CELL DETECTOR BLOODHOUND

Manual version 1.4

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INTRODUCTION

The Bloodhound cell phone detector unit is a multi-band receiver controlled by an on-board processor which continuously scans up-link channels for GSM, CDMA, WCDMA and PCS frequency bands.

The Bloodhound systematically covers the frequency ranges listed in Table 1:

Table 1. Frequency Bands Allocated to Cell Phone Uplink Channels

CDMA	824-849 MHz
GSM	890-915 MHz
PCS	1850-1910 MHz
WCDMA	1920-1980 MHz

The Bloodhound receiver uses a square-law detector. It can detect RF power in multiple cell phone channels simultaneously. The receiver output is proportional to the output of the detector, which is used to drive one or more of the following indicators:

1. LCD signal level indicators
2. Pulsating Laser beam (optional accessory)
3. Sound Alert (speaker or ear bud)
4. Vibrator Alert

The Bloodhound unit may be used in the hand-held mode either with an Omnidirectional antenna (see left side of Figure 1 below) for only detecting cell phone use, or with a Direction Finding (DF) antenna (see right side of Figure 1) for identifying the relative orientation (i.e. Line Of Position) of a radiating cell phone. Either antenna interfaces with the Bloodhound unit via the coaxial port located at the LCD end of the unit as seen in Figure 1 :

Figure 1. Bloodhound Hand-Held Unit used with the Omnidirectional or Direction Finding Antennas

Items Supplied

Figure 2 shows a photograph of the Bloodhound unit and its accessories as shipped:

Figure 2. Bloodhound unit and accessories

The Bloodhound package includes the following items:

Bloodhound unit
VELCRO hand strap
Ear bud
AC Charger
Bracket-mounted pulsed green Laser
Omnidirectional monopole antenna
Direction Finding (DF) Antenna assembly with Laser module
Pelican® briefcase (with secure lock and keys)

BLOODHOUND UNIT DESCRIPTION

A photograph of the Bloodhound unit appears in Figure 3. The unit has an LCD, two LED lights, three electrical interfaces (Antenna, Audio and DC Power) and a 7 button keypad:

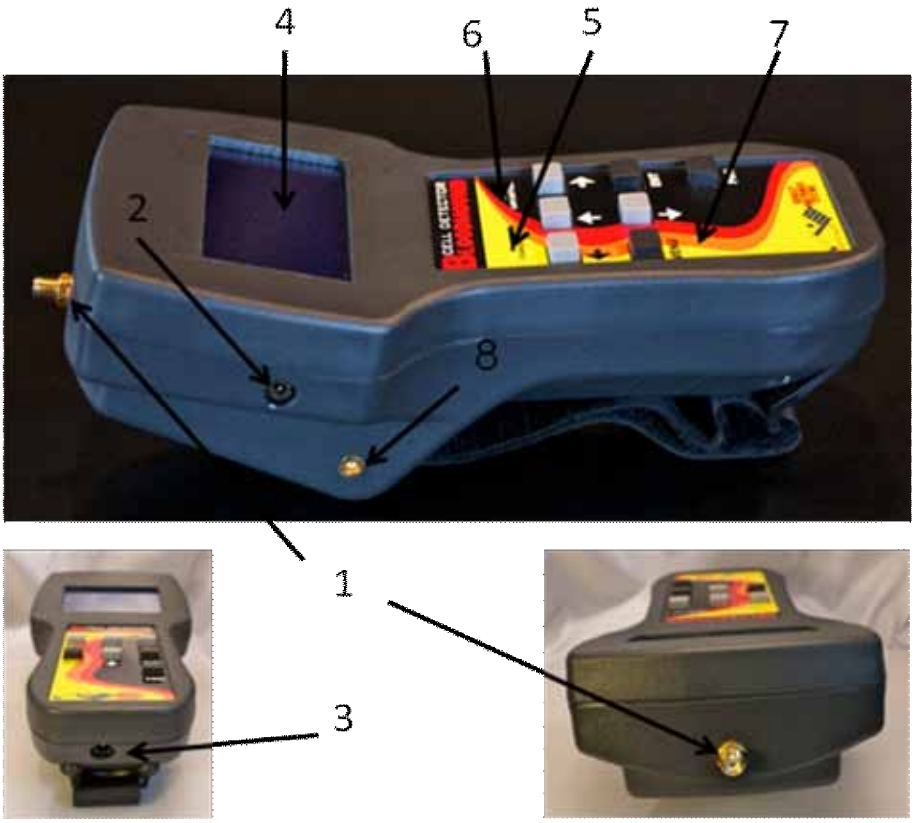

Figure 3. The Bloodhound Unit, Controls, Indicators and Interfaces

1. Antenna jack
2. Audio (ear bud) jack
3. DC Power jack
4. LCD
5. Charging LED
6. Low Battery LED
7. Keypad
8. Laser jack

Liquid Crystal Display (LCD)

The Bloodhound unit is powered by pressing the "PWR" button on the unit keypad. When the unit is powered-up, the LCD display will show the top-level monochrome screen shown in Figure 4, which will be referred to as the "Monitoring Screen" in the rest of this manual. (i.e., the Bloodhound unit icon, the graduated bar-chart and the battery status indicator on the lower right hand corner, as well as the laser, audible alert and vibrating alert icons when one or more of these are activated).

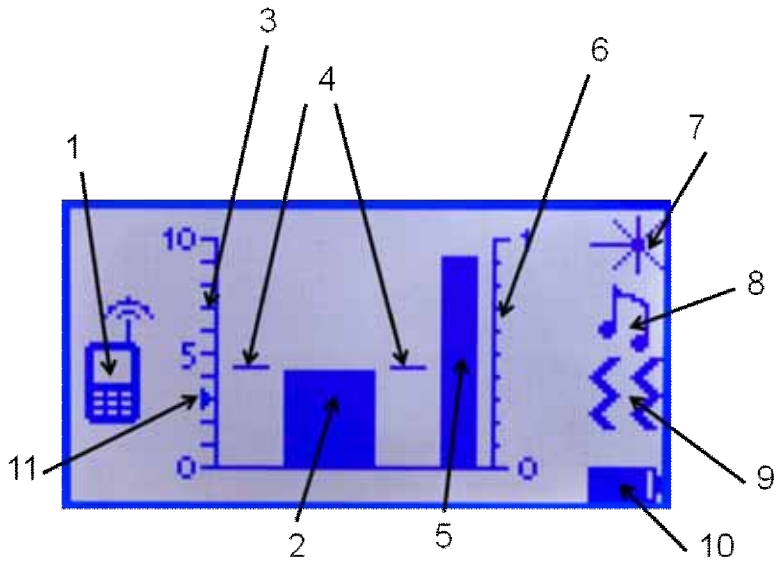

Figure 4. Bloodhound LCD Monitoring Screen fields

The following is a complete list of items that may be displayed at any time on the unit LCD display (see Figure 4):

1. Bloodhound Icon (will be displayed as long as coarse signal level exceeds pre-set value of the Threshold Level indicated by the triangular marker (11) in Figure 4)
2. Detector Output Coarse bar-chart
3. Coarse bar-chart scale (0-10)
4. Coarse Scale Maximum Hold marker (_ _)
5. Detector Output Sensitive bar-chart
6. Sensitive bar-chart scale
7. "Laser ON" indicator
8. " Sound ON" indicator
9. " Vibrator ON" indicator

10. “Battery Status” gauge

11. Marker indicating Threshold Level setting for Bloodhound Icon and Vibrator activation.

“CHARGING” LED (steady Blue)

When the Bloodhound unit is not powered by the AC Adaptor/Charger, the unit runs on an internal pair of Lithium Ion-Polymer batteries. When these batteries are in charging mode this indicator light will turn on (steady Blue). The light will go off when the unit batteries are in the fully charged state. The unit may be turned on while the batteries are being charged by the AC Adaptor/Charger.

“LOW BATTERY” LED (blinking Red)

When the AC adaptor/charger is connected to the unit or the batteries are charged this light will be out. This LED indicator will turn on (blinking Red) and stay so when the charge held by the unit batteries has fallen below a pre-determined fraction of full capacity but not fully discharged. If the unit is used beyond this point without charging, the unit LCD will display the warning message: “**Battery Critically Low Shutting Down**” and the unit will turn itself off. After the AC Adaptor/Charger output is connected to the unit, the LOW BATTERY LED will turn off (and the steady blue CHARGING LED will turn on). While the batteries are being charged, their status will be indicated by the Battery Status gauge (variable between empty and full) located at the lower right corner of the LCD Monitoring window (see arrow (10) in Figure 4).

Battery Charger/AC Power Adaptor

When the unit batteries need to be charged, or the user wants to keep batteries charged while using the unit, the AC Adaptor/Charger needs to be deployed.

SETUP

Setup of the unit involves the following sequence of steps:

1. Attaching one of the provided antennas to the unit as applicable.
2. powering up the unit by pressing the **PWR** key on the keyboard [1]
3. activating accessories and adjusting contrast and volume as indicated below

Antenna Connection

The antenna port (SMA-jack connector) is located just below the LCD when the unit is held in the normal orientation (arrow (1) in Figure 3). Either one of the two antennas (Omnidirectional or Direction Finding) will interface with this connector, as follows:

[1] Powering the unit before connecting the antenna should be avoided.

Attachment of Omnidirectional Antenna

Simply screw the antenna connector at the base of the antenna to the antenna jack on the unit (see left side of Figure 1).

Attachment of Direction Finding (DF) Antenna

Attaching the DF antenna to the unit is done in three steps, as follows:

1) attach bracket to the DF antenna flange using the two thumb screws with plastic heads

2) attach the DF antenna assembly RF and Laser connectors to the Antenna[2] and Laser jacks respectively (see Figure 5, left and right sides)

3) secure the Bloodhound unit to the DF antenna assembly bracket (see Figure 6) by tightening the thumb screw on bracket (finger-tight only).

Figure 5. Attaching DF Antenna Assembly Connectors to Antenna and Laser jacks on unit ("finger-tight" only)

Figure 6. Securing DF Antenna Assembly Bracket to Unit with Thumb-Screw

[2] Use of wrench to tighten antenna connector may damage unit. Finger-tight only -- DO NOT use a wrench.

CAUTION:
Application of stress to the DF Antenna should be avoided to preclude permanent damage to Unit and/or the DF Antenna assembly.

Activating Accessories

Press the "MENU" button on keyboard to obtain

the Settings menu (see Figure 7):

Figure 7. Bloodhound Settings menu

The Laser the Sound , and the Vibrator are turned ON (or OFF) by scrolling the cursor to the desired item (using "**_(up arrow)" or "_(down arrow)**" buttons) then pressing the "ENT" button., these accessories will behave as follows:

Laser:

In the ON state the pulsating green Laser duty cycle increases with detected signal level

Sound:

In the ON state beeping rate increases with detected signal level

Vibrator:

In the ON state, the Vibrator will activate if the detected signal level exceeds the pre-set Threshold Level (see "Threshold" below)

Threshold:

When the cursor is on "Threshold" (see Figure 7 above), pressing "ENT" repeatedly will display "1" through "9" to allow the user select the desired threshold level on the Coarse Scale. The selected threshold level will become effective when the user returns to the Monitoring screen by pressing "MENU". The effective Threshold level will be indicated by a triangular marker on the Coarse Scale in the Monitoring Screen (see (11) in Figure 4 above).Thus, if the Threshold level is set to "3", the Vibrator and Bloodhound icon will not activate unless the detected signal level reads "3" or more on the Coarse Scale, as seen in Figure 4 above.

Setting Contrast or Volume

To adjust Contrast, press “ENT” while the cursor is on “Set Contrast” to enter the screen in Figure 8:

Figure 8. Adjust Contrast screen

The Contrast is adjusted by repeated strokes on the “**_(up arrow)” or “_(down arrow)**” buttons as needed.

Volume is adjusted by pressing the “ENT” button while the cursor is on “Set Volume”, to enter the screen in Figure 9:

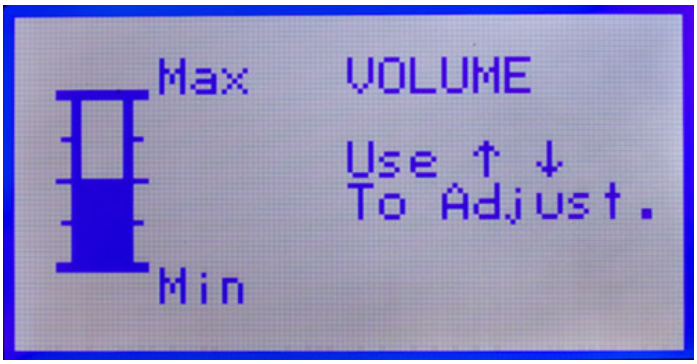

Figure 9. Adjust Volume screen

Adjust Volume by stroking on the “**_(up arrow)” or “_(down arrow)**” buttons as needed.

OPERATION & USE

Depending on the desired mode of use (i.e., detection or location of cell phone(s)) one of the antennas shipped with the unit has to be connected to the antenna jack (see (1) in Figure 3 above) before powering unit up. Powering up the unit without an antenna should be avoided.

Keypad

Figure 10 shows the Bloodhound unit keypad;

Figure 10. Bloodhound Keypad

The function(s) associated with each of the keys are as follows:

PWR

The Bloodhound unit is turned on/off by pressing the "PWR" switch (see Figure 1) located on the lower right hand side of the unit keyboard. After pressing this button, the BVS logo and the version of the unit firmware will be displayed in the LCD while the unit is starting (see Figure 11):

Figure 11. Bloodhound LCD Starting Window

The unit firmware information (consisting of version "v 1.13" followed by "USA" or "EU") is displayed on the lower left corner of the Starting Window.

MENU
Pressing this button repeatedly will alternate the unit LCD between the "Monitoring" screen and the "Settings" screen.

_ (up arrow)
When in the Bloodhound Settings screen, pressing this button will Scroll the cursor up to make a selection for unit setup.

_ (down arrow)
When the LCD is displaying the Monitoring screen, pressing this button resets the Coarse Scale Maximum Hold marker (see arrow (4) in Figure 4) register to "zero" on the Coarse Scale (see arrow (3) in Figure 4). Pressing the "**_(down arrow**)" button will also make the Sensitive bar-chart read maximum for as long as the detector output stays at the same level. If the detector output decreases from the last Maximum Hold register value by more than 1/10 of the Coarse Scale, the Sensitive bar-chart will read "zero" (i.e., disappear). The Coarse Scale Maximum Hold marker register may be re-set to zero at any time, from the LCD Monitoring screen.

When the LCD is displaying the Bloodhound Settings screen, pressing this button "**_(down arrow**)" will Scroll the cursor down to make a selection for unit setup.

ENT
When in the Bloodhound Settings screen, pressing this button will enable (ON) or disable (OFF) any one of the first three selections (i.e., Laser or Sound, or Vibrator). Pressing this button when the cursor is on "**Set Contrast**"will invoke the menu screen to allow the user to adjust contrast using "**_ (up arrow)"** and **"_(down arrow)"** key strokes (continuous pressing will not change contrast).

_ (left arrow)
Not Used

_ (right arrow)
Not used

Antennas

The Bloodhound unit comes with the Omnidirectiomal antenna and the Direction Finding (DF) antenna assembly with integral bubble level and pulsed green Laser.

The Omnidirectional antenna is a monopole (quarter-wave) antenna for multiple bands. When it is oriented vertically (i.e., tip of monopole pointing straight up) the Omnidirectional antenna will detect signals with uniform sensitivity around 360 degrees in the horizontal plane. Since this antenna will detect RF signals incident from any direction in the horizontal plane with uniform sensitivity, the user cannot distinguish the azimouth angle of the RF source.

The Direction Finding antenna is also for multi-band use and it will help identify the relative orientation of cell phones transmitting RF waves. The DF antenna output will be maximum when the imaginary line connecting the antenna to the source is approximately perpendicular to the plane defined by the flat

face of the DF antenna panel. Sources falling to the rear of the plane of the DF antenna panel will produce diminished antenna output. To help the user maintain proper orientation of the DF antenna, a bubble level indicator (located at the top edge of DF antenna panel) and a pulsed green Laser (located at the lower edge of the DF antenna panel) are integrated into the DF antenna assembly. The duty cycle of the pulsed Laser will increase when the detected signal level increases.

General Guidelines for Bloodhound Use

The Bloodhound unit should be kept at about waist to head height from the floor, and away from walls and obstructions for proper performance. For the same reason, keep the Bloodhound unit at least one foot (but preferably more) away from large metal obstructions or surfaces (i.e., reflecting metal walls, heavy steel structural elements, metal-wire screens, etc.). The unit should not be used while its antenna (either kind) is contained by bags or enclosures made of metal, carbon or other RF energy absorbing or shielding materials; doing so will seriously degrade its performance.

Monitoring Cell Phone Use in Real-Time

For real-time monitoring of cell phone use, observe the Coarse and Sensitive bar charts in the LCD Monitoring screen (see arrows (2), (5) in Figure 4).

Monitoring Coarse Scale Maximum Hold

The Coarse Scale Maximum Hold marker (see arrows (4) in Figure 4) represents the maximum observed level of the detector output signal since the last re-set of the Coarse Scale Maximum Hold marker register. The Coarse Scale Maximum Hold register can be re-set to zero at any time while in the LCD Monitoring screen, by pressing the "**_(down arrow)"** button.

Using Bloodhound Unit with the Omnidirectional Antenna

To detect and monitor the existence of powered-on cell phones in a confined space, place the Bloodhound unit at about waist to head height from the floor, away from walls and obstructions. For best performance, the Omnidirectional antenna should be oriented vertical with respect to the floor.

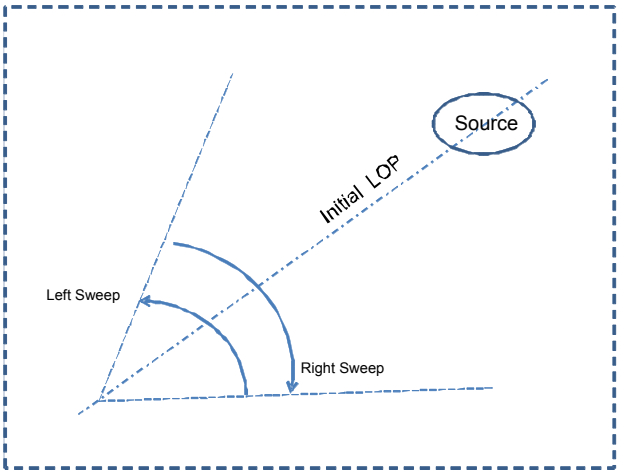

Figure 12. LOP Continually Re-Confirmed About Initial Orientation

Using the Bloodhound Unit with the Direction Finding (DF) Antenna

After an initial Line Of Position (LOP) is established by a 360 degree sweep, the user re-confirms the LOP orientation by sweeping the Bloodhound/DF unit back and forth about the initial LOP (see Figure 12), while observing the receiver output on the Sensitive Scale (see arrows (5) and (6) in Figure 4). Once the initial LOP is determined, sources can quickly be located by using one of the following two useful techniques:

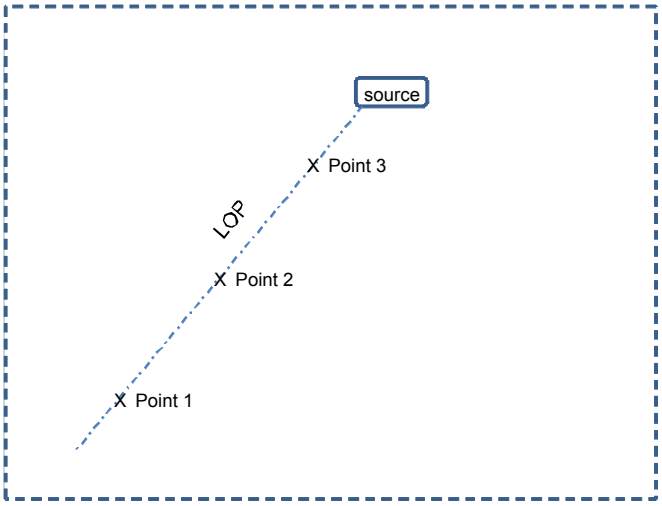

Figure 13. Method 1: Pursuing Source Along the Same LOP

Method 1: Maximizing Signal Along the Same LOP

This method is based on approaching the source along the same LOP (see Figure 13) to maximize receiver output. For Method 1 use the following sequence:

1. Level the DF antenna by observing the air bubble on the integral level indicator at the top of the DF antenna (or point the flat surface of the DF antenna to the potential source).

2. Keeping it level (or at the angle of the potential source), scan the DF antenna azimouthally, from side to side within an arc of about 90 degrees (i.e., 45 degrees to right, then 45 degrees to left, and repeat …) to determine relative direction for maximum detector output on the Sensitive bar-chart (see arrows (5) and (6) in Figure 4).

3. While the DF antenna is pointing at the potential source, re-set the Coarse Scale Maximum Hold marker register by pressing the "**_(down arrow)"** button. This will make the Sensitive bar-chart read maximum level (i.e. 1 on the Sensitive Scale") to help the user make small adjustments to his/her intermediate heading to "lock-in" on the actual orientation of the source.

4. Walking slowly in the same heading, scan the unit again for maximum signal in the same manner, while the signal level increases.

5. Keep walking in the same direction and repeat Steps 3 and 4 for increased signal till the source is found.

Method 2: "Triangulate" with Two (or more) LOPs

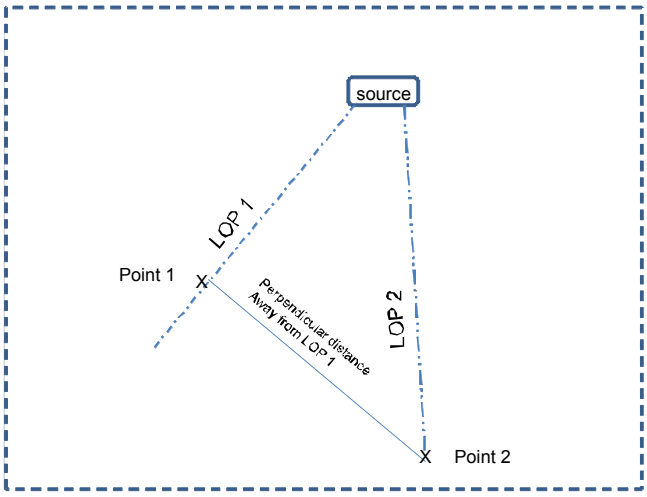

Figure 14. "Triangulating" the Source on Two LOPs

This method helps the user rapidly "triangulate" the approximate location of source by determining two (or more) LOPs of the source from two (or more) positions on the floor (see Figure 14). Once the approximate location is known, Method 1 can be used to "zoom-in" on the source, by maximizing receiver signal level. The following sequence is used:

1. Choose Point 1 and determine LOP1
2. Move away from LOP 1 in the perpendicular direction to Point 2 without getting too close to obstructions and/or walls. At Point 2 determine LOP2.
3. Mentally determine approximate area of intersection for LOP1 and LOP2 within the space monitored.
4. Move to point of intersection (of LOP1 and LOP2) and use Method 1 to zoom-in on the source, if necessary.

MAINTENANCE and TROUBLESHOOTING

Charging Batteries

The unit batteries are charged by attaching the AC Adaptor/Charger output plug to the DC in jack on the unit. Starting with fully depleted batteries (i.e., after the unit has turned itself off), the Battery Status gauge in the Monitoring screen will show "full" in about 3.5 hours using the AC Adaptor/Charger. After this point, it will take about an hour more for the CHARGING LED indicator (steady Blue) to go out completely; indicating batteries are charged 100%. A partially discharged unit (i.e., before the LOW BATTERY (blinking Red) LED comes on) can be returned to fully charged state at most within an hour.