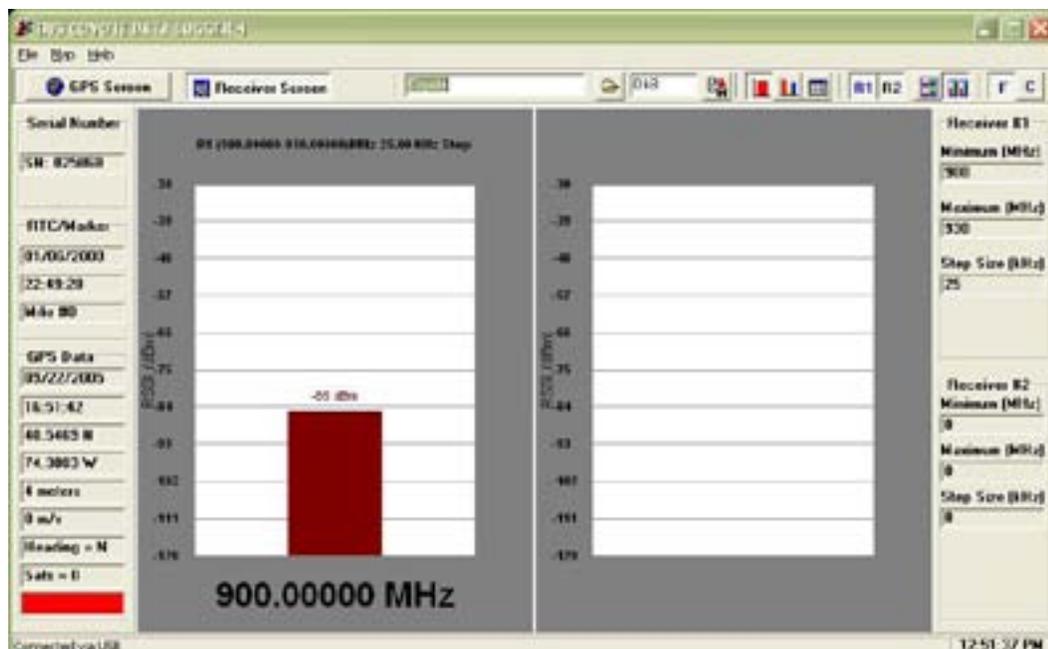


Figure 1 – Main Screen

Quick Start

To begin receiving data into the CDL, use the following steps:

- Connect the Coyote to the PC via serial cable or USB cable.
- If USB, you will be prompted for a USB driver the first time. Driver is on the enclosed CD.
- Turn on the Coyote power (and the GPS power if applicable)
- Start the CDL on the PC.

- Choose the correct communications port on the CDL.
- Start a measurement on the Coyote.
- You will see information appear in the CDL.
- Log data by pressing the log button located next to the filesize field in the speed button panel.
- View GPS information by pressing the button with the globe on it.

Speed Button Panel

Following is a description of the speed button panel from left to right:

Info button – Displays the receiver information screen as shown in Figure 1.

GPS button - Displays GPS satellite screen as shown in Figure 2.

Log File - Shows current log file name.

Log File Browse – Searches for a new log file.

File Size - Displays file size (when logging).

Log Enable - Press to start logging data.

1 Freq. Mode - Now in Single frequency mode.

List Mode – Now in Channel List mode.

N Freq. Mode - Now in scan table mode.

R1 - Display Receiver 1 graph.

R2 - Display Receiver 2 graph.

Tile Vertical - Tile graphical screens vertically.

Tile Horizontal - Tile graphical screens horizontally.

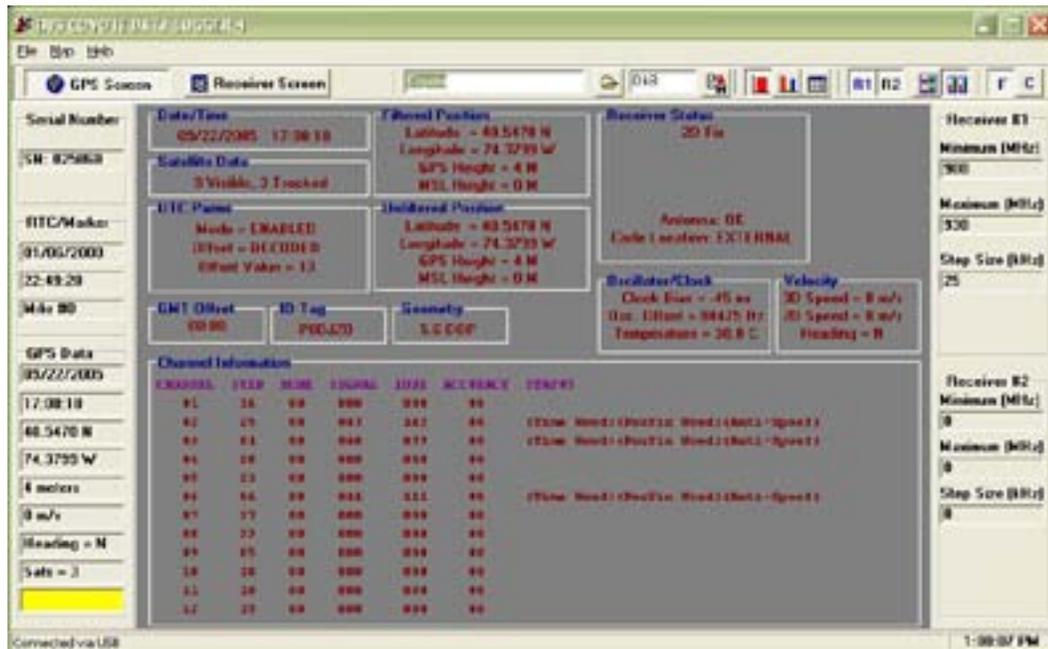


Figure 2 – GPS Satellite Screen

RTC/GPS Status Bar

From top to bottom, the RTC/GPS status bar on the left represents:

- Serial Number of the unit
- RTC Date
- RTC Time
- Current Marker Number
- GPS Date
- GPS Time
- Latitude
- Longitude
- Altitude (m)
- Speed (m/s)
- Heading

- Visible Satellites
- Lock Indicator (red=no lock, yellow=2D lock, green=3D lock)

Receiver Status Bar

From top to bottom, the receiver status bar on the right represents:

- Receiver #1 minimum frequency (MHz)
- Receiver #1 maximum frequency (MHz)
- Receiver #1 step size (kHz)
- Receiver #2 minimum frequency (MHz)
- Receiver #2 maximum frequency (MHz)
- Receiver #2 step size (kHz)

Bottom Status Bar

The bottom status bar simply contains a status message and the current PC system time.

Logging Screen

This logging screen warns the user during logging if certain information has not been recorded (scan channels) once logging has been enabled.

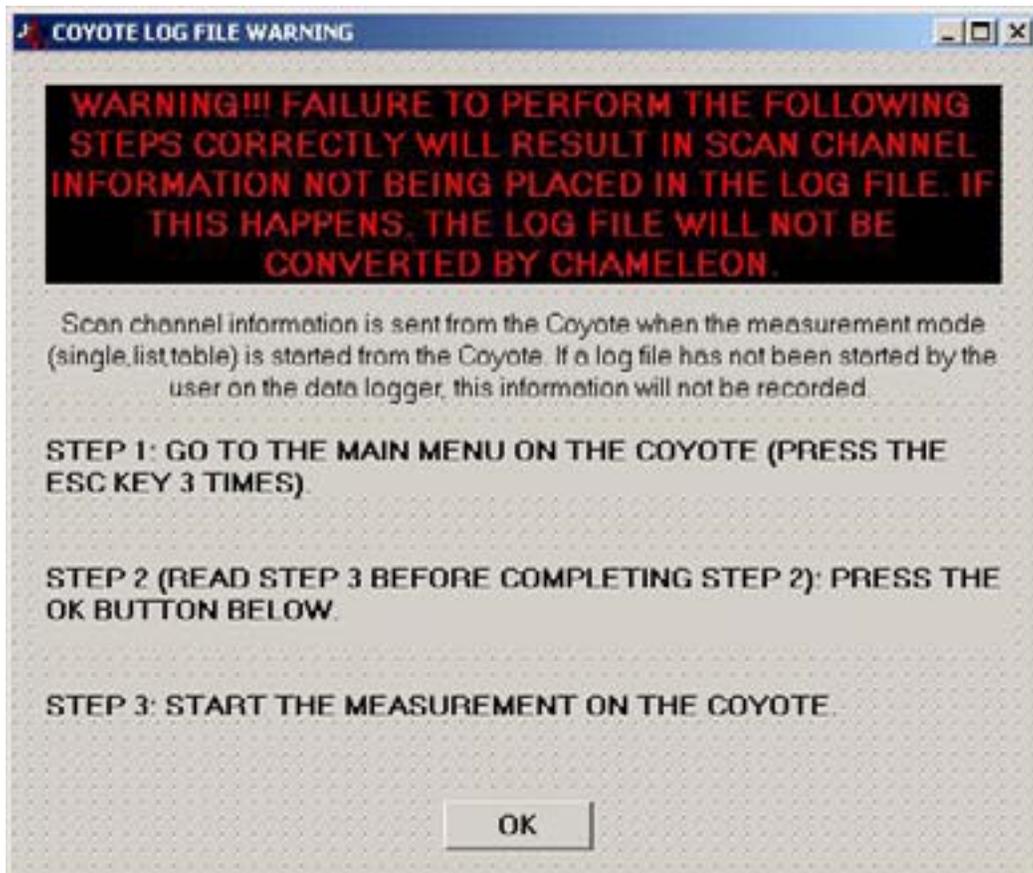


Figure 3 – Logging Warning Screen

BVS Coyote Channel Table Utility

Introduction

The channel table utility allows channel tables to be created on the PC and then transferred over to the Coyote through either the RS-232 connection or through the USB. This is used for the table mode on the Coyote, not the list mode.

A table can be created literally by using the channel table editor, or can be derived from a sequence created using the sequence table editor.

Tour

On the left is a sequence table editor. From this table you can enter channel sequences for later entry into the channel table on the right. This sequence table and channel table can be saved and retrieved to/from a disk by choosing the “SAVE” and “OPEN” buttons.

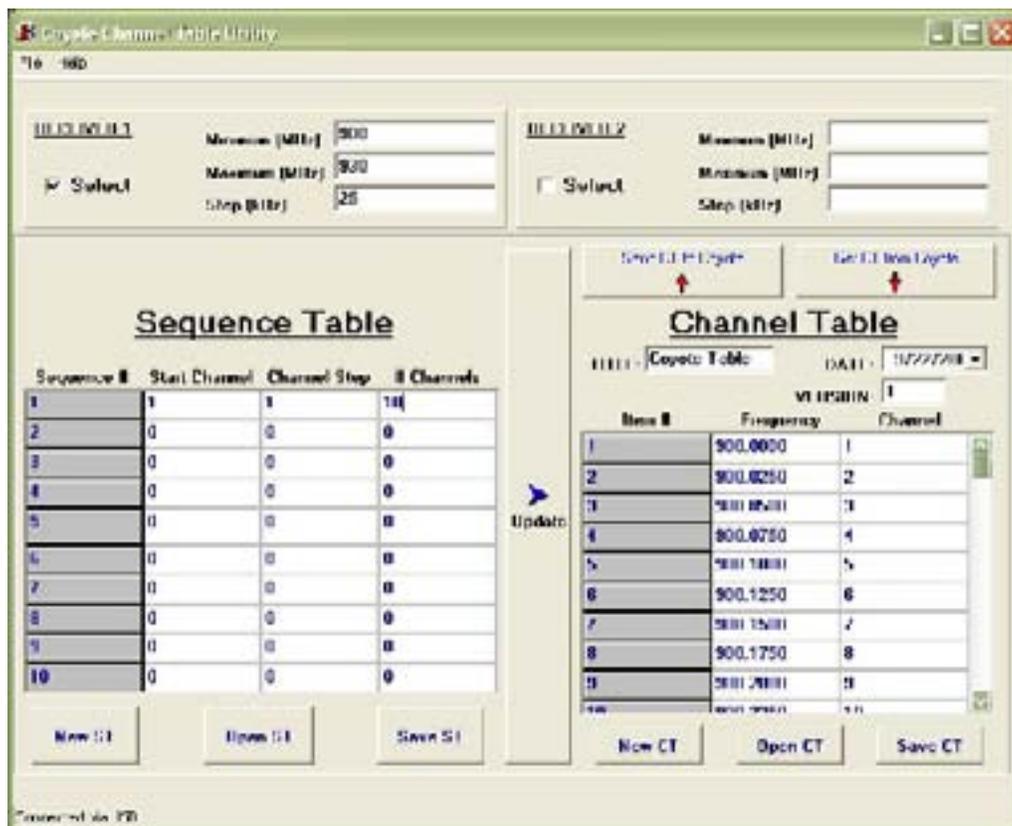


FIGURE 1 – Coyote Channel Table Utility

Choosing the “NEW” buttons will clear the respective table editors. The buttons on top of the channel table editor allow the table to be sent and received from the Coyote. The table title and date may also be chosen. The title must be less than 17 characters.

On the right is the channel table editor, from here you can create or edit a channel table and then send and retrieve tables from/to the Coyote.

The top of the main screen contains information about the two receivers in the Coyote. If a receiver is not installed, there will be no receiver information present.

The receiver information box which is checked signifies which information and receiver is being targeted by the table editors. For example, if Receiver 1 is checked, the table editors use the information from receiver 1 and send/retrieve tables from/to the Coyote receiver 1 slot.

Example

Below is an example of how to use the channel table editor.

NOTE: When creating a table, each channel can only be used once. If you try to send a table that contains duplicate channel numbers, the duplicates will not be used on the Coyote.

Step 1 – Create a channel sequence

I want a sequence starting with channel 12, running through channel 24, hitting every other channel. In order to accomplish this task, clear the sequence table editor by pressing the “NEW ST” button. Then enter 12 for the start channel, 2 for the step, and 6 for the length. This will accomplish the desired effect. Up to 10 sequences can be entered into the sequence table editor at any one time.

NOTE: The sequence editor does not have to be used. Channels can be directly entered into the channel table editor as well.

Step 2 – Create a channel table

Our next step is to create a channel table from the sequence created in step 1. Clear the channel table editor by pressing the “NEW CT” button. Then press the “UPDATE” button. Each channel in the sequence is entered into the channel table editor!

Step 3 – Upload channel table to Coyote

You are now ready to send the channel table to the Coyote. On the Coyote, go to the main menu. Now go to the PC software. If you wish to alter the title and date of the table, do so now. Then press the “Send CT to Coyote” button. A progress bar will appear until the transfer of information is complete. On the Coyote, go to the “Scan Channels” screen. Then press the “Scan Table Info” button. The title and date of the table that you just loaded will appear under the appropriate receiver.

Step 4 – Clear the channel table editor

To verify that the channel table was loaded properly, we can download the table back from the Coyote. First, clear the channel table editor by pressing the “New CT” button.

Step 5 – Download channel table from Coyote

Next, on the Coyote, go back to the main menu. Then, press “Get CT from Coyote”. A progress bar will appear to show the status of the transfer. After completion, the table data in the channel table editor should appear the same as the table you has just uploaded.

NOTE: The table is read out as single entities for each channel in channel order. This means that no matter how many times a channel is entered into the table, it will only be registered once with the Coyote for scanning. The channels that appear in the editor will also be channel ordered (1 through the max channel, up to 3072.)

Step 6 – Save the channel table to disk

The channel tables created may be saved to disk for later retrieval by pressing the “Save CT” button and then reopening with the “Open CT” button. Properly delimited channel files may be imported into the Coyote DL.

Coyote Channel Table Import Format

Up to 3072 channels can be loaded into a Coyote for scanning. A file with channels to be scanned can be imported from an ASCII comma-delimited file as shown below:

```
Table Title (up to 16 chars), Date (mm/dd/yyyy), 99, F or C (frequencies or channels) <CR>
Channel/Frequency #1 <CR>
Channel/Frequency #2 <CR>
Channel/Frequency #3 <CR>
...
Channel/Frequency #n <CR>
```

Example:

```
Channel Table 1, 07/03/01, 99, F
1930.05
1940.00
1950.00
1962.50
```

1963.75
1980.00

or

Channel Table 1, 07/0301, 99, C

1

22

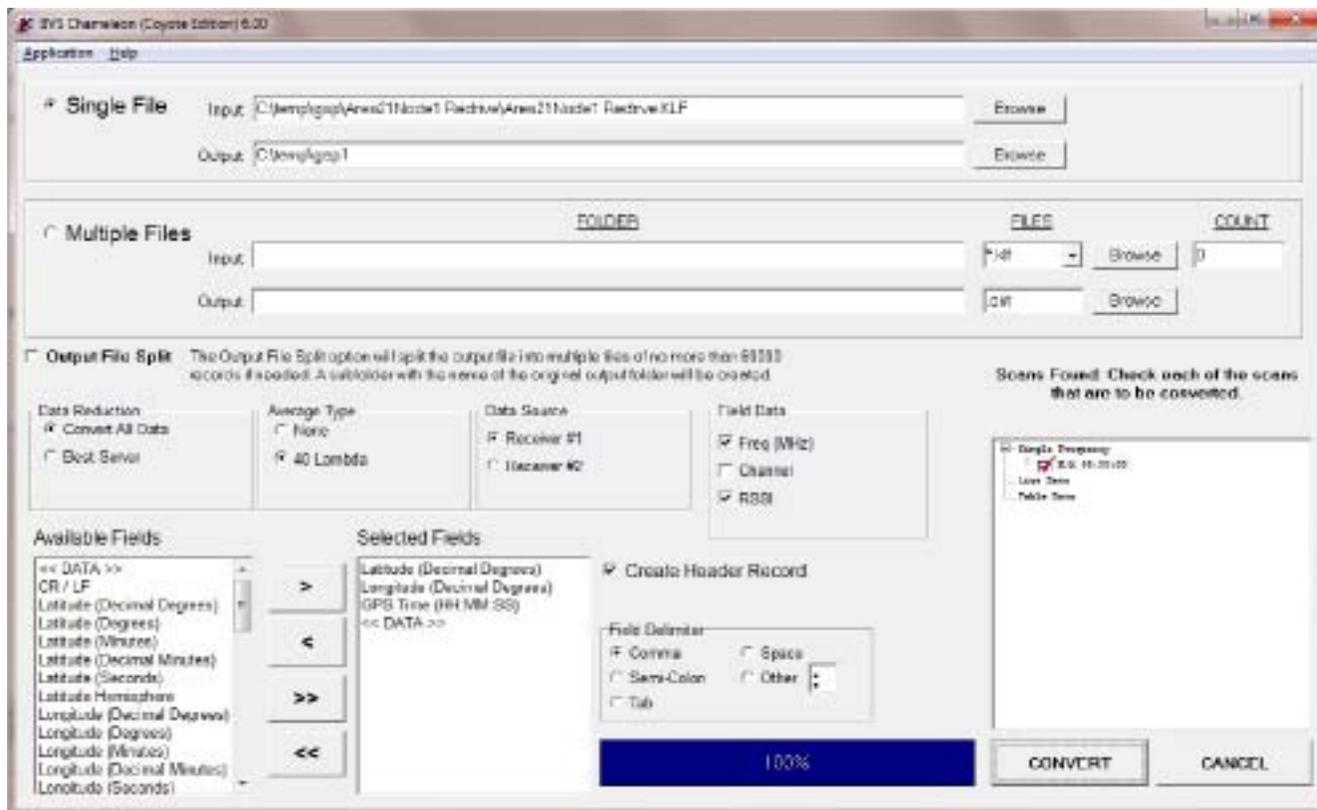
333

1111

BVS Chameleon User Manual

Introduction

The Chameleon application software is the data conversion and filtering tool for the Coyote. Chameleon was designed to greatly simplify the conversion of binary receiver data to an ASCII delimited format. Most post-processing applications can then import this converted data. The following sections of this document outline how to convert data using the Chameleon software.



Installation

Installation of Chameleon is straightforward. Insert the CD provided with the Coyote purchased into the PC. Wait a few seconds for the autorun program on the CD to boot up. Choose Chameleon from the list of applications to install.

This will load the installation program. Next, follow the steps outlined for this application. After the installation has been completed, an icon will be placed in the chosen folder.

Running the Application

After starting the application, the main screen will appear. The steps to conversion 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 man-

ual change to the configuration files may result in the loss of configuration information.

Input / Output Files

Chameleon can convert a single file or can convert multiple files. The choice is made by selecting the radio button next to either “Single File” or “Multiple Files”.

Single File

Choose the data file that is to be converted as the input. Chameleon will automatically determine which product created the file. Chameleon will display the product type next to the file name. A default output file name will be chosen with the .OUT extension. This may be modified to suit the users needs.

Multiple Files

For multiple files, select the input folder. Then select the file extension (default is *.klf). After the folder has been selected, the number of files that have been found will show up in the “Count” box.

Choose the output folder and file extension for the output files. The resulting output will be placed in this folder.

Output File Split

There is a check box option to split the output file. If this choice is selected, the output will be be split into multiple files of no more than 60 thousand records. A new folder derived from the output file name will be created with these files.

This option is useful where a post-processing application (such as Microsoft Excel TM) cannot except files with more than a certain number of rows.

Data Reduction

The output data can be reduced by choosing the “Best Server” option from the “Data Reduction” box. If this type is selected, then only the best channel (frequency) for each scan is presented.

Average Type

All data can be output or the data may be averaged. The averaging type that can be selected is “40 Lambda”. This will average the data to suppress the effect of Rayleigh fading.

For a greater understanding of Rayleigh fading, please see the documentation available on the BVS web-site at www.bvsystems.com.

Data Source

The data that is to be converted can be from either receiver on the Coyote. This can be selected from the “Data Source” box.

Data Streams

The Coyote has three scanning modes. These are “Single Frequency”, “List Data”, and “Table Data” scans. After an input file has been selected (for single file conversion), the scans found will appear in the “Scans Found” list box.

By default, all scans are selected to be converted. Removing the check from the red check boxes next to each scan removes that scan from conversion.

Output Fields

Select the fields that are to be placed in the output file. Simply highlight fields desired in the “Available Fields” box and then move them to the “Selected Fields” box by using the directional arrow buttons.

The delimiting character may also be chosen. Field titles may be placed in the output file by checking the “Header” box. To include data fields as specified by the “Field Data” box, be sure to have the “<<DATA>>” field in the selected box.

Conversion

Press the CONVERT button. The progress bar will be updated as the file is being processed. After the message appears stating that the conversion has been completed, the converted file will be ready for import into most post-processing applications.

Coyote Dead Reckoning Optional Software

The Coyote 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 Coyote or from an external Blaupunkt TravelPilot. The DX-V or EX-V versions are supported.

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

The TravelPilot will feed data into the Coyote 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 Coyote 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 Coyote DR software.



Figure 1 – Coyote 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.

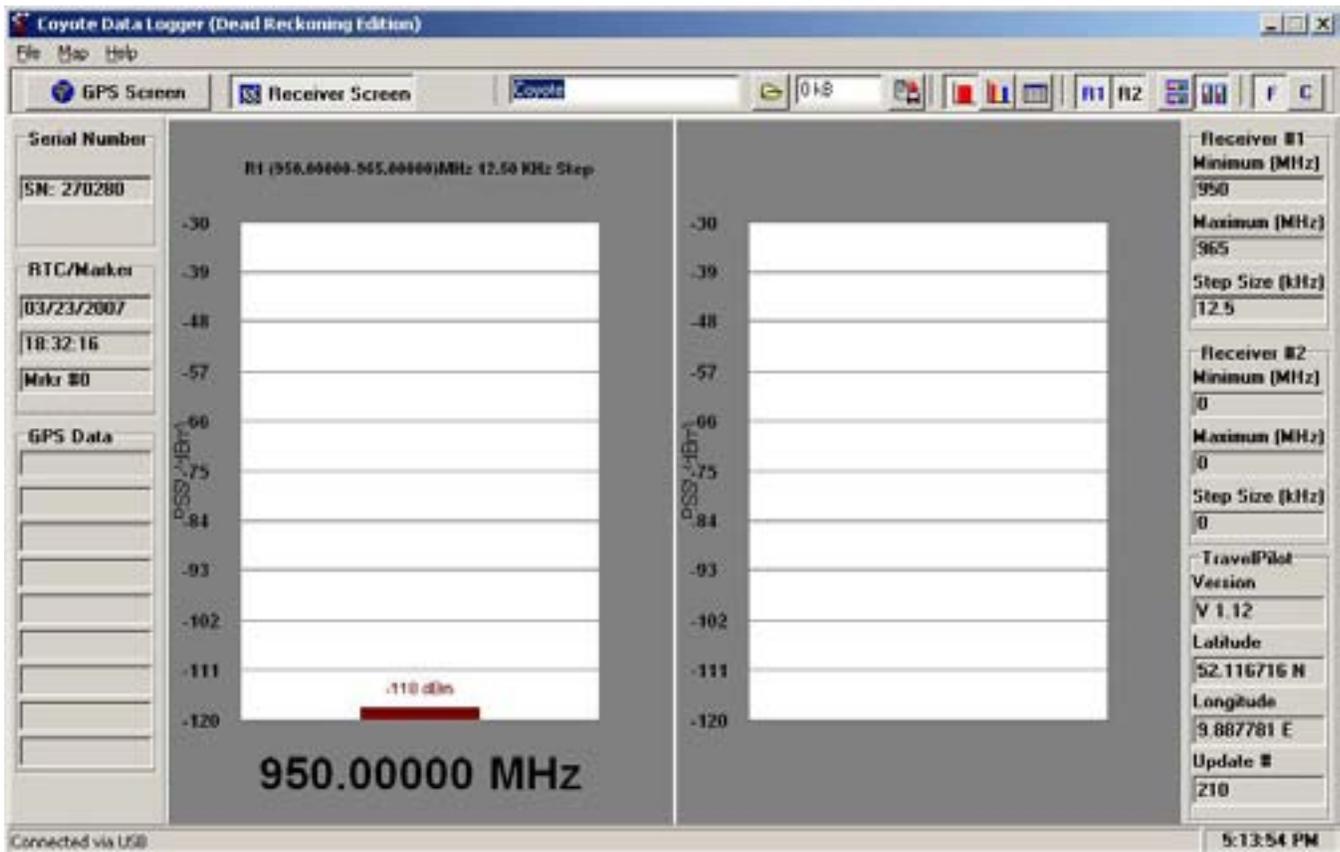


Figure 2 – Coyote Main Screen

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 Coyote 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 Coyote DR is running.
- TP_Time – HH:MM:SS from the computer on which the Coyote DR is running.

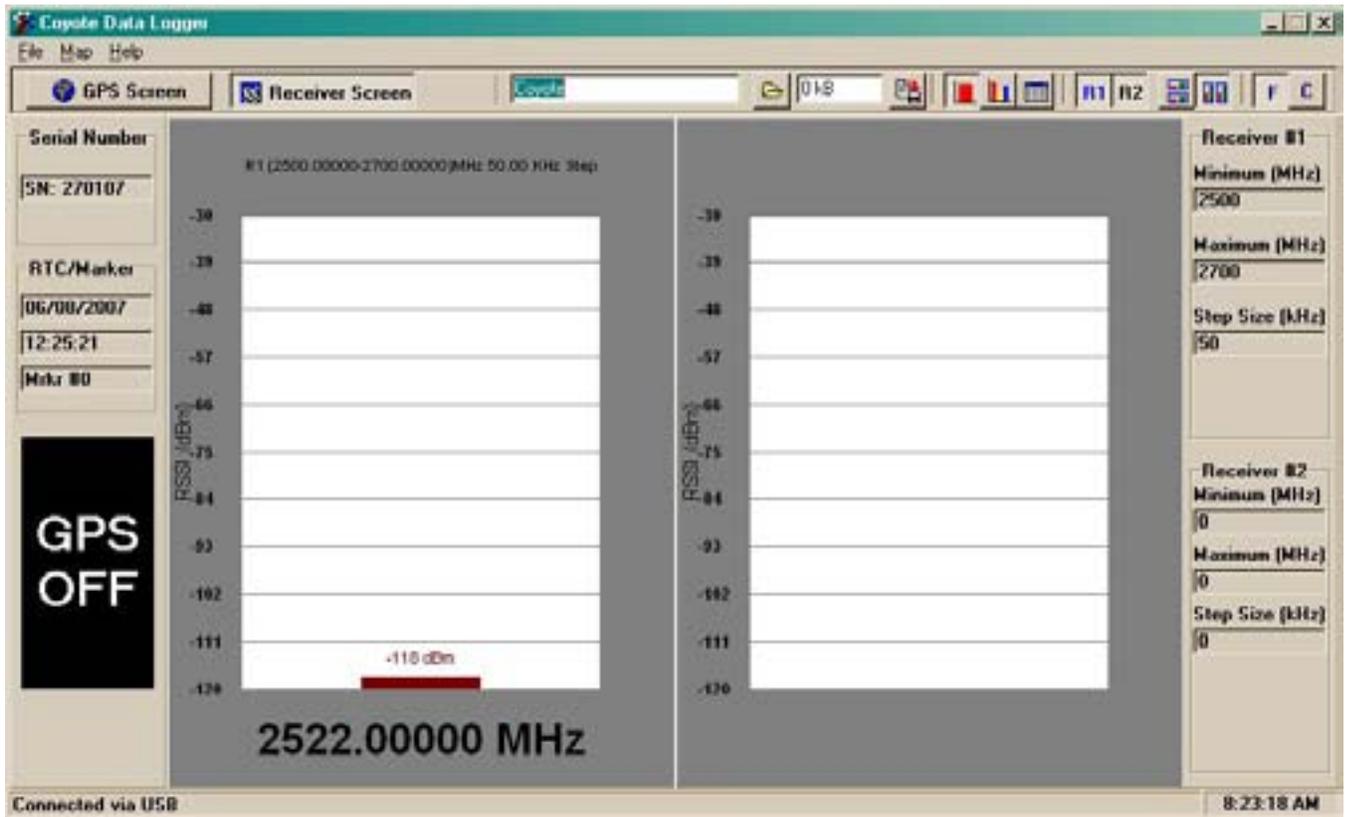


Figure 3 – Coyote GPS Off

This shows “GPS OFF”. This will either appear at the beginning of the session (before a measurement is started and/or GPS power is applied) or after the GPS power has been shut off and RTC packets are being received (accompanied by a PING sound).

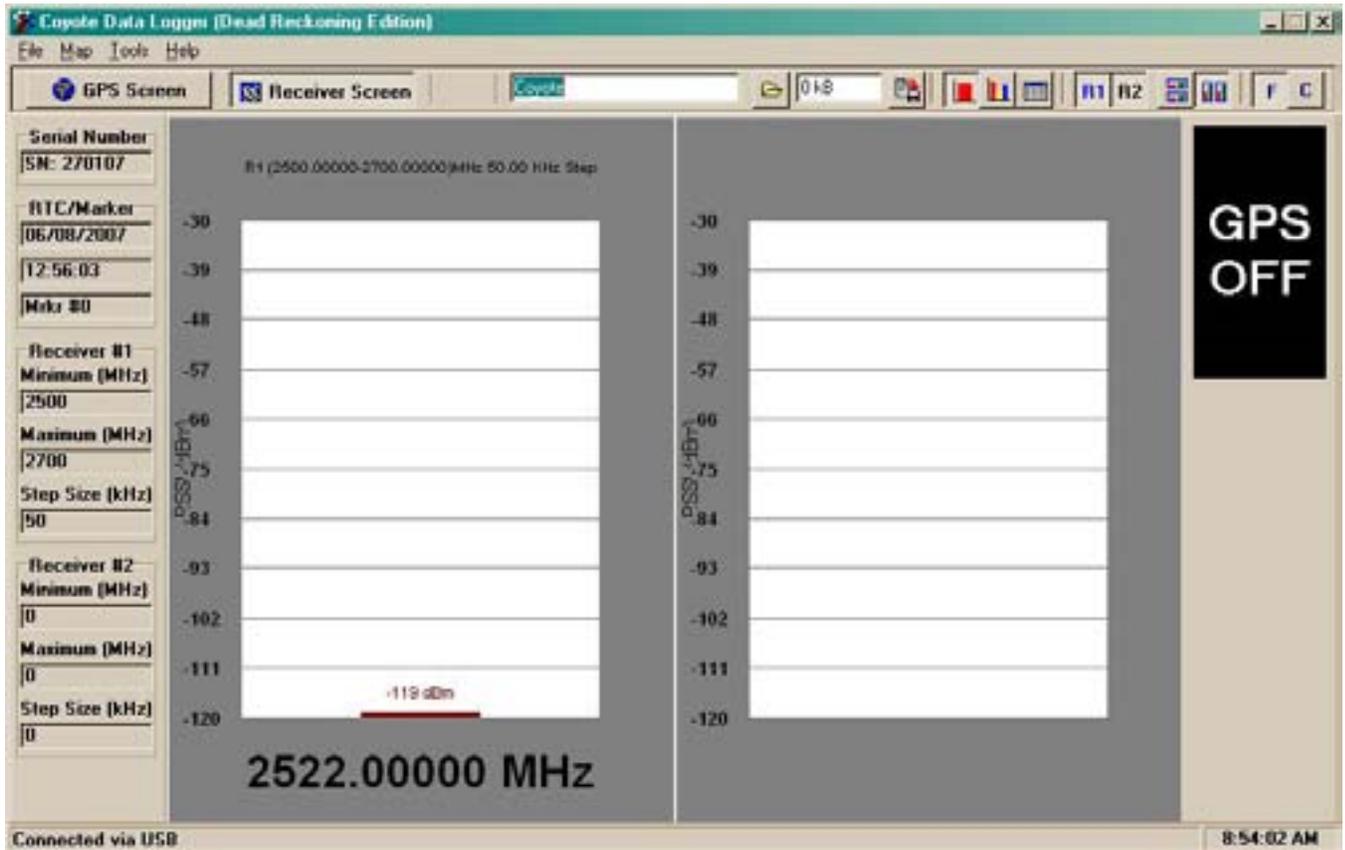


Figure 4 – Dead Reckoning GPS Off

This shows “GPS OFF” for the dead reckoning software. This will either appear at the beginning of the session (before a measurement is started and/or GPS power is applied) or after the GPS power has been shut off and RTC packets are being received (accompanied by a PING sound). Note that the TravelPilot fields are no longer there. This means that Internal GPS was selected.

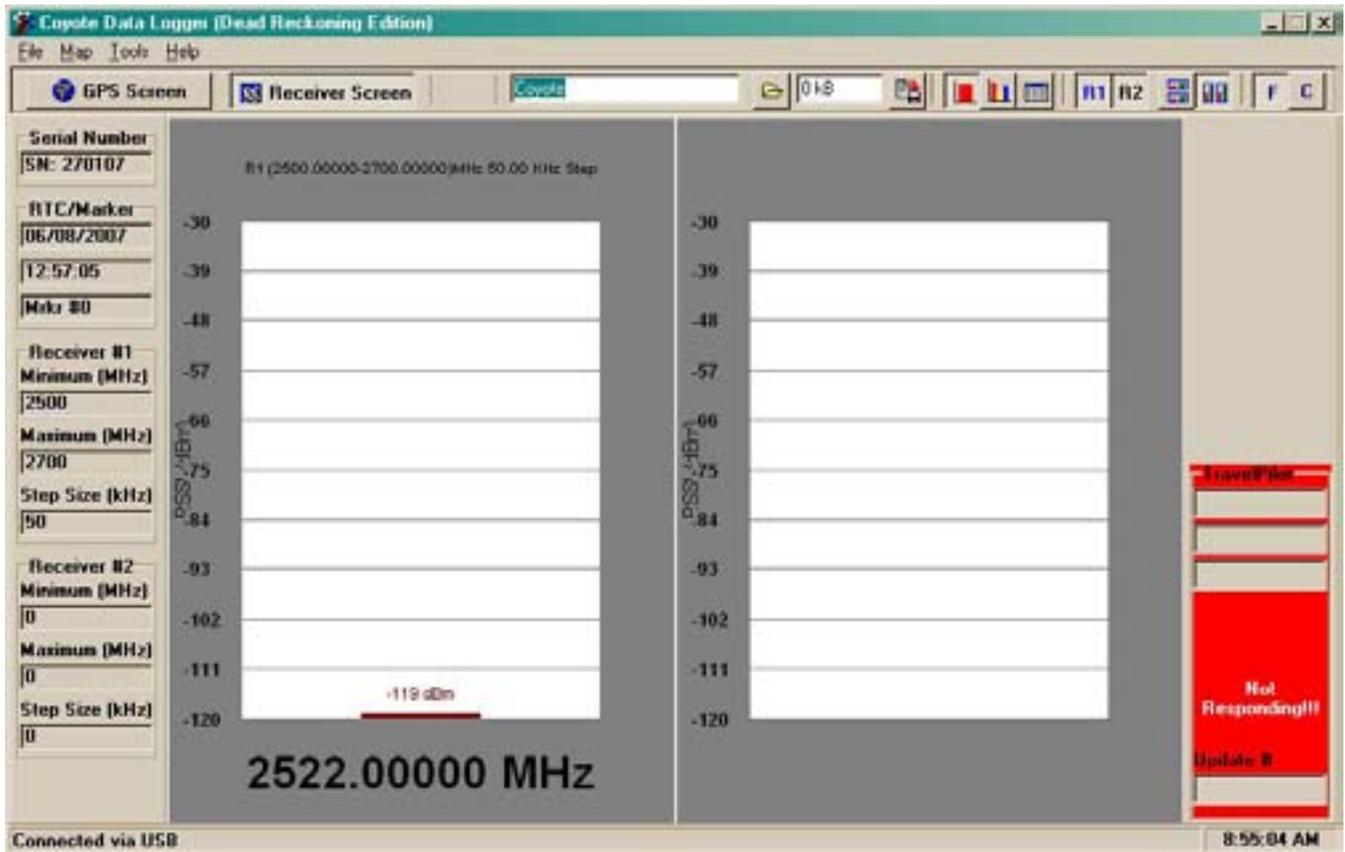


Figure 5 – TravelPilot Data Not Being Received

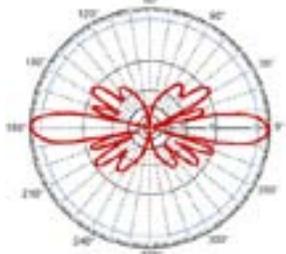
This shows TravelPilot has been selected. The GPS data fields will not display on the main screen. This picture shows TravelPilot data not being received.

TravelPilot Serial Cable Diagram

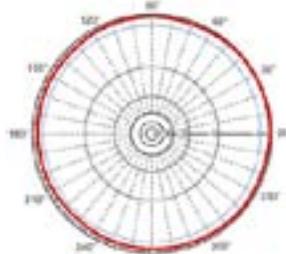


When connecting the TravelPilot to your computer, if a gender changer is needed, it cannot be pin-for-pin. The Rx and Tx lines need to be crossed (as shown in the diagram). Some manufacturers of gender changers will connect pins 1-9 to pins 1-9 directly. The lines need to be connected as in the diagram. Otherwise, you will not be able to communicate to the TravelPilot.

Optional Omni-Directional Antennae



Vertical



Horizontal



Frequency	2500-2700 MHz
Gain	8.5 dBi
Impedance	50 Ohm
VSWR	< 2.0:1 avg.
Maximum Input Power	100 W

Mechanical Specifications

Polarization	Vertical
Vertical Beam Width	15°
Horizontal Beam Width	360°
Weight	0.5 lbs. (.22 kg)
Length	20 in. (508 mm)
Base Diameter	1.27 in. (3.22 cm)
Radome Diameter	.75 in. (1.90 cm)
Radome Material	Gray Fiberglass
Wind Survival	>150 MPH
Operating Temperature	-40° C to to 85° C (-40° F to 185° F)
Antenna Connector	Integral N-Male

Wind Loading Data

Wind Speed (MPH)	Loading
100	3 lb.
125	5 lb.



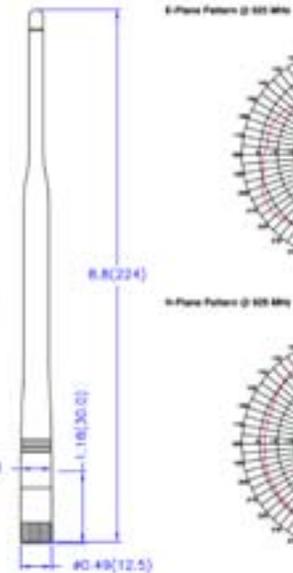
900 MHz Omni-Directional (9.5" long)

Electrical Properties:

Frequency Range: 890-900 MHz GSM Band or
 824-896 MHz AMPS Band
 Impedance: 50Ω nominal
 VSWR: <2.0:1
 Gain: 2.0 dBi
 Radiation: Omni
 Polarization: Vertical
 Wave: Half Wave Dipole

Mechanical Properties:

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



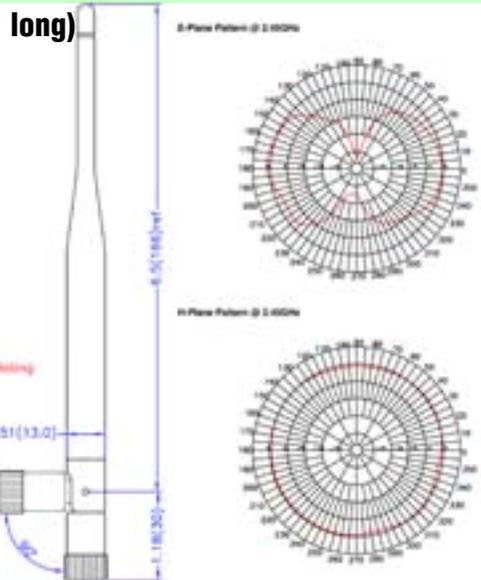
2.4 GHz Omni-Directional (7.5" long)

Electrical Properties:

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

Mechanical Properties:

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



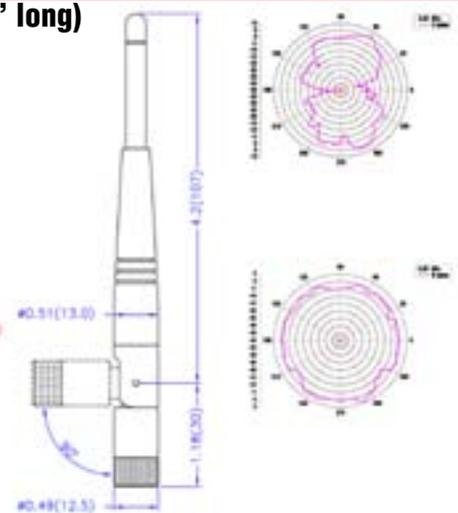
4.9/5 GHz Omni-Directional (5.5" long)

Electrical Properties:

Frequency Range: 4.9-5.35 GHz
 Impedance: 50Ω nominal
 VSWR: <2.0:1
 Gain: 5 dBi
 Radiation: Omni
 Polarization: Vertical

Mechanical Properties:

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



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 than 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:

<u>Chemical Name</u>	<u>Weight by %</u>	<u>Formula</u>	<u>Component</u>
Lithium Cobalt Oxide	10 - 25%	LiCoO ₂	Positive Electrode
Graphite (Carbon)	5 - 15%	C	Negative Electrode
Ethylene Carbonate-Solvent	0 - 14%	C ₃ H ₄ O ₃	Electrolyte
Diethyl Carbonate-Solvent	"	C ₈ H ₁₆ O ₃	Electrolyte
Lithium Hexafluorophosphate-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: $\text{Li}_x\text{C} + \text{Li}_{1-x}\text{CoO}_2 \rightleftharpoons \text{C} + \text{LiCoO}_2$

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.

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

IMPORTANT SAFETY INSTRUCTIONS

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

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

INSTALLATION INSTRUCTIONS

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

INSTRUCTION FOR BATTERIES

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

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