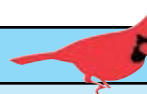


Cardinal

manual version 1.1



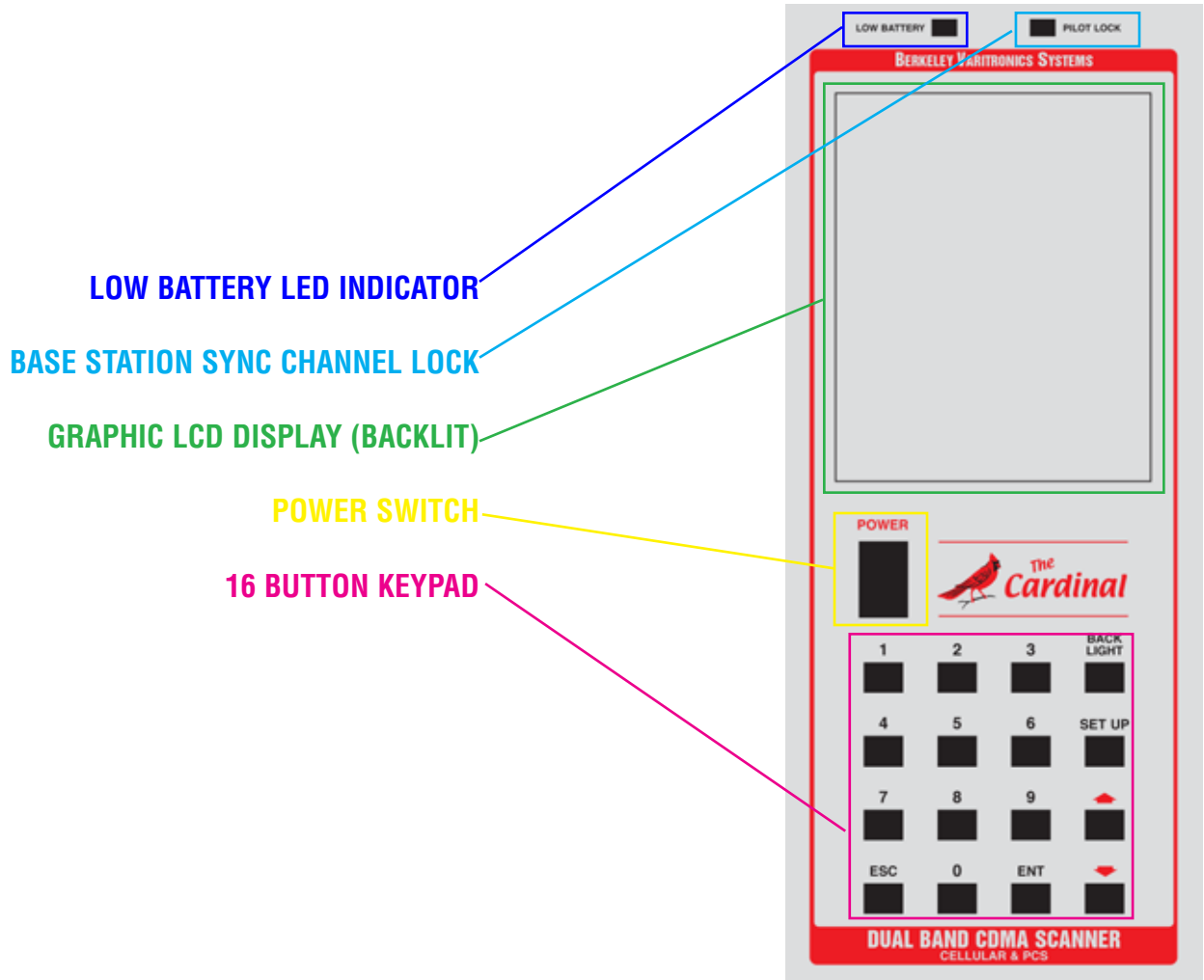


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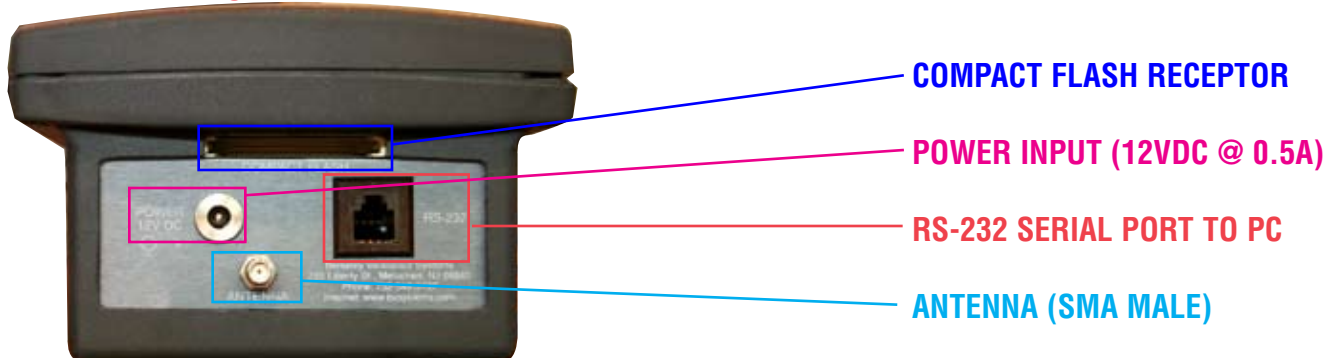
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FRONT VIEW



TOP VIEW



Simply turn **knob** the spring-loaded knob counterclockwise to release the Li-Ion battery. Charging time on each battery is approximately 1 hour. Run time varies from ≥ 8 (backlight on) to ≥ 12 hours. Cardinal is powered from generic laptop (Toshiba) batteries that may be purchased at most computer outlets.



BOTTOM VIEW

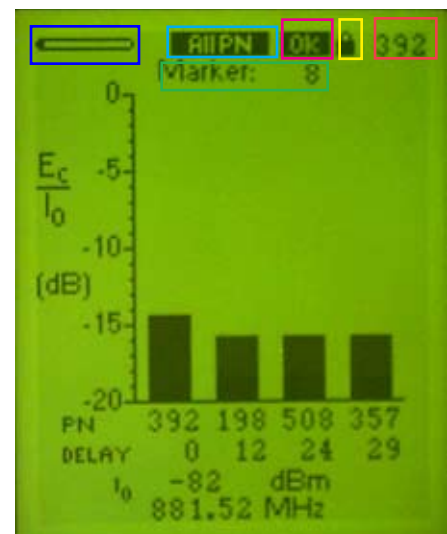


BATTERY REMOVAL & CHARGING



MAIN SCREEN ICONS

- indicates remaining space left on compact flash card
- indicates current logging mode (All PN or Top 4)
- indicates compact flash card status as OK or bad
- indicates status of sync channel "LOCK"
- indicates current strongest basestation channel number
- indicates current user marker number

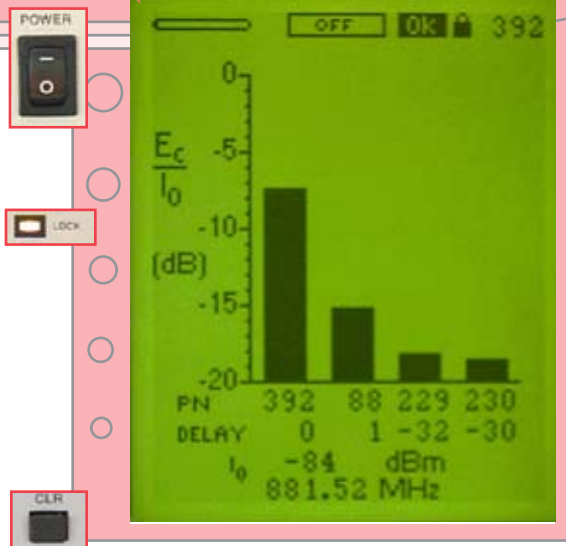


- No GPS required
- Backlit graphic LCD
- Sync channel demodulation
- Removable lithium-ion battery
- Supports CDMA 2000/1XRTT & IS-95B
- Removable PCMCIA flash card for data storage (16MB capacity)
- Scans and displays all 512 base stations in 800ms
- Measures CDMA correlated signal strength (E_c/I_0) ± 1.0 dB
- "Playback" allows engineer to review problem spots with markers
- Serial-port (RS-232C) for PC control and downloading measurements

POWER ON

Upon powering up the **CARDINAL™**, the user must verify that the scanner is set to a carrier frequency for an active CDMA (1XRTT/CDMA 2000 & IS-95B) network in either PCS or Cellular. The current frequency (in MHz) is displayed at the bottom of the Hummingbird's main screen. Use the Frequency Select or Channel Select options in the SETUP Menu to change this value. The Cardinal will store the value of the carrier frequency even if it is turned off or if the battery is removed. The user will notice that the Cardinal finds the strongest basestation (PN) and locks within a few seconds to this signal when tuned to an active network. The yellow "**LOCK**" LED indicates this lock status and only turns off should the signal become too weak or in extreme cases of multipath signal fading. The user may begin taking measurements immediately but should first familiarize themselves with **CARDINAL**'s basic menu features. The Backlight is only controlled through the **CLR** key on the **CARDINAL** keypad. Push to turn ON. Push again to turn OFF the backlight.

Note: While the **CARDINAL** does provide up to 12 hours using the supplied single lithium-ion battery, using the backlight substantially decreases battery life (approximately 8 hours of operation) so it is recommended to use the backlight only if necessary.

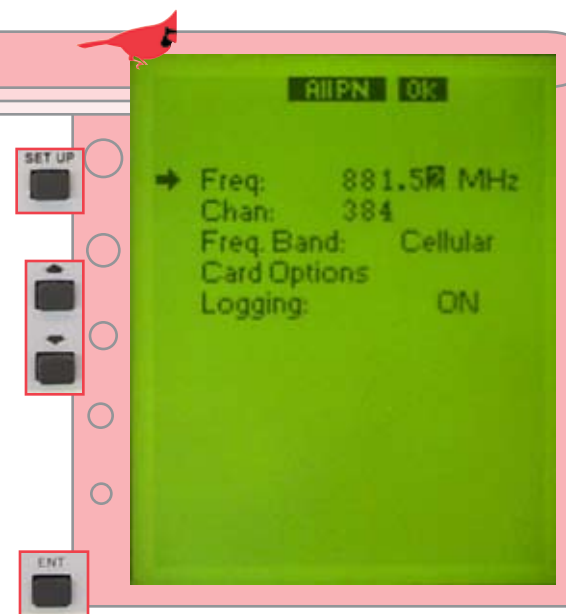


SETUP MENU

While in the main screen, press the **SETUP** button to enter the **SETUP** menu. Use the entire keypad here to navigate through this menu. **ARROW** keys move from between options, keypad numbers enter frequency and channel number, **ENT** key executes the selection and **ESC** takes the user back to the main scanning screen.

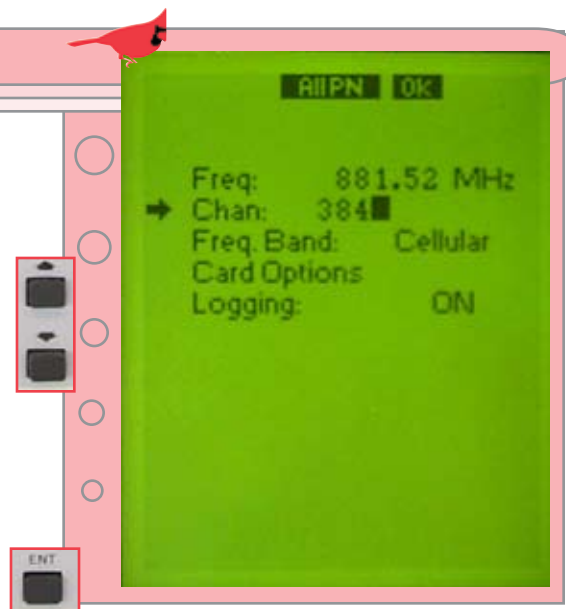
FREQUENCY SELECT

Users that know what basestation frequency they wish to scan must first enter the frequency number in the **SETUP** MENU. Use the keypad and hit **ENT** when finished.



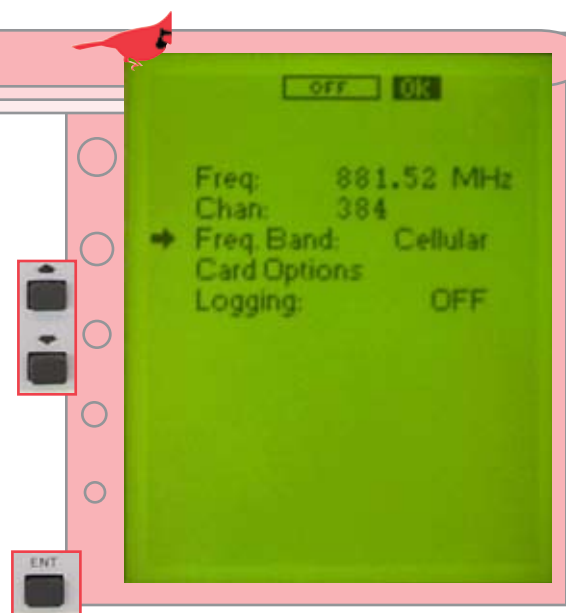
CHANNEL SELECT

Users that know what basestation channel they wish to scan must first enter the channel number in the SETUP MENU. Use the keypad and hit **ENT** when finished.



FREQUENCY BAND

This menu option indicates the receiver band supported by your **CARDINAL**. Cellular and PCS frequencies are both supported. Use the keypad and hit **ENT** to toggle between these two options.



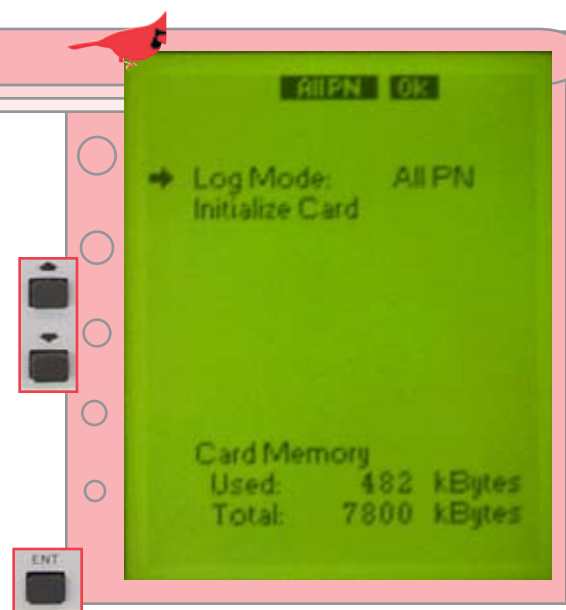
CARD OPTIONS

This menu option takes the user into a submenu indicating the compact flash card options available.

All PN:

This mode allows the user to switch between two different modes of receiving. The screen example here shows All PN has been selected. In this mode, the **CARDINAL** scans all 512 basestations (regardless of Ec/Io) and logs them to the compact flash card.

Note: In this mode, the average size compact flash card will fill up much more quickly than in the other mode. Be sure to



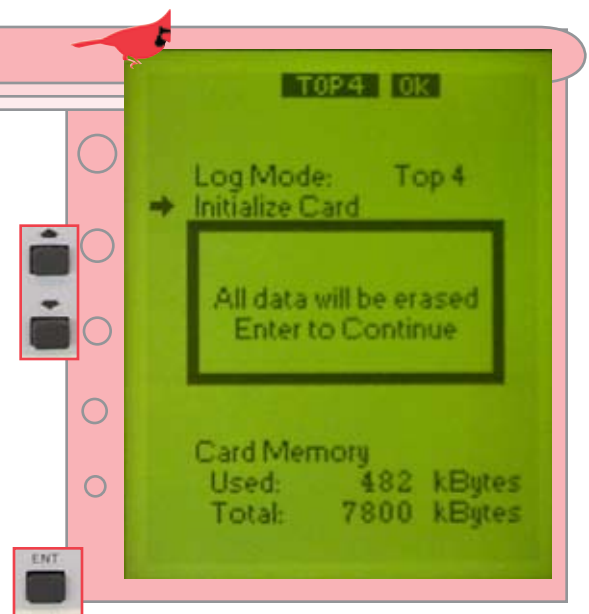
keep watch of the remaining card space at the bottom of this menu. Larger compact flash cards are becoming increasingly cheaper and more available. The **CARDINAL** is currently shipping with a 16MB card. Should the user need further storage space, the **CARDINAL** is also equipped to spool out data from its serial port to any PC. See the Logging menu selection on the next page.

Top 4:

This mode allows the user to view and log the top four basestations and their Ec/Io measurements. The main screen will show the top four measurements regardless of the mode that is selected for storage.

INITIALIZE CARD

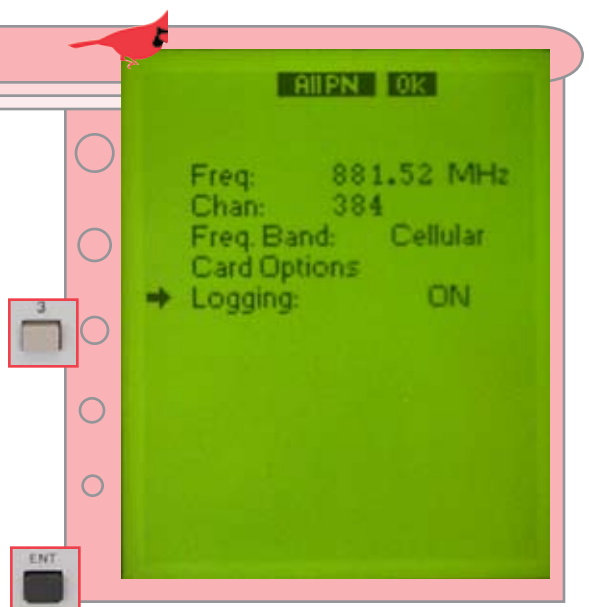
This menu option allows the user to initialize the PCMCIA compact flash card for use in the **CARDINAL**. This option must be chosen in order to proceed with recording to the compact flash card. Press the **ENT** key to continue with initialization after prompted with a message box.



LOGGING

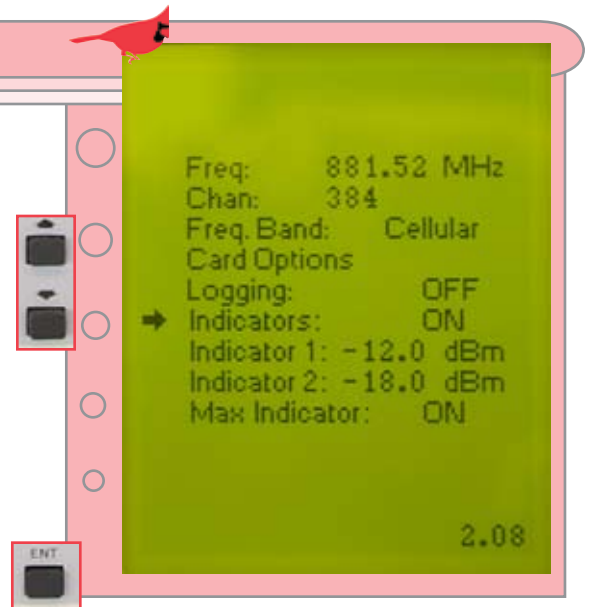
This menu option allows the user to toggle between recording and not recording to the compact flash card. Simply push the **ENT** key to turn ON (begin logging) or turn OFF (stop logging) this option. This option can also be toggled ON or OFF at any time in the main signal strength screen by pressing the number **3** key on the keypad.

Note: The serial port is always outputting data regardless of the logging option setting. This allows the user to collect all data directly to a PC for virtually unlimited storage of data limited only by the size of the hard drive.



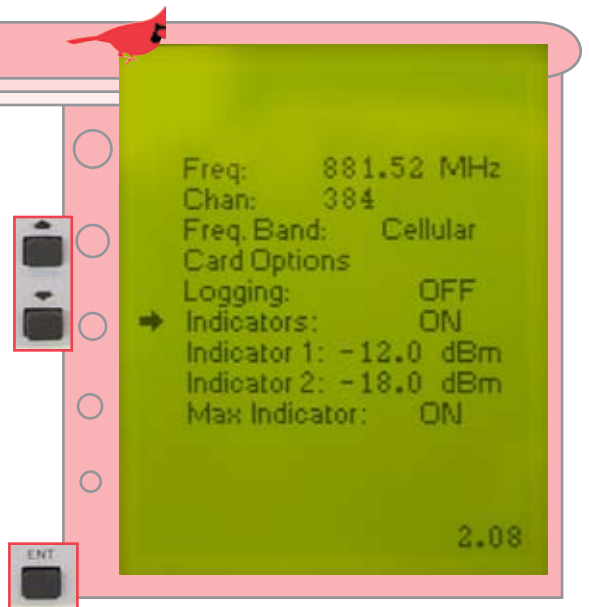
INDICATORS ON

This SETUP MENU option allows users to toggle ON or OFF the dotted indicators line in the measurement screen. These indicators are for power levels.



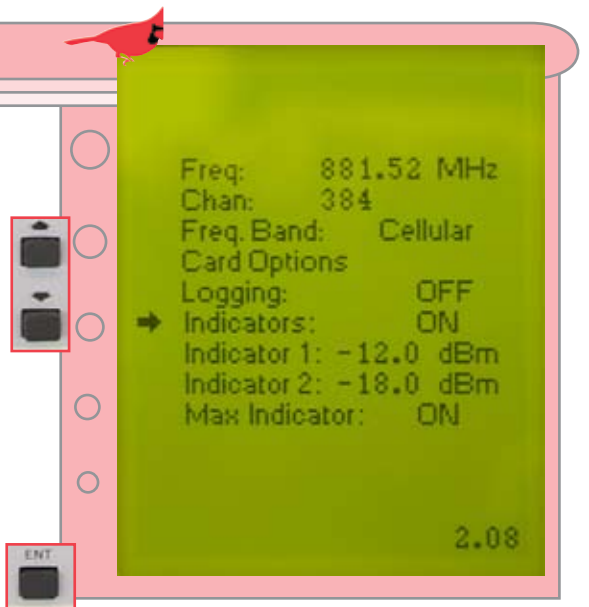
INDICATOR 1 SETTING

This SETUP MENU option allows users to set the power level indicator in dBm for the indicator line 1.



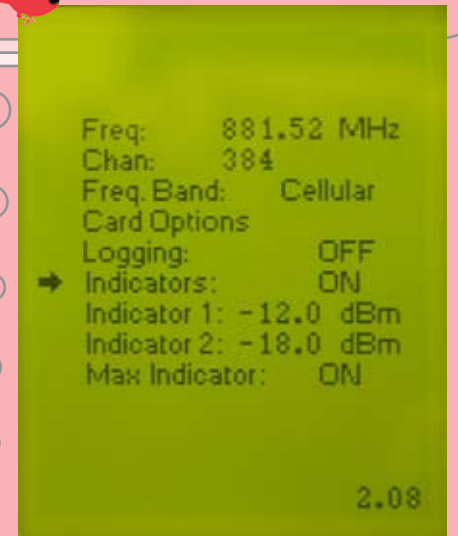
INDICATOR 2 SETTING

This SETUP MENU option allows users to set the power level indicator in dBm for the indicator line 2.



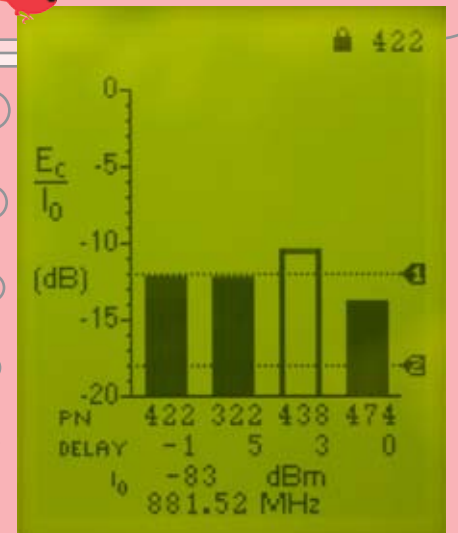
MAX INDICATOR

This SETUP MENU option allows users to toggle the signal strength bar between either opaque or outlined. When this option is on, the PN with the highest power will always appear hollowed while the others appear opaque.



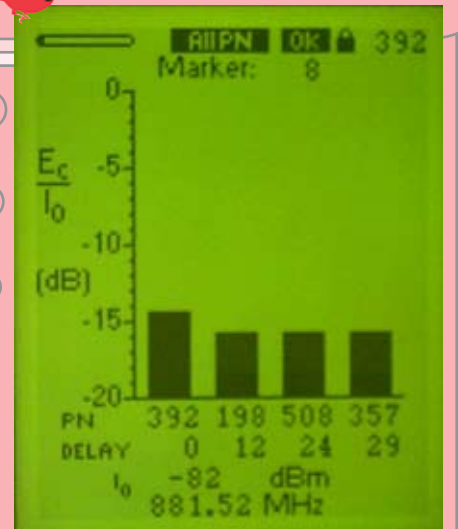
MEASUREMENT SCREEN

This is the main measurement screen on Cardinal. The Y axis displays E_c/I_0 in dB while the X axis displays up to the 4 strongest base station PNs detected for that frequency (located at bottom of screen). This screen is currently displaying 2 indicator thresholds (dotted horizontal lines) and the Max indicator (highest PN in outline).



MARKER

This feature allows the user to set incremental markers simply by pressing the number 1 key on the keypad. The marker number increases by one each time the marker key is pressed. The marker number will disappear from the screen after about three seconds of being displayed. Initialization of the card will destroy all data as well as the marker data.



CARDINAL SOFTWARE

The Cardinal includes two separate pieces of software; the **Cardinal Data Logger™** (CDL) application and **Chameleon CDMA™** application. **CDL** collects data from the Cardinal and displays the data. The CDL also logs the data to binary files. **Chameleon** software is the universal data conversion and filtering tool for BVS Receivers. Be sure to visit the Berkeley website to obtain the latest version of these freely distributed applications <www.bvsystems.com>

Cardinal Data Logger™ User Manual

System Requirements

Pentium II

500 MHz

64MB RAM

100MB free on Hard Drive

Operating System: Windows XP/95/98/Me

Cardinal interface: 1 free serial port between COM1: and COM4:

Introduction

The Cardinal Data Logger (CDL) is the PC interface to the Cardinal. This application collects data from the Cardinal 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 or MSI Planet.

Installation

The installation of CDL can be completed in a few minutes. Place the included software installation CD into an available CD-ROM drive. Wait a few seconds for the software installation window to appear.

Click on the "Install Windows Software/Drivers" button. Then choose Cardinal from the drop down list by the message "I want to install a...". The applications available for use with a Cardinal are highlighted. Choose the Cardinal DL button.

You will be prompted through the InstallShield installation process. After this process has been completed, an icon will be created in the folder that has been specified. This icon will launch the CDL application.

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 system status information.



Parameter Screen

Data being received from the Cardinal includes statuses as well as the latest information for each of the 512 PN offsets.

Quick Start

1. Connect serial cable from Cardinal to available serial (DB9) port.
2. Turn on Cardinal.
3. Start Cardinal Data Logger.
4. Choose communications port (usually COM1:).
5. Choose screen, logging, and other options.
6. Press F10 to view data on the screen real-time.

Parameter Screen

Log File Information

Clicking on the SELECT button in the Log File Information group box brings up a dialog box to choose a filename for logging data and/or alerts. After a file is chosen, it will appear next to the “Data:” or “Alerts:” caption. Checking the “Log Data” checkbox begins the logging of information from the Cardinal. Unchecking this box stops the logging process. The size of the file is displayed next to the “Size:” caption. NOTE: Data being logged contains all 512 PN offsets, the logging mode of the unit does not affect the PC logging.

Data Averaging

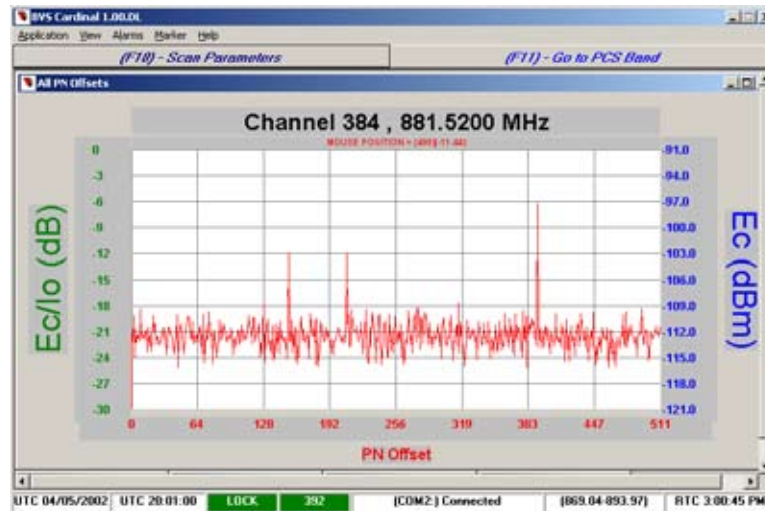
The data averaging group box allows for the averaging of data coming into the serial port. The rolling averages will average the last N values, N being either 4 or 16. The weighted sum average places a higher weight on the current point. “None” simply displays the latest point. NOTE: The averaged data is not stored to the data file. The original data is stored.

Display Selections

The “Display Selections” group allows the user to select the data to be displayed on the screen. It is broken down to 5 different screens, each of which is described later in this document. Some screens have an associated option button that allows the user to select different ways to display the data for that particular screen.

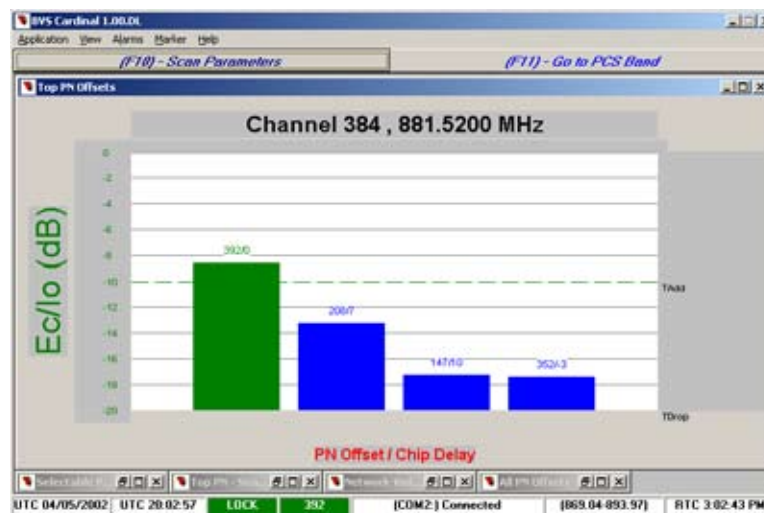
Checking the particular screen tells the CDL to display it when in display screen mode. Any or all of the screens may be displayed at the same time. Multiple screens will be tiled into the available area. Press F10 from the parameter screen to access the display screen mode.

Display Screens



PN Temporal Screen (All 512)

This screen will display all 512 PN offsets. Ec/Io is shown on the left and Ec is shown on the right. There are no options for this screen.



Top PN Offsets

This screen displays the top PN offsets based on the current averaging scheme. 1 to 20 PN offsets can be chosen from the options screen. The colors of the bars may also be chosen, based on selections of TAdd and TDrop.

OPS Cardinal 1.00.DL

Application View Alarms Marker Help

(F10) - Scan Parameters (F11) - Go to PCS Band

Network Violations Alert Window

MARKER	DATE	TIME	TYPE	ALERT	DESCRIPTION
000	01/06/1998	00:02:11	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:11	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:13	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:13	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:14	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:15	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:16	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:18	Network Hole	No Pin Move	= -15
000	01/06/1998	00:02:18	Network Hole	No Pin Move	= -15
000	04/05/2002	20:04:10	Search Window	Pin Offset	= 009
				Chip Offset	= -18
				Search Window	= 16

Selectable [F10] [F11] [F12] [F13] [F14] [F15] [F16] [F17] [F18] [F19] [F20] [F21] [F22] [F23] [F24] [F25] [F26] [F27] [F28] [F29] [F30] [F31] [F32] [F33] [F34] [F35] [F36] [F37] [F38] [F39] [F40] [F41] [F42] [F43] [F44] [F45] [F46] [F47] [F48] [F49] [F50] [F51] [F52] [F53] [F54] [F55] [F56] [F57] [F58] [F59] [F60] [F61] [F62] [F63] [F64] [F65] [F66] [F67] [F68] [F69] [F70] [F71] [F72] [F73] [F74] [F75] [F76] [F77] [F78] [F79] [F80] [F81] [F82] [F83] [F84] [F85] [F86] [F87] [F88] [F89] [F90] [F91] [F92] [F93] [F94] [F95] [F96] [F97] [F98] [F99] [F100] [F101] [F102] [F103] [F104] [F105] [F106] [F107] [F108] [F109] [F110] [F111] [F112] [F113] [F114] [F115] [F116] [F117] [F118] [F119] [F120] [F121] [F122] [F123] [F124] [F125] [F126] [F127] [F128] [F129] [F130] [F131] [F132] [F133] [F134] [F135] [F136] [F137] [F138] [F139] [F140] [F141] [F142] [F143] [F144] [F145] [F146] [F147] [F148] [F149] [F150] [F151] [F152] [F153] [F154] [F155] [F156] [F157] [F158] [F159] [F160] [F161] [F162] [F163] [F164] [F165] [F166] [F167] [F168] [F169] [F170] [F171] [F172] [F173] [F174] [F175] [F176] [F177] [F178] [F179] [F180] [F181] [F182] [F183] [F184] [F185] [F186] [F187] [F188] [F189] [F190] [F191] [F192] [F193] [F194] [F195] [F196] [F197] [F198] [F199] [F200] [F201] [F202] [F203] [F204] [F205] [F206] [F207] [F208] [F209] [F210] [F211] [F212] [F213] [F214] [F215] [F216] [F217] [F218] [F219] [F220] [F221] [F222] [F223] [F224] [F225] [F226] [F227] [F228] [F229] [F230] [F231] [F232] [F233] [F234] [F235] [F236] [F237] [F238] [F239] [F240] [F241] [F242] [F243] [F244] [F245] [F246] [F247] [F248] [F249] [F250] [F251] [F252] [F253] [F254] [F255] [F256] [F257] [F258] [F259] [F260] [F261] [F262] [F263] [F264] [F265] [F266] [F267] [F268] [F269] [F270] [F271] [F272] [F273] [F274] [F275] [F276] [F277] [F278] [F279] [F280] [F281] [F282] [F283] [F284] [F285] [F286] [F287] [F288] [F289] [F290] [F291] [F292] [F293] [F294] [F295] [F296] [F297] [F298] [F299] [F300] [F301] [F302] [F303] [F304] [F305] [F306] [F307] [F308] [F309] [F310] [F311] [F312] [F313] [F314] [F315] [F316] [F317] [F318] [F319] [F320] [F321] [F322] [F323] [F324] [F325] [F326] [F327] [F328] [F329] [F330] [F331] [F332] [F333] [F334] [F335] [F336] [F337] [F338] [F339] [F340] [F341] [F342] [F343] [F344] [F345] [F346] [F347] [F348] [F349] [F350] [F351] [F352] [F353] [F354] [F355] [F356] [F357] [F358] [F359] [F360] [F361] [F362] [F363] [F364] [F365] [F366] [F367] [F368] [F369] [F370] [F371] [F372] [F373] [F374] [F375] [F376] [F377] [F378] [F379] [F380] [F381] [F382] [F383] [F384] [F385] [F386] [F387] [F388] [F389] [F390] [F391] [F392] [F393] [F394] [F395] [F396] [F397] [F398] [F399] [F400] [F401] [F402] [F403] [F404] [F405] [F406] [F407] [F408] [F409] [F410] [F411] [F412] [F413] [F414] [F415] [F416] [F417] [F418] [F419] [F420] [F421] [F422] [F423] [F424] [F425] [F426] [F427] [F428] [F429] [F430] [F431] [F432] [F433] [F434] [F435] [F436] [F437] [F438] [F439] [F440] [F441] [F442] [F443] [F444] [F445] [F446] [F447] [F448] [F449] [F450] [F451] [F452] [F453] [F454] [F455] [F456] [F457] [F458] [F459] [F460] [F461] [F462] [F463] [F464] [F465] [F466] [F467] [F468] [F469] [F470] [F471] [F472] [F473] [F474] [F475] [F476] [F477] [F478] [F479] [F480] [F481] [F482] [F483] [F484] [F485] [F486] [F487] [F488] [F489] [F490] [F491] [F492] [F493] [F494] [F495] [F496] [F497] [F498] [F499] [F500] [F501] [F502] [F503] [F504] [F505] [F506] [F507] [F508] [F509] [F510] [F511] [F512] [F513] [F514] [F515] [F516] [F517] [F518] [F519] [F520] [F521] [F522] [F523] [F524] [F525] [F526] [F527] [F528] [F529] [F530] [F53

Network Violations Alert Data

HPV Cardinal 1.00.01

Application View Alarms Marker Help

(F10) - Scan Parameters (F11) - Go to PCS Band

Top PN - Search Window Offset

Channel 384, 881.5200 MHz

SW Left SW Right

Ec/Io (dB)

PN Offset / Chip Delay

Valid

392.0 208.7 152.7 57.0 91.15

0 -30 -20 -10 -5 0 5 10 20 30

UTC 04/05/2002 UTC 20:03:42 LOCK 292 [COM2] Connected (869.04-893.97) RTC 3:03:29 PM

Status Bar

The status bar on the bottom of the main screen contains the UTC Time and Date received from the locked

Page 12

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. The frequency range of the unit and the real-time clock round out the status bar.

Menu Options

Application Menu

The user may exit the application from the application menu.

View Menu

The view menu allows the user to toggle between the display screens and the parameter screen. F10 and the button bar also accomplish this task.

Alarms Menu

The alarm alerts the user if communication has been lost with the Cardinal.

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 conversion.

Help Menu

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

Introduction

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

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

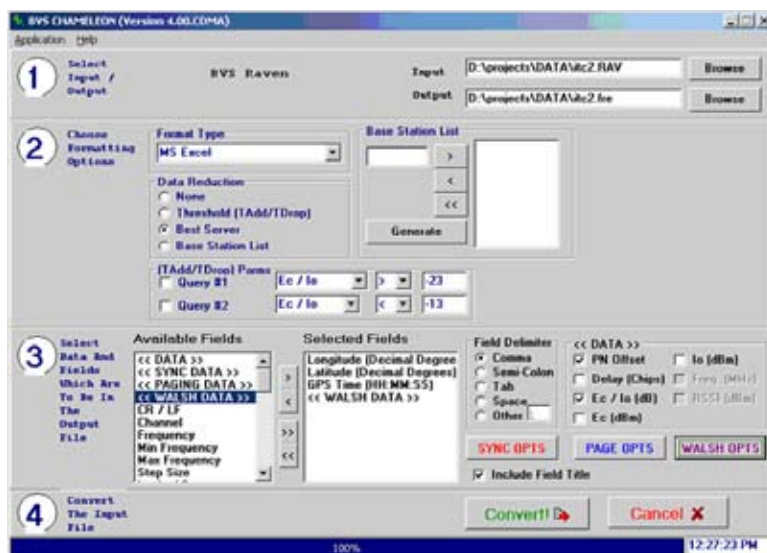


FIGURE 1 – Chameleon Main Screen

Installation

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

Running the Application

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

Main Menu

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

Step 1 – Select Input / Output

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

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

Step 2 – Choose Formatting Options

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

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

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

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

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

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

Step 3 – Select Data and Fields Which Are To Be In The Output File

Select the fields that are to be placed in the output file. The delimiting character may also be chosen. Field titles may be placed in the output file by checking the appropriate box. To include data fields as specified by the “Output Filter” page, be sure to have the “<<DATA>>” field in the selected box.

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

Step 4 – Convert The Input File

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

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

BATTERY SYSTEM

Cardinal includes the PA2488U Battery Charger provides a convenient way to charge main battery packs without requiring use of your computer. The battery charger holds up to two Lithium-Ion battery packs, which it charges one after the other in succession.

Charge time is about 2 to 3 hours per battery. The actual times may vary according to the condition of the battery and other factors such as variations in battery capacitance. For example, a battery that has not been used for a long time might take longer to charge, because batteries tend to self-discharge.

The battery charger comes with its own Universal AC Adapter. Be sure to use only this adapter with your battery charger.

CAUTION

Use of the wrong AC adapter could damage your equipment. please read this instruction manual carefully to assure proper operation and care of your battery charger and AC adapter.

PRECAUTIONS

- Use only the AC adapter that came with the Battery Charger.
- Do not leave batteries in the Battery Charger unless they are being recharged.
- Remove the battery pack from the Battery Charger when it is not connected to a power source.
- Do not attempt to charge a fully charged battery pack.
- Observe temperature and humidity specifications:
5° to 35°C (41° to 95°F), 20% to 80% humidity
- Avoid sudden or extreme temperature changes and exposure to high temperatures such as close proximity to heaters or inside cars in warm weather.
- Avoid exposure to direct sunlight, dust and moisture.
- Do not spill liquids or put metal objects in the Battery Charger's sockets.
- Do not place objects on the Battery Charger or AC adapter.
- Do not drop, bump or otherwise subject the Battery Charger or AC adapter to undue shock.
- Do not pull or twist power cables.
- Do not attempt to disassemble the Battery Charger or AC adapter.
- Use a slightly damp cloth to clean the Battery Charger and AC adapter. If extremely dirty, use a neutral detergent.

WARNING

Always disconnect the Battery Charger and AC adapter from all power sources before cleaning. Cleaning these devices while they are connected to a power source can cause electric shock.

Battery Charger Parts

The Battery Charger has sockets for two batteries. LUD indicators let you monitor the charge status of the batteries and the power status (of the battery charger).

• Battery sockets

Each of the two sockets, 1 and 2, in the Battery Charger accommodates one battery pack. Insert a battery into either socket for recharging.

• Indicator lights (for details see the Indicator Lights section) An indicator at each socket shows the status of the battery. A power indicator shows the status of input power.

- **DC IN socket**

The AC adapter plugs into this socket located at the back of the Battery Charger.

- **Safety latches**

A safety latch secures the battery pack, in place to protect it from accidental dislodging.

AC Adapter Parts

The universal AC adapter supplies 15 volt DC power to the battery charger. Since it is universal, it can receive a range of AC voltage between 100 and 240 volts.

Recharging a Battery Pack

This section describes handling precautions, powering on the charger, inserting a battery, removing a charged battery and the indicator lights.

Handling precautions

When a battery pack is installed, observe the following to prevent the battery pack from accidentally detaching or falling out of the charger.

- Make sure the battery is fully seated and secured by the safety latch.
(See Inserting the Battery Pack.)
- Before you connect the battery charger to a power source, make sure it is on a flat, level surface.
- Do not set it on an incline.
- Do not move the battery charger while it is charging a battery.
- Do not tilt or turn over the battery charger.
- Do not apply excessive pressure or impact to the battery charger.

Powering on the Battery Charger

To use the Battery Charger, you must first attach the AC adapter.

BATTERY CHARGING

1. Connect the power cord to the AC adapter.
2. Plug, the AC adapter's round connector into the DC IN socket on the back of the Battery Charger.
3. Plug, the AC adapter's power cord into a wall outlet. The power indicator should glow green.

Inserting the Battery Pack

To insert a battery pack, follow the steps below:

1. Set the terminal end of the battery pack into the connectors on the battery charger.
2. Pull back the safety latch and lay the battery pack in the charger.
3. Release the safety latch so it covers the end of the battery.

Quick charge begins when the AC adapter is connected. It takes about 2 to 3 hours to fully charge a battery pack. When the battery status indicator turns green, the battery is fully charged.

If you first connect the AC adapter to the battery charger and a power source then insert two batteries, the battery charged first.

When a battery becomes fully charged, the Battery Charger automatically begins charging the other battery. Also, when a battery is fully charged, the Battery Charger tops up the charge and begins trickle charge so the batteries will not overcharge even

if left in the Battery Charger. It is best, however, to remove batteries when they become fully charged.

Battery charging notice

The battery may not charge right away under the following conditions:

1. The battery is extremely hot or cold. To assure the battery charges to its full capacity, charge the battery at room temperature from 10° to 30°C (50°F to 86°F).
2. The battery is nearly completely discharged. Leave the AC adapter connected for a few minutes and the battery should begin charging.

Removing the Battery Pack

To remove a battery pack:

1. Pull back the safety latch.
2. Lift out the battery pack.

Indicator Lights

Battery Status Indicators

No light No battery pack is inserted.

Glows **orange** Battery pack is being quick charged.

Glows **green** Battery pack is fully charged or being trickle charged.

Blinks **orange** Battery pack is waiting for charge.

Blinks **red** Fault condition. (For example, the battery pack may be too hot or malfunctioning.)

Power Status Indicator

No light Not connected to power source.

Glows **green** Battery charger is connected to a power source and is operating normally.

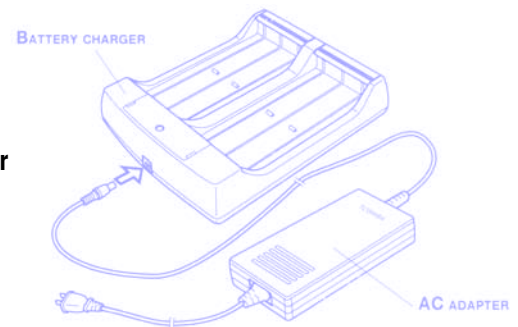
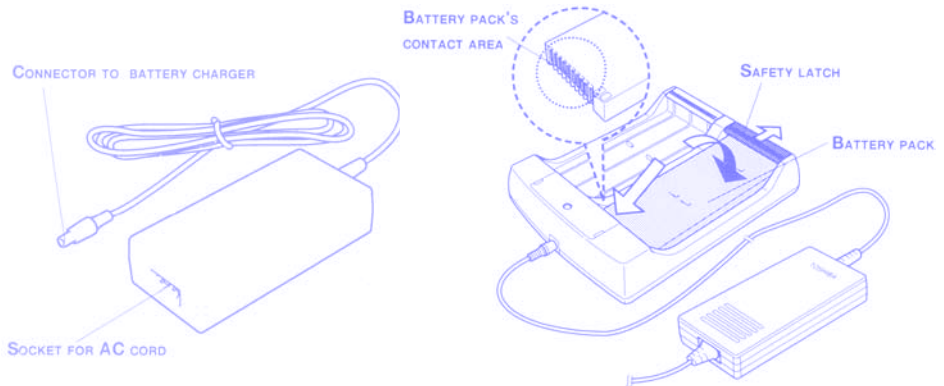
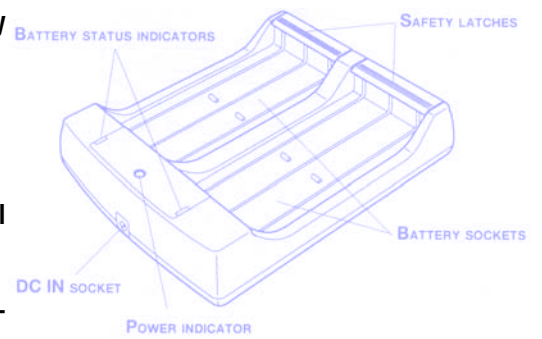
Blinks **red** Battery Charger or AC adapter is malfunctioning or the wrong AC adapter is connected.

The Power Status indicator might blink red if power to the unit is cut off and restored, for example, by a power outage. If the indicator blinks red, disconnect the AC adapter and remove the battery. Make sure the AC adapter is the correct model, then try again to charge the battery. If the indicator continues to blink red, contact your BVS.

Troubleshooting

If Your Battery Charger or AC adapter does not operate as it should, review the procedures in this manual. Then:

- Check all cable for firm connections.
- Check that the batteries are firmly seated in Battery Charger sockets.
- If a battery status light blinks red. (the battery may be malfunctioning, or hot. If you have a spare battery pack, try to charge it. If it charges properly, the problem is with the first battery pack. If the indicator continues to blink red, the problem may be with the Battery Charger. Contact your dealer.
- If the power indicator blinks red, the Battery Charger or AC adapter may be malfunctioning. Contact your dealer.



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 $f_r=860+N(0.0125)$ MHz

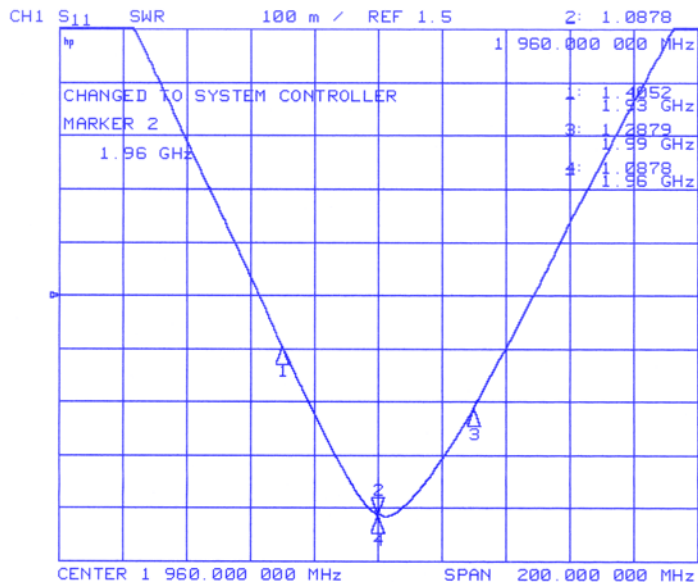
Channels 801-1039 $f_r=843+(N-800)(0.0125)$ MHz

Band B device#142

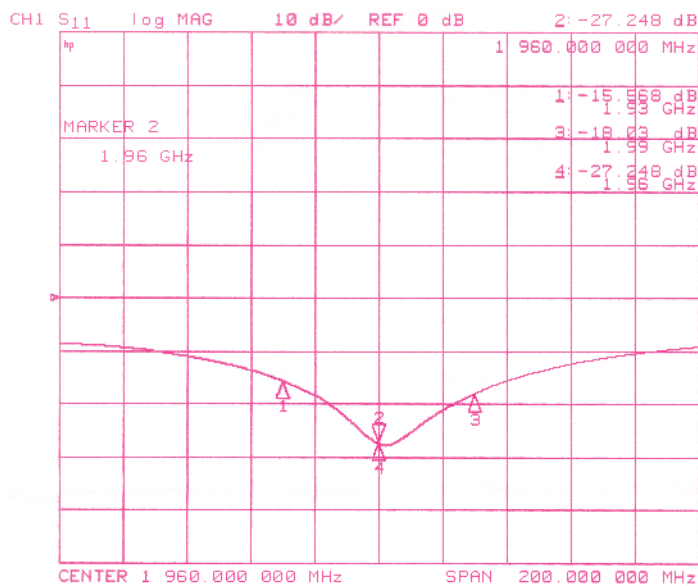
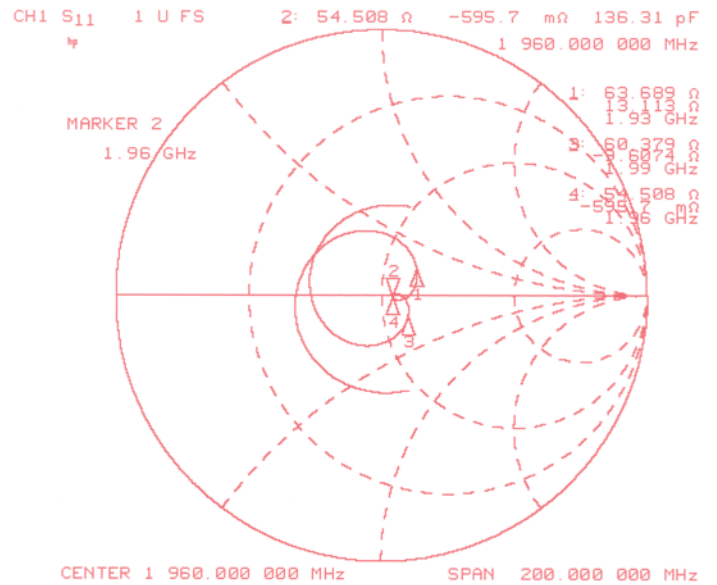
Channels 801-1039 $f_r=843+(N-800)(0.0125)$ MHz

Channels 1041-1199 $f_r=832+(N-1040)(0.0125)$ MHz

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



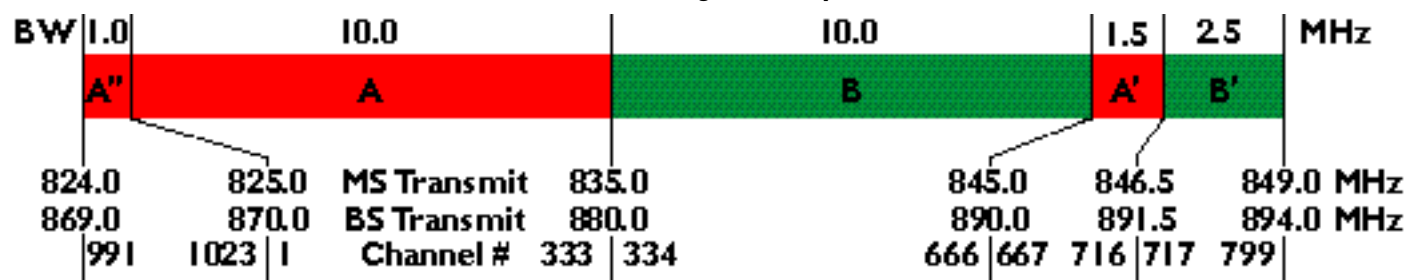
PCS SMA ANTENNA SPECIFICATIONS



Frequency Plans

Cellular (IS-95A)

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

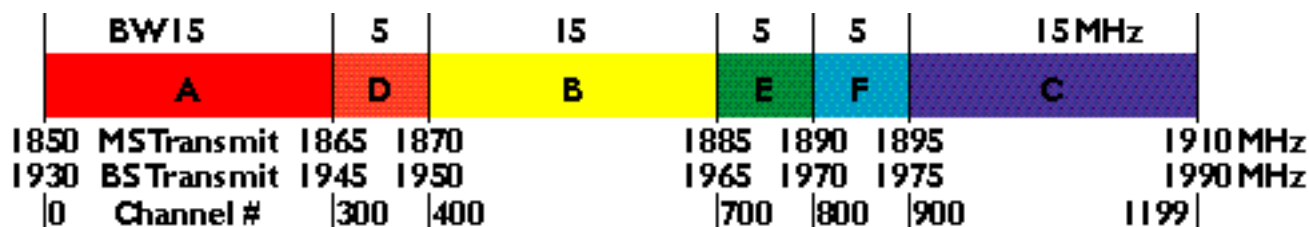


Consecutive AMPS channels are spaced by 30 kHz. CDMA stations are permitted to operate on any AMPS channel, except for guard bands at the edges of the allocations. CDMA stations, of course, would normally be assigned channel at least 1.25 MHz apart (about 42 channels). The mobile station transmit frequency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

MOBILE TRANSMIT														GUARD BAND				BASE STATION TRANSMIT FREQUENCY																																	
MTA A 15														BTA D 5				MTA B 15										BTA E 5				BTA F 5				MTA C 15															
UNLICENSED 20														MTA A 15										BTA D 5				MTA B 15										BTA E 5				BTA F 5				MTA C 15					

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.