Wolfhound-Ultra

User Manual Version 1.5



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The Story of Cellular Standards

The story of mobile standards is really the story of how our airwaves became more efficient, global, and data-centric with every generation. Berkeley Varitronics Systems, Inc. was there from the start developing the early AMPS test transmitters, receivers, and propagation analysis used by the wireless carriers to determine where to place the cell towers. We have continued to pioneer test tools from the 1980's (AMPS) to more advanced tools such as the Wolfhound-Ultra that scans and detects multiple bands. Below is a brief overview to help provide you as the user with a basic understanding of how things have changed over the decades to where we are today.

AMPS (1G, 1980s):
It began with the **Advanced Mobile Phone System**, an analog voice network using **800 MHz** bands (824–894 MHz in the U.S.). Each call occupied a single frequency channel—simple, but wildly inefficient. Every nation had its own flavor; roaming was virtually impossible.

2G (1990s):
Digital arrived with **GSM** (Europe) and **CDMA** (U.S.), turning voices into bits. GSM used **900 MHz** and **1800 MHz**internationally; the U.S. added **850 MHz** and **1900 MHz** PCS. This era introduced **SIM cards**, **text messaging**, and—crucially—**interoperability** across borders for GSM users. CDMA was technically elegant but regionally isolated, an early warning of what happens when standards diverge.

3G (2000s):
Data crept in. Two branches evolved: **W-CDMA/UMTS** (for GSM carriers) and **CDMA2000** (for Verizon, Sprint). Bands expanded into **850 MHz**, **1900 MHz**, and **2100 MHz**, with fragments across regions. 3G unified much of the world under the **IMT-2000** umbrella, but it still carried national quirks. Download speeds hit single-digit megabits per second—a revolution at the time.

4G (2010s):
Finally, **LTE** changed everything. It abandoned circuit-switched voice, running all traffic as IP data. LTE harmonized previously fractured ecosystems, operating across nearly every band from **600 MHz** (low-band) to **2.6 GHz** (mid-band). For the first time, U.S. and international carriers could deploy the *same* core technology—only frequencies varied. LTE became the first truly **global mobile broadband standard**.

5G (2020s):
The newest generation is layered. The **non-mmWave (sub-6 GHz)** version—using **600 MHz**, **2.5 GHz**, **3.5 GHz**, and **C-band (3.7–3.98 GHz)** in the U.S., and **3.3–3.8 GHz** globally—continues LTE's legacy, providing faster, lower-latency connections on existing towers. The **mmWave** variant (24–40 GHz) offers gigabit speeds but limited range.

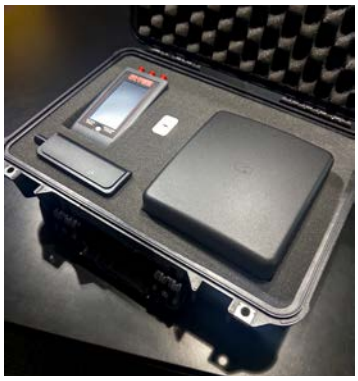
Crucially, 5G's architecture merges local and international planning into a common **3GPP standard**, allowing devices to roam seamlessly between countries and generations.

In short:

- **1G–3G:** fragmented, regional, and voice-centric.
- **4G:** unified, data-driven, and global.
- **5G (sub-6 GHz):** evolutionary, expanding on 4G's universality while preparing the spectrum for what's next.

The airwaves today are less about borders and more about bandwidth—each generation compressing more communication into the same invisible fabric that began with a handful of analog channels in the 1980s.

Introduction



Wolfhound-Ultra tactical signal detection system includes the following:
Wolfhound-Ultra receiver unit
Rugged transport case
(1) Wideband direction finding antenna
(2) Wideband omni-directional antennas
(1) GPS external mag mount antenna
(1) Power adapter
(1) USB-C charging/data cable

Unboxing



Unpack and completely charge up your Wolfhound-Ultra using the supplied power transformer and cable. Check with BVS support to make sure you have the latest firmware and updating instructions. Be sure to only use the provided multiband antennas authorized by BVS and be sure they are connected to the proper connection ports at the top of the unit (see unit info for more information). This will ensure that your unit properly scans all bands, carriers and frequencies at maximum sensitivity. Wolfhound-Ultra ships standard with Pelican® 1500 case that weighs 12 pounds and ships in a 20” x 15” x 7” packing box.

Powering Up/Down Your Unit

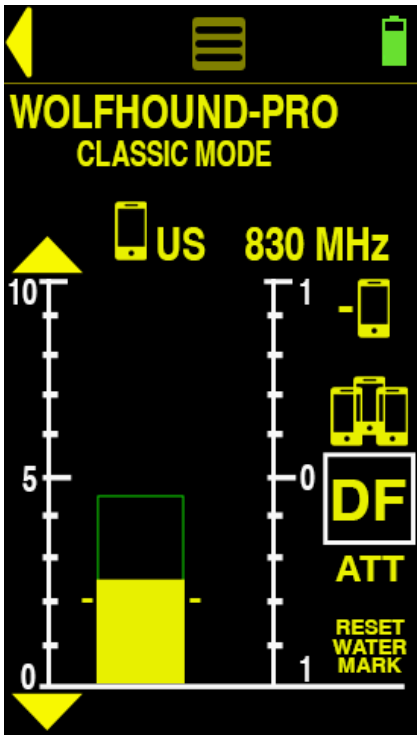
Power up Wolfhound-Ultra by pressing the white button below the touchscreen. This same button is the only physical button on the unit and also powers down the unit by holding it in for a few seconds. Before powering up, connect the antenna.



STARTUP SCREEN

Powering up Wolfhound-Ultra reveals the main selector screen. From this screen, users can access all the primary sub-screens and features. However, some of these screens and features are not functional without a firmware upgrade which includes search and rescue, RF jammer and GPS and satellite tracker detector features. Contact sales@bvsystems.com or call +1 732-548-3737 to get more information on purchasing this upgrade.

The primary cellular detection and direction finding features are all included with the unit and do not require any special firmware upgrades.





WOLFHOUND CLASSIC

This screen features all the basic functions of cell phone detection and direction finding. It looks different from other screens because it was designed to resemble the look and functionality of the original Wolfhound-Pro for the many existing users. Unlike the original Wolfhound-Pro, this screen supports touch-sensitivity so some things have changed.

The yellow vertical measurement bars raise with higher signal strength detected and lower with less signal strength detected. This measurement only displays the strongest signal detected from a given phone. That means it can dynamically change to detect a different phone or device if that new signal is higher in than the one it was previously detecting. This can be useful for surveying facilities with many active devices.

However, in facilities and areas where cellphones are unauthorized or illegal to use, users might want to select the 'see all phones' mode which only shows the highest signal detected at the time.



Back Arrow – Touch this icon on any screen to return to the previous screen



Main Menu – Select this to navigate to settings menu where users can adjust measurement, display and alert features



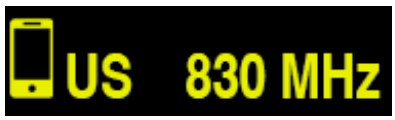
Battery – Provides current battery level of unit. The Battery Status screen provides more details.



Adjust Threshold Up – Press this up arrow to increase the threshold. Increasing threshold will trigger less cell phone detection alerts.

Signal Strength Scale – This scale runs from 0 to 10. The scale does not indicate true RSSI in dBm. It is only a visual reference for general signal strength.

Adjust Threshold Down – Press this down arrow to decrease the threshold. Decreasing threshold will trigger more cell phone detection alerts.



Cellular Identifier – The cellphone icon appears each time the signal strength threshold is broken. Next to that is the country or region of the base station. Next to that is the frequency that the downlink or uplink signal being measured.



Remove Strongest Signal – Select this to remove strongest signal from all detected phones and display the next strongest measured device.



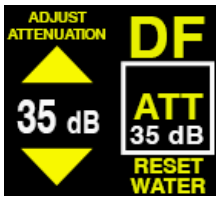
See All Phones – Select this to "see" all nearby cellphones detected. This mode will only display the strongest measurement which means it might not always show the same device or frequency detected as it the only displays the strongest measured device at the moment.



Direction Finding – Select this to enter DF or Direction Finding mode.



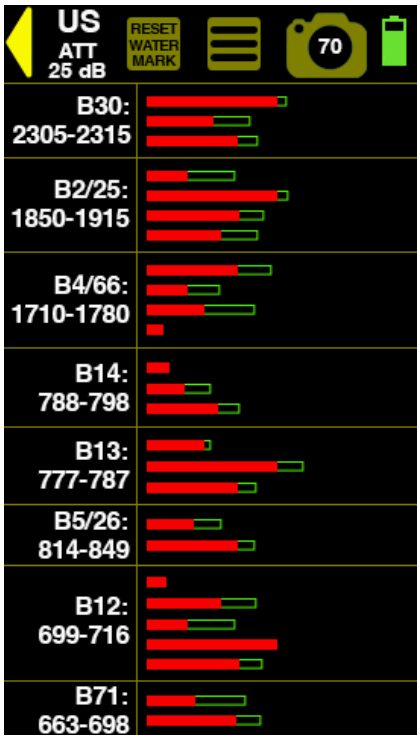
Direction Finding Scale – This scale runs from 1 to 0 to 1. The scale does not indicate true RSSI in dBm. It is only a 'zoomed in' visual reference for the direction finding measurement since small changes in signal strength occurs as the user moves and turns when in DF mode.



Attenuation – Select this button to adjust the attenuation of the receiver. The 1 dB adjustments can be made by pressing the up or down arrows that appears when the ATT button is touched. This attenuates the signal coming into the receiver in order to keep overly strong signals from overwhelming the visual status of the measurement bars.



Reset Water Mark – This button resets the watermark which appears as a thin green outline above the regular signal strength measurement bar. This is useful for resetting measurements after a longer periods of time has elapsed.





MULTIPLE DEVICE DETECTION

Choose this button if you want to see every device detected across multiple frequencies and nearby base stations within one country or region. This screen displays signal measurement bars broken down by their cellular bands and corresponding frequencies. The thin green lines protruding to the right of the red signal bars are watermarks indicating the highest measurement detected.

You can select each band of interest by touching the area it appears in order to perform a deeper survey focused on only a few devices instead of the complete overview that this screen shows.



This area shows the region or country being surveyed. Under that is the current attenuation setting that can be changed in the Wolfhound Classic measurement screen.



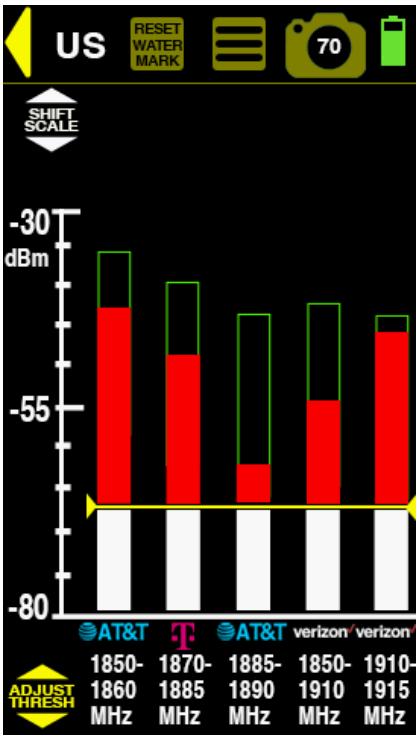
Reset Watermark – Touch this button to reset all watermarks (thin green rectangles to the right of the red bars showing strongest signal detected) on this screen.



Data Snapshot – Touch this button to record a data snapshot of the current screen. This data can be exported into any PC spreadsheet for further analysis.



Each one of these blocks shows all cellular measurements associated with each band and frequency. Touch each block to view only those measurements in a new screen for more detail.



SINGLE BAND MEASUREMENT

This measurement screen shows all signals contained in a specific wireless cellular band and corresponding frequencies. To step back for a complete wireless overview, touch the back arrow in the upper left corner of the screen.

Threshold, dBm scale and display rates are all adjustable in this screen as well as features found in other screens such as data snapshots, resetting of watermarks and menu settings navigation.

This screen also displays the associated carrier with each cellular signal which can be helpful for engineers surveying for specific carriers.

Touching as specific signal strength bar will takes users to the direction finding measurement screen.



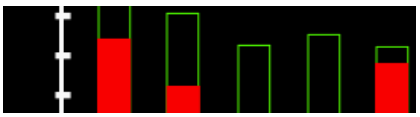
Shift Scale - Touching the up arrow shifts the scale higher and touching the down arrow lowers the scale. The highest scale runs between -50 to -100 dBm and the lowest (shown) runs between -30 to -80 dBm.



Adjust Threshold - Touching the up arrow raises the yellow, horizontal threshold bar up and touching the down arrow lowers the threshold bar. Raising the threshold bar will trigger less measurement alerts while lowering threshold will increase alerts.



Touching this button resets the thin, green watermark lines that are currently displayed.

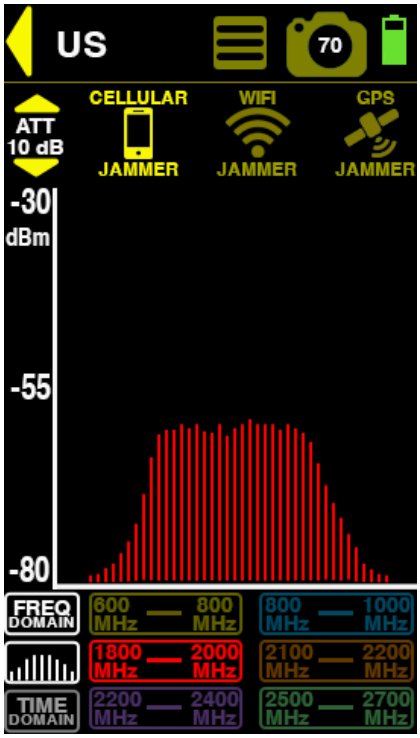




Main Menu – Select this to navigate to settings menu where users can adjust measurement, display and alert features.



Data Snapshot – Touch this button to record a data snapshot of the current screen. This data can be exported into any PC spreadsheet for further analysis.



JAMMER DETECTION

This measurement screen allows users to scan for nearby RF jammers. Users searching for specific jammers can choose between cellular, Wi-Fi and GPS jamming.

Threshold, dBm scale and display rates are all adjustable in this screen as well as features found in other screens such as data snapshots and menu settings navigation.

This screen currently shows frequency domain (signal strength pertaining to frequency) and allows users to view RF jamming activity in both frequency and time domain in order to better determine if the signal is an RF jammer or just some RF interference.



Attenuation - Touching the up arrow shifts the attenuation higher and touching the down arrow lowers the attenuation. The two attenuation settings currently available are 10 dB and 20 dB.



Frequency Domain – Touch this button to view frequency domain.



When this button is lit, the signal strength is being shown as vertical lines rather than plotted dots.



Time Domain – Touch this button to view measurements based upon passage of time.



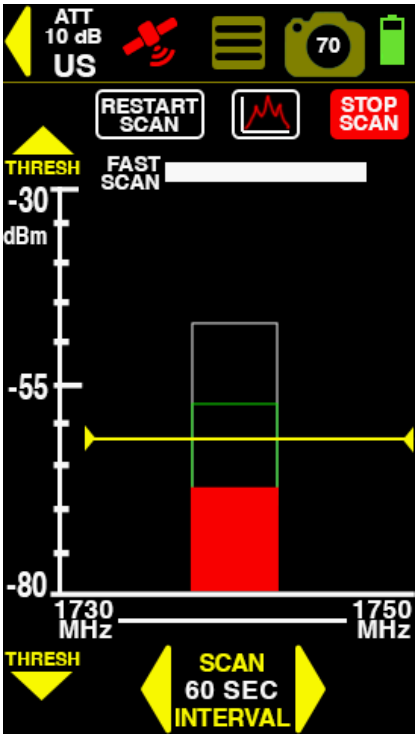
Cellular Jammer – Select this to view 6 color-coded, selectable cellular bands including 600-800 MHz, 800-1000 MHz, 1800-2000 MHz, 2100-2200 MHz, 2200-2400 MHz, 2500-2700 MHz.



WiFi Jammer – Select this to view 2 color-coded, selectable Wi-Fi bands including 2.4000-2.4835 GHz and 5.150-5.825 GHz.



GPS Jammer – Select this to view 3 color-coded, selectable GPS bands including 1567.6-1583.2 MHz L1, 1220.0-1233.2 MHz L2, 1170.2-1182.8 MHz L5.



GPS TRACKER DETECTION (frequency domain)

This frequency domain measurement screen allows users to scan for nearby GPS trackers. This is accomplished by first fast scanning many frequencies. After that, a slow scan automatically begins. If no threshold is broken or suspicious watermarks appear in an area, users can touch the time domain button near the center to enter the time domain screen.

Threshold, dBm scale and display rates are all adjustable in this screen as well as features found in other screens such as data snapshots and menu settings navigation.

This screen allows users to scan frequency intervals (user selectable) in both fast and slow scan times. Before starting any of these scans, set threshold above the RF noise floor and be sure that vehicle in question is in motion (to trigger the GPS tracker to start transmitting) and that all nearby cellular devices are off. Taking the vehicle in question to an isolated area where no cellular devices are in use will avoid false positives and save time.



Threshold Up - Touching the up arrow shifts the threshold up the scale. Raising the threshold up will cause less alerts.



Threshold Down - Touching the down arrow shifts the threshold down the scale. Lowering the threshold down will cause more alerts.



Scan Interval – Touch left or right arrows to toggle between scan intervals including 10 seconds, 60 seconds, 2 minutes, 5 minutes and 30 minutes. This wide variety of time intervals is due to the many different GPS tracker models and user settings accounting for this variety.



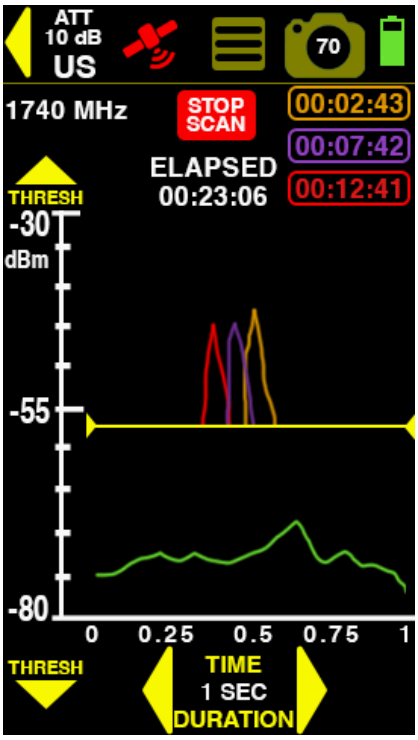
Restart Scan – This restarts the scanning in case users are not ready to scan effectively.



Time Domain – Touch this button to view measurements on a new screen based upon passage of time.



Stop Scan – Select this button to stop all scanning on this screen.



GPS TRACKER DETECTION (time domain)

This time domain measurement screen allows users to scan for nearby GPS trackers. This is accomplished by first fast and slow scanning many frequencies (previous screen). If there is no clear indication of a GPS tracker, the user can then go to this time domain screen.

Threshold, dBm scale and display rates are all adjustable in this screen as well as features found in other screens such as data snapshots and menu settings navigation.

This screen allows users to scan by time and to set frequency intervals to better display signal peaks that have broken the threshold. Due to the variances between GPS tracker models, each scan can last over 30 minutes. Once a threshold is broken, a new color-coded scan begins until that threshold is broken. When all 3 scans are completed, the user should see an alignment in elapsed timing and waveform shape that correlates to a nearby GPS tracker transmission.

Before starting any of these scans, set threshold above the RF noise floor (green line) and be sure that vehicle in question is in motion (to trigger the GPS tracker to start transmitting) and that all nearby cellular devices are off. Taking the vehicle in question to an isolated area where no cellular devices are in use will avoid false positives and save time.



Threshold Up - Touching the up arrow shifts the threshold up the scale. Raising the threshold up will cause less alerts.



Threshold Down - Touching the down arrow shifts the threshold down the scale. Lowering the threshold down will cause more alerts.



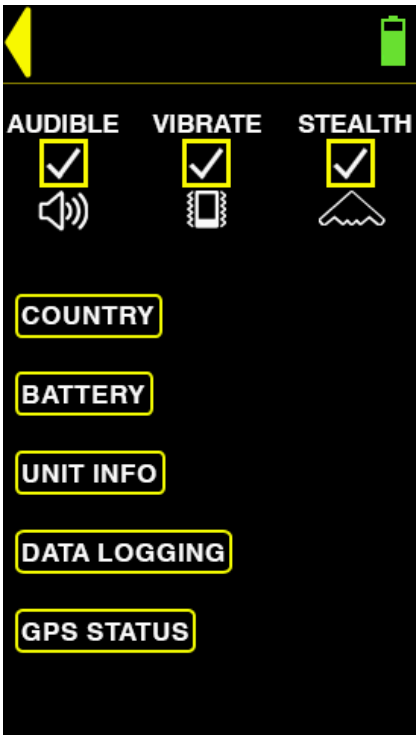
Elapsed Timers – These color-coded timers all begin at 0 and count down in seconds until the threshold is broken. First the orange, then the purple and finally the red timer. Once the final threshold has been broken and the red timer has finished, that user should see a pattern in both time and signal strength among the 3 captured scans.



Stop Scan – Select this button to stop all scanning on this screen.



Time Duration – Touch left or right arrows to toggle between time durations displayed on the X axis including 1 second, 2 seconds and 5 seconds. These durations allow users to effectively "zoom" in closer to inspect signal strength peaks for similarities that would only appear in a GPS tracker emitting cellular signals at regular intervals.





SETTINGS MENU

This screen allows users to customize their alerts, country or region and view battery, unit information, GPS status and access data logging for export to PC.



Check this box to hear audible beeps and tone alerts when measurements break user-selectable thresholds.



Check this box to allow the unit to vibrate when measurements break user-selectable thresholds.



Check this box to put the unit into stealth mode. Stealth mode keeps the screen dark and mutes all audio so that surveys can be made without alerting anyone to the act. This is especially useful in scenarios involving correctional facilities and impromptu wireless surveys in facilities where cell phones are unauthorized or illegal.





COUNTRY SELECTION

Users can choose their country or region of operation in order to properly label nearby cellular bands and corresponding frequencies. This is especially useful when performing surveys adjacent to borders of any country. Contact support@bvsystems.com if you do not see your country listed here.

Touch the country you are currently located in before you begin measurements. Press the small info button to the right of each country to view the specific frequencies and bands covered under each country.

These are the countries covered and their country codes:

United States - US
US-iDEN – US IDEN
Canada - CA
Philippines - PH
Europe - EU
Australia - AU
New Zealand - NZ
Israel - IL
Sweden - SE
Brazil - BR
Japan - JP
South Korea - KR
Chili - CL
Trinidad - TT
Pakistan - PK
Thailand – TH
Italy - IT

US BANDS TUNED

BAND	FREQUENCY
B71 / B12	663-716 / 699-716 MHz
B13 / B14	777-787 / 788-798 MHz
B26/5	814-849 MHz
B4 / B66	1710-1780 MHz
B25	1850-1915 MHz
B30	2305-2315 MHz

US IDEN

BAND	FREQUENCY
B12	699-716 MHz
B13/14	776-798 MHz

CA BANDS TUNED

BAND	FREQUENCY
B12 / B8	698-716 / 896-901 MHz
B13	777-787 MHz
B5	824-849 MHz
B4 / B66	1710-1780 MHz
B2	1850-1910 MHz
B7	2500-2570 MHz

PH BANDS TUNED

BAND	FREQUENCY
B28	703-748 MHz
B5	824-849 MHz
B8	890-915 MHz
B3	1710-1785 MHz
B1	1920-1980 MHz
B7	2500-2570 MHz

EU BANDS TUNED

BAND	FREQUENCY
B28	703-733 MHz
B20	832-862 MHz
B8	880-915 MHz
B3	1710-1785 MHz
B1	1920-1980 MHz
B7	2500-2570 MHz

AU BANDS TUNED

BAND	FREQUENCY
B28	703-748 MHz
B5	824-849 MHz
B8	890-915 MHz
B3	1710-1785 MHz
B1	1920-1980 MHz
B7	2500-2570 MHz

NZ BANDS TUNED

BAND	FREQUENCY
B28	703-748 MHz
B5	825-840 MHz
B8	890-915 MHz
B4	1710-1735 MHz
B1	1920-1980 MHz

IL BANDS TUNED

BAND	FREQUENCY
B27	811-820 MHz
B5	825-845 MHz
B8	903-915 MHz
B4	1710-1740 MHz
B1	1930-1980 MHz

SE BANDS TUNED

BAND	FREQUENCY
B20	832-862 MHz
B8	880-915 MHz
B66	1710-1780 MHz
B1	1920-1980 MHz
B7	2500-2570 MHz

BR BANDS TUNED

BAND	FREQUENCY
B27 / B5	806-824 / 824-849 MHz
B8	897-901 / 906-910 MHz
B3	1710-1785 MHz
B2	1895-1900 MHz
B1	1920-1975 MHz
B7	2500-2570 MHz

JP BANDS TUNED

BAND	FREQUENCY
B28	703-748 MHz
B26	815-845 MHz
B8	880-915 MHz
B11 / B21	1428-1448 / 1448-1463 MHz
B9	1750-1785 MHz
B1	1920-1980 MHz

KR BANDS TUNED

BAND	FREQUENCY
B26	819-849 MHz
B8	905-915 MHz
B3	1710-1785 MHz
B1	1920-1980 MHz
B7	2500-2570 MHz

CL BANDS TUNED

BAND	FREQUENCY
B28	703-748 MHz
B5	824-849 MHz
B8	880-915 MHz
B4	1710-1755 MHz
B2	1850-1910 MHz
B7	2500-2570 MHz

TT BANDS TUNED

BAND	FREQUENCY
B28	703-748 MHz
B5	824-849 MHz
B4	1710-1755 MHz
B2	1850-1910 MHz
B7	2500-2570 MHz

PK BANDS TUNED

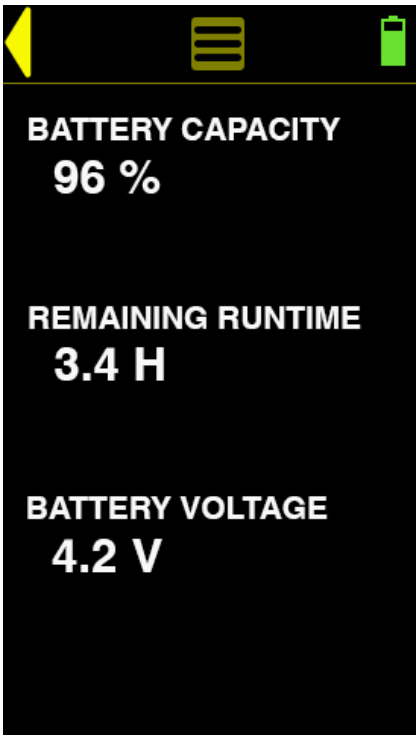
BAND	FREQUENCY
B5	824-849 MHz
B8	880-915 MHz
B3	1710-1785 MHz
B1	1920-1980 MHz

TH BANDS TUNED

BAND	FREQUENCY
B28	703-748 MHz
B5	824-849 MHz
B8	890-915 MHz
B3	1710-1785 MHz
B1	1920-1980 MHz

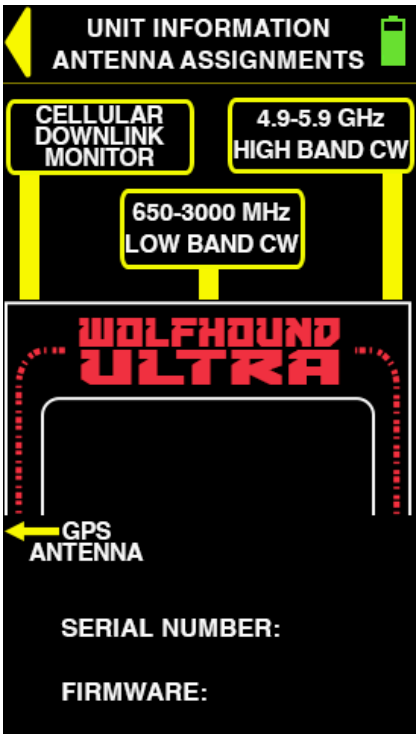
IT BANDS TUNED

BAND	FREQUENCY
B20	832-862 MHz
B8	880-915 MHz
B3	1710-1785 MHz
B1	1920-1980 MHz
B7	2500-2570 MHz



BATTERY STATUS

This screen provides valuable information regarding your internal battery's capacity, runtime and voltage output. If you are experiencing difficulties charging or operating your unit due to battery issues, be sure to note this information when contacting support@bvsystems.com.



UNIT INFO

This screen details the antenna port assignments, unit serial number and firmware version. Be sure to have this information handy when contacting support@bvsystems.com for any reasons.



GPS STATUS

This screen shows information about GPS acquisition in the unit. Be sure your external GPS antenna is connected before viewing this screen.

Thank you for your purchase, we look forward to supporting you and your team.

Customer Support

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